

All India Medical Scholarship Entrance Test

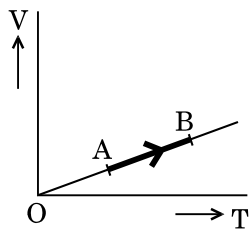


NEET - 2018
All Set Question Paper with Answer Key
(Code AA, BB, CC, DD)

All India Medical Scholarship Entrance Test
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1. The volume (V) of a monatomic gas varies with its temperature (T), as shown in the graph. The ratio of work done by the gas, to the heat absorbed by it, when it undergoes a change from state A to state B, is



- (1) $\frac{1}{3}$
 (2) $\frac{2}{3}$
 (3) $\frac{2}{5}$
 (4) $\frac{2}{7}$
2. The fundamental frequency in an open organ pipe is equal to the third harmonic of a closed organ pipe. If the length of the closed organ pipe is 20 cm, the length of the open organ pipe is
- (1) 12.5 cm
 (2) 8 cm
 (3) 13.2 cm
 (4) 16 cm
3. At what temperature will the rms speed of oxygen molecules become just sufficient for escaping from the Earth's atmosphere?
 (Given :
 Mass of oxygen molecule (m) = 2.76×10^{-26} kg
 Boltzmann's constant $k_B = 1.38 \times 10^{-23}$ J K $^{-1}$)
- (1) 5.016×10^4 K
 (2) 8.360×10^4 K
 (3) 2.508×10^4 K
 (4) 1.254×10^4 K
4. The efficiency of an ideal heat engine working between the freezing point and boiling point of water, is
- (1) 6.25%
 (2) 20%
 (3) 26.8%
 (4) 12.5%

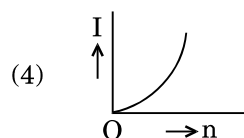
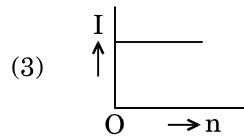
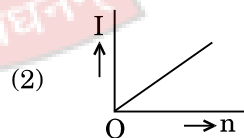
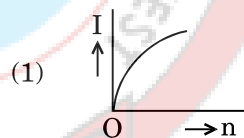
5. A carbon resistor of (47 ± 4.7) k Ω is to be marked with rings of different colours for its identification. The colour code sequence will be

- (1) Yellow – Green – Violet – Gold
 (2) Yellow – Violet – Orange – Silver
 (3) Violet – Yellow – Orange – Silver
 (4) Green – Orange – Violet – Gold

6. A set of 'n' equal resistors, of value 'R' each, are connected in series to a battery of emf 'E' and internal resistance 'R'. The current drawn is I. Now, the 'n' resistors are connected in parallel to the same battery. Then the current drawn from battery becomes 10 I. The value of 'n' is

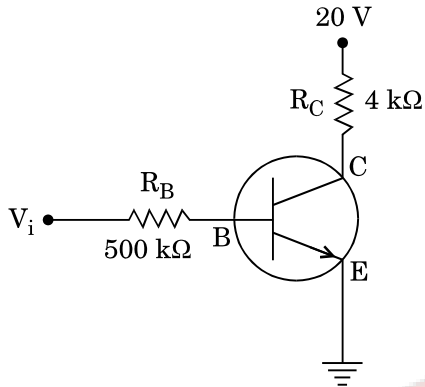
- (1) 20
 (2) 11
 (3) 10
 (4) 9

7. A battery consists of a variable number 'n' of identical cells (having internal resistance 'r' each) which are connected in series. The terminals of the battery are short-circuited and the current I is measured. Which of the graphs shows the correct relationship between I and n?

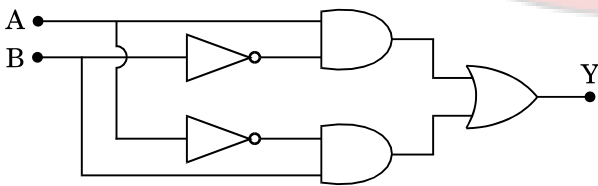


8. Unpolarised light is incident from air on a plane surface of a material of refractive index ' μ '. At a particular angle of incidence ' i ', it is found that the reflected and refracted rays are perpendicular to each other. Which of the following options is correct for this situation ?
- (1) $i = \sin^{-1}\left(\frac{1}{\mu}\right)$
 - (2) Reflected light is polarised with its electric vector perpendicular to the plane of incidence
 - (3) Reflected light is polarised with its electric vector parallel to the plane of incidence
 - (4) $i = \tan^{-1}\left(\frac{1}{\mu}\right)$
9. In Young's double slit experiment the separation d between the slits is 2 mm, the wavelength λ of the light used is 5896 Å and distance D between the screen and slits is 100 cm. It is found that the angular width of the fringes is 0.20° . To increase the fringe angular width to 0.21° (with same λ and D) the separation between the slits needs to be changed to
- (1) 2.1 mm
 - (2) 1.9 mm
 - (3) 1.8 mm
 - (4) 1.7 mm
10. An astronomical refracting telescope will have large angular magnification and high angular resolution, when it has an objective lens of
- (1) large focal length and large diameter
 - (2) large focal length and small diameter
 - (3) small focal length and large diameter
 - (4) small focal length and small diameter
11. The ratio of kinetic energy to the total energy of an electron in a Bohr orbit of the hydrogen atom, is
- (1) 2 : -1
 - (2) 1 : -1
 - (3) 1 : 1
 - (4) 1 : -2
12. An electron of mass m with an initial velocity $\vec{V} = V_0 \hat{i}$ ($V_0 > 0$) enters an electric field $\vec{E} = -E_0 \hat{i}$ ($E_0 = \text{constant} > 0$) at $t = 0$. If λ_0 is its de-Broglie wavelength initially, then its de-Broglie wavelength at time t is
- (1) $\lambda_0 t$
 - (2) $\lambda_0 \left(1 + \frac{eE_0}{mV_0} t\right)$
 - (3) $\frac{\lambda_0}{\left(1 + \frac{eE_0}{mV_0} t\right)}$
 - (4) λ_0
13. For a radioactive material, half-life is 10 minutes. If initially there are 600 number of nuclei, the time taken (in minutes) for the disintegration of 450 nuclei is
- (1) 30
 - (2) 10
 - (3) 20
 - (4) 15
14. When the light of frequency $2\nu_0$ (where ν_0 is threshold frequency), is incident on a metal plate, the maximum velocity of electrons emitted is ν_1 . When the frequency of the incident radiation is increased to $5\nu_0$, the maximum velocity of electrons emitted from the same plate is ν_2 . The ratio of ν_1 to ν_2 is
- (1) 4 : 1
 - (2) 1 : 4
 - (3) 1 : 2
 - (4) 2 : 1

15. In the circuit shown in the figure, the input voltage V_i is 20 V, $V_{BE} = 0$ and $V_{CE} = 0$. The values of I_B , I_C and β are given by



- (1) $I_B = 20 \mu\text{A}$, $I_C = 5 \text{ mA}$, $\beta = 250$
 (2) $I_B = 25 \mu\text{A}$, $I_C = 5 \text{ mA}$, $\beta = 200$
 (3) $I_B = 40 \mu\text{A}$, $I_C = 10 \text{ mA}$, $\beta = 250$
 (4) $I_B = 40 \mu\text{A}$, $I_C = 5 \text{ mA}$, $\beta = 125$
16. In a p-n junction diode, change in temperature due to heating
- (1) does not affect resistance of p-n junction
 (2) affects only forward resistance
 (3) affects only reverse resistance
 (4) affects the overall $V - I$ characteristics of p-n junction
17. In the combination of the following gates the output Y can be written in terms of inputs A and B as



- (1) $\overline{A \cdot B} + A \cdot B$
 (2) $A \cdot \bar{B} + \bar{A} \cdot B$
 (3) $\overline{A \cdot B}$
 (4) $\overline{A + B}$

18. An em wave is propagating in a medium with a velocity $\vec{V} = V \hat{i}$. The instantaneous oscillating electric field of this em wave is along +y axis. Then the direction of oscillating magnetic field of the em wave will be along

- (1) -y direction
 (2) +z direction
 (3) -z direction
 (4) -x direction

19. The refractive index of the material of a prism is $\sqrt{2}$ and the angle of the prism is 30° . One of the two refracting surfaces of the prism is made a mirror inwards, by silver coating. A beam of monochromatic light entering the prism from the other face will retrace its path (after reflection from the silvered surface) if its angle of incidence on the prism is

- (1) 30°
 (2) 45°
 (3) 60°
 (4) zero

20. An object is placed at a distance of 40 cm from a concave mirror of focal length 15 cm. If the object is displaced through a distance of 20 cm towards the mirror, the displacement of the image will be

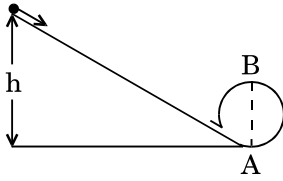
- (1) 30 cm towards the mirror
 (2) 36 cm away from the mirror
 (3) 30 cm away from the mirror
 (4) 36 cm towards the mirror

21. The magnetic potential energy stored in a certain inductor is 25 mJ, when the current in the inductor is 60 mA. This inductor is of inductance

- (1) 1.389 H
 (2) 138.88 H
 (3) 0.138 H
 (4) 13.89 H

22. An electron falls from rest through a vertical distance h in a uniform and vertically upward directed electric field E . The direction of electric field is now reversed, keeping its magnitude the same. A proton is allowed to fall from rest in it through the same vertical distance h . The time of fall of the electron, in comparison to the time of fall of the proton is
- (1) 10 times greater
 - (2) 5 times greater
 - (3) smaller
 - (4) equal
23. The electrostatic force between the metal plates of an isolated parallel plate capacitor C having a charge Q and area A , is
- (1) proportional to the square root of the distance between the plates.
 - (2) linearly proportional to the distance between the plates.
 - (3) independent of the distance between the plates.
 - (4) inversely proportional to the distance between the plates.
24. A tuning fork is used to produce resonance in a glass tube. The length of the air column in this tube can be adjusted by a variable piston. At room temperature of 27°C two successive resonances are produced at 20 cm and 73 cm of column length. If the frequency of the tuning fork is 320 Hz, the velocity of sound in air at 27°C is
- (1) 350 m/s
 - (2) 339 m/s
 - (3) 330 m/s
 - (4) 300 m/s
25. A pendulum is hung from the roof of a sufficiently high building and is moving freely to and fro like a simple harmonic oscillator. The acceleration of the bob of the pendulum is 20 m/s^2 at a distance of 5 m from the mean position. The time period of oscillation is
- (1) 2 s
 - (2) π s
 - (3) 2π s
 - (4) 1 s
26. A metallic rod of mass per unit length 0.5 kg m^{-1} is lying horizontally on a smooth inclined plane which makes an angle of 30° with the horizontal. The rod is not allowed to slide down by flowing a current through it when a magnetic field of induction 0.25 T is acting on it in the vertical direction. The current flowing in the rod to keep it stationary is
- (1) 14.76 A
 - (2) 5.98 A
 - (3) 7.14 A
 - (4) 11.32 A
27. A thin diamagnetic rod is placed vertically between the poles of an electromagnet. When the current in the electromagnet is switched on, then the diamagnetic rod is pushed up, out of the horizontal magnetic field. Hence the rod gains gravitational potential energy. The work required to do this comes from
- (1) the lattice structure of the material of the rod
 - (2) the magnetic field
 - (3) the current source
 - (4) the induced electric field due to the changing magnetic field
28. An inductor 20 mH , a capacitor $100 \mu\text{F}$ and a resistor 50Ω are connected in series across a source of emf, $V = 10 \sin 314 t$. The power loss in the circuit is
- (1) 2.74 W
 - (2) 0.43 W
 - (3) 0.79 W
 - (4) 1.13 W
29. Current sensitivity of a moving coil galvanometer is 5 div/mA and its voltage sensitivity (angular deflection per unit voltage applied) is 20 div/V . The resistance of the galvanometer is
- (1) 250 Ω
 - (2) 25 Ω
 - (3) 40 Ω
 - (4) 500 Ω

30. A body initially at rest and sliding along a frictionless track from a height h (as shown in the figure) just completes a vertical circle of diameter $AB = D$. The height h is equal to

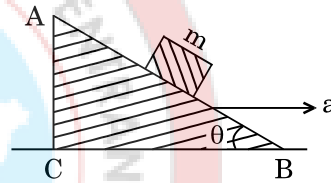


- (1) $\frac{7}{5} D$
 (2) D
 (3) $\frac{3}{2} D$
 (4) $\frac{5}{4} D$
31. Three objects, A : (a solid sphere), B : (a thin circular disk) and C : (a circular ring), each have the same mass M and radius R . They all spin with the same angular speed ω about their own symmetry axes. The amounts of work (W) required to bring them to rest, would satisfy the relation
- (1) $W_B > W_A > W_C$
 (2) $W_A > W_B > W_C$
 (3) $W_C > W_B > W_A$
 (4) $W_A > W_C > W_B$
32. A moving block having mass m , collides with another stationary block having mass $4m$. The lighter block comes to rest after collision. When the initial velocity of the lighter block is v , then the value of coefficient of restitution (e) will be
- (1) 0.8
 (2) 0.25
 (3) 0.5
 (4) 0.4
33. Which one of the following statements is **incorrect** ?
- (1) Frictional force opposes the relative motion.
 (2) Limiting value of static friction is directly proportional to normal reaction.
 (3) Rolling friction is smaller than sliding friction.
 (4) Coefficient of sliding friction has dimensions of length.

34. A toy car with charge q moves on a frictionless horizontal plane surface under the influence of a uniform electric field \vec{E} . Due to the force $q\vec{E}$, its velocity increases from 0 to 6 m/s in one second duration. At that instant the direction of the field is reversed. The car continues to move for two more seconds under the influence of this field. The average velocity and the average speed of the toy car between 0 to 3 seconds are respectively

- (1) 1 m/s, 3.5 m/s
 (2) 1 m/s, 3 m/s
 (3) 2 m/s, 4 m/s
 (4) 1.5 m/s, 3 m/s

35. A block of mass m is placed on a smooth inclined wedge ABC of inclination θ as shown in the figure. The wedge is given an acceleration 'a' towards the right. The relation between a and θ for the block to remain stationary on the wedge is

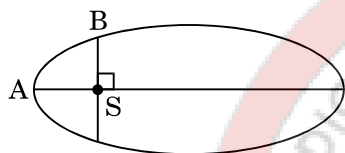


- (1) $a = g \cos \theta$
 (2) $a = \frac{g}{\sin \theta}$
 (3) $a = \frac{g}{\operatorname{cosec} \theta}$
 (4) $a = g \tan \theta$
36. The moment of the force, $\vec{F} = 4\hat{i} + 5\hat{j} - 6\hat{k}$ at $(2, 0, -3)$, about the point $(2, -2, -2)$, is given by
- (1) $-7\hat{i} - 8\hat{j} - 4\hat{k}$
 (2) $-4\hat{i} - \hat{j} - 8\hat{k}$
 (3) $-8\hat{i} - 4\hat{j} - 7\hat{k}$
 (4) $-7\hat{i} - 4\hat{j} - 8\hat{k}$
37. A student measured the diameter of a small steel ball using a screw gauge of least count 0.001 cm. The main scale reading is 5 mm and zero of circular scale division coincides with 25 divisions above the reference level. If screw gauge has a zero error of -0.004 cm, the correct diameter of the ball is
- (1) 0.053 cm
 (2) 0.525 cm
 (3) 0.521 cm
 (4) 0.529 cm

38. A solid sphere is rotating freely about its symmetry axis in free space. The radius of the sphere is increased keeping its mass same. Which of the following physical quantities would remain constant for the sphere ?

- (1) Rotational kinetic energy
- (2) Moment of inertia
- (3) Angular velocity
- (4) Angular momentum

39. The kinetic energies of a planet in an elliptical orbit about the Sun, at positions A, B and C are K_A , K_B and K_C , respectively. AC is the major axis and SB is perpendicular to AC at the position of the Sun S as shown in the figure. Then



- (1) $K_B < K_A < K_C$
- (2) $K_A > K_B > K_C$
- (3) $K_A < K_B < K_C$
- (4) $K_B > K_A > K_C$

40. If the mass of the Sun were ten times smaller and the universal gravitational constant were ten times larger in magnitude, which of the following is **not** correct ?

- (1) Time period of a simple pendulum on the Earth would decrease.
- (2) Walking on the ground would become more difficult.
- (3) Raindrops will fall faster.
- (4) 'g' on the Earth will not change.

41. A solid sphere is in rolling motion. In rolling motion a body possesses translational kinetic energy (K_t) as well as rotational kinetic energy (K_r) simultaneously. The ratio $K_t : (K_t + K_r)$ for the sphere is

- (1) 10 : 7
- (2) 5 : 7
- (3) 7 : 10
- (4) 2 : 5

42. A small sphere of radius 'r' falls from rest in a viscous liquid. As a result, heat is produced due to viscous force. The rate of production of heat when the sphere attains its terminal velocity, is proportional to

- (1) r^5
- (2) r^2
- (3) r^3
- (4) r^4

43. The power radiated by a black body is P and it radiates maximum energy at wavelength, λ_0 . If the temperature of the black body is now changed so that it radiates maximum energy at wavelength $\frac{3}{4}\lambda_0$, the power radiated by it becomes nP. The value of n is

- (1) $\frac{256}{81}$
- (2) $\frac{4}{3}$
- (3) $\frac{3}{4}$
- (4) $\frac{81}{256}$

44. Two wires are made of the same material and have the same volume. The first wire has cross-sectional area A and the second wire has cross-sectional area 3A. If the length of the first wire is increased by Δl on applying a force F, how much force is needed to stretch the second wire by the same amount ?

- (1) 4 F
- (2) 6 F
- (3) 9 F
- (4) F

45. A sample of 0.1 g of water at 100°C and normal pressure ($1.013 \times 10^5 \text{ Nm}^{-2}$) requires 54 cal of heat energy to convert to steam at 100°C . If the volume of the steam produced is 167.1 cc, the change in internal energy of the sample, is

- (1) 42.2 J
- (2) 208.7 J
- (3) 104.3 J
- (4) 84.5 J

46. The correct order of N-compounds in its decreasing order of oxidation states is

- (1) $\text{HNO}_3, \text{NH}_4\text{Cl}, \text{NO}, \text{N}_2$
- (2) $\text{HNO}_3, \text{NO}, \text{NH}_4\text{Cl}, \text{N}_2$
- (3) $\text{HNO}_3, \text{NO}, \text{N}_2, \text{NH}_4\text{Cl}$
- (4) $\text{NH}_4\text{Cl}, \text{N}_2, \text{NO}, \text{HNO}_3$

47. Which one of the following elements is unable to form MF_6^{3-} ion ?

- (1) B
- (2) Al
- (3) Ga
- (4) In

48. Considering Ellingham diagram, which of the following metals can be used to reduce alumina ?

- (1) Mg
- (2) Zn
- (3) Fe
- (4) Cu

49. The correct order of atomic radii in group 13 elements is

- (1) $\text{B} < \text{Ga} < \text{Al} < \text{Tl} < \text{In}$
- (2) $\text{B} < \text{Al} < \text{Ga} < \text{In} < \text{Tl}$
- (3) $\text{B} < \text{Al} < \text{In} < \text{Ga} < \text{Tl}$
- (4) $\text{B} < \text{Ga} < \text{Al} < \text{In} < \text{Tl}$

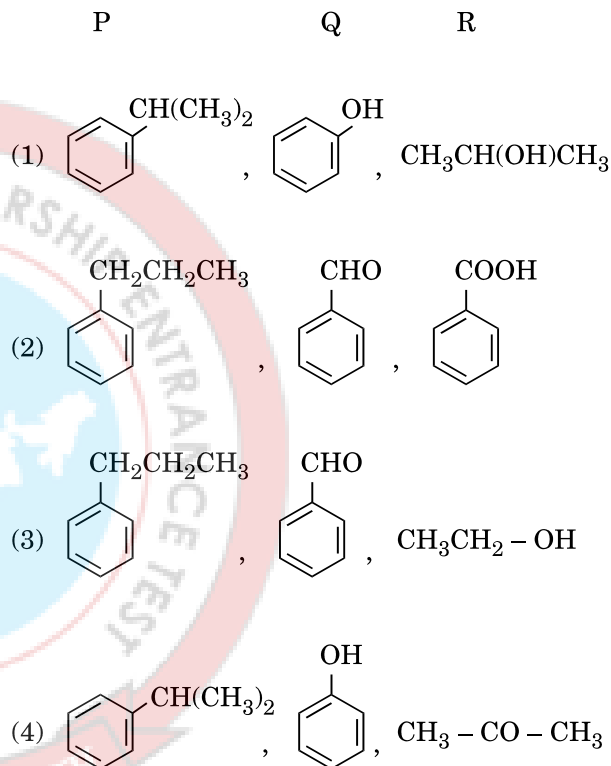
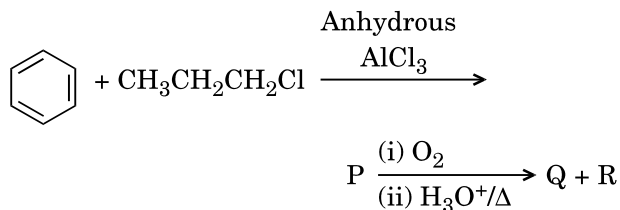
50. Which of the following statements is **not** true for halogens ?

- (1) All but fluorine show positive oxidation states.
- (2) All are oxidizing agents.
- (3) All form monobasic oxyacids.
- (4) Chlorine has the highest electron-gain enthalpy.

51. In the structure of ClF_3 , the number of lone pairs of electrons on central atom 'Cl' is

- (1) four
- (2) two
- (3) one
- (4) three

52. Identify the major products P, Q and R in the following sequence of reactions :



53. Which of the following compounds can form a zwitterion ?

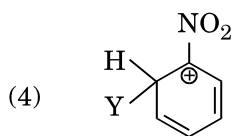
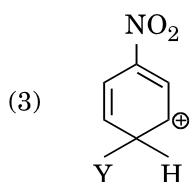
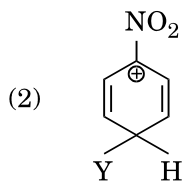
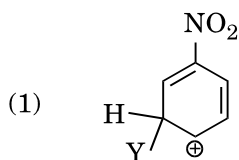
- (1) Benzoic acid
- (2) Acetanilide
- (3) Aniline
- (4) Glycine

54. Regarding cross-linked or network polymers, which of the following statements is **incorrect** ?
- (1) Examples are bakelite and melamine.
 - (2) They are formed from bi- and tri-functional monomers.
 - (3) They contain covalent bonds between various linear polymer chains.
 - (4) They contain strong covalent bonds in their polymer chains.
55. Nitration of aniline in strong acidic medium also gives m-nitroaniline because
- (1) In absence of substituents nitro group always goes to m-position.
 - (2) In electrophilic substitution reactions amino group is meta directive.
 - (3) In spite of substituents nitro group always goes to only m-position.
 - (4) In acidic (strong) medium aniline is present as anilinium ion.
56. The difference between amylose and amylopectin is
- (1) Amylopectin have 1 → 4 α-linkage and 1 → 6 β-linkage
 - (2) Amylose have 1 → 4 α-linkage and 1 → 6 β-linkage
 - (3) Amylopectin have 1 → 4 α-linkage and 1 → 6 α-linkage
 - (4) Amylose is made up of glucose and galactose
57. A mixture of 2.3 g formic acid and 4.5 g oxalic acid is treated with conc. H₂SO₄. The evolved gaseous mixture is passed through KOH pellets. Weight (in g) of the remaining product at STP will be
- (1) 2.8
 - (2) 3.0
 - (3) 1.4
 - (4) 4.4
58. Which of the following oxides is most acidic in nature ?
- (1) BaO
 - (2) BeO
 - (3) MgO
 - (4) CaO
59. Which oxide of nitrogen is **not** a common pollutant introduced into the atmosphere both due to natural and human activity ?
- (1) N₂O
 - (2) NO₂
 - (3) N₂O₅
 - (4) NO
60. The compound A on treatment with Na gives B, and with PCl₅ gives C. B and C react together to give diethyl ether. A, B and C are in the order
- (1) C₂H₅Cl, C₂H₆, C₂H₅OH
 - (2) C₂H₅OH, C₂H₅Cl, C₂H₅ONa
 - (3) C₂H₅OH, C₂H₆, C₂H₅Cl
 - (4) C₂H₅OH, C₂H₅ONa, C₂H₅Cl
61. The compound C₇H₈ undergoes the following reactions :
- $$C_7H_8 \xrightarrow{3 Cl_2 / \Delta} A \xrightarrow{Br_2 / Fe} B \xrightarrow{Zn / HCl} C$$
- The product 'C' is
- (1) 3-bromo-2,4,6-trichlorotoluene
 - (2) o-bromotoluene
 - (3) m-bromotoluene
 - (4) p-bromotoluene
62. Hydrocarbon (A) reacts with bromine by substitution to form an alkyl bromide which by Wurtz reaction is converted to gaseous hydrocarbon containing less than four carbon atoms. (A) is
- (1) CH₃ - CH₃
 - (2) CH₂ = CH₂
 - (3) CH ≡ CH
 - (4) CH₄

63. Which of the following molecules represents the order of hybridisation sp^2 , sp^2 , sp , sp from left to right atoms ?

- (1) $CH_2 = CH - CH = CH_2$
- (2) $CH_2 = CH - C \equiv CH$
- (3) $HC \equiv C - C \equiv CH$
- (4) $CH_3 - CH = CH - CH_3$

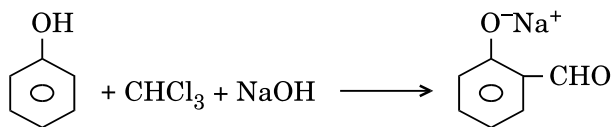
64. Which of the following carbocations is expected to be most stable ?



65. Which of the following is correct with respect to -I effect of the substituents ? (R = alkyl)

- (1) $-NH_2 > -OR > -F$
- (2) $-NR_2 < -OR < -F$
- (3) $-NH_2 < -OR < -F$
- (4) $-NR_2 > -OR > -F$

66. In the reaction



the electrophile involved is

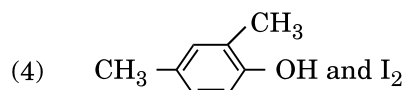
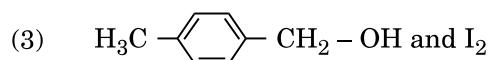
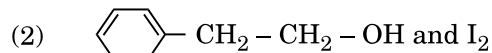
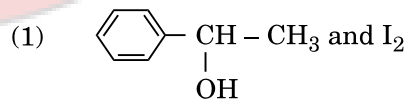
- (1) dichloromethyl anion ($\ominus\text{CHCl}_2$)
- (2) formyl cation ($\oplus\text{CHO}$)
- (3) dichloromethyl cation ($\oplus\text{CHCl}_2$)
- (4) dichlorocarbene ($:\text{CCl}_2$)

67. Carboxylic acids have higher boiling points than aldehydes, ketones and even alcohols of comparable molecular mass. It is due to their

- (1) more extensive association of carboxylic acid via van der Waals force of attraction
- (2) formation of carboxylate ion
- (3) formation of intramolecular H-bonding
- (4) formation of intermolecular H-bonding

68. Compound A, $C_8H_{10}O$, is found to react with NaOI (produced by reacting Y with NaOH) and yields a yellow precipitate with characteristic smell.

A and Y are respectively



69. Match the metal ions given in Column I with the spin magnetic moments of the ions given in Column II and assign the **correct** code :

Column I		Column II	
a. Co^{3+}		i. $\sqrt{8}$ B.M.	
b. Cr^{3+}		ii. $\sqrt{35}$ B.M.	
c. Fe^{3+}		iii. $\sqrt{3}$ B.M.	
d. Ni^{2+}		iv. $\sqrt{24}$ B.M.	
		v. $\sqrt{15}$ B.M.	

	a	b	c	d
(1)	iv	i	ii	iii
(2)	i	ii	iii	iv
(3)	iv	v	ii	i
(4)	iii	v	i	ii

70. Which one of the following ions exhibits d-d transition and paramagnetism as well ?

- (1) MnO_4^-
- (2) $\text{Cr}_2\text{O}_7^{2-}$
- (3) CrO_4^{2-}
- (4) MnO_4^{2-}

71. Iron carbonyl, $\text{Fe}(\text{CO})_5$ is

- (1) trinuclear
- (2) mononuclear
- (3) tetranuclear
- (4) dinuclear

72. The type of isomerism shown by the complex $[\text{CoCl}_2(\text{en})_2]$ is

- (1) Ionization isomerism
- (2) Coordination isomerism
- (3) Geometrical isomerism
- (4) Linkage isomerism

73. The geometry and magnetic behaviour of the complex $[\text{Ni}(\text{CO})_4]$ are

- (1) square planar geometry and paramagnetic
- (2) tetrahedral geometry and diamagnetic
- (3) square planar geometry and diamagnetic
- (4) tetrahedral geometry and paramagnetic

74. Following solutions were prepared by mixing different volumes of NaOH and HCl of different concentrations :

- a. 60 mL $\frac{M}{10}$ HCl + 40 mL $\frac{M}{10}$ NaOH
- b. 55 mL $\frac{M}{10}$ HCl + 45 mL $\frac{M}{10}$ NaOH
- c. 75 mL $\frac{M}{5}$ HCl + 25 mL $\frac{M}{5}$ NaOH
- d. 100 mL $\frac{M}{10}$ HCl + 100 mL $\frac{M}{10}$ NaOH

pH of which one of them will be equal to 1 ?

- (1) d
- (2) a
- (3) b
- (4) c

75. On which of the following properties does the coagulating power of an ion depend ?

- (1) Both magnitude and sign of the charge on the ion
- (2) Size of the ion alone
- (3) The magnitude of the charge on the ion alone
- (4) The sign of charge on the ion alone

76. Given van der Waals constant for NH_3 , H_2 , O_2 and CO_2 are respectively 4.17, 0.244, 1.36 and 3.59, which one of the following gases is most easily liquefied ?

- (1) O_2
- (2) H_2
- (3) NH_3
- (4) CO_2

77. The solubility of BaSO_4 in water is $2.42 \times 10^{-3} \text{ gL}^{-1}$ at 298 K. The value of its solubility product (K_{sp}) will be

(Given molar mass of $\text{BaSO}_4 = 233 \text{ g mol}^{-1}$)

- (1) $1.08 \times 10^{-14} \text{ mol}^2 \text{ L}^{-2}$
- (2) $1.08 \times 10^{-12} \text{ mol}^2 \text{ L}^{-2}$
- (3) $1.08 \times 10^{-10} \text{ mol}^2 \text{ L}^{-2}$
- (4) $1.08 \times 10^{-8} \text{ mol}^2 \text{ L}^{-2}$

78. In which case is the number of molecules of water maximum ?

- (1) 0.00224 L of water vapours at 1 atm and 273 K
- (2) 0.18 g of water
- (3) 18 mL of water
- (4) 10^{-3} mol of water

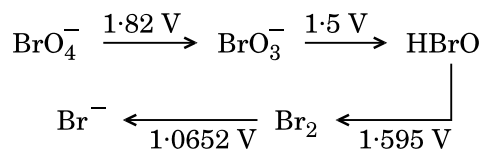
79. The correct difference between first- and second-order reactions is that

- (1) a first-order reaction can be catalyzed; a second-order reaction cannot be catalyzed
- (2) the half-life of a first-order reaction does not depend on $[A]_0$; the half-life of a second-order reaction does depend on $[A]_0$
- (3) the rate of a first-order reaction does not depend on reactant concentrations; the rate of a second-order reaction does depend on reactant concentrations
- (4) the rate of a first-order reaction does depend on reactant concentrations; the rate of a second-order reaction does not depend on reactant concentrations

80. Among CaH_2 , BeH_2 , BaH_2 , the order of ionic character is

- (1) $\text{BeH}_2 < \text{BaH}_2 < \text{CaH}_2$
- (2) $\text{CaH}_2 < \text{BeH}_2 < \text{BaH}_2$
- (3) $\text{BeH}_2 < \text{CaH}_2 < \text{BaH}_2$
- (4) $\text{BaH}_2 < \text{BeH}_2 < \text{CaH}_2$

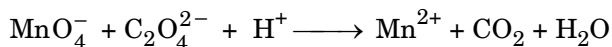
81. Consider the change in oxidation state of Bromine corresponding to different emf values as shown in the diagram below :



Then the species undergoing disproportionation is

- (1) Br_2
- (2) BrO_4^-
- (3) BrO_3^-
- (4) HBrO

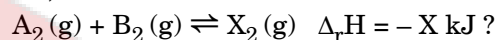
82. For the redox reaction



the correct coefficients of the reactants for the balanced equation are

- | | MnO_4^- | $\text{C}_2\text{O}_4^{2-}$ | H^+ |
|-----|------------------|-----------------------------|--------------|
| (1) | 2 | 16 | 5 |
| (2) | 2 | 5 | 16 |
| (3) | 16 | 5 | 2 |
| (4) | 5 | 16 | 2 |

83. Which one of the following conditions will favour maximum formation of the product in the reaction,



- (1) High temperature and high pressure
- (2) Low temperature and low pressure
- (3) Low temperature and high pressure
- (4) High temperature and low pressure

84. When initial concentration of the reactant is doubled, the half-life period of a zero order reaction

- (1) is tripled
- (2) is doubled
- (3) is halved
- (4) remains unchanged

85. The bond dissociation energies of X_2 , Y_2 and XY are in the ratio of 1 : 0.5 : 1. ΔH for the formation of XY is -200 kJ mol^{-1} . The bond dissociation energy of X_2 will be

- (1) 800 kJ mol^{-1}
- (2) 100 kJ mol^{-1}
- (3) 200 kJ mol^{-1}
- (4) 400 kJ mol^{-1}

86. The correction factor 'a' to the ideal gas equation corresponds to

- (1) electric field present between the gas molecules
- (2) volume of the gas molecules
- (3) density of the gas molecules
- (4) forces of attraction between the gas molecules

87. Consider the following species :



Which one of these will have the highest bond order ?

- (1) CN^+
- (2) CN^-
- (3) NO
- (4) CN

88. Magnesium reacts with an element (X) to form an ionic compound. If the ground state electronic configuration of (X) is $1s^2 2s^2 2p^3$, the simplest formula for this compound is

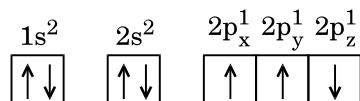
- (1) Mg_2X
- (2) MgX_2
- (3) Mg_2X_3
- (4) Mg_3X_2

89. Iron exhibits bcc structure at room temperature. Above 900°C , it transforms to fcc structure. The ratio of density of iron at room temperature to that at 900°C (assuming molar mass and atomic radii of iron remains constant with temperature) is

- (1) $\frac{3\sqrt{3}}{4\sqrt{2}}$
- (2) $\frac{4\sqrt{3}}{3\sqrt{2}}$
- (3) $\frac{\sqrt{3}}{\sqrt{2}}$
- (4) $\frac{1}{2}$

90. Which one is a **wrong** statement ?

(1) The electronic configuration of N atom is



- (2) An orbital is designated by three quantum numbers while an electron in an atom is designated by four quantum numbers.
- (3) Total orbital angular momentum of electron in 's' orbital is equal to zero.
- (4) The value of m for d_{z^2} is zero.

91. Oxygen is **not** produced during photosynthesis by

- (1) *Cycas*
- (2) *Nostoc*
- (3) Green sulphur bacteria
- (4) *Chara*

92. Double fertilization is

- (1) Fusion of two male gametes with one egg
- (2) Fusion of one male gamete with two polar nuclei
- (3) Fusion of two male gametes of a pollen tube with two different eggs
- (4) Syngamy and triple fusion

93. Which one of the following plants shows a very close relationship with a species of moth, where none of the two can complete its life cycle without the other ?

- (1) Banana
- (2) *Yucca*
- (3) *Hydrilla*
- (4) *Viola*

94. Pollen grains can be stored for several years in liquid nitrogen having a temperature of

- (1) -196°C
- (2) -80°C
- (3) -120°C
- (4) -160°C

95. Which of the following elements is responsible for maintaining turgor in cells ?

- (1) Potassium
- (2) Sodium
- (3) Magnesium
- (4) Calcium

96. What is the role of NAD^+ in cellular respiration ?

- (1) It is a nucleotide source for ATP synthesis.
- (2) It functions as an electron carrier.
- (3) It functions as an enzyme.
- (4) It is the final electron acceptor for anaerobic respiration.

97. In which of the following forms is iron absorbed by plants ?

- (1) Free element
- (2) Ferrous
- (3) Ferric
- (4) Both ferric and ferrous

98. Which of the following is commonly used as a vector for introducing a DNA fragment in human lymphocytes ?
- (1) λ phage
 - (2) Ti plasmid
 - (3) Retrovirus
 - (4) pBR 322
99. Use of bioresources by multinational companies and organisations without authorisation from the concerned country and its people is called
- (1) Biodegradation
 - (2) Biopiracy
 - (3) Bio-infringement
 - (4) Bioexploitation
100. In India, the organisation responsible for assessing the safety of introducing genetically modified organisms for public use is
- (1) Research Committee on Genetic Manipulation (RCGM)
 - (2) Council for Scientific and Industrial Research (CSIR)
 - (3) Indian Council of Medical Research (ICMR)
 - (4) Genetic Engineering Appraisal Committee (GEAC)
101. The correct order of steps in Polymerase Chain Reaction (PCR) is
- (1) Denaturation, Extension, Annealing
 - (2) Annealing, Extension, Denaturation
 - (3) Extension, Denaturation, Annealing
 - (4) Denaturation, Annealing, Extension
102. Select the **correct** match :
- (1) T.H. Morgan – Transduction
 - (2) $F_2 \times$ Recessive parent – Dihybrid cross
 - (3) Ribozyme – Nucleic acid
 - (4) G. Mendel – Transformation
103. A 'new' variety of rice was patented by a foreign company, though such varieties have been present in India for a long time. This is related to
- (1) Lerma Rojo
 - (2) Sharbati Sonora
 - (3) Co-667
 - (4) Basmati
104. Which of the following pairs is **wrongly** matched ?
- (1) XO type sex determination : Grasshopper
 - (2) ABO blood grouping : Co-dominance
 - (3) Starch synthesis in pea : Multiple alleles
 - (4) T.H. Morgan : Linkage
105. Select the **correct** statement :
- (1) Spliceosomes take part in translation.
 - (2) Punnett square was developed by a British scientist.
 - (3) Franklin Stahl coined the term "linkage".
 - (4) Transduction was discovered by S. Altman.
106. The experimental proof for semiconservative replication of DNA was first shown in a
- (1) Plant
 - (2) Bacterium
 - (3) Fungus
 - (4) Virus
107. Which of the following flowers only once in its life-time ?
- (1) Mango
 - (2) Jackfruit
 - (3) Bamboo species
 - (4) Papaya
108. Offsets are produced by
- (1) Parthenocarp
 - (2) Mitotic divisions
 - (3) Meiotic divisions
 - (4) Parthenogenesis
109. Select the **correct** match :
- (1) Matthew Meselson and F. Stahl – *Pisum sativum*
 - (2) Alfred Hershey and Martha Chase – TMV
 - (3) Alec Jeffreys – *Streptococcus pneumoniae*
 - (4) Francois Jacob and Jacques Monod – *Lac operon*
110. Which of the following has proved helpful in preserving pollen as fossils ?
- (1) Oil content
 - (2) Cellulosic intine
 - (3) Pollenkitt
 - (4) Sporopollenin

- 111.** Natality refers to
- (1) Number of individuals leaving the habitat
 - (2) Birth rate
 - (3) Death rate
 - (4) Number of individuals entering a habitat
- 112.** World Ozone Day is celebrated on
- (1) 16th September
 - (2) 21st April
 - (3) 5th June
 - (4) 22nd April
- 113.** Which of the following is a secondary pollutant ?
- (1) SO₂
 - (2) CO₂
 - (3) CO
 - (4) O₃
- 114.** Niche is
- (1) the range of temperature that the organism needs to live
 - (2) the physical space where an organism lives
 - (3) all the biological factors in the organism's environment
 - (4) the functional role played by the organism where it lives
- 115.** What type of ecological pyramid would be obtained with the following data ?
 Secondary consumer : 120 g
 Primary consumer : 60 g
 Primary producer : 10 g
- (1) Upright pyramid of numbers
 - (2) Pyramid of energy
 - (3) Inverted pyramid of biomass
 - (4) Upright pyramid of biomass
- 116.** In stratosphere, which of the following elements acts as a catalyst in degradation of ozone and release of molecular oxygen ?
- (1) Fe
 - (2) Cl
 - (3) Carbon
 - (4) Oxygen
- 117.** The two functional groups characteristic of sugars are
- (1) carbonyl and phosphate
 - (2) carbonyl and methyl
 - (3) hydroxyl and methyl
 - (4) carbonyl and hydroxyl
- 118.** Which among the following is **not** a prokaryote ?
- (1) *Nostoc*
 - (2) *Mycobacterium*
 - (3) *Saccharomyces*
 - (4) *Oscillatoria*
- 119.** The Golgi complex participates in
- (1) Respiration in bacteria
 - (2) Formation of secretory vesicles
 - (3) Fatty acid breakdown
 - (4) Activation of amino acid
- 120.** Which of the following is **not** a product of light reaction of photosynthesis ?
- (1) NADPH
 - (2) NADH
 - (3) ATP
 - (4) Oxygen
- 121.** Which of the following is true for nucleolus ?
- (1) It takes part in spindle formation.
 - (2) It is a membrane-bound structure.
 - (3) Larger nucleoli are present in dividing cells.
 - (4) It is a site for active ribosomal RNA synthesis.
- 122.** Stomatal movement is **not** affected by
- (1) O₂ concentration
 - (2) Light
 - (3) Temperature
 - (4) CO₂ concentration
- 123.** The stage during which separation of the paired homologous chromosomes begins is
- (1) Diakinesis
 - (2) Diplotene
 - (3) Pachytene
 - (4) Zygotene
- 124.** Stomata in grass leaf are
- (1) Rectangular
 - (2) Kidney shaped
 - (3) Dumb-bell shaped
 - (4) Barrel shaped

125. Secondary xylem and phloem in dicot stem are produced by

- (1) Phellogen
- (2) Vascular cambium
- (3) Apical meristems
- (4) Axillary meristems

126. Pneumatophores occur in

- (1) Carnivorous plants
- (2) Free-floating hydrophytes
- (3) Halophytes
- (4) Submerged hydrophytes

127. Casparian strips occur in

- (1) Cortex
- (2) Pericycle
- (3) Epidermis
- (4) Endodermis

128. Plants having little or no secondary growth are

- (1) Conifers
- (2) Deciduous angiosperms
- (3) Grasses
- (4) Cycads

129. Sweet potato is a modified

- (1) Tap root
- (2) Adventitious root
- (3) Stem
- (4) Rhizome

130. Which of the following statements is **correct** ?

- (1) Horsetails are gymnosperms.
- (2) *Selaginella* is heterosporous, while *Salvinia* is homosporous.
- (3) Ovules are not enclosed by ovary wall in gymnosperms.
- (4) Stems are usually unbranched in both *Cycas* and *Cedrus*.

131. Select the **wrong** statement :

- (1) Pseudopodia are locomotory and feeding structures in Sporozoans.
- (2) Mushrooms belong to Basidiomycetes.
- (3) Cell wall is present in members of Fungi and Plantae.
- (4) Mitochondria are the powerhouse of the cell in all kingdoms except Monera.

132. After karyogamy followed by meiosis, spores are produced exogenously in

- (1) *Agaricus*
- (2) *Alternaria*
- (3) *Neurospora*
- (4) *Saccharomyces*

133. Match the items given in Column I with those in Column II and select the **correct** option given below :

Column I

Column II

- | | |
|--------------|---|
| a. Herbarium | i. It is a place having a collection of preserved plants and animals. |
| b. Key | ii. A list that enumerates methodically all the species found in an area with brief description aiding identification. |
| c. Museum | iii. Is a place where dried and pressed plant specimens mounted on sheets are kept. |
| d. Catalogue | iv. A booklet containing a list of characters and their alternates which are helpful in identification of various taxa. |

- | | a | b | c | d |
|-----|-----|----|-----|----|
| (1) | ii | iv | iii | i |
| (2) | iii | ii | i | iv |
| (3) | i | iv | iii | ii |
| (4) | iii | iv | i | ii |

134. Winged pollen grains are present in

- (1) Mango
- (2) *Cycas*
- (3) Mustard
- (4) *Pinus*

135. Which one is **wrongly** matched ?

- | | | |
|----------------------------|---|---------------------|
| (1) Gemma cups | – | <i>Marchantia</i> |
| (2) Biflagellate zoospores | – | Brown algae |
| (3) Uniflagellate gametes | – | <i>Polysiphonia</i> |
| (4) Unicellular organism | – | <i>Chlorella</i> |

136. Which of the following options correctly represents the lung conditions in asthma and emphysema, respectively ?

- (1) Increased respiratory surface; Inflammation of bronchioles
- (2) Increased number of bronchioles; Increased respiratory surface
- (3) Inflammation of bronchioles; Decreased respiratory surface
- (4) Decreased respiratory surface; Inflammation of bronchioles

137. Match the items given in Column I with those in Column II and select the **correct** option given below :

<i>Column I</i>		<i>Column II</i>	
a. Tricuspid valve	i.	Between left atrium and left ventricle	
b. Bicuspid valve	ii.	Between right ventricle and pulmonary artery	
c. Semilunar valve	iii.	Between right atrium and right ventricle	

- | | a | b | c |
|-----|----------|----------|----------|
| (1) | i | ii | iii |
| (2) | i | iii | ii |
| (3) | iii | i | ii |
| (4) | ii | i | iii |

138. Match the items given in Column I with those in Column II and select the **correct** option given below :

<i>Column I</i>		<i>Column II</i>	
a. Tidal volume	i.	2500 – 3000 mL	
b. Inspiratory Reserve volume	ii.	1100 – 1200 mL	
c. Expiratory Reserve volume	iii.	500 – 550 mL	
d. Residual volume	iv.	1000 – 1100 mL	

- | | a | b | c | d |
|-----|----------|----------|----------|----------|
| (1) | i | iv | ii | iii |
| (2) | iii | i | iv | ii |
| (3) | iii | ii | i | iv |
| (4) | iv | iii | ii | i |

139. The transparent lens in the human eye is held in its place by

- (1) smooth muscles attached to the iris
- (2) ligaments attached to the iris
- (3) ligaments attached to the ciliary body
- (4) smooth muscles attached to the ciliary body

140. Which of the following is an amino acid derived hormone ?

- (1) Estradiol
- (2) Ecdysone
- (3) Epinephrine
- (4) Estriol

141. Which of the following hormones can play a significant role in osteoporosis ?

- (1) Estrogen and Parathyroid hormone
- (2) Progesterone and Aldosterone
- (3) Aldosterone and Prolactin
- (4) Parathyroid hormone and Prolactin

142. Which of the following structures or regions is **incorrectly** paired with its function ?

- (1) Hypothalamus : production of releasing hormones and regulation of temperature, hunger and thirst.
- (2) Limbic system : consists of fibre tracts that interconnect different regions of brain; controls movement.
- (3) Medulla oblongata : controls respiration and cardiovascular reflexes.
- (4) Corpus callosum : band of fibers connecting left and right cerebral hemispheres.

143. The amnion of mammalian embryo is derived from
- (1) mesoderm and trophoblast
 - (2) endoderm and mesoderm
 - (3) ectoderm and mesoderm
 - (4) ectoderm and endoderm
144. Hormones secreted by the placenta to maintain pregnancy are
- (1) hCG, hPL, progesterones, estrogens
 - (2) hCG, hPL, estrogens, relaxin, oxytocin
 - (3) hCG, hPL, progesterones, prolactin
 - (4) hCG, progesterones, estrogens, glucocorticoids
145. The difference between spermiogenesis and spermiation is
- (1) In spermiogenesis spermatozoa from sertoli cells are released into the cavity of seminiferous tubules, while in spermiation spermatozoa are formed.
 - (2) In spermiogenesis spermatozoa are formed, while in spermiation spermatids are formed.
 - (3) In spermiogenesis spermatids are formed, while in spermiation spermatozoa are formed.
 - (4) In spermiogenesis spermatozoa are formed, while in spermiation spermatozoa are released from sertoli cells into the cavity of seminiferous tubules.
146. The contraceptive 'SAHELI'
- (1) is an IUD.
 - (2) increases the concentration of estrogen and prevents ovulation in females.
 - (3) blocks estrogen receptors in the uterus, preventing eggs from getting implanted.
 - (4) is a post-coital contraceptive.
147. Ciliates differ from all other protozoans in
- (1) using pseudopodia for capturing prey
 - (2) having a contractile vacuole for removing excess water
 - (3) using flagella for locomotion
 - (4) having two types of nuclei
148. Identify the vertebrate group of animals characterized by crop and gizzard in its digestive system.
- (1) Aves
 - (2) Reptilia
 - (3) Amphibia
 - (4) Osteichthyes
149. Which of the following features is used to identify a male cockroach from a female cockroach ?
- (1) Forewings with darker tegmina
 - (2) Presence of caudal styles
 - (3) Presence of a boat shaped sternum on the 9th abdominal segment
 - (4) Presence of anal cerci
150. Which one of these animals is **not** a homeotherm ?
- (1) *Camelus*
 - (2) *Chelone*
 - (3) *Macropus*
 - (4) *Psittacula*
151. Which of the following animals does **not** undergo metamorphosis ?
- (1) Moth
 - (2) Tunicate
 - (3) Earthworm
 - (4) Starfish
152. Which of the following organisms are known as chief producers in the oceans ?
- (1) Cyanobacteria
 - (2) Diatoms
 - (3) Dinoflagellates
 - (4) Euglenoids

153. Which one of the following population interactions is widely used in medical science for the production of antibiotics ?

- (1) Parasitism
- (2) Mutualism
- (3) Commensalism
- (4) Amensalism

154. All of the following are included in 'Ex-situ conservation' *except*

- (1) Botanical gardens
- (2) Sacred groves
- (3) Wildlife safari parks
- (4) Seed banks

155. Match the items given in Column I with those in Column II and select the **correct** option given below :

Column I

Column II

- | | |
|----------------------|--------------------------|
| a. Eutrophication | i. UV-B radiation |
| b. Sanitary landfill | ii. Deforestation |
| c. Snow blindness | iii. Nutrient enrichment |
| d. Jhum cultivation | iv. Waste disposal |

a b c d

- | | | | |
|---------|-----|-----|-----|
| (1) iii | iv | i | ii |
| (2) i | iii | iv | ii |
| (3) ii | i | iii | iv |
| (4) i | ii | iv | iii |

156. In a growing population of a country,

- (1) reproductive and pre-reproductive individuals are equal in number.
- (2) reproductive individuals are less than the post-reproductive individuals.
- (3) pre-reproductive individuals are more than the reproductive individuals.
- (4) pre-reproductive individuals are less than the reproductive individuals.

157. Which part of poppy plant is used to obtain the drug "Smack" ?

- (1) Roots
- (2) Latex
- (3) Flowers
- (4) Leaves

158. All of the following are part of an operon *except*

- (1) an enhancer
- (2) structural genes
- (3) an operator
- (4) a promoter

159. A woman has an X-linked condition on one of her X chromosomes. This chromosome can be inherited by

- (1) Only grandchildren
- (2) Only sons
- (3) Only daughters
- (4) Both sons and daughters

160. According to Hugo de Vries, the mechanism of evolution is

- (1) Phenotypic variations
- (2) Saltation
- (3) Multiple step mutations
- (4) Minor mutations

161. AGGTATCGCAT is a sequence from the coding strand of a gene. What will be the corresponding sequence of the transcribed mRNA ?

- (1) ACCUAUGCGAU
- (2) UGGTUTCGCAT
- (3) AGGUAUCGCAU
- (4) UCCAUAGCGUA

162. Match the items given in Column I with those in Column II and select the **correct** option given below :

Column I

Column II

- | | |
|------------------------|------------------------------------|
| a. Proliferative Phase | i. Breakdown of endometrial lining |
| b. Secretory Phase | ii. Follicular Phase |
| c. Menstruation | iii. Luteal Phase |

a b c

- | | | |
|---------|-----|----|
| (1) ii | iii | i |
| (2) i | iii | ii |
| (3) iii | ii | i |
| (4) iii | i | ii |

- 163.** Match the items given in Column I with those in Column II and select the **correct** option given below :

<i>Column I</i>		<i>Column II</i>	
a. Glycosuria		i. Accumulation of uric acid in joints	
b. Gout		ii. Mass of crystallised salts within the kidney	
c. Renal calculi		iii. Inflammation in glomeruli	
d. Glomerular nephritis		iv. Presence of glucose in urine	
a	b	c	d
(1) ii	iii	i	iv
(2) i	ii	iii	iv
(3) iii	ii	iv	i
(4) iv	i	ii	iii

- 164.** Match the items given in Column I with those in Column II and select the **correct** option given below :

<i>Column I</i> (Function)		<i>Column II</i> (Part of Excretory System)	
a. Ultrafiltration		i. Henle's loop	
b. Concentration of urine		ii. Ureter	
c. Transport of urine		iii. Urinary bladder	
d. Storage of urine		iv. Malpighian corpuscle	
		v. Proximal convoluted tubule	
a	b	c	d
(1) v	iv	i	ii
(2) iv	i	ii	iii
(3) iv	v	ii	iii
(4) v	iv	i	iii

- 165.** Which of the following gastric cells indirectly help in erythropoiesis ?

- (1) Goblet cells
- (2) Mucous cells
- (3) Chief cells
- (4) Parietal cells

- 166.** Match the items given in Column I with those in Column II and select the **correct** option given below :

<i>Column I</i>		<i>Column II</i>	
a. Fibrinogen		i. Osmotic balance	
b. Globulin		ii. Blood clotting	
c. Albumin		iii. Defence mechanism	
a	b	c	
(1) i	iii	ii	
(2) i	ii	iii	
(3) iii	ii	i	
(4) ii	iii	i	

- 167.** Which of the following is an occupational respiratory disorder ?

- (1) Botulism
- (2) Silicosis
- (3) Anthracis
- (4) Emphysema

- 168.** Calcium is important in skeletal muscle contraction because it

- (1) detaches the myosin head from the actin filament.
- (2) activates the myosin ATPase by binding to it.
- (3) binds to troponin to remove the masking of active sites on actin for myosin.
- (4) prevents the formation of bonds between the myosin cross bridges and the actin filament.

169. Nissl bodies are mainly composed of

- (1) Nucleic acids and SER
- (2) DNA and RNA
- (3) Proteins and lipids
- (4) Free ribosomes and RER

170. Which of these statements is **incorrect** ?

- (1) Glycolysis operates as long as it is supplied with NAD that can pick up hydrogen atoms.
- (2) Glycolysis occurs in cytosol.
- (3) Enzymes of TCA cycle are present in mitochondrial matrix.
- (4) Oxidative phosphorylation takes place in outer mitochondrial membrane.

171. Select the **incorrect** match :

- (1) Submetacentric – L-shaped chromosomes
- (2) Allosomes – Sex chromosomes
- (3) Lampbrush chromosomes – Diplotene bivalents
- (4) Polytene chromosomes – Oocytes of amphibians

172. Which of the following terms describe human dentition ?

- (1) Pleurodont, Monophodont, Homodont
- (2) Thecodont, Diphyodont, Heterodont
- (3) Thecodont, Diphyodont, Homodont
- (4) Pleurodont, Diphyodont, Heterodont

173. Which of the following events does **not** occur in rough endoplasmic reticulum ?

- (1) Cleavage of signal peptide
- (2) Protein glycosylation
- (3) Protein folding
- (4) Phospholipid synthesis

174. Many ribosomes may associate with a single mRNA to form multiple copies of a polypeptide simultaneously. Such strings of ribosomes are termed as

- (1) Plastidome
- (2) Polyhedral bodies
- (3) Polysome
- (4) Nucleosome

175. In which disease does mosquito transmitted pathogen cause chronic inflammation of lymphatic vessels ?

- (1) Ringworm disease
- (2) Ascariasis
- (3) Elephantiasis
- (4) Amoebiasis

176. Which of the following is **not** an autoimmune disease ?

- (1) Alzheimer's disease
- (2) Rheumatoid arthritis
- (3) Psoriasis
- (4) Vitiligo

177. Among the following sets of examples for divergent evolution, select the **incorrect** option :

- (1) Brain of bat, man and cheetah
- (2) Heart of bat, man and cheetah
- (3) Forelimbs of man, bat and cheetah
- (4) Eye of octopus, bat and man

178. Conversion of milk to curd improves its nutritional value by increasing the amount of

- (1) Vitamin B₁₂
- (2) Vitamin A
- (3) Vitamin D
- (4) Vitamin E

179. The similarity of bone structure in the forelimbs of many vertebrates is an example of

- (1) Convergent evolution
- (2) Analogy
- (3) Homology
- (4) Adaptive radiation

180. Which of the following characteristics represent 'Inheritance of blood groups' in humans ?

- a. Dominance
- b. Co-dominance
- c. Multiple allele
- d. Incomplete dominance
- e. Polygenic inheritance

- (1) b, d and e
- (2) a, b and c
- (3) b, c and e
- (4) a, c and e

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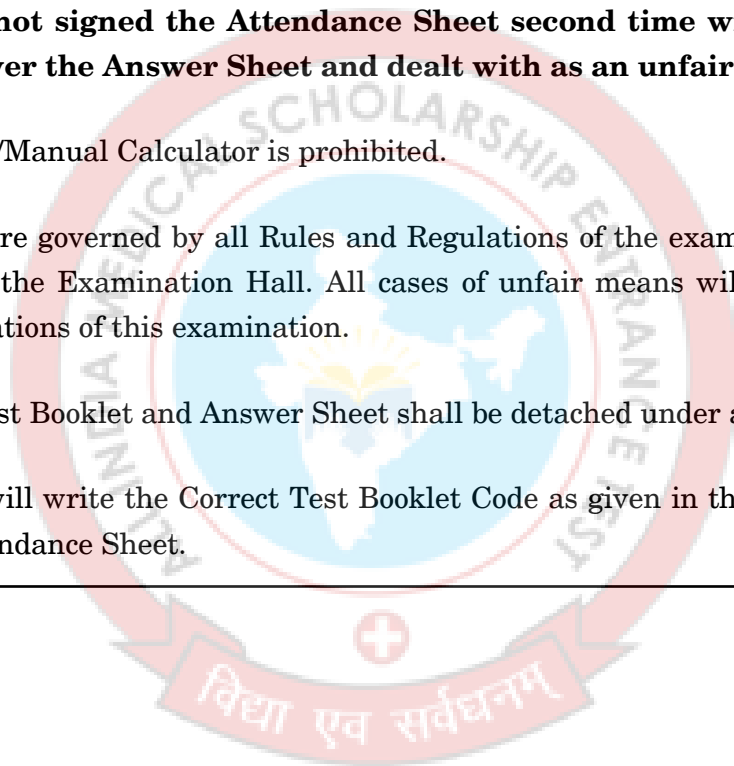


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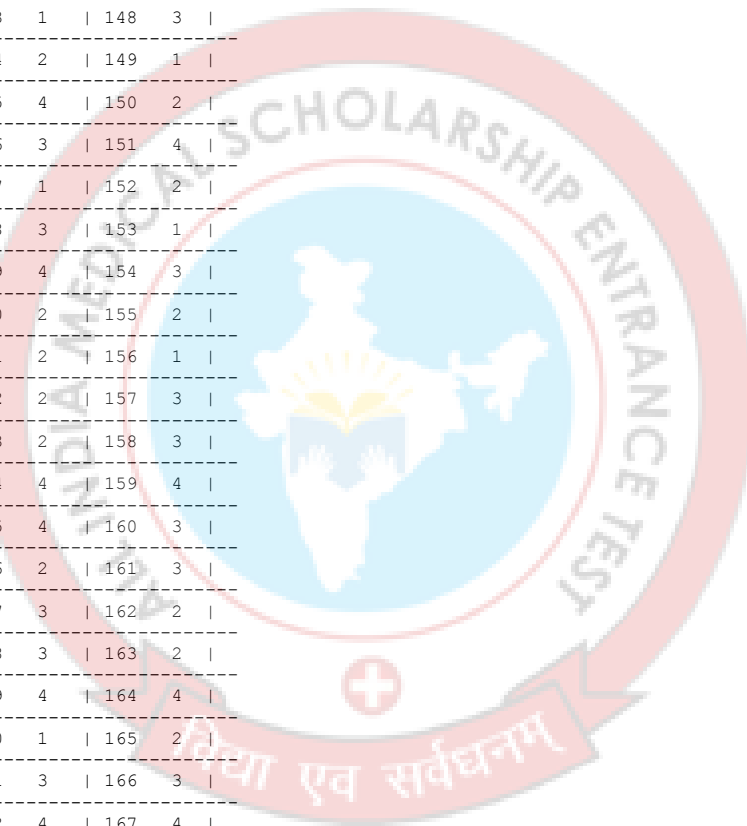
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2	2	47	3	92	2	137	1
3	3	48	1	93	1	138	2
4	3	49	4	94	2	139	3
5	3	50	4	95	4	140	1
6	2	51	4	96	4	141	3
7	3	52	4	97	2	142	1
8	1	53	3	98	3	143	2
9	4	54	3	99	2	144	4
10	4	55	1	100	3	145	3
11	3	56	2	101	1	146	4
12	2	57	4	102	4	147	1
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16	4	61	3	106	3	151	4
17	4	62	3	107	1	152	2
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21	1	66	1	111	2	156	1
22	2	67	4	112	2	157	3
23	2	68	1	113	2	158	3
24	3	69	1	114	4	159	4
25	3	70	2	115	4	160	3
26	2	71	3	116	2	161	3
27	2	72	1	117	3	162	2
28	4	73	4	118	3	163	2
29	4	74	2	119	4	164	4
30	2	75	3	120	1	165	2
31	4	76	1	121	3	166	3
32	4	77	4	122	4	167	4
33	4	78	4	123	2	168	4
34	4	79	1	124	3	169	4
35	3	80	3	125	2	170	3
36	2	81	2	126	3	171	2
37	4	82	2	127	1	172	4
38	3	83	4	128	4	173	4
39	2	84	3	129	3	174	4
40	1	85	4	130	4	175	2
41	1	86	1	131	3	176	2
42	3	87	3	132	4	177	1
43	3	88	3	133	3	178	4
44	2	89	4	134	4	179	2
45	3	90	4	135	2	180	3





This Booklet contains **24** pages.

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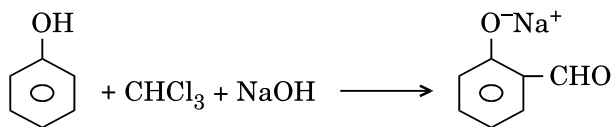
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1. The type of isomerism shown by the complex $[\text{CoCl}_2(\text{en})_2]$ is
- (1) Geometrical isomerism
 - (2) Linkage isomerism
 - (3) Ionization isomerism
 - (4) Coordination isomerism
2. Which one of the following ions exhibits d-d transition and paramagnetism as well?
- (1) CrO_4^{2-}
 - (2) MnO_4^{2-}
 - (3) MnO_4^-
 - (4) $\text{Cr}_2\text{O}_7^{2-}$
3. Match the metal ions given in Column I with the spin magnetic moments of the ions given in Column II and assign the **correct** code :
- | Column I | | Column II | |
|---------------------|----------------------|-----------|--|
| a. Co^{3+} | i. $\sqrt{8}$ B.M. | | |
| b. Cr^{3+} | ii. $\sqrt{35}$ B.M. | | |
| c. Fe^{3+} | iii. $\sqrt{3}$ B.M. | | |
| d. Ni^{2+} | iv. $\sqrt{24}$ B.M. | | |
| | v. $\sqrt{15}$ B.M. | | |
- | a | b | c | d |
|---------|----|-----|-----|
| (1) iv | v | ii | i |
| (2) iii | v | i | ii |
| (3) iv | i | ii | iii |
| (4) i | ii | iii | iv |
4. Iron carbonyl, $\text{Fe}(\text{CO})_5$ is
- (1) tetranuclear
 - (2) dinuclear
 - (3) trinuclear
 - (4) mononuclear
5. The geometry and magnetic behaviour of the complex $[\text{Ni}(\text{CO})_4]$ are
- (1) square planar geometry and diamagnetic
 - (2) tetrahedral geometry and paramagnetic
 - (3) square planar geometry and paramagnetic
 - (4) tetrahedral geometry and diamagnetic
6. The correct order of N-compounds in its decreasing order of oxidation states is
- (1) $\text{HNO}_3, \text{NO}, \text{N}_2, \text{NH}_4\text{Cl}$
 - (2) $\text{NH}_4\text{Cl}, \text{N}_2, \text{NO}, \text{HNO}_3$
 - (3) $\text{HNO}_3, \text{NH}_4\text{Cl}, \text{NO}, \text{N}_2$
 - (4) $\text{HNO}_3, \text{NO}, \text{NH}_4\text{Cl}, \text{N}_2$
7. Which one of the following elements is unable to form MF_6^{3-} ion?
- (1) Ga
 - (2) In
 - (3) B
 - (4) Al
8. Considering Ellingham diagram, which of the following metals can be used to reduce alumina?
- (1) Fe
 - (2) Cu
 - (3) Mg
 - (4) Zn
9. The correct order of atomic radii in group 13 elements is
- (1) $\text{B} < \text{Al} < \text{In} < \text{Ga} < \text{Tl}$
 - (2) $\text{B} < \text{Ga} < \text{Al} < \text{In} < \text{Tl}$
 - (3) $\text{B} < \text{Ga} < \text{Al} < \text{Tl} < \text{In}$
 - (4) $\text{B} < \text{Al} < \text{Ga} < \text{In} < \text{Tl}$
10. Which of the following statements is **not** true for halogens?
- (1) All form monobasic oxyacids.
 - (2) Chlorine has the highest electron-gain enthalpy.
 - (3) All but fluorine show positive oxidation states.
 - (4) All are oxidizing agents.
11. In the structure of ClF_3 , the number of lone pairs of electrons on central atom 'Cl' is
- (1) one
 - (2) three
 - (3) four
 - (4) two

12. In the reaction



the electrophile involved is

- (1) dichloromethyl cation (CHCl_2^\oplus)
- (2) dichlorocarbene ($:\text{CCl}_2$)
- (3) dichloromethyl anion (CHCl_2^\ominus)
- (4) formyl cation (CHO^\oplus)

13. Carboxylic acids have higher boiling points than aldehydes, ketones and even alcohols of comparable molecular mass. It is due to their

- (1) formation of intramolecular H-bonding
- (2) formation of intermolecular H-bonding
- (3) more extensive association of carboxylic acid via van der Waals force of attraction
- (4) formation of carboxylate ion

14. Compound A, $\text{C}_8\text{H}_{10}\text{O}$, is found to react with NaOI (produced by reacting Y with NaOH) and yields a yellow precipitate with characteristic smell.

A and Y are respectively

- (1) $\text{H}_3\text{C}-\text{C}_6\text{H}_4-\text{CH}_2-\text{OH}$ and I_2
- (2) $\text{CH}_3-\text{C}_6\text{H}_3(\text{CH}_3)-\text{OH}$ and I_2
- (3) $\text{C}_6\text{H}_5-\text{CH}(\text{OH})-\text{CH}_3$ and I_2
- (4) $\text{C}_6\text{H}_5-\text{CH}_2-\text{CH}_2-\text{OH}$ and I_2

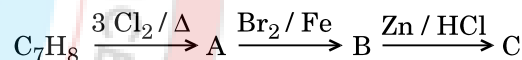
15. Which oxide of nitrogen is **not** a common pollutant introduced into the atmosphere both due to natural and human activity?

- (1) N_2O_5
- (2) NO
- (3) N_2O
- (4) NO_2

16. The compound A on treatment with Na gives B, and with PCl_5 gives C. B and C react together to give diethyl ether. A, B and C are in the order

- (1) $\text{C}_2\text{H}_5\text{OH}$, C_2H_6 , $\text{C}_2\text{H}_5\text{Cl}$
- (2) $\text{C}_2\text{H}_5\text{OH}$, $\text{C}_2\text{H}_5\text{ONa}$, $\text{C}_2\text{H}_5\text{Cl}$
- (3) $\text{C}_2\text{H}_5\text{Cl}$, C_2H_6 , $\text{C}_2\text{H}_5\text{OH}$
- (4) $\text{C}_2\text{H}_5\text{OH}$, $\text{C}_2\text{H}_5\text{Cl}$, $\text{C}_2\text{H}_5\text{ONa}$

17. The compound C_7H_8 undergoes the following reactions:



The product 'C' is

- (1) *m*-bromotoluene
- (2) *p*-bromotoluene
- (3) 3-bromo-2,4,6-trichlorotoluene
- (4) *o*-bromotoluene

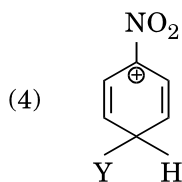
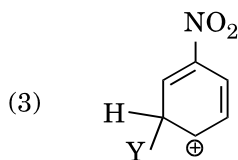
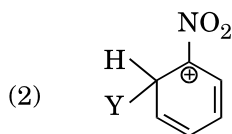
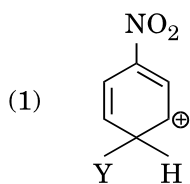
18. Hydrocarbon (A) reacts with bromine by substitution to form an alkyl bromide which by Wurtz reaction is converted to gaseous hydrocarbon containing less than four carbon atoms. (A) is

- (1) $\text{CH} \equiv \text{CH}$
- (2) CH_4
- (3) $\text{CH}_3 - \text{CH}_3$
- (4) $\text{CH}_2 = \text{CH}_2$

19. Which of the following molecules represents the order of hybridisation sp^2 , sp^2 , sp , sp from left to right atoms ?

- (1) $HC \equiv C - C \equiv CH$
- (2) $CH_3 - CH = CH - CH_3$
- (3) $CH_2 = CH - CH = CH_2$
- (4) $CH_2 = CH - C \equiv CH$

20. Which of the following carbocations is expected to be most stable ?



21. Which of the following is correct with respect to -I effect of the substituents ? (R = alkyl)

- (1) $-NH_2 < -OR < -F$
- (2) $-NR_2 > -OR > -F$
- (3) $-NH_2 > -OR > -F$
- (4) $-NR_2 < -OR < -F$

22. A mixture of 2.3 g formic acid and 4.5 g oxalic acid is treated with conc. H_2SO_4 . The evolved gaseous mixture is passed through KOH pellets. Weight (in g) of the remaining product at STP will be

- (1) 1.4
- (2) 4.4
- (3) 2.8
- (4) 3.0

23. The difference between amylose and amylopectin is

- (1) Amylopectin have $1 \rightarrow 4$ α -linkage and $1 \rightarrow 6$ α -linkage
- (2) Amylose is made up of glucose and galactose
- (3) Amylopectin have $1 \rightarrow 4$ α -linkage and $1 \rightarrow 6$ β -linkage
- (4) Amylose have $1 \rightarrow 4$ α -linkage and $1 \rightarrow 6$ β -linkage

24. Which of the following compounds can form a zwitterion ?

- (1) Aniline
- (2) Glycine
- (3) Benzoic acid
- (4) Acetanilide

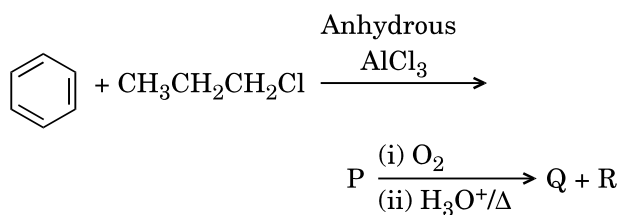
25. Regarding cross-linked or network polymers, which of the following statements is **incorrect** ?

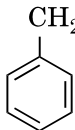
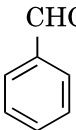




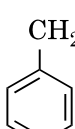
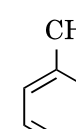
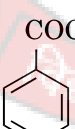
- (1) They contain covalent bonds between various linear polymer chains.
- (2) They contain strong covalent bonds in their polymer chains.
- (3) Examples are bakelite and melamine.
- (4) They are formed from bi- and tri-functional monomers.

26. Nitration of aniline in strong acidic medium also gives m-nitroaniline because

- (1) In spite of substituents nitro group always goes to only m-position.
- (2) In acidic (strong) medium aniline is present as anilinium ion.
- (3) In absence of substituents nitro group always goes to m-position.
- (4) In electrophilic substitution reactions amino group is meta directive.

27. Identify the major products P, Q and R in the following sequence of reactions :



- | | P | Q | R |
|-----|---|---|---|
| (1) |  |  | $\text{CH}_3\text{CH}_2 - \text{OH}$ |
| (2) |  |  | $\text{CH}_3 - \text{CO} - \text{CH}_3$ |
| (3) |  |  | $\text{CH}_3\text{CH}(\text{OH})\text{CH}_3$ |
| (4) |  |  |  |

28. Which of the following oxides is most acidic in nature ?

- (1) MgO
- (2) CaO
- (3) BaO
- (4) BeO

29. Following solutions were prepared by mixing different volumes of NaOH and HCl of different concentrations :

- a. $60 \text{ mL } \frac{\text{M}}{10} \text{ HCl} + 40 \text{ mL } \frac{\text{M}}{10} \text{ NaOH}$
- b. $55 \text{ mL } \frac{\text{M}}{10} \text{ HCl} + 45 \text{ mL } \frac{\text{M}}{10} \text{ NaOH}$
- c. $75 \text{ mL } \frac{\text{M}}{5} \text{ HCl} + 25 \text{ mL } \frac{\text{M}}{5} \text{ NaOH}$
- d. $100 \text{ mL } \frac{\text{M}}{10} \text{ HCl} + 100 \text{ mL } \frac{\text{M}}{10} \text{ NaOH}$

pH of which one of them will be equal to 1 ?

- (1) b
- (2) c
- (3) d
- (4) a

30. On which of the following properties does the coagulating power of an ion depend ?

- (1) The magnitude of the charge on the ion alone
- (2) The sign of charge on the ion alone
- (3) Both magnitude and sign of the charge on the ion
- (4) Size of the ion alone

31. Given van der Waals constant for NH_3 , H_2 , O_2 and CO_2 are respectively 4.17, 0.244, 1.36 and 3.59, which one of the following gases is most easily liquefied ?

- (1) NH_3
- (2) CO_2
- (3) O_2
- (4) H_2

32. The solubility of BaSO_4 in water is $2.42 \times 10^{-3} \text{ gL}^{-1}$ at 298 K. The value of its solubility product (K_{sp}) will be

(Given molar mass of $\text{BaSO}_4 = 233 \text{ g mol}^{-1}$)

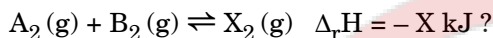
- (1) $1.08 \times 10^{-10} \text{ mol}^2 \text{ L}^{-2}$
- (2) $1.08 \times 10^{-8} \text{ mol}^2 \text{ L}^{-2}$
- (3) $1.08 \times 10^{-14} \text{ mol}^2 \text{ L}^{-2}$
- (4) $1.08 \times 10^{-12} \text{ mol}^2 \text{ L}^{-2}$

33. For the redox reaction

$$\text{MnO}_4^- + \text{C}_2\text{O}_4^{2-} + \text{H}^+ \longrightarrow \text{Mn}^{2+} + \text{CO}_2 + \text{H}_2\text{O}$$
the correct coefficients of the reactants for the balanced equation are

	MnO_4^-	$\text{C}_2\text{O}_4^{2-}$	H^+
(1)	16	5	2
(2)	5	16	2
(3)	2	16	5
(4)	2	5	16

34. Which one of the following conditions will favour maximum formation of the product in the reaction,



- (1) Low temperature and high pressure
(2) High temperature and low pressure
(3) High temperature and high pressure
(4) Low temperature and low pressure
35. When initial concentration of the reactant is doubled, the half-life period of a zero order reaction

- (1) is halved
(2) remains unchanged
(3) is tripled
(4) is doubled

36. The bond dissociation energies of X_2 , Y_2 and XY are in the ratio of 1 : 0.5 : 1. ΔH for the formation of XY is -200 kJ mol^{-1} . The bond dissociation energy of X_2 will be

- (1) 200 kJ mol^{-1}
(2) 400 kJ mol^{-1}
(3) 800 kJ mol^{-1}
(4) 100 kJ mol^{-1}

37. The correction factor 'a' to the ideal gas equation corresponds to

- (1) density of the gas molecules
(2) forces of attraction between the gas molecules
(3) electric field present between the gas molecules
(4) volume of the gas molecules

38. In which case is the number of molecules of water maximum ?

- (1) 18 mL of water
(2) 10^{-3} mol of water
(3) 0.00224 L of water vapours at 1 atm and 273 K
(4) 0.18 g of water

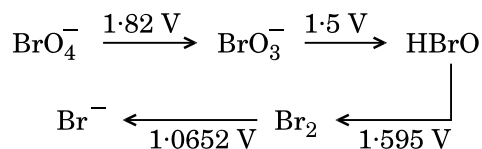
39. The correct difference between first- and second-order reactions is that

- (1) the rate of a first-order reaction does not depend on reactant concentrations; the rate of a second-order reaction does depend on reactant concentrations
(2) the rate of a first-order reaction does depend on reactant concentrations; the rate of a second-order reaction does not depend on reactant concentrations
(3) a first-order reaction can be catalyzed; a second-order reaction cannot be catalyzed
(4) the half-life of a first-order reaction does not depend on $[\text{A}]_0$; the half-life of a second-order reaction does depend on $[\text{A}]_0$

40. Among CaH_2 , BeH_2 , BaH_2 , the order of ionic character is

- (1) $\text{BeH}_2 < \text{CaH}_2 < \text{BaH}_2$
(2) $\text{BaH}_2 < \text{BeH}_2 < \text{CaH}_2$
(3) $\text{BeH}_2 < \text{BaH}_2 < \text{CaH}_2$
(4) $\text{CaH}_2 < \text{BeH}_2 < \text{BaH}_2$

41. Consider the change in oxidation state of Bromine corresponding to different emf values as shown in the diagram below :



Then the species undergoing disproportionation is

- (1) BrO_3^-
(2) HBrO
(3) Br_2
(4) BrO_4^-

42. Consider the following species :

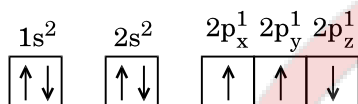


Which one of these will have the highest bond order ?

- (1) NO
- (2) CN
- (3) CN^+
- (4) CN^-

43. Which one is a **wrong** statement ?

- (1) Total orbital angular momentum of electron in 's' orbital is equal to zero.
- (2) The value of m for d_{z^2} is zero.
- (3) The electronic configuration of N atom is



- (4) An orbital is designated by three quantum numbers while an electron in an atom is designated by four quantum numbers.

44. Iron exhibits bcc structure at room temperature. Above 900°C , it transforms to fcc structure. The ratio of density of iron at room temperature to that at 900°C (assuming molar mass and atomic radii of iron remains constant with temperature) is

- (1) $\frac{\sqrt{3}}{\sqrt{2}}$
- (2) $\frac{1}{2}$
- (3) $\frac{3\sqrt{3}}{4\sqrt{2}}$
- (4) $\frac{4\sqrt{3}}{3\sqrt{2}}$

45. Magnesium reacts with an element (X) to form an ionic compound. If the ground state electronic configuration of (X) is $1s^2 2s^2 2p^3$, the simplest formula for this compound is

- (1) Mg_2X_3
- (2) Mg_3X_2
- (3) Mg_2X
- (4) MgX_2

46. Which of the following gastric cells indirectly help in erythropoiesis ?

- (1) Chief cells
- (2) Parietal cells
- (3) Goblet cells
- (4) Mucous cells

47. Match the items given in Column I with those in Column II and select the **correct** option given below :

Column I

Column II

- | | |
|---------------|------------------------|
| a. Fibrinogen | i. Osmotic balance |
| b. Globulin | ii. Blood clotting |
| c. Albumin | iii. Defence mechanism |

a b c

- | | | |
|---------|-----|-----|
| (1) iii | ii | i |
| (2) ii | iii | i |
| (3) i | iii | ii |
| (4) i | ii | iii |

48. Calcium is important in skeletal muscle contraction because it

- (1) binds to troponin to remove the masking of active sites on actin for myosin.
- (2) prevents the formation of bonds between the myosin cross bridges and the actin filament.
- (3) detaches the myosin head from the actin filament.
- (4) activates the myosin ATPase by binding to it.

49. Which of the following is an occupational respiratory disorder ?

- (1) Anthracis
- (2) Emphysema
- (3) Botulism
- (4) Silicosis

50. Which of the following is an amino acid derived hormone ?
- (1) Epinephrine
 - (2) Estriol
 - (3) Estradiol
 - (4) Ecdysone
51. Which of the following structures or regions is **incorrectly** paired with its function ?
- (1) Medulla oblongata : controls respiration and cardiovascular reflexes.
 - (2) Corpus callosum : band of fibers connecting left and right cerebral hemispheres.
 - (3) Hypothalamus : production of releasing hormones and regulation of temperature, hunger and thirst.
 - (4) Limbic system : consists of fibre tracts that interconnect different regions of brain; controls movement.
52. The transparent lens in the human eye is held in its place by
- (1) ligaments attached to the ciliary body
 - (2) smooth muscles attached to the ciliary body
 - (3) smooth muscles attached to the iris
 - (4) ligaments attached to the iris
53. Which of the following hormones can play a significant role in osteoporosis ?
- (1) Aldosterone and Prolactin
 - (2) Parathyroid hormone and Prolactin
 - (3) Estrogen and Parathyroid hormone
 - (4) Progesterone and Aldosterone
54. Hormones secreted by the placenta to maintain pregnancy are
- (1) hCG, hPL, progestogens, prolactin
 - (2) hCG, progestogens, estrogens, glucocorticoids
 - (3) hCG, hPL, progestogens, estrogens
 - (4) hCG, hPL, estrogens, relaxin, oxytocin
55. The contraceptive 'SAHEL' is
- (1) blocks estrogen receptors in the uterus, preventing eggs from getting implanted.
 - (2) is a post-coital contraceptive.
 - (3) is an IUD.
 - (4) increases the concentration of estrogen and prevents ovulation in females.
56. The amnion of mammalian embryo is derived from
- (1) ectoderm and mesoderm
 - (2) ectoderm and endoderm
 - (3) mesoderm and trophoblast
 - (4) endoderm and mesoderm
57. The difference between spermiogenesis and spermiation is
- (1) In spermiogenesis spermatids are formed, while in spermiation spermatozoa are formed.
 - (2) In spermiogenesis spermatozoa are formed, while in spermiation spermatozoa are released from sertoli cells into the cavity of seminiferous tubules.
 - (3) In spermiogenesis spermatozoa from sertoli cells are released into the cavity of seminiferous tubules, while in spermiation spermatozoa are formed.
 - (4) In spermiogenesis spermatozoa are formed, while in spermiation spermatids are formed.

58. All of the following are part of an operon *except*
- (1) an operator
 - (2) a promoter
 - (3) an enhancer
 - (4) structural genes
59. A woman has an X-linked condition on one of her X chromosomes. This chromosome can be inherited by
- (1) Only daughters
 - (2) Both sons and daughters
 - (3) Only grandchildren
 - (4) Only sons
60. According to Hugo de Vries, the mechanism of evolution is
- (1) Multiple step mutations
 - (2) Minor mutations
 - (3) Phenotypic variations
 - (4) Saltation
61. AGGTATCGCAT is a sequence from the coding strand of a gene. What will be the corresponding sequence of the transcribed mRNA ?
- (1) AGGUAUCGCAU
 - (2) UCCAUAGCGUA
 - (3) ACCUAUGCGAU
 - (4) UGGTUTCGCAT
62. Match the items given in Column I with those in Column II and select the **correct** option given below :
- | <i>Column I</i> | <i>Column II</i> |
|------------------------|------------------------------------|
| a. Proliferative Phase | i. Breakdown of endometrial lining |
| b. Secretory Phase | ii. Follicular Phase |
| c. Menstruation | iii. Luteal Phase |
- | a | b | c |
|----------|----------|----------|
| (1) iii | ii | i |
| (2) iii | i | ii |
| (3) ii | iii | i |
| (4) i | iii | ii |
63. In which disease does mosquito transmitted pathogen cause chronic inflammation of lymphatic vessels ?
- (1) Elephantiasis
 - (2) Amoebiasis
 - (3) Ringworm disease
 - (4) Ascariasis
64. Conversion of milk to curd improves its nutritional value by increasing the amount of
- (1) Vitamin D
 - (2) Vitamin E
 - (3) Vitamin B₁₂
 - (4) Vitamin A
65. Which of the following is **not** an autoimmune disease ?
- (1) Psoriasis
 - (2) Vitiligo
 - (3) Alzheimer's disease
 - (4) Rheumatoid arthritis
66. Among the following sets of examples for divergent evolution, select the **incorrect** option :
- (1) Forelimbs of man, bat and cheetah
 - (2) Eye of octopus, bat and man
 - (3) Brain of bat, man and cheetah
 - (4) Heart of bat, man and cheetah
67. The similarity of bone structure in the forelimbs of many vertebrates is an example of
- (1) Homology
 - (2) Adaptive radiation
 - (3) Convergent evolution
 - (4) Analogy
68. Which of the following characteristics represent 'Inheritance of blood groups' in humans ?
- a. Dominance
 - b. Co-dominance
 - c. Multiple allele
 - d. Incomplete dominance
 - e. Polygenic inheritance
- (1) b, c and e
 - (2) a, c and e
 - (3) b, d and e
 - (4) a, b and c

69. Which of the following options correctly represents the lung conditions in asthma and emphysema, respectively ?

- (1) Inflammation of bronchioles; Decreased respiratory surface
- (2) Decreased respiratory surface; Inflammation of bronchioles
- (3) Increased respiratory surface; Inflammation of bronchioles
- (4) Increased number of bronchioles; Increased respiratory surface

70. Match the items given in Column I with those in Column II and select the **correct** option given below :

Column I

Column II

- | | |
|--------------------|--|
| a. Tricuspid valve | i. Between left atrium and left ventricle |
| b. Bicuspid valve | ii. Between right ventricle and pulmonary artery |
| c. Semilunar valve | iii. Between right atrium and right ventricle |

a b c

- (1) iii i ii
- (2) ii i iii
- (3) i ii iii
- (4) i iii ii

71. Match the items given in Column I with those in Column II and select the **correct** option given below :

Column I

Column II

- | | |
|-------------------------------|--------------------|
| a. Tidal volume | i. 2500 – 3000 mL |
| b. Inspiratory Reserve volume | ii. 1100 – 1200 mL |
| c. Expiratory Reserve volume | iii. 500 – 550 mL |
| d. Residual volume | iv. 1000 – 1100 mL |

a b c d

- (1) iii ii i iv
- (2) iv iii ii i
- (3) i iv ii iii
- (4) iii i iv ii

72. Which one of the following population interactions is widely used in medical science for the production of antibiotics ?

- (1) Commensalism
- (2) Amensalism
- (3) Parasitism
- (4) Mutualism

73. All of the following are included in 'Ex-situ conservation' *except*

- (1) Wildlife safari parks
- (2) Seed banks
- (3) Botanical gardens
- (4) Sacred groves

74. Match the items given in Column I with those in Column II and select the **correct** option given below :

Column I

Column II

- | | |
|----------------------|--------------------------|
| a. Eutrophication | i. UV-B radiation |
| b. Sanitary landfill | ii. Deforestation |
| c. Snow blindness | iii. Nutrient enrichment |
| d. Jhum cultivation | iv. Waste disposal |

a b c d

- (1) ii i iii iv
- (2) i ii iv iii
- (3) iii iv i ii
- (4) i iii iv ii

75. In a growing population of a country,

- (1) pre-reproductive individuals are more than the reproductive individuals.
- (2) pre-reproductive individuals are less than the reproductive individuals.
- (3) reproductive and pre-reproductive individuals are equal in number.
- (4) reproductive individuals are less than the post-reproductive individuals.

76. Which part of poppy plant is used to obtain the drug "Smack" ?

- (1) Flowers
- (2) Leaves
- (3) Roots
- (4) Latex

77. Match the items given in Column I with those in Column II and select the **correct** option given below :

<i>Column I</i>		<i>Column II</i>	
a. Glycosuria	i. Accumulation of uric acid in joints		
b. Gout	ii. Mass of crystallised salts within the kidney		
c. Renal calculi	iii. Inflammation in glomeruli		
d. Glomerular nephritis	iv. Presence of glucose in urine		

	a	b	c	d
(1)	iii	ii	iv	i
(2)	iv	i	ii	iii
(3)	ii	iii	i	iv
(4)	i	ii	iii	iv

78. Match the items given in Column I with those in Column II and select the **correct** option given below :

<i>Column I</i> (Function)		<i>Column II</i> (Part of Excretory System)	
a. Ultrafiltration	i. Henle's loop		
b. Concentration of urine	ii. Ureter		
c. Transport of urine	iii. Urinary bladder		
d. Storage of urine	iv. Malpighian corpuscle		
	v. Proximal convoluted tubule		

	a	b	c	d
(1)	iv	v	ii	iii
(2)	v	iv	i	iii
(3)	v	iv	i	ii
(4)	iv	i	ii	iii

79. Nissl bodies are mainly composed of

- (1) Proteins and lipids
- (2) Free ribosomes and RER
- (3) Nucleic acids and SER
- (4) DNA and RNA

80. Which of these statements is **incorrect** ?

- (1) Enzymes of TCA cycle are present in mitochondrial matrix.
- (2) Oxidative phosphorylation takes place in outer mitochondrial membrane.
- (3) Glycolysis operates as long as it is supplied with NAD that can pick up hydrogen atoms.
- (4) Glycolysis occurs in cytosol.

81. Which of the following terms describe human dentition ?

- (1) Thecodont, Diphyodont, Homodont
- (2) Pleurodont, Diphyodont, Heterodont
- (3) Pleurodont, Monophyodont, Homodont
- (4) Thecodont, Diphyodont, Heterodont

82. Select the **incorrect** match :

- (1) Lampbrush chromosomes – Diplotene bivalents
- (2) Polytene chromosomes – Oocytes of amphibians
- (3) Submetacentric chromosomes – L-shaped chromosomes
- (4) Allosomes – Sex chromosomes

83. Which of the following events does **not** occur in rough endoplasmic reticulum ?

- (1) Protein folding
- (2) Phospholipid synthesis
- (3) Cleavage of signal peptide
- (4) Protein glycosylation

84. Many ribosomes may associate with a single mRNA to form multiple copies of a polypeptide simultaneously. Such strings of ribosomes are termed as

- (1) Polysome
- (2) Nucleosome
- (3) Plastidome
- (4) Polyhedral bodies

85. Which of the following animals does **not** undergo metamorphosis ?
- (1) Earthworm
 - (2) Starfish
 - (3) Moth
 - (4) Tunicate
86. Which one of these animals is **not** a homeotherm ?
- (1) *Macropus*
 - (2) *Psittacula*
 - (3) *Camelus*
 - (4) *Chelone*
87. Which of the following features is used to identify a male cockroach from a female cockroach ?
- (1) Presence of a boat shaped sternum on the 9th abdominal segment
 - (2) Presence of anal cerci
 - (3) Forewings with darker tegmina
 - (4) Presence of caudal styles
88. Identify the vertebrate group of animals characterized by crop and gizzard in its digestive system.
- (1) Amphibia
 - (2) Osteichthyes
 - (3) Aves
 - (4) Reptilia
89. Ciliates differ from all other protozoans in
- (1) using flagella for locomotion
 - (2) having two types of nuclei
 - (3) using pseudopodia for capturing prey
 - (4) having a contractile vacuole for removing excess water
90. Which of the following organisms are known as chief producers in the oceans ?
- (1) Dinoflagellates
 - (2) Euglenoids
 - (3) Cyanobacteria
 - (4) Diatoms
91. The Golgi complex participates in
- (1) Fatty acid breakdown
 - (2) Activation of amino acid
 - (3) Respiration in bacteria
 - (4) Formation of secretory vesicles
92. Stomata in grass leaf are
- (1) Dumb-bell shaped
 - (2) Barrel shaped
 - (3) Rectangular
 - (4) Kidney shaped
93. The stage during which separation of the paired homologous chromosomes begins is
- (1) Pachytene
 - (2) Zygotene
 - (3) Diakinesis
 - (4) Diplotene
94. The two functional groups characteristic of sugars are
- (1) hydroxyl and methyl
 - (2) carbonyl and hydroxyl
 - (3) carbonyl and phosphate
 - (4) carbonyl and methyl
95. Which among the following is **not** a prokaryote ?
- (1) *Saccharomyces*
 - (2) *Oscillatoria*
 - (3) *Nostoc*
 - (4) *Mycobacterium*
96. Stomatal movement is **not** affected by
- (1) Temperature
 - (2) CO₂ concentration
 - (3) O₂ concentration
 - (4) Light
97. Which of the following is true for nucleolus ?
- (1) Larger nucleoli are present in dividing cells.
 - (2) It is a site for active ribosomal RNA synthesis.
 - (3) It takes part in spindle formation.
 - (4) It is a membrane-bound structure.
98. Which of the following is **not** a product of light reaction of photosynthesis ?
- (1) ATP
 - (2) Oxygen
 - (3) NADPH
 - (4) NADH

99. Which of the following elements is responsible for maintaining turgor in cells ?
- (1) Magnesium
 - (2) Calcium
 - (3) Potassium
 - (4) Sodium
100. Which one of the following plants shows a very close relationship with a species of moth, where none of the two can complete its life cycle without the other ?
- (1) *Hydrilla*
 - (2) *Viola*
 - (3) Banana
 - (4) *Yucca*
101. Pollen grains can be stored for several years in liquid nitrogen having a temperature of
- (1) -120°C
 - (2) -160°C
 - (3) -196°C
 - (4) -80°C
102. Oxygen is **not** produced during photosynthesis by
- (1) Green sulphur bacteria
 - (2) *Chara*
 - (3) *Cycas*
 - (4) *Nostoc*
103. Double fertilization is
- (1) Fusion of two male gametes of a pollen tube with two different eggs
 - (2) Syngamy and triple fusion
 - (3) Fusion of two male gametes with one egg
 - (4) Fusion of one male gamete with two polar nuclei
104. What is the role of NAD^+ in cellular respiration ?
- (1) It functions as an enzyme.
 - (2) It is the final electron acceptor for anaerobic respiration.
 - (3) It is a nucleotide source for ATP synthesis.
 - (4) It functions as an electron carrier.
105. In which of the following forms is iron absorbed by plants ?
- (1) Ferric
 - (2) Both ferric and ferrous
 - (3) Free element
 - (4) Ferrous
106. Select the **correct** statement :
- (1) Franklin Stahl coined the term "linkage".
 - (2) Transduction was discovered by S. Altman.
 - (3) Spliceosomes take part in translation.
 - (4) Punnett square was developed by a British scientist.
107. Select the **correct** match :
- (1) Alec Jeffreys – *Streptococcus pneumoniae*
 - (2) Francois Jacob and Jacques Monod – *Lac operon*
 - (3) Matthew Meselson and F. Stahl – *Pisum sativum*
 - (4) Alfred Hershey and Martha Chase – TMV
108. The experimental proof for semiconservative replication of DNA was first shown in a
- (1) Fungus
 - (2) Virus
 - (3) Plant
 - (4) Bacterium
109. Offsets are produced by
- (1) Meiotic divisions
 - (2) Parthenogenesis
 - (3) Parthenocarpy
 - (4) Mitotic divisions
110. Which of the following pairs is **wrongly** matched ?
- (1) Starch synthesis in pea : Multiple alleles
 - (2) T.H. Morgan : Linkage
 - (3) XO type sex determination : Grasshopper
 - (4) ABO blood grouping : Co-dominance
111. Which of the following has proved helpful in preserving pollen as fossils ?
- (1) Pollenkitt
 - (2) Sporopollenin
 - (3) Oil content
 - (4) Cellulosic intine
112. Which of the following flowers only once in its life-time ?
- (1) Bamboo species
 - (2) Papaya
 - (3) Mango
 - (4) Jackfruit

- 113.** The correct order of steps in Polymerase Chain Reaction (PCR) is
- (1) Extension, Denaturation, Annealing
 - (2) Denaturation, Annealing, Extension
 - (3) Denaturation, Extension, Annealing
 - (4) Annealing, Extension, Denaturation
- 114.** In India, the organisation responsible for assessing the safety of introducing genetically modified organisms for public use is
- (1) Indian Council of Medical Research (ICMR)
 - (2) Genetic Engineering Appraisal Committee (GEAC)
 - (3) Research Committee on Genetic Manipulation (RCGM)
 - (4) Council for Scientific and Industrial Research (CSIR)
- 115.** Use of bioresources by multinational companies and organisations without authorisation from the concerned country and its people is called
- (1) Bio-infringement
 - (2) Bioexploitation
 - (3) Biodegradation
 - (4) Biopiracy
- 116.** Which of the following is commonly used as a vector for introducing a DNA fragment in human lymphocytes ?
- (1) Retrovirus
 - (2) pBR 322
 - (3) λ phage
 - (4) Ti plasmid
- 117.** A 'new' variety of rice was patented by a foreign company, though such varieties have been present in India for a long time. This is related to
- (1) Co-667
 - (2) Basmati
 - (3) Lerma Rojo
 - (4) Sharbati Sonora
- 118.** Select the **correct** match :
- | | |
|-----------------------------------|------------------|
| (1) Ribozyme | – Nucleic acid |
| (2) G. Mendel | – Transformation |
| (3) T.H. Morgan | – Transduction |
| (4) $F_2 \times$ Recessive parent | – Dihybrid cross |
- 119.** Natality refers to
- (1) Death rate
 - (2) Number of individuals entering a habitat
 - (3) Number of individuals leaving the habitat
 - (4) Birth rate
- 120.** World Ozone Day is celebrated on
- (1) 5th June
 - (2) 22nd April
 - (3) 16th September
 - (4) 21st April
- 121.** Which of the following is a secondary pollutant ?
- (1) CO
 - (2) O₃
 - (3) SO₂
 - (4) CO₂
- 122.** Niche is
- (1) all the biological factors in the organism's environment
 - (2) the functional role played by the organism where it lives
 - (3) the range of temperature that the organism needs to live
 - (4) the physical space where an organism lives
- 123.** What type of ecological pyramid would be obtained with the following data ?
- Secondary consumer : 120 g
Primary consumer : 60 g
Primary producer : 10 g
- (1) Inverted pyramid of biomass
 - (2) Upright pyramid of biomass
 - (3) Upright pyramid of numbers
 - (4) Pyramid of energy
- 124.** In stratosphere, which of the following elements acts as a catalyst in degradation of ozone and release of molecular oxygen ?
- (1) Carbon
 - (2) Oxygen
 - (3) Fe
 - (4) Cl

125. Casparian strips occur in

- (1) Epidermis
- (2) Endodermis
- (3) Cortex
- (4) Pericycle

126. Plants having little or no secondary growth are

- (1) Grasses
- (2) Cycads
- (3) Conifers
- (4) Deciduous angiosperms

127. Which of the following statements is **correct** ?

- (1) Ovules are not enclosed by ovary wall in gymnosperms.
- (2) Stems are usually unbranched in both *Cycas* and *Cedrus*.
- (3) Horsetails are gymnosperms.
- (4) *Selaginella* is heterosporous, while *Salvinia* is homosporous.

128. Select the **wrong** statement :

- (1) Cell wall is present in members of Fungi and Plantae.
- (2) Mitochondria are the powerhouse of the cell in all kingdoms except Monera.
- (3) Pseudopodia are locomotory and feeding structures in Sporozoans.
- (4) Mushrooms belong to Basidiomycetes.

129. Secondary xylem and phloem in dicot stem are produced by

- (1) Apical meristems
- (2) Axillary meristems
- (3) Phellogen
- (4) Vascular cambium

130. Pneumatophores occur in

- (1) Halophytes
- (2) Submerged hydrophytes
- (3) Carnivorous plants
- (4) Free-floating hydrophytes

131. Sweet potato is a modified

- (1) Stem
- (2) Rhizome
- (3) Tap root
- (4) Adventitious root

132. Which one is **wrongly** matched ?

- (1) Uniflagellate gametes – *Polysiphonia*
- (2) Unicellular organism – *Chlorella*
- (3) Gemma cups – *Marchantia*
- (4) Biflagellate zoospores – Brown algae

133. After karyogamy followed by meiosis, spores are produced exogenously in

- (1) *Neurospora*
- (2) *Saccharomyces*
- (3) *Agaricus*
- (4) *Alternaria*

134. Match the items given in Column I with those in Column II and select the **correct** option given below :

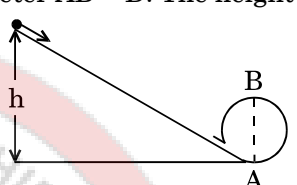
- | Column I | | Column II | |
|--------------|------|---|--|
| a. Herbarium | i. | It is a place having a collection of preserved plants and animals. | |
| b. Key | ii. | A list that enumerates methodically all the species found in an area with brief description aiding identification. | |
| c. Museum | iii. | Is a place where dried and pressed plant specimens mounted on sheets are kept. | |
| d. Catalogue | iv. | A booklet containing a list of characters and their alternates which are helpful in identification of various taxa. | |

- | | a | b | c | d |
|-----|-----|----|-----|----|
| (1) | i | iv | iii | ii |
| (2) | iii | iv | i | ii |
| (3) | ii | iv | iii | i |
| (4) | iii | ii | i | iv |

135. Winged pollen grains are present in

- (1) Mustard
- (2) *Pinus*
- (3) Mango
- (4) *Cycas*

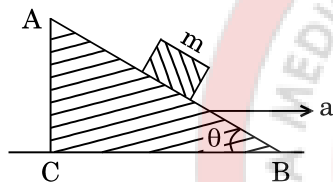
136. An inductor 20 mH, a capacitor 100 μF and a resistor 50 Ω are connected in series across a source of emf, $V = 10 \sin 314 t$. The power loss in the circuit is
- (1) 0.79 W
 - (2) 1.13 W
 - (3) 2.74 W
 - (4) 0.43 W
137. A metallic rod of mass per unit length 0.5 kg m^{-1} is lying horizontally on a smooth inclined plane which makes an angle of 30° with the horizontal. The rod is not allowed to slide down by flowing a current through it when a magnetic field of induction 0.25 T is acting on it in the vertical direction. The current flowing in the rod to keep it stationary is
- (1) 7.14 A
 - (2) 11.32 A
 - (3) 14.76 A
 - (4) 5.98 A
138. Current sensitivity of a moving coil galvanometer is 5 div/mA and its voltage sensitivity (angular deflection per unit voltage applied) is 20 div/V. The resistance of the galvanometer is
- (1) 40 Ω
 - (2) 500 Ω
 - (3) 250 Ω
 - (4) 25 Ω
139. A thin diamagnetic rod is placed vertically between the poles of an electromagnet. When the current in the electromagnet is switched on, then the diamagnetic rod is pushed up, out of the horizontal magnetic field. Hence the rod gains gravitational potential energy. The work required to do this comes from
- (1) the current source
 - (2) the induced electric field due to the changing magnetic field
 - (3) the lattice structure of the material of the rod
 - (4) the magnetic field
140. Unpolarised light is incident from air on a plane surface of a material of refractive index ' μ '. At a particular angle of incidence ' i ', it is found that the reflected and refracted rays are perpendicular to each other. Which of the following options is correct for this situation ?
- (1) Reflected light is polarised with its electric vector parallel to the plane of incidence
 - (2) $i = \tan^{-1}\left(\frac{1}{\mu}\right)$
 - (3) $i = \sin^{-1}\left(\frac{1}{\mu}\right)$
 - (4) Reflected light is polarised with its electric vector perpendicular to the plane of incidence
141. In Young's double slit experiment the separation d between the slits is 2 mm, the wavelength λ of the light used is 5896 \AA and distance D between the screen and slits is 100 cm. It is found that the angular width of the fringes is 0.20° . To increase the fringe angular width to 0.21° (with same λ and D) the separation between the slits needs to be changed to
- (1) 1.8 mm
 - (2) 1.7 mm
 - (3) 2.1 mm
 - (4) 1.9 mm
142. An astronomical refracting telescope will have large angular magnification and high angular resolution, when it has an objective lens of
- (1) small focal length and large diameter
 - (2) small focal length and small diameter
 - (3) large focal length and large diameter
 - (4) large focal length and small diameter

143. An object is placed at a distance of 40 cm from a concave mirror of focal length 15 cm. If the object is displaced through a distance of 20 cm towards the mirror, the displacement of the image will be
- (1) 30 cm away from the mirror
 - (2) 36 cm towards the mirror
 - (3) 30 cm towards the mirror
 - (4) 36 cm away from the mirror
144. An em wave is propagating in a medium with a velocity $\vec{V} = V \hat{i}$. The instantaneous oscillating electric field of this em wave is along +y axis. Then the direction of oscillating magnetic field of the em wave will be along
- (1) -z direction
 - (2) -x direction
 - (3) -y direction
 - (4) +z direction
145. The magnetic potential energy stored in a certain inductor is 25 mJ, when the current in the inductor is 60 mA. This inductor is of inductance
- (1) 0.138 H
 - (2) 13.89 H
 - (3) 1.389 H
 - (4) 138.88 H
146. The refractive index of the material of a prism is $\sqrt{2}$ and the angle of the prism is 30° . One of the two refracting surfaces of the prism is made a mirror inwards, by silver coating. A beam of monochromatic light entering the prism from the other face will retrace its path (after reflection from the silvered surface) if its angle of incidence on the prism is
- (1) 60°
 - (2) zero
 - (3) 30°
 - (4) 45°
147. A moving block having mass m , collides with another stationary block having mass $4m$. The lighter block comes to rest after collision. When the initial velocity of the lighter block is v , then the value of coefficient of restitution (e) will be
- (1) 0.5
 - (2) 0.4
 - (3) 0.8
 - (4) 0.25
148. A body initially at rest and sliding along a frictionless track from a height h (as shown in the figure) just completes a vertical circle of diameter $AB = D$. The height h is equal to
- 
- (1) $\frac{3}{2} D$
 - (2) $\frac{5}{4} D$
 - (3) $\frac{7}{5} D$
 - (4) D
149. Three objects, A : (a solid sphere), B : (a thin circular disk) and C : (a circular ring), each have the same mass M and radius R . They all spin with the same angular speed ω about their own symmetry axes. The amounts of work (W) required to bring them to rest, would satisfy the relation
- (1) $W_C > W_B > W_A$
 - (2) $W_A > W_C > W_B$
 - (3) $W_B > W_A > W_C$
 - (4) $W_A > W_B > W_C$
150. Which one of the following statements is **incorrect** ?
- (1) Rolling friction is smaller than sliding friction.
 - (2) Coefficient of sliding friction has dimensions of length.
 - (3) Frictional force opposes the relative motion.
 - (4) Limiting value of static friction is directly proportional to normal reaction.

151. A toy car with charge q moves on a frictionless horizontal plane surface under the influence of a uniform electric field \vec{E} . Due to the force $q\vec{E}$, its velocity increases from 0 to 6 m/s in one second duration. At that instant the direction of the field is reversed. The car continues to move for two more seconds under the influence of this field. The average velocity and the average speed of the toy car between 0 to 3 seconds are respectively

- (1) 2 m/s, 4 m/s
- (2) 1.5 m/s, 3 m/s
- (3) 1 m/s, 3.5 m/s
- (4) 1 m/s, 3 m/s

152. A block of mass m is placed on a smooth inclined wedge ABC of inclination θ as shown in the figure. The wedge is given an acceleration 'a' towards the right. The relation between a and θ for the block to remain stationary on the wedge is



- (1) $a = \frac{g}{\operatorname{cosec} \theta}$
- (2) $a = g \tan \theta$
- (3) $a = g \cos \theta$
- (4) $a = \frac{g}{\sin \theta}$

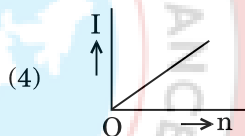
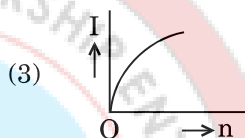
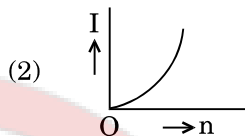
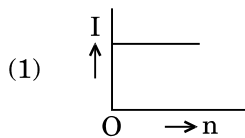
153. The moment of the force, $\vec{F} = 4\hat{i} + 5\hat{j} - 6\hat{k}$ at (2, 0, -3), about the point (2, -2, -2), is given by

- (1) $-8\hat{i} - 4\hat{j} - 7\hat{k}$
- (2) $-7\hat{i} - 4\hat{j} - 8\hat{k}$
- (3) $-7\hat{i} - 8\hat{j} - 4\hat{k}$
- (4) $-4\hat{i} - \hat{j} - 8\hat{k}$

154. A student measured the diameter of a small steel ball using a screw gauge of least count 0.001 cm. The main scale reading is 5 mm and zero of circular scale division coincides with 25 divisions above the reference level. If screw gauge has a zero error of -0.004 cm, the correct diameter of the ball is

- (1) 0.521 cm
- (2) 0.529 cm
- (3) 0.053 cm
- (4) 0.525 cm

155. A battery consists of a variable number 'n' of identical cells (having internal resistance 'r' each) which are connected in series. The terminals of the battery are short-circuited and the current I is measured. Which of the graphs shows the correct relationship between I and n?



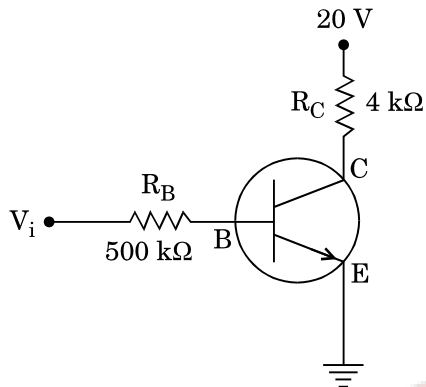
156. A carbon resistor of $(47 \pm 4.7) \text{ k}\Omega$ is to be marked with rings of different colours for its identification. The colour code sequence will be

- (1) Violet - Yellow - Orange - Silver
- (2) Green - Orange - Violet - Gold
- (3) Yellow - Green - Violet - Gold
- (4) Yellow - Violet - Orange - Silver

157. A set of 'n' equal resistors, of value 'R' each, are connected in series to a battery of emf 'E' and internal resistance 'R'. The current drawn is I. Now, the 'n' resistors are connected in parallel to the same battery. Then the current drawn from battery becomes 10 I. The value of 'n' is

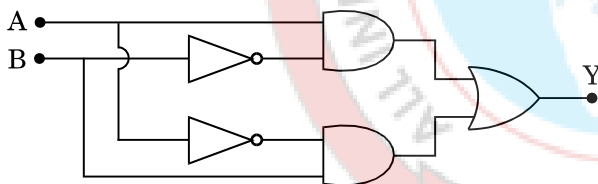
- (1) 10
- (2) 9
- (3) 20
- (4) 11

158. In the circuit shown in the figure, the input voltage V_i is 20 V, $V_{BE} = 0$ and $V_{CE} = 0$. The values of I_B , I_C and β are given by



- (1) $I_B = 40 \mu\text{A}$, $I_C = 10 \text{ mA}$, $\beta = 250$
 (2) $I_B = 40 \mu\text{A}$, $I_C = 5 \text{ mA}$, $\beta = 125$
 (3) $I_B = 20 \mu\text{A}$, $I_C = 5 \text{ mA}$, $\beta = 250$
 (4) $I_B = 25 \mu\text{A}$, $I_C = 5 \text{ mA}$, $\beta = 200$

159. In the combination of the following gates the output Y can be written in terms of inputs A and B as



- (1) $\overline{A \cdot B}$
 (2) $\overline{A + B}$
 (3) $\overline{A \cdot B} + A \cdot B$
 (4) $A \cdot \overline{B} + \overline{A} \cdot B$

160. In a p-n junction diode, change in temperature due to heating
- (1) affects only reverse resistance
 (2) affects the overall V – I characteristics of p-n junction
 (3) does not affect resistance of p-n junction
 (4) affects only forward resistance

161. An electron of mass m with an initial velocity $\vec{V} = V_0 \hat{i}$ ($V_0 > 0$) enters an electric field $\vec{E} = -E_0 \hat{i}$ ($E_0 = \text{constant} > 0$) at $t = 0$. If λ_0 is its de-Broglie wavelength initially, then its de-Broglie wavelength at time t is

- (1) $\frac{\lambda_0}{\left(1 + \frac{eE_0 t}{mV_0}\right)}$
 (2) λ_0
 (3) $\lambda_0 t$
 (4) $\lambda_0 \left(1 + \frac{eE_0 t}{mV_0}\right)$

162. The ratio of kinetic energy to the total energy of an electron in a Bohr orbit of the hydrogen atom, is

- (1) 1 : 1
 (2) 1 : -2
 (3) 2 : -1
 (4) 1 : -1

163. For a radioactive material, half-life is 10 minutes. If initially there are 600 number of nuclei, the time taken (in minutes) for the disintegration of 450 nuclei is

- (1) 20
 (2) 15
 (3) 30
 (4) 10

164. When the light of frequency $2\nu_0$ (where ν_0 is threshold frequency), is incident on a metal plate, the maximum velocity of electrons emitted is v_1 . When the frequency of the incident radiation is increased to $5\nu_0$, the maximum velocity of electrons emitted from the same plate is v_2 . The ratio of v_1 to v_2 is

- (1) 1 : 2
 (2) 2 : 1
 (3) 4 : 1
 (4) 1 : 4

165. A tuning fork is used to produce resonance in a glass tube. The length of the air column in this tube can be adjusted by a variable piston. At room temperature of 27°C two successive resonances are produced at 20 cm and 73 cm of column length. If the frequency of the tuning fork is 320 Hz, the velocity of sound in air at 27°C is

- (1) 330 m/s
- (2) 300 m/s
- (3) 350 m/s
- (4) 339 m/s

166. The electrostatic force between the metal plates of an isolated parallel plate capacitor C having a charge Q and area A, is

- (1) independent of the distance between the plates.
- (2) inversely proportional to the distance between the plates.
- (3) proportional to the square root of the distance between the plates.
- (4) linearly proportional to the distance between the plates.

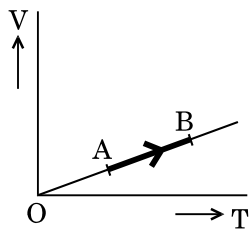
167. An electron falls from rest through a vertical distance h in a uniform and vertically upward directed electric field E. The direction of electric field is now reversed, keeping its magnitude the same. A proton is allowed to fall from rest in it through the same vertical distance h. The time of fall of the electron, in comparison to the time of fall of the proton is

- (1) smaller
- (2) equal
- (3) 10 times greater
- (4) 5 times greater

168. A pendulum is hung from the roof of a sufficiently high building and is moving freely to and fro like a simple harmonic oscillator. The acceleration of the bob of the pendulum is 20 m/s^2 at a distance of 5 m from the mean position. The time period of oscillation is

- (1) $2\pi\text{ s}$
- (2) 1 s
- (3) 2 s
- (4) $\pi\text{ s}$

169. The volume (V) of a monatomic gas varies with its temperature (T), as shown in the graph. The ratio of work done by the gas, to the heat absorbed by it, when it undergoes a change from state A to state B, is



- (1) $\frac{2}{5}$
- (2) $\frac{2}{7}$
- (3) $\frac{1}{3}$
- (4) $\frac{2}{3}$

170. The fundamental frequency in an open organ pipe is equal to the third harmonic of a closed organ pipe. If the length of the closed organ pipe is 20 cm, the length of the open organ pipe is

- (1) 13.2 cm
- (2) 16 cm
- (3) 12.5 cm
- (4) 8 cm

171. At what temperature will the rms speed of oxygen molecules become just sufficient for escaping from the Earth's atmosphere?

(Given :

Mass of oxygen molecule (m) = $2.76 \times 10^{-26}\text{ kg}$

Boltzmann's constant $k_B = 1.38 \times 10^{-23}\text{ J K}^{-1}$)

- (1) $2.508 \times 10^4\text{ K}$
- (2) $1.254 \times 10^4\text{ K}$
- (3) $5.016 \times 10^4\text{ K}$
- (4) $8.360 \times 10^4\text{ K}$

172. The efficiency of an ideal heat engine working between the freezing point and boiling point of water, is

- (1) 26.8%
- (2) 12.5%
- (3) 6.25%
- (4) 20%

173. The power radiated by a black body is P and it radiates maximum energy at wavelength, λ_0 . If the temperature of the black body is now changed so that it radiates maximum energy at wavelength $\frac{3}{4}\lambda_0$, the power radiated by it becomes nP . The value of n is

- (1) $\frac{3}{4}$
- (2) $\frac{81}{256}$
- (3) $\frac{256}{81}$
- (4) $\frac{4}{3}$

174. Two wires are made of the same material and have the same volume. The first wire has cross-sectional area A and the second wire has cross-sectional area $3A$. If the length of the first wire is increased by Δl on applying a force F , how much force is needed to stretch the second wire by the same amount?

- (1) $9F$
- (2) F
- (3) $4F$
- (4) $6F$

175. A small sphere of radius ' r ' falls from rest in a viscous liquid. As a result, heat is produced due to viscous force. The rate of production of heat when the sphere attains its terminal velocity, is proportional to

- (1) r^3
- (2) r^4
- (3) r^5
- (4) r^2

176. A sample of 0.1 g of water at 100°C and normal pressure ($1.013 \times 10^5 \text{ Nm}^{-2}$) requires 54 cal of heat energy to convert to steam at 100°C . If the volume of the steam produced is 167.1 cc, the change in internal energy of the sample, is

- (1) 104.3 J
- (2) 84.5 J
- (3) 42.2 J
- (4) 208.7 J

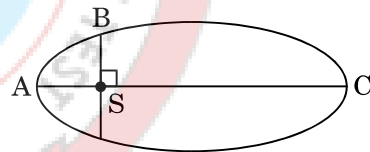
177. A solid sphere is rotating freely about its symmetry axis in free space. The radius of the sphere is increased keeping its mass same. Which of the following physical quantities would remain constant for the sphere?

- (1) Angular velocity
- (2) Angular momentum
- (3) Rotational kinetic energy
- (4) Moment of inertia

178. A solid sphere is in rolling motion. In rolling motion a body possesses translational kinetic energy (K_t) as well as rotational kinetic energy (K_r) simultaneously. The ratio $K_t : (K_t + K_r)$ for the sphere is

- (1) $7 : 10$
- (2) $2 : 5$
- (3) $10 : 7$
- (4) $5 : 7$

179. The kinetic energies of a planet in an elliptical orbit about the Sun, at positions A, B and C are K_A , K_B and K_C , respectively. AC is the major axis and SB is perpendicular to AC at the position of the Sun S as shown in the figure. Then



- (1) $K_A < K_B < K_C$
- (2) $K_B > K_A > K_C$
- (3) $K_B < K_A < K_C$
- (4) $K_A > K_B > K_C$

180. If the mass of the Sun were ten times smaller and the universal gravitational constant were ten times larger in magnitude, which of the following is **not** correct?

- (1) Raindrops will fall faster.
- (2) 'g' on the Earth will not change.
- (3) Time period of a simple pendulum on the Earth would decrease.
- (4) Walking on the ground would become more difficult.

SPACE FOR ROUGH WORK

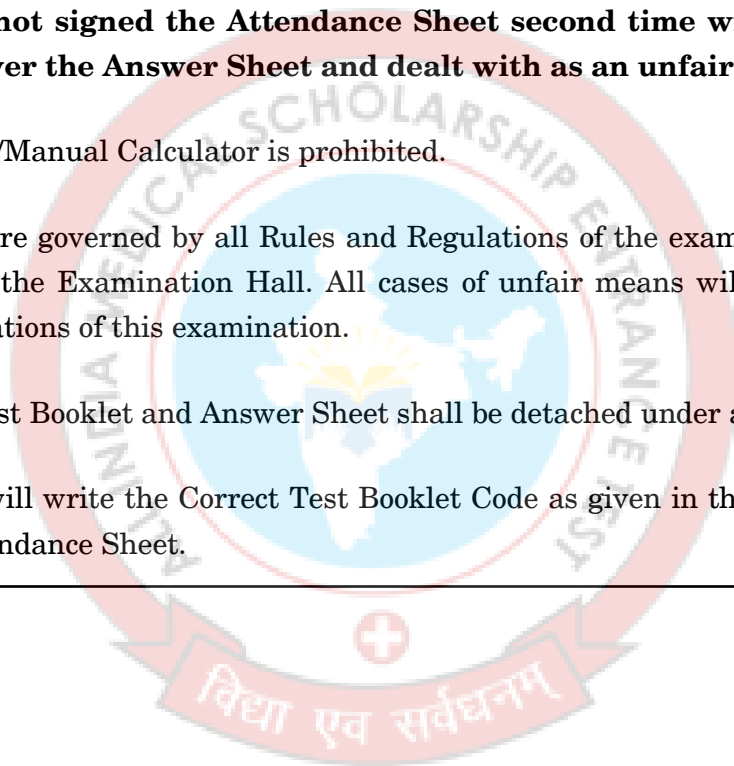


SPACE FOR ROUGH WORK



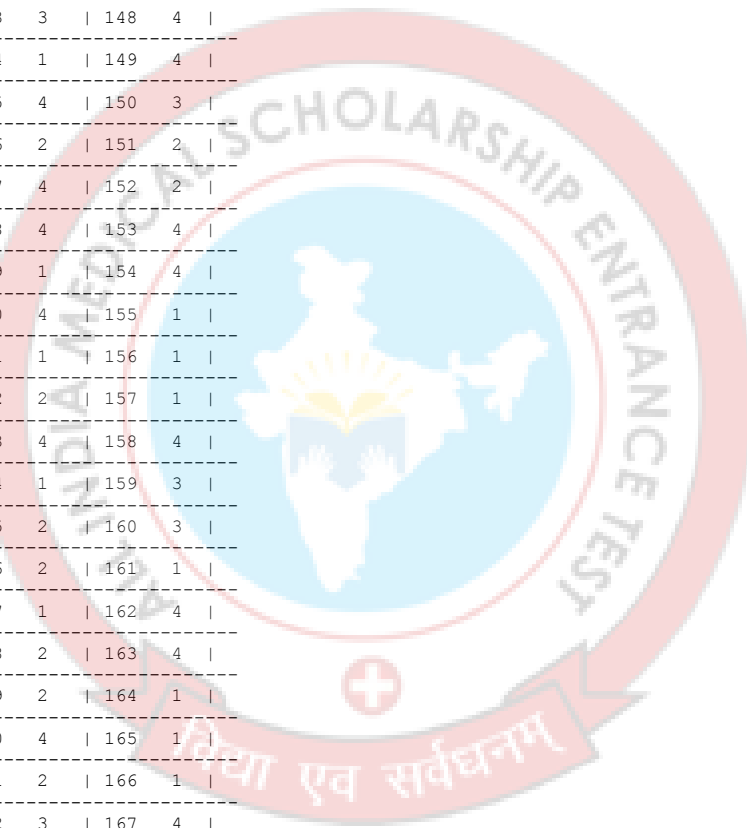
Read carefully the following instructions :

1. Each candidate must show on demand his/her Admit Card to the Invigilator.
2. No candidate, without special permission of the Superintendent or Invigilator, would leave his/her seat.
3. The candidates should not leave the Examination Hall without handing over their Answer Sheet to the Invigilator on duty and sign the Attendance Sheet twice. **Cases where a candidate has not signed the Attendance Sheet second time will be deemed not to have handed over the Answer Sheet and dealt with as an unfair means case.**
4. Use of Electronic/Manual Calculator is prohibited.
5. The candidates are governed by all Rules and Regulations of the examination with regard to their conduct in the Examination Hall. All cases of unfair means will be dealt with as per Rules and Regulations of this examination.
6. No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.
7. The candidates will write the Correct Test Booklet Code as given in the Test Booklet/Answer Sheet in the Attendance Sheet.



CODE :- ACHLA Set :- BB

QNO	ANS	QNO	ANS	QNO	ANS	QNO	ANS
1	3	46	1	91	2	136	1
2	4	47	1	92	1	137	4
3	2	48	4	93	4	138	1
4	1	49	1	94	3	139	1
5	4	50	1	95	4	140	2
6	2	51	4	96	2	141	1
7	2	52	3	97	4	142	2
8	3	53	1	98	1	143	3
9	4	54	3	99	3	144	4
10	2	55	3	100	1	145	2
11	1	56	4	101	2	146	2
12	1	57	2	102	4	147	1
13	1	58	1	103	3	148	4
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26	4	71	1	116	2	161	1
27	4	72	2	117	1	162	4
28	1	73	2	118	2	163	4
29	1	74	4	119	2	164	1
30	2	75	2	120	4	165	1
31	2	76	2	121	2	166	1
32	1	77	4	122	3	167	4
33	2	78	1	123	4	168	1
34	1	79	2	124	1	169	4
35	2	80	1	125	1	170	2
36	2	81	2	126	4	171	2
37	4	82	2	127	4	172	4
38	3	83	2	128	1	173	4
39	1	84	4	129	2	174	2
40	1	85	4	130	3	175	4
41	3	86	4	131	1	176	4
42	2	87	4	132	2	177	2
43	4	88	2	133	3	178	2
44	1	89	1	134	1	179	2
45	3	90	3	135	2	180	4





This Booklet contains **24** pages.

CC

Do not open this Test Booklet until you are asked to do so.

Read carefully the Instructions on the Back Cover of this Test Booklet.

Important Instructions :

1. The Answer Sheet is inside this Test Booklet. When you are directed to open the Test Booklet, take out the Answer Sheet and fill in the particulars on **Side-1** and **Side-2** carefully with **blue/black** ball point pen only.
2. The test is of **3 hours** duration and this Test Booklet contains **180** questions. Each question carries **4** marks. For each correct response, the candidate will get **4** marks. For each incorrect response, **one mark** will be deducted from the total scores. The maximum marks are 720.
3. Use **Blue/Black Ball Point Pen only** for writing particulars on this page/markings responses.
4. Rough work is to be done on the space provided for this purpose in the Test Booklet only.
5. **On completion of the test, the candidate must hand over the Answer Sheet to the Invigilator before leaving the Room/Hall. The candidates are allowed to take away this Test Booklet with them.**
6. The CODE for this Booklet is **CC**. Make sure that the CODE printed on **Side-2** of the Answer Sheet is the same as that on this Test Booklet. In case of discrepancy, the candidate should immediately report the matter to the Invigilator for replacement of both the Test Booklet and the Answer Sheet.
7. The candidates should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. Do not write your Roll No. anywhere else except in the specified space in the Test Booklet/Answer Sheet.
8. Use of white fluid for correction is **not** permissible on the Answer Sheet.

Name of the Candidate (in Capitals) : _____

Roll Number : in figures _____

: in words _____

Centre of Examination (in Capitals) : _____

Candidate's Signature : _____ Invigilator's Signature : _____

Facsimile signature stamp of

Centre Superintendent : _____

1. Niche is
- (1) the functional role played by the organism where it lives
 - (2) the range of temperature that the organism needs to live
 - (3) the physical space where an organism lives
 - (4) all the biological factors in the organism's environment
2. Which of the following is a secondary pollutant ?
- (1) O₃
 - (2) SO₂
 - (3) CO₂
 - (4) CO
3. In stratosphere, which of the following elements acts as a catalyst in degradation of ozone and release of molecular oxygen ?
- (1) Oxygen
 - (2) Fe
 - (3) Cl
 - (4) Carbon
4. World Ozone Day is celebrated on
- (1) 22nd April
 - (2) 16th September
 - (3) 21st April
 - (4) 5th June
5. What type of ecological pyramid would be obtained with the following data ?
 Secondary consumer : 120 g
 Primary consumer : 60 g
 Primary producer : 10 g
- (1) Upright pyramid of biomass
 - (2) Upright pyramid of numbers
 - (3) Pyramid of energy
 - (4) Inverted pyramid of biomass
6. Natality refers to
- (1) Number of individuals entering a habitat
 - (2) Number of individuals leaving the habitat
 - (3) Birth rate
 - (4) Death rate
7. Offsets are produced by
- (1) Parthenogenesis
 - (2) Parthenocarypy
 - (3) Mitotic divisions
 - (4) Meiotic divisions
8. The experimental proof for semiconservative replication of DNA was first shown in a
- (1) Virus
 - (2) Plant
 - (3) Bacterium
 - (4) Fungus
9. Select the **correct** match :
- (1) Francois Jacob and Jacques Monod – *Lac* operon
 - (2) Matthew Meselson and F. Stahl – *Pisum sativum*
 - (3) Alfred Hershey and Martha Chase – TMV
 - (4) Alec Jeffreys – *Streptococcus pneumoniae*
10. Which of the following has proved helpful in preserving pollen as fossils ?
- (1) Sporopollenin
 - (2) Oil content
 - (3) Cellulosic intine
 - (4) Pollenkitt
11. Which of the following pairs is **wrongly** matched ?
- (1) T.H. Morgan : Linkage
 - (2) XO type sex determination : Grasshopper
 - (3) ABO blood grouping : Co-dominance
 - (4) Starch synthesis in pea : Multiple alleles
12. Which of the following flowers only once in its life-time ?
- (1) Papaya
 - (2) Mango
 - (3) Jackfruit
 - (4) Bamboo species
13. Select the **correct** statement :
- (1) Transduction was discovered by S. Altman.
 - (2) Spliceosomes take part in translation.
 - (3) Punnett square was developed by a British scientist.
 - (4) Franklin Stahl coined the term "linkage".

14. The Golgi complex participates in
- (1) Activation of amino acid
 - (2) Respiration in bacteria
 - (3) Formation of secretory vesicles
 - (4) Fatty acid breakdown
15. The stage during which separation of the paired homologous chromosomes begins is
- (1) Zygotene
 - (2) Diakinesis
 - (3) Diplotene
 - (4) Pachytene
16. Stomatal movement is **not** affected by
- (1) CO₂ concentration
 - (2) O₂ concentration
 - (3) Light
 - (4) Temperature
17. Stomata in grass leaf are
- (1) Barrel shaped
 - (2) Rectangular
 - (3) Kidney shaped
 - (4) Dumb-bell shaped
18. Which of the following is **not** a product of light reaction of photosynthesis ?
- (1) Oxygen
 - (2) NADPH
 - (3) NADH
 - (4) ATP
19. Which of the following is true for nucleolus ?
- (1) It is a site for active ribosomal RNA synthesis.
 - (2) It takes part in spindle formation.
 - (3) It is a membrane-bound structure.
 - (4) Larger nucleoli are present in dividing cells.
20. Which among the following is **not** a prokaryote ?
- (1) *Oscillatoria*
 - (2) *Nostoc*
 - (3) *Mycobacterium*
 - (4) *Saccharomyces*
21. The two functional groups characteristic of sugars are
- (1) carbonyl and hydroxyl
 - (2) carbonyl and phosphate
 - (3) carbonyl and methyl
 - (4) hydroxyl and methyl

22. Match the items given in Column I with those in Column II and select the **correct** option given below :

Column I

Column II

- | | | |
|--------------|------|---|
| a. Herbarium | i. | It is a place having a collection of preserved plants and animals. |
| b. Key | ii. | A list that enumerates methodically all the species found in an area with brief description aiding identification. |
| c. Museum | iii. | Is a place where dried and pressed plant specimens mounted on sheets are kept. |
| d. Catalogue | iv. | A booklet containing a list of characters and their alternates which are helpful in identification of various taxa. |

- | | a | b | c | d |
|-----|-----|----|-----|----|
| (1) | iii | iv | i | ii |
| (2) | ii | iv | iii | i |
| (3) | iii | ii | i | iv |
| (4) | i | iv | iii | ii |

23. Which one is **wrongly** matched ?

- | | | |
|----------------------------|---|---------------------|
| (1) Unicellular organism | – | <i>Chlorella</i> |
| (2) Gemma cups | – | <i>Marchantia</i> |
| (3) Biflagellate zoospores | – | Brown algae |
| (4) Uniflagellate gametes | – | <i>Polysiphonia</i> |

24. After karyogamy followed by meiosis, spores are produced exogenously in

- (1) *Saccharomyces*
- (2) *Agaricus*
- (3) *Alternaria*
- (4) *Neurospora*

25. Winged pollen grains are present in

- (1) *Pinus*
- (2) Mango
- (3) *Cycas*
- (4) Mustard

26. Which of the following is commonly used as a vector for introducing a DNA fragment in human lymphocytes ?
- (1) pBR 322
 - (2) λ phage
 - (3) Ti plasmid
 - (4) Retrovirus
27. A 'new' variety of rice was patented by a foreign company, though such varieties have been present in India for a long time. This is related to
- (1) Basmati
 - (2) Lerma Rojo
 - (3) Sharbati Sonora
 - (4) Co-667
28. Use of bioresources by multinational companies and organisations without authorisation from the concerned country and its people is called
- (1) Bioexploitation
 - (2) Biodegradation
 - (3) Biopiracy
 - (4) Bio-infringement
29. Select the **correct** match :
- | | | |
|-----------------------------------|---|----------------|
| (1) G. Mendel | – | Transformation |
| (2) T.H. Morgan | – | Transduction |
| (3) $F_2 \times$ Recessive parent | – | Dihybrid cross |
| (4) Ribozyme | – | Nucleic acid |
30. The correct order of steps in Polymerase Chain Reaction (PCR) is
- (1) Denaturation, Annealing, Extension
 - (2) Denaturation, Extension, Annealing
 - (3) Annealing, Extension, Denaturation
 - (4) Extension, Denaturation, Annealing
31. In India, the organisation responsible for assessing the safety of introducing genetically modified organisms for public use is
- (1) Genetic Engineering Appraisal Committee (GEAC)
 - (2) Research Committee on Genetic Manipulation (RCGM)
 - (3) Council for Scientific and Industrial Research (CSIR)
 - (4) Indian Council of Medical Research (ICMR)
32. What is the role of NAD^+ in cellular respiration ?
- (1) It is the final electron acceptor for anaerobic respiration.
 - (2) It is a nucleotide source for ATP synthesis.
 - (3) It functions as an electron carrier.
 - (4) It functions as an enzyme.
33. Which one of the following plants shows a very close relationship with a species of moth, where none of the two can complete its life cycle without the other ?
- (1) *Viola*
 - (2) Banana
 - (3) *Yucca*
 - (4) *Hydrilla*
34. Pollen grains can be stored for several years in liquid nitrogen having a temperature of
- (1) -160°C
 - (2) -196°C
 - (3) -80°C
 - (4) -120°C
35. In which of the following forms is iron absorbed by plants ?
- (1) Both ferric and ferrous
 - (2) Free element
 - (3) Ferrous
 - (4) Ferric
36. Double fertilization is
- (1) Syngamy and triple fusion
 - (2) Fusion of two male gametes with one egg
 - (3) Fusion of one male gamete with two polar nuclei
 - (4) Fusion of two male gametes of a pollen tube with two different eggs
37. Oxygen is **not** produced during photosynthesis by
- (1) *Chara*
 - (2) *Cycas*
 - (3) *Nostoc*
 - (4) Green sulphur bacteria
38. Which of the following elements is responsible for maintaining turgor in cells ?
- (1) Calcium
 - (2) Potassium
 - (3) Sodium
 - (4) Magnesium

39. Pneumatophores occur in
- (1) Submerged hydrophytes
 - (2) Carnivorous plants
 - (3) Free-floating hydrophytes
 - (4) Halophytes
40. Select the **wrong** statement :
- (1) Mitochondria are the powerhouse of the cell in all kingdoms except Monera.
 - (2) Pseudopodia are locomotory and feeding structures in Sporozoans.
 - (3) Mushrooms belong to Basidiomycetes.
 - (4) Cell wall is present in members of Fungi and Plantae.
41. Secondary xylem and phloem in dicot stem are produced by
- (1) Axillary meristems
 - (2) Phellogen
 - (3) Vascular cambium
 - (4) Apical meristems
42. Sweet potato is a modified
- (1) Rhizome
 - (2) Tap root
 - (3) Adventitious root
 - (4) Stem
43. Which of the following statements is **correct** ?
- (1) Stems are usually unbranched in both *Cycas* and *Cedrus*.
 - (2) Horsetails are gymnosperms.
 - (3) *Selaginella* is heterosporous, while *Salvinia* is homosporous.
 - (4) Ovules are not enclosed by ovary wall in gymnosperms.
44. Casparian strips occur in
- (1) Endodermis
 - (2) Cortex
 - (3) Pericycle
 - (4) Epidermis
45. Plants having little or no secondary growth are
- (1) Cycads
 - (2) Conifers
 - (3) Deciduous angiosperms
 - (4) Grasses
46. Nissl bodies are mainly composed of
- (1) Free ribosomes and RER
 - (2) Nucleic acids and SER
 - (3) DNA and RNA
 - (4) Proteins and lipids
47. Which of these statements is **incorrect** ?
- (1) Oxidative phosphorylation takes place in outer mitochondrial membrane.
 - (2) Glycolysis operates as long as it is supplied with NAD that can pick up hydrogen atoms.
 - (3) Glycolysis occurs in cytosol.
 - (4) Enzymes of TCA cycle are present in mitochondrial matrix.
48. Many ribosomes may associate with a single mRNA to form multiple copies of a polypeptide simultaneously. Such strings of ribosomes are termed as
- (1) Nucleosome
 - (2) Plastidome
 - (3) Polyhedral bodies
 - (4) Polysome
49. Which of the following terms describe human dentition ?
- (1) Pleurodont, Diphyodont, Heterodont
 - (2) Pleurodont, Monophyodont, Homodont
 - (3) Thecodont, Diphyodont, Heterodont
 - (4) Thecodont, Diphyodont, Homodont
50. Which of the following events does **not** occur in rough endoplasmic reticulum ?
- (1) Phospholipid synthesis
 - (2) Cleavage of signal peptide
 - (3) Protein glycosylation
 - (4) Protein folding
51. Select the **incorrect** match :
- (1) Polytene – Oocytes of amphibians chromosomes
 - (2) Submetacentric – L-shaped chromosomes
 - (3) Allosomes – Sex chromosomes
 - (4) Lampbrush – Diplotene bivalents chromosomes

52. Which of the following is an amino acid derived hormone ?
- (1) Estriol
 - (2) Estradiol
 - (3) Ecdysone
 - (4) Epinephrine
53. Which of the following structures or regions is **incorrectly** paired with its function ?
- (1) Corpus callosum : band of fibers connecting left and right cerebral hemispheres.
 - (2) Hypothalamus : production of releasing hormones and regulation of temperature, hunger and thirst.
 - (3) Limbic system : consists of fibre tracts that interconnect different regions of brain; controls movement.
 - (4) Medulla oblongata : controls respiration and cardiovascular reflexes.
54. Which of the following hormones can play a significant role in osteoporosis ?
- (1) Parathyroid hormone and Prolactin
 - (2) Estrogen and Parathyroid hormone
 - (3) Progesterone and Aldosterone
 - (4) Aldosterone and Prolactin
55. The transparent lens in the human eye is held in its place by
- (1) smooth muscles attached to the ciliary body
 - (2) smooth muscles attached to the iris
 - (3) ligaments attached to the iris
 - (4) ligaments attached to the ciliary body
56. In a growing population of a country,
- (1) pre-reproductive individuals are less than the reproductive individuals.
 - (2) reproductive and pre-reproductive individuals are equal in number.
 - (3) reproductive individuals are less than the post-reproductive individuals.
 - (4) pre-reproductive individuals are more than the reproductive individuals.
57. Match the items given in Column I with those in Column II and select the **correct** option given below :
- | <i>Column I</i> | <i>Column II</i> |
|----------------------|--------------------------|
| a. Eutrophication | i. UV-B radiation |
| b. Sanitary landfill | ii. Deforestation |
| c. Snow blindness | iii. Nutrient enrichment |
| d. Jhum cultivation | iv. Waste disposal |
- | a | b | c | d |
|----------|----------|----------|----------|
| (1) i | ii | iv | iii |
| (2) iii | iv | i | ii |
| (3) i | iii | iv | ii |
| (4) ii | i | iii | iv |
58. Which part of poppy plant is used to obtain the drug "Smack" ?
- (1) Leaves
 - (2) Roots
 - (3) Latex
 - (4) Flowers
59. Which one of the following population interactions is widely used in medical science for the production of antibiotics ?
- (1) Amensalism
 - (2) Parasitism
 - (3) Mutualism
 - (4) Commensalism
60. All of the following are included in 'Ex-situ conservation' *except*
- (1) Seed banks
 - (2) Botanical gardens
 - (3) Sacred groves
 - (4) Wildlife safari parks

61. Which of the following gastric cells indirectly help in erythropoiesis ?

- (1) Parietal cells
- (2) Goblet cells
- (3) Mucous cells
- (4) Chief cells

62. Match the items given in Column I with those in Column II and select the **correct** option given below :

Column I

Column II

- | | |
|---------------|------------------------|
| a. Fibrinogen | i. Osmotic balance |
| b. Globulin | ii. Blood clotting |
| c. Albumin | iii. Defence mechanism |

a b c

- | | | |
|---------|-----|-----|
| (1) ii | iii | i |
| (2) i | iii | ii |
| (3) i | ii | iii |
| (4) iii | ii | i |

63. Calcium is important in skeletal muscle contraction because it

- (1) prevents the formation of bonds between the myosin cross bridges and the actin filament.
- (2) detaches the myosin head from the actin filament.
- (3) activates the myosin ATPase by binding to it.
- (4) binds to troponin to remove the masking of active sites on actin for myosin.

64. Which of the following is an occupational respiratory disorder ?

- (1) Emphysema
- (2) Botulism
- (3) Silicosis
- (4) Anthracis

65. AGGTATCGCAT is a sequence from the coding strand of a gene. What will be the corresponding sequence of the transcribed mRNA ?

- (1) UCCAUAGCGUA
- (2) ACCUAUGCGAU
- (3) UGGTUTCGCAT
- (4) AGGUAUCGCAU

66. A woman has an X-linked condition on one of her X chromosomes. This chromosome can be inherited by

- (1) Both sons and daughters
- (2) Only grandchildren
- (3) Only sons
- (4) Only daughters

67. Match the items given in Column I with those in Column II and select the **correct** option given below :

Column I

Column II

- | | |
|------------------------|------------------------------------|
| a. Proliferative Phase | i. Breakdown of endometrial lining |
| b. Secretory Phase | ii. Follicular Phase |
| c. Menstruation | iii. Luteal Phase |

a b c

- | | | |
|---------|-----|----|
| (1) iii | i | ii |
| (2) ii | iii | i |
| (3) i | iii | ii |
| (4) iii | ii | i |

68. According to Hugo de Vries, the mechanism of evolution is

- (1) Minor mutations
- (2) Phenotypic variations
- (3) Saltation
- (4) Multiple step mutations

69. All of the following are part of an operon *except*

- (1) a promoter
- (2) an enhancer
- (3) structural genes
- (4) an operator

70. Which of the following options correctly represents the lung conditions in asthma and emphysema, respectively ?

- (1) Decreased respiratory surface; Inflammation of bronchioles
- (2) Increased respiratory surface; Inflammation of bronchioles
- (3) Increased number of bronchioles; Increased respiratory surface
- (4) Inflammation of bronchioles; Decreased respiratory surface

71. Match the items given in Column I with those in Column II and select the **correct** option given below :

Column I

Column II

- | | |
|--------------------|--|
| a. Tricuspid valve | i. Between left atrium and left ventricle |
| b. Bicuspid valve | ii. Between right ventricle and pulmonary artery |
| c. Semilunar valve | iii. Between right atrium and right ventricle |

a b c

- | | | |
|---------|-----|-----|
| (1) ii | i | iii |
| (2) i | ii | iii |
| (3) i | iii | ii |
| (4) iii | i | ii |

72. Match the items given in Column I with those in Column II and select the **correct** option given below :

Column I

Column II

- | | |
|-------------------------------|--------------------|
| a. Tidal volume | i. 2500 – 3000 mL |
| b. Inspiratory Reserve volume | ii. 1100 – 1200 mL |
| c. Expiratory Reserve volume | iii. 500 – 550 mL |
| d. Residual volume | iv. 1000 – 1100 mL |

a b c d

- | | | | |
|---------|-----|----|-----|
| (1) iv | iii | ii | i |
| (2) i | iv | ii | iii |
| (3) iii | i | iv | ii |
| (4) iii | ii | i | iv |

73. Hormones secreted by the placenta to maintain pregnancy are

- (1) hCG, progestogens, estrogens, glucocorticoids
- (2) hCG, hPL, progestogens, estrogens
- (3) hCG, hPL, estrogens, relaxin, oxytocin
- (4) hCG, hPL, progestogens, prolactin

74. The contraceptive 'SAHELI'

- (1) is a post-coital contraceptive.
- (2) is an IUD.
- (3) increases the concentration of estrogen and prevents ovulation in females.
- (4) blocks estrogen receptors in the uterus, preventing eggs from getting implanted.

75. The difference between spermiogenesis and spermiation is

- (1) In spermiogenesis spermatozoa are formed, while in spermiation spermatozoa are released from sertoli cells into the cavity of seminiferous tubules.
- (2) In spermiogenesis spermatozoa from sertoli cells are released into the cavity of seminiferous tubules, while in spermiation spermatozoa are formed.
- (3) In spermiogenesis spermatozoa are formed, while in spermiation spermatids are formed.
- (4) In spermiogenesis spermatids are formed, while in spermiation spermatozoa are formed.

76. The amnion of mammalian embryo is derived from

- (1) ectoderm and endoderm
- (2) mesoderm and trophoblast
- (3) endoderm and mesoderm
- (4) ectoderm and mesoderm

77. Which of the following animals does **not** undergo metamorphosis ?

- (1) Starfish
- (2) Moth
- (3) Tunicate
- (4) Earthworm

78. Which one of these animals is **not** a homeotherm ?

- (1) *Psittacula*
- (2) *Camelus*
- (3) *Chelone*
- (4) *Macropus*

79. Which of the following features is used to identify a male cockroach from a female cockroach ?

- (1) Presence of anal cerci
- (2) Forewings with darker tegmina
- (3) Presence of caudal styles
- (4) Presence of a boat shaped sternum on the 9th abdominal segment

80. Which of the following organisms are known as chief producers in the oceans ?

- (1) Euglenoids
- (2) Cyanobacteria
- (3) Diatoms
- (4) Dinoflagellates

81. Ciliates differ from all other protozoans in

- (1) having two types of nuclei
- (2) using pseudopodia for capturing prey
- (3) having a contractile vacuole for removing excess water
- (4) using flagella for locomotion

82. Identify the vertebrate group of animals characterized by crop and gizzard in its digestive system.

- (1) Osteichthyes
- (2) Aves
- (3) Reptilia
- (4) Amphibia

83. Match the items given in Column I with those in Column II and select the **correct** option given below :

Column I

Column II

- | | |
|-------------------------|--|
| a. Glycosuria | i. Accumulation of uric acid in joints |
| b. Gout | ii. Mass of crystallised salts within the kidney |
| c. Renal calculi | iii. Inflammation in glomeruli |
| d. Glomerular nephritis | iv. Presence of glucose in urine |

a b c d

- | | | | |
|---------|-----|-----|-----|
| (1) iv | i | ii | iii |
| (2) ii | iii | i | iv |
| (3) i | ii | iii | iv |
| (4) iii | ii | iv | i |

84. Match the items given in Column I with those in Column II and select the **correct** option given below :

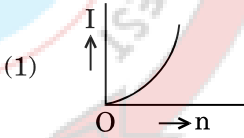
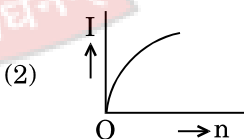
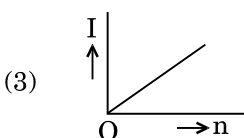
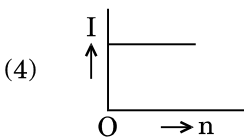
Column I
(Function)

Column II
(Part of Excretory System)

- | | |
|---------------------------|-------------------------------|
| a. Ultrafiltration | i. Henle's loop |
| b. Concentration of urine | ii. Ureter |
| c. Transport of urine | iii. Urinary bladder |
| d. Storage of urine | iv. Malpighian corpuscle |
| | v. Proximal convoluted tubule |

a b c d

- | | | | |
|--------|----|----|-----|
| (1) v | iv | i | iii |
| (2) v | iv | i | ii |
| (3) iv | i | ii | iii |
| (4) iv | v | ii | iii |

85. Among the following sets of examples for divergent evolution, select the **incorrect** option :
- (1) Eye of octopus, bat and man
 - (2) Brain of bat, man and cheetah
 - (3) Heart of bat, man and cheetah
 - (4) Forelimbs of man, bat and cheetah
86. Conversion of milk to curd improves its nutritional value by increasing the amount of
- (1) Vitamin E
 - (2) Vitamin B₁₂
 - (3) Vitamin A
 - (4) Vitamin D
87. Which of the following characteristics represent 'Inheritance of blood groups' in humans ?
- a. Dominance
 - b. Co-dominance
 - c. Multiple allele
 - d. Incomplete dominance
 - e. Polygenic inheritance
- (1) a, c and e
 - (2) b, d and e
 - (3) a, b and c
 - (4) b, c and e
88. Which of the following is **not** an autoimmune disease ?
- (1) Vitiligo
 - (2) Alzheimer's disease
 - (3) Rheumatoid arthritis
 - (4) Psoriasis
89. The similarity of bone structure in the forelimbs of many vertebrates is an example of
- (1) Adaptive radiation
 - (2) Convergent evolution
 - (3) Analogy
 - (4) Homology
90. In which disease does mosquito transmitted pathogen cause chronic inflammation of lymphatic vessels ?
- (1) Amoebiasis
 - (2) Ringworm disease
 - (3) Ascariasis
 - (4) Elephantiasis
91. A carbon resistor of $(47 \pm 4.7) \text{ k}\Omega$ is to be marked with rings of different colours for its identification. The colour code sequence will be
- (1) Green – Orange – Violet – Gold
 - (2) Yellow – Green – Violet – Gold
 - (3) Yellow – Violet – Orange – Silver
 - (4) Violet – Yellow – Orange – Silver
92. A set of 'n' equal resistors, of value 'R' each, are connected in series to a battery of emf 'E' and internal resistance 'R'. The current drawn is I. Now, the 'n' resistors are connected in parallel to the same battery. Then the current drawn from battery becomes 10 I. The value of 'n' is
- (1) 9
 - (2) 20
 - (3) 11
 - (4) 10
93. A battery consists of a variable number 'n' of identical cells (having internal resistance 'r' each) which are connected in series. The terminals of the battery are short-circuited and the current I is measured. Which of the graphs shows the correct relationship between I and n ?
- (1) 
- (2) 
- (3) 
- (4) 

94. The power radiated by a black body is P and it radiates maximum energy at wavelength, λ_0 . If the temperature of the black body is now changed so that it radiates maximum energy at wavelength $\frac{3}{4}\lambda_0$, the power radiated by it becomes nP . The value of n is

- (1) $\frac{81}{256}$
- (2) $\frac{256}{81}$
- (3) $\frac{4}{3}$
- (4) $\frac{3}{4}$

95. Two wires are made of the same material and have the same volume. The first wire has cross-sectional area A and the second wire has cross-sectional area $3A$. If the length of the first wire is increased by Δl on applying a force F , how much force is needed to stretch the second wire by the same amount?

- (1) F
- (2) $4F$
- (3) $6F$
- (4) $9F$

96. A sample of 0.1 g of water at 100°C and normal pressure ($1.013 \times 10^5 \text{ Nm}^{-2}$) requires 54 cal of heat energy to convert to steam at 100°C . If the volume of the steam produced is 167.1 cc, the change in internal energy of the sample, is

- (1) 84.5 J
- (2) 42.2 J
- (3) 208.7 J
- (4) 104.3 J

97. A small sphere of radius ' r ' falls from rest in a viscous liquid. As a result, heat is produced due to viscous force. The rate of production of heat when the sphere attains its terminal velocity, is proportional to

- (1) r^4
- (2) r^5
- (3) r^2
- (4) r^3

98. The moment of the force, $\vec{F} = 4\hat{i} + 5\hat{j} - 6\hat{k}$ at $(2, 0, -3)$, about the point $(2, -2, -2)$, is given by

- (1) $-7\hat{i} - 4\hat{j} - 8\hat{k}$
- (2) $-7\hat{i} - 8\hat{j} - 4\hat{k}$
- (3) $-4\hat{i} - \hat{j} - 8\hat{k}$
- (4) $-8\hat{i} - 4\hat{j} - 7\hat{k}$

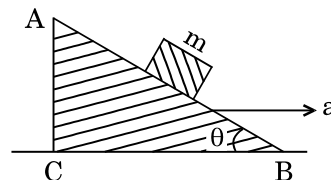
99. A student measured the diameter of a small steel ball using a screw gauge of least count 0.001 cm. The main scale reading is 5 mm and zero of circular scale division coincides with 25 divisions above the reference level. If screw gauge has a zero error of -0.004 cm, the correct diameter of the ball is

- (1) 0.529 cm
- (2) 0.053 cm
- (3) 0.525 cm
- (4) 0.521 cm

100. A toy car with charge q moves on a frictionless horizontal plane surface under the influence of a uniform electric field \vec{E} . Due to the force $q\vec{E}$, its velocity increases from 0 to 6 m/s in one second duration. At that instant the direction of the field is reversed. The car continues to move for two more seconds under the influence of this field. The average velocity and the average speed of the toy car between 0 to 3 seconds are respectively

- (1) 1.5 m/s, 3 m/s
- (2) 1 m/s, 3.5 m/s
- (3) 1 m/s, 3 m/s
- (4) 2 m/s, 4 m/s

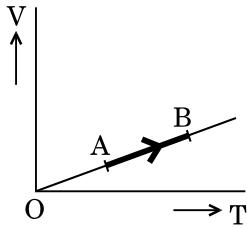
101. A block of mass m is placed on a smooth inclined wedge ABC of inclination θ as shown in the figure. The wedge is given an acceleration ' a ' towards the right. The relation between a and θ for the block to remain stationary on the wedge is



- (1) $a = g \tan \theta$
- (2) $a = g \cos \theta$
- (3) $a = \frac{g}{\sin \theta}$
- (4) $a = \frac{g}{\operatorname{cosec} \theta}$

102. An em wave is propagating in a medium with a velocity $\vec{V} = V\hat{i}$. The instantaneous oscillating electric field of this em wave is along +y axis. Then the direction of oscillating magnetic field of the em wave will be along
- (1) -x direction
 - (2) -y direction
 - (3) +z direction
 - (4) -z direction
103. The refractive index of the material of a prism is $\sqrt{2}$ and the angle of the prism is 30° . One of the two refracting surfaces of the prism is made a mirror inwards, by silver coating. A beam of monochromatic light entering the prism from the other face will retrace its path (after reflection from the silvered surface) if its angle of incidence on the prism is
- (1) zero
 - (2) 30°
 - (3) 45°
 - (4) 60°
104. The magnetic potential energy stored in a certain inductor is 25 mJ, when the current in the inductor is 60 mA. This inductor is of inductance
- (1) 13.89 H
 - (2) 1.389 H
 - (3) 138.88 H
 - (4) 0.138 H
105. An object is placed at a distance of 40 cm from a concave mirror of focal length 15 cm. If the object is displaced through a distance of 20 cm towards the mirror, the displacement of the image will be
- (1) 36 cm towards the mirror
 - (2) 30 cm towards the mirror
 - (3) 36 cm away from the mirror
 - (4) 30 cm away from the mirror
106. The ratio of kinetic energy to the total energy of an electron in a Bohr orbit of the hydrogen atom, is
- (1) 1 : -2
 - (2) 2 : -1
 - (3) 1 : -1
 - (4) 1 : 1
107. An electron of mass m with an initial velocity $\vec{V} = V_0\hat{i}$ ($V_0 > 0$) enters an electric field $\vec{E} = -E_0\hat{i}$ ($E_0 = \text{constant} > 0$) at $t = 0$. If λ_0 is its de-Broglie wavelength initially, then its de-Broglie wavelength at time t is
- (1) λ_0
 - (2) $\lambda_0 t$
 - (3) $\lambda_0 \left(1 + \frac{eE_0}{mV_0} t \right)$
 - (4) $\frac{\lambda_0}{\left(1 + \frac{eE_0}{mV_0} t \right)}$
108. When the light of frequency $2\nu_0$ (where ν_0 is threshold frequency), is incident on a metal plate, the maximum velocity of electrons emitted is v_1 . When the frequency of the incident radiation is increased to $5\nu_0$, the maximum velocity of electrons emitted from the same plate is v_2 . The ratio of v_1 to v_2 is
- (1) 2 : 1
 - (2) 4 : 1
 - (3) 1 : 4
 - (4) 1 : 2
109. For a radioactive material, half-life is 10 minutes. If initially there are 600 number of nuclei, the time taken (in minutes) for the disintegration of 450 nuclei is
- (1) 15
 - (2) 30
 - (3) 10
 - (4) 20

110. The volume (V) of a monatomic gas varies with its temperature (T), as shown in the graph. The ratio of work done by the gas, to the heat absorbed by it, when it undergoes a change from state A to state B, is



- (1) $\frac{2}{7}$
 (2) $\frac{1}{3}$
 (3) $\frac{2}{3}$
 (4) $\frac{2}{5}$
111. The fundamental frequency in an open organ pipe is equal to the third harmonic of a closed organ pipe. If the length of the closed organ pipe is 20 cm, the length of the open organ pipe is
- (1) 16 cm
 (2) 12.5 cm
 (3) 8 cm
 (4) 13.2 cm
112. The efficiency of an ideal heat engine working between the freezing point and boiling point of water, is
- (1) 12.5%
 (2) 6.25%
 (3) 20%
 (4) 26.8%
113. At what temperature will the rms speed of oxygen molecules become just sufficient for escaping from the Earth's atmosphere ?

(Given :

$$\text{Mass of oxygen molecule (m)} = 2.76 \times 10^{-26} \text{ kg}$$

$$\text{Boltzmann's constant } k_B = 1.38 \times 10^{-23} \text{ J K}^{-1}$$

- (1) $1.254 \times 10^4 \text{ K}$
 (2) $5.016 \times 10^4 \text{ K}$
 (3) $8.360 \times 10^4 \text{ K}$
 (4) $2.508 \times 10^4 \text{ K}$

114. Unpolarised light is incident from air on a plane surface of a material of refractive index ' μ '. At a particular angle of incidence ' i ', it is found that the reflected and refracted rays are perpendicular to each other. Which of the following options is correct for this situation ?

(1) $i = \tan^{-1}\left(\frac{1}{\mu}\right)$

(2) $i = \sin^{-1}\left(\frac{1}{\mu}\right)$

- (3) Reflected light is polarised with its electric vector perpendicular to the plane of incidence

- (4) Reflected light is polarised with its electric vector parallel to the plane of incidence

115. In Young's double slit experiment the separation d between the slits is 2 mm, the wavelength λ of the light used is 5896 Å and distance D between the screen and slits is 100 cm. It is found that the angular width of the fringes is 0.20° . To increase the fringe angular width to 0.21° (with same λ and D) the separation between the slits needs to be changed to

(1) 1.7 mm

(2) 2.1 mm

(3) 1.9 mm

(4) 1.8 mm

116. An astronomical refracting telescope will have large angular magnification and high angular resolution, when it has an objective lens of

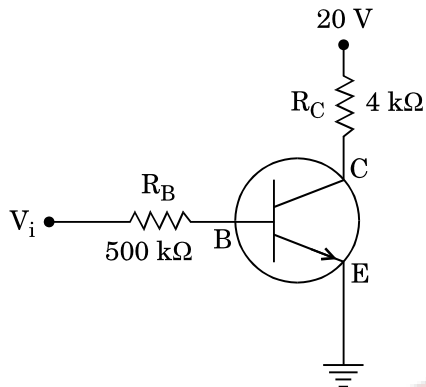
- (1) small focal length and small diameter

- (2) large focal length and large diameter

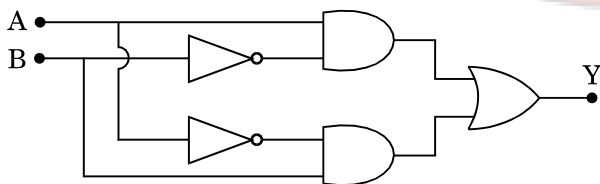
- (3) large focal length and small diameter

- (4) small focal length and large diameter

117. In the circuit shown in the figure, the input voltage V_i is 20 V, $V_{BE} = 0$ and $V_{CE} = 0$. The values of I_B , I_C and β are given by



- (1) $I_B = 40 \mu\text{A}$, $I_C = 5 \text{ mA}$, $\beta = 125$
 (2) $I_B = 20 \mu\text{A}$, $I_C = 5 \text{ mA}$, $\beta = 250$
 (3) $I_B = 25 \mu\text{A}$, $I_C = 5 \text{ mA}$, $\beta = 200$
 (4) $I_B = 40 \mu\text{A}$, $I_C = 10 \text{ mA}$, $\beta = 250$
118. In a p-n junction diode, change in temperature due to heating
- (1) affects the overall $V - I$ characteristics of p-n junction
 (2) does not affect resistance of p-n junction
 (3) affects only forward resistance
 (4) affects only reverse resistance
119. In the combination of the following gates the output Y can be written in terms of inputs A and B as



- (1) $\overline{A + B}$
 (2) $\overline{A \cdot B} + A \cdot B$
 (3) $A \cdot \overline{B} + \overline{A} \cdot B$
 (4) $\overline{A \cdot B}$

120. A metallic rod of mass per unit length 0.5 kg m^{-1} is lying horizontally on a smooth inclined plane which makes an angle of 30° with the horizontal. The rod is not allowed to slide down by flowing a current through it when a magnetic field of induction 0.25 T is acting on it in the vertical direction. The current flowing in the rod to keep it stationary is

- (1) 11.32 A
 (2) 14.76 A
 (3) 5.98 A
 (4) 7.14 A

121. An inductor 20 mH , a capacitor $100 \mu\text{F}$ and a resistor 50Ω are connected in series across a source of emf, $V = 10 \sin 314 t$. The power loss in the circuit is

- (1) 1.13 W
 (2) 2.74 W
 (3) 0.43 W
 (4) 0.79 W

122. A thin diamagnetic rod is placed vertically between the poles of an electromagnet. When the current in the electromagnet is switched on, then the diamagnetic rod is pushed up, out of the horizontal magnetic field. Hence the rod gains gravitational potential energy. The work required to do this comes from

- (1) the induced electric field due to the changing magnetic field
 (2) the lattice structure of the material of the rod
 (3) the magnetic field
 (4) the current source

123. Current sensitivity of a moving coil galvanometer is 5 div/mA and its voltage sensitivity (angular deflection per unit voltage applied) is 20 div/V . The resistance of the galvanometer is

- (1) 500Ω
 (2) 250Ω
 (3) 25Ω
 (4) 40Ω

124. A tuning fork is used to produce resonance in a glass tube. The length of the air column in this tube can be adjusted by a variable piston. At room temperature of 27°C two successive resonances are produced at 20 cm and 73 cm of column length. If the frequency of the tuning fork is 320 Hz, the velocity of sound in air at 27°C is

- (1) 300 m/s
- (2) 350 m/s
- (3) 339 m/s
- (4) 330 m/s

125. The electrostatic force between the metal plates of an isolated parallel plate capacitor C having a charge Q and area A, is

- (1) inversely proportional to the distance between the plates.
- (2) proportional to the square root of the distance between the plates.
- (3) linearly proportional to the distance between the plates.
- (4) independent of the distance between the plates.

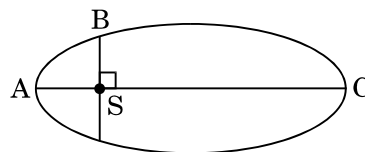
126. A pendulum is hung from the roof of a sufficiently high building and is moving freely to and fro like a simple harmonic oscillator. The acceleration of the bob of the pendulum is 20 m/s^2 at a distance of 5 m from the mean position. The time period of oscillation is

- (1) 1 s
- (2) 2 s
- (3) π s
- (4) 2π s

127. An electron falls from rest through a vertical distance h in a uniform and vertically upward directed electric field E. The direction of electric field is now reversed, keeping its magnitude the same. A proton is allowed to fall from rest in it through the same vertical distance h. The time of fall of the electron, in comparison to the time of fall of the proton is

- (1) equal
- (2) 10 times greater
- (3) 5 times greater
- (4) smaller

128. The kinetic energies of a planet in an elliptical orbit about the Sun, at positions A, B and C are K_A , K_B and K_C , respectively. AC is the major axis and SB is perpendicular to AC at the position of the Sun S as shown in the figure. Then



- (1) $K_B > K_A > K_C$
- (2) $K_B < K_A < K_C$
- (3) $K_A > K_B > K_C$
- (4) $K_A < K_B < K_C$

129. A solid sphere is in rolling motion. In rolling motion a body possesses translational kinetic energy (K_t) as well as rotational kinetic energy (K_r) simultaneously. The ratio $K_t : (K_t + K_r)$ for the sphere is

- (1) 2 : 5
- (2) 10 : 7
- (3) 5 : 7
- (4) 7 : 10

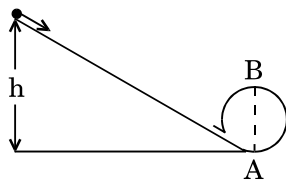
130. If the mass of the Sun were ten times smaller and the universal gravitational constant were ten times larger in magnitude, which of the following is **not** correct ?

- (1) 'g' on the Earth will not change.
- (2) Time period of a simple pendulum on the Earth would decrease.
- (3) Walking on the ground would become more difficult.
- (4) Raindrops will fall faster.

131. A solid sphere is rotating freely about its symmetry axis in free space. The radius of the sphere is increased keeping its mass same. Which of the following physical quantities would remain constant for the sphere ?

- (1) Angular momentum
- (2) Rotational kinetic energy
- (3) Moment of inertia
- (4) Angular velocity

132. A body initially at rest and sliding along a frictionless track from a height h (as shown in the figure) just completes a vertical circle of diameter $AB = D$. The height h is equal to



- (1) $\frac{5}{4}D$
 (2) $\frac{7}{5}D$
 (3) D
 (4) $\frac{3}{2}D$
133. Three objects, A : (a solid sphere), B : (a thin circular disk) and C : (a circular ring), each have the same mass M and radius R . They all spin with the same angular speed ω about their own symmetry axes. The amounts of work (W) required to bring them to rest, would satisfy the relation
- (1) $W_A > W_C > W_B$
 (2) $W_B > W_A > W_C$
 (3) $W_A > W_B > W_C$
 (4) $W_C > W_B > W_A$
134. Which one of the following statements is **incorrect** ?
- (1) Coefficient of sliding friction has dimensions of length.
 (2) Frictional force opposes the relative motion.
 (3) Limiting value of static friction is directly proportional to normal reaction.
 (4) Rolling friction is smaller than sliding friction.
135. A moving block having mass m , collides with another stationary block having mass $4m$. The lighter block comes to rest after collision. When the initial velocity of the lighter block is v , then the value of coefficient of restitution (e) will be
- (1) 0.4
 (2) 0.8
 (3) 0.25
 (4) 0.5

136. Iron carbonyl, $Fe(CO)_5$ is

- (1) dinuclear
 (2) trinuclear
 (3) mononuclear
 (4) tetranuclear

137. Match the metal ions given in Column I with the spin magnetic moments of the ions given in Column II and assign the **correct** code :

Column I

Column II

- | | |
|--------------|----------------------|
| a. Co^{3+} | i. $\sqrt{8}$ B.M. |
| b. Cr^{3+} | ii. $\sqrt{35}$ B.M. |
| c. Fe^{3+} | iii. $\sqrt{3}$ B.M. |
| d. Ni^{2+} | iv. $\sqrt{24}$ B.M. |
| | v. $\sqrt{15}$ B.M. |

a b c d

- | | | | |
|---------|----|-----|-----|
| (1) iii | v | i | ii |
| (2) iv | i | ii | iii |
| (3) i | ii | iii | iv |
| (4) iv | v | ii | i |

138. Which one of the following ions exhibits d-d transition and paramagnetism as well ?

- (1) MnO_4^{2-}
 (2) MnO_4^-
 (3) $Cr_2O_7^{2-}$
 (4) CrO_4^{2-}

139. The geometry and magnetic behaviour of the complex $[Ni(CO)_4]$ are

- (1) tetrahedral geometry and paramagnetic
 (2) square planar geometry and paramagnetic
 (3) tetrahedral geometry and diamagnetic
 (4) square planar geometry and diamagnetic

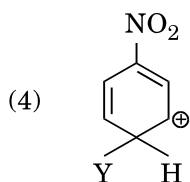
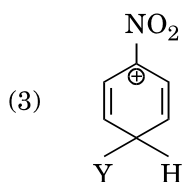
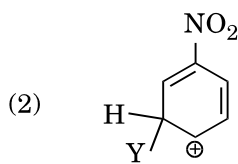
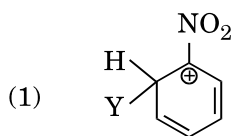
140. The type of isomerism shown by the complex $[CoCl_2(en)_2]$ is

- (1) Linkage isomerism
 (2) Ionization isomerism
 (3) Coordination isomerism
 (4) Geometrical isomerism

148. Which of the following molecules represents the order of hybridisation sp^2 , sp^2 , sp , sp from left to right atoms ?

- (1) $\text{CH}_3 - \text{CH} = \text{CH} - \text{CH}_3$
- (2) $\text{CH}_2 = \text{CH} - \text{CH} = \text{CH}_2$
- (3) $\text{CH}_2 = \text{CH} - \text{C} \equiv \text{CH}$
- (4) $\text{HC} \equiv \text{C} - \text{C} \equiv \text{CH}$

149. Which of the following carbocations is expected to be most stable ?



150. Which of the following is correct with respect to -I effect of the substituents ? (R = alkyl)

- (1) $-\text{NR}_2 > -\text{OR} > -\text{F}$
- (2) $-\text{NH}_2 > -\text{OR} > -\text{F}$
- (3) $-\text{NR}_2 < -\text{OR} < -\text{F}$
- (4) $-\text{NH}_2 < -\text{OR} < -\text{F}$

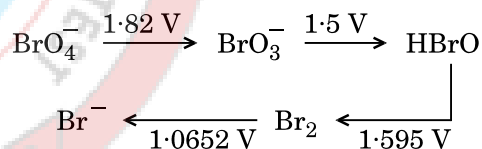
151. The correct difference between first- and second-order reactions is that

- (1) the rate of a first-order reaction does depend on reactant concentrations; the rate of a second-order reaction does not depend on reactant concentrations
- (2) a first-order reaction can be catalyzed; a second-order reaction cannot be catalyzed
- (3) the half-life of a first-order reaction does not depend on $[\text{A}]_0$; the half-life of a second-order reaction does depend on $[\text{A}]_0$
- (4) the rate of a first-order reaction does not depend on reactant concentrations; the rate of a second-order reaction does depend on reactant concentrations

152. Among CaH_2 , BeH_2 , BaH_2 , the order of ionic character is

- (1) $\text{BaH}_2 < \text{BeH}_2 < \text{CaH}_2$
- (2) $\text{BeH}_2 < \text{BaH}_2 < \text{CaH}_2$
- (3) $\text{CaH}_2 < \text{BeH}_2 < \text{BaH}_2$
- (4) $\text{BeH}_2 < \text{CaH}_2 < \text{BaH}_2$

153. Consider the change in oxidation state of Bromine corresponding to different emf values as shown in the diagram below :



Then the species undergoing disproportionation is

- (1) HBrO
- (2) Br_2
- (3) BrO_4^-
- (4) BrO_3^-

154. In which case is the number of molecules of water maximum ?

- (1) 10^{-3} mol of water
- (2) 0.00224 L of water vapours at 1 atm and 273 K
- (3) 0.18 g of water
- (4) 18 mL of water

155. The compound A on treatment with Na gives B, and with PCl_5 gives C. B and C react together to give diethyl ether. A, B and C are in the order
- (1) $\text{C}_2\text{H}_5\text{OH}$, $\text{C}_2\text{H}_5\text{ONa}$, $\text{C}_2\text{H}_5\text{Cl}$
 - (2) $\text{C}_2\text{H}_5\text{Cl}$, C_2H_6 , $\text{C}_2\text{H}_5\text{OH}$
 - (3) $\text{C}_2\text{H}_5\text{OH}$, $\text{C}_2\text{H}_5\text{Cl}$, $\text{C}_2\text{H}_5\text{ONa}$
 - (4) $\text{C}_2\text{H}_5\text{OH}$, C_2H_6 , $\text{C}_2\text{H}_5\text{Cl}$
156. Hydrocarbon (A) reacts with bromine by substitution to form an alkyl bromide which by Wurtz reaction is converted to gaseous hydrocarbon containing less than four carbon atoms. (A) is
- (1) CH_4
 - (2) $\text{CH}_3 - \text{CH}_3$
 - (3) $\text{CH}_2 = \text{CH}_2$
 - (4) $\text{CH} \equiv \text{CH}$
157. The compound C_7H_8 undergoes the following reactions :
- $$\text{C}_7\text{H}_8 \xrightarrow{3 \text{ Cl}_2 / \Delta} \text{A} \xrightarrow{\text{Br}_2 / \text{Fe}} \text{B} \xrightarrow{\text{Zn} / \text{HCl}} \text{C}$$
- The product 'C' is
- (1) *p*-bromotoluene
 - (2) 3-bromo-2,4,6-trichlorotoluene
 - (3) *o*-bromotoluene
 - (4) *m*-bromotoluene
158. Which oxide of nitrogen is **not** a common pollutant introduced into the atmosphere both due to natural and human activity ?
- (1) NO
 - (2) N_2O
 - (3) NO_2
 - (4) N_2O_5
159. A mixture of 2.3 g formic acid and 4.5 g oxalic acid is treated with conc. H_2SO_4 . The evolved gaseous mixture is passed through KOH pellets. Weight (in g) of the remaining product at STP will be
- (1) 4.4
 - (2) 2.8
 - (3) 3.0
 - (4) 1.4
160. The difference between amylose and amylopectin is
- (1) Amylose is made up of glucose and galactose
 - (2) Amylopectin have $1 \rightarrow 4$ α -linkage and $1 \rightarrow 6$ β -linkage
 - (3) Amylose have $1 \rightarrow 4$ α -linkage and $1 \rightarrow 6$ β -linkage
 - (4) Amylopectin have $1 \rightarrow 4$ α -linkage and $1 \rightarrow 6$ α -linkage
161. Which of the following oxides is most acidic in nature ?
- (1) CaO
 - (2) BaO
 - (3) BeO
 - (4) MgO
162. Nitration of aniline in strong acidic medium also gives *m*-nitroaniline because
- (1) In acidic (strong) medium aniline is present as anilinium ion.
 - (2) In absence of substituents nitro group always goes to *m*-position.
 - (3) In electrophilic substitution reactions amino group is meta directive.
 - (4) In spite of substituents nitro group always goes to only *m*-position.
163. Regarding cross-linked or network polymers, which of the following statements is **incorrect** ?
- (1) They contain strong covalent bonds in their polymer chains.
 - (2) Examples are bakelite and melamine.
 - (3) They are formed from bi- and tri-functional monomers.
 - (4) They contain covalent bonds between various linear polymer chains.

164. Following solutions were prepared by mixing different volumes of NaOH and HCl of different concentrations :

- 60 mL $\frac{M}{10}$ HCl + 40 mL $\frac{M}{10}$ NaOH
- 55 mL $\frac{M}{10}$ HCl + 45 mL $\frac{M}{10}$ NaOH
- 75 mL $\frac{M}{5}$ HCl + 25 mL $\frac{M}{5}$ NaOH
- 100 mL $\frac{M}{10}$ HCl + 100 mL $\frac{M}{10}$ NaOH

pH of which one of them will be equal to 1 ?

- c
- d
- a
- b

165. On which of the following properties does the coagulating power of an ion depend ?

- The sign of charge on the ion alone
- Both magnitude and sign of the charge on the ion
- Size of the ion alone
- The magnitude of the charge on the ion alone

166. The solubility of BaSO_4 in water is $2.42 \times 10^{-3} \text{ g L}^{-1}$ at 298 K. The value of its solubility product (K_{sp}) will be

(Given molar mass of $\text{BaSO}_4 = 233 \text{ g mol}^{-1}$)

- $1.08 \times 10^{-8} \text{ mol}^2 \text{ L}^{-2}$
- $1.08 \times 10^{-14} \text{ mol}^2 \text{ L}^{-2}$
- $1.08 \times 10^{-12} \text{ mol}^2 \text{ L}^{-2}$
- $1.08 \times 10^{-10} \text{ mol}^2 \text{ L}^{-2}$

167. Given van der Waals constant for NH_3 , H_2 , O_2 and CO_2 are respectively 4.17, 0.244, 1.36 and 3.59, which one of the following gases is most easily liquefied ?

- CO_2
- O_2
- H_2
- NH_3

168. Magnesium reacts with an element (X) to form an ionic compound. If the ground state electronic configuration of (X) is $1s^2 2s^2 2p^3$, the simplest formula for this compound is

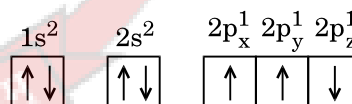
- Mg_3X_2
- Mg_2X
- MgX_2
- Mg_2X_3

169. Iron exhibits bcc structure at room temperature. Above 900°C , it transforms to fcc structure. The ratio of density of iron at room temperature to that at 900°C (assuming molar mass and atomic radii of iron remains constant with temperature) is

- $\frac{1}{2}$
- $\frac{3\sqrt{3}}{4\sqrt{2}}$
- $\frac{4\sqrt{3}}{3\sqrt{2}}$
- $\frac{\sqrt{3}}{\sqrt{2}}$

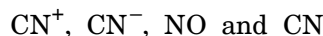
170. Which one is a **wrong** statement ?

- The value of m for d_{z^2} is zero.
- The electronic configuration of N atom is



- An orbital is designated by three quantum numbers while an electron in an atom is designated by four quantum numbers.
- Total orbital angular momentum of electron in 's' orbital is equal to zero.

171. Consider the following species :



Which one of these will have the highest bond order ?

- CN
- CN^+
- CN^-
- NO

172. Which of the following statements is **not** true for halogens ?

- (1) Chlorine has the highest electron-gain enthalpy.
- (2) All but fluorine show positive oxidation states.
- (3) All are oxidizing agents.
- (4) All form monobasic oxyacids.

173. Which one of the following elements is unable to form MF_6^{3-} ion ?

- (1) In
- (2) B
- (3) Al
- (4) Ga

174. In the structure of ClF_3 , the number of lone pairs of electrons on central atom 'Cl' is

- (1) three
- (2) four
- (3) two
- (4) one

175. Considering Ellingham diagram, which of the following metals can be used to reduce alumina ?

- (1) Cu
- (2) Mg
- (3) Zn
- (4) Fe

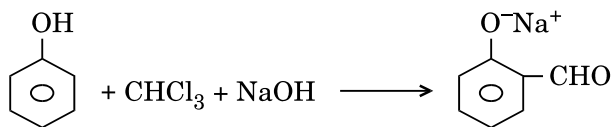
176. The correct order of atomic radii in group 13 elements is

- (1) $\text{B} < \text{Ga} < \text{Al} < \text{In} < \text{Tl}$
- (2) $\text{B} < \text{Ga} < \text{Al} < \text{Tl} < \text{In}$
- (3) $\text{B} < \text{Al} < \text{Ga} < \text{In} < \text{Tl}$
- (4) $\text{B} < \text{Al} < \text{In} < \text{Ga} < \text{Tl}$

177. The correct order of N-compounds in its decreasing order of oxidation states is

- (1) $\text{NH}_4\text{Cl}, \text{N}_2, \text{NO}, \text{HNO}_3$
- (2) $\text{HNO}_3, \text{NH}_4\text{Cl}, \text{NO}, \text{N}_2$
- (3) $\text{HNO}_3, \text{NO}, \text{NH}_4\text{Cl}, \text{N}_2$
- (4) $\text{HNO}_3, \text{NO}, \text{N}_2, \text{NH}_4\text{Cl}$

178. In the reaction



the electrophile involved is

- (1) dichlorocarbene ($:\text{CCl}_2$)
- (2) dichloromethyl anion ($\overset{\ominus}{\text{C}}\text{HCl}_2$)
- (3) formyl cation ($\overset{\oplus}{\text{C}}\text{HO}$)
- (4) dichloromethyl cation ($\overset{\oplus}{\text{C}}\text{HCl}_2$)

179. Carboxylic acids have higher boiling points than aldehydes, ketones and even alcohols of comparable molecular mass. It is due to their

- (1) formation of intermolecular H-bonding
- (2) more extensive association of carboxylic acid via van der Waals force of attraction
- (3) formation of carboxylate ion
- (4) formation of intramolecular H-bonding

180. Compound A, $\text{C}_8\text{H}_{10}\text{O}$, is found to react with NaOI (produced by reacting Y with NaOH) and yields a yellow precipitate with characteristic smell.

A and Y are respectively

- (1) CH_3 - OH and I_2
- (2) $\text{CH}-\text{CH}_3$ and I_2
- (3) $\text{CH}_2-\text{CH}_2-\text{OH}$ and I_2
- (4) H_3C - CH_2-OH and I_2

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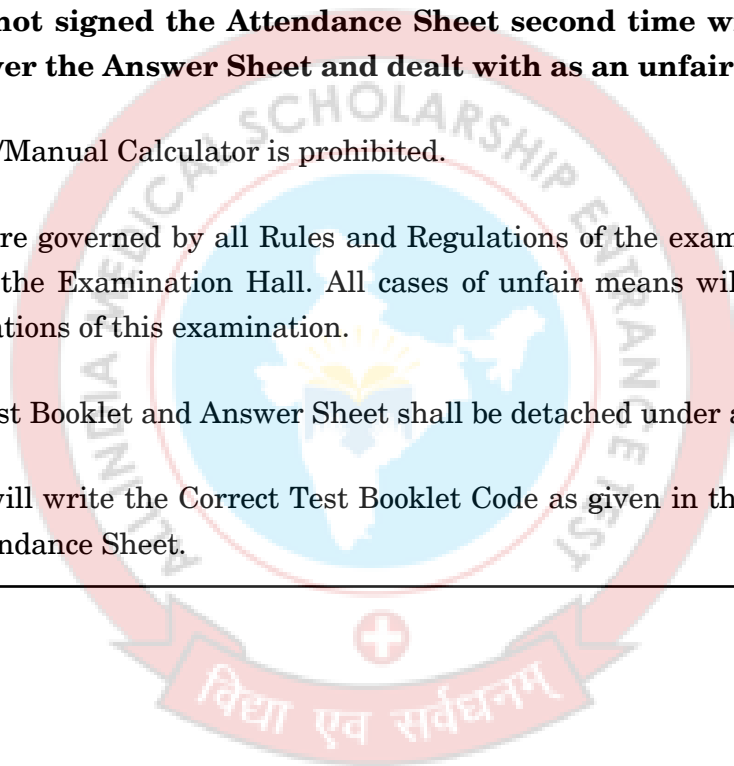


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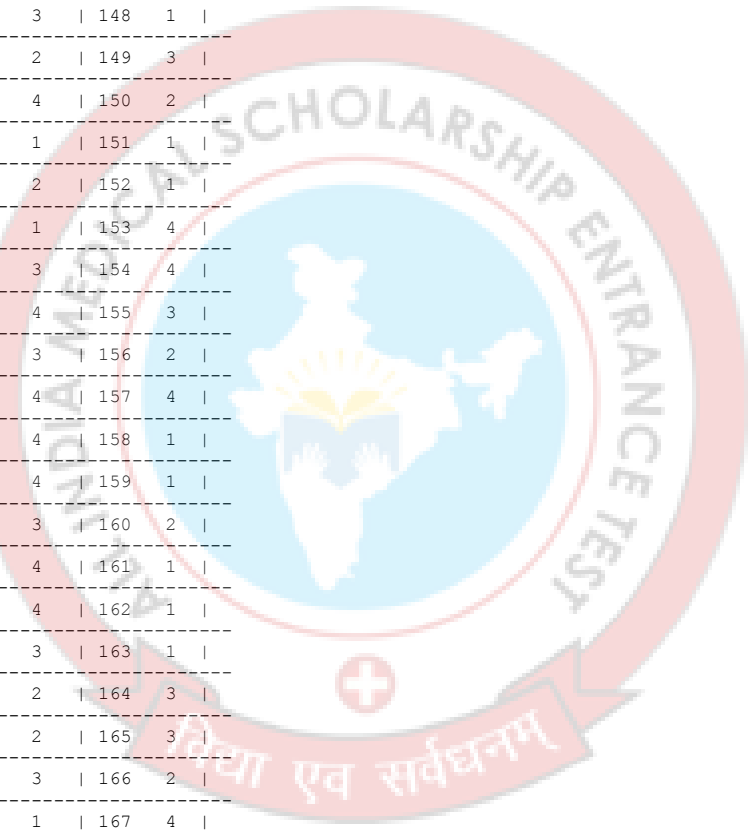


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1. Each candidate must show on demand his/her Admit Card to the Invigilator.
2. No candidate, without special permission of the Superintendent or Invigilator, would leave his/her seat.
3. The candidates should not leave the Examination Hall without handing over their Answer Sheet to the Invigilator on duty and sign the Attendance Sheet twice. **Cases where a candidate has not signed the Attendance Sheet second time will be deemed not to have handed over the Answer Sheet and dealt with as an unfair means case.**
4. Use of Electronic/Manual Calculator is prohibited.
5. The candidates are governed by all Rules and Regulations of the examination with regard to their conduct in the Examination Hall. All cases of unfair means will be dealt with as per Rules and Regulations of this examination.
6. No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.
7. The candidates will write the Correct Test Booklet Code as given in the Test Booklet/Answer Sheet in the Attendance Sheet.



QNO	ANS	QNO	ANS	QNO	ANS	QNO	ANS
1	4	46	1	91	4	136	3
2	3	47	1	92	3	137	4
3	4	48	1	93	4	138	4
4	2	49	1	94	3	139	1
5	2	50	3	95	1	140	3
6	1	51	4	96	3	141	4
7	3	52	3	97	3	142	2
8	4	53	2	98	4	143	1
9	4	54	3	99	4	144	2
10	3	55	3	100	3	145	4
11	1	56	1	101	4	146	1
12	1	57	4	102	3	147	4
13	1	58	4	103	3	148	1
14	3	59	4	104	2	149	3
15	2	60	3	105	4	150	2
16	1	61	4	106	1	151	1
17	1	62	3	107	2	152	1
18	4	63	4	108	1	153	4
19	3	64	2	109	3	154	4
20	4	65	2	110	4	155	3
21	3	66	4	111	3	156	2
22	3	67	1	112	4	157	4
23	1	68	4	113	4	158	1
24	3	69	1	114	4	159	1
25	4	70	2	115	3	160	2
26	1	71	4	116	4	161	1
27	1	72	2	117	4	162	1
28	4	73	4	118	3	163	1
29	3	74	3	119	2	164	3
30	2	75	1	120	2	165	3
31	3	76	2	121	3	166	2
32	1	77	3	122	1	167	4
33	3	78	4	123	1	168	2
34	4	79	3	124	3	169	3
35	1	80	2	125	3	170	1
36	4	81	1	126	1	171	2
37	4	82	3	127	1	172	1
38	3	83	4	128	1	173	2
39	3	84	2	129	3	174	4
40	4	85	1	130	1	175	4
41	2	86	3	131	1	176	4
42	1	87	3	132	4	177	1
43	2	88	4	133	3	178	3
44	1	89	1	134	1	179	4
45	4	90	1	135	1	180	3





This Booklet contains **24** pages.

DD

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2. The test is of **3 hours** duration and this Test Booklet contains **180** questions. Each question carries **4** marks. For each correct response, the candidate will get **4** marks. For each incorrect response, **one mark** will be deducted from the total scores. The maximum marks are 720.
3. Use **Blue/Black Ball Point Pen only** for writing particulars on this page/markings responses.
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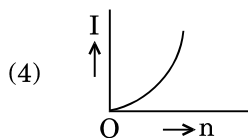
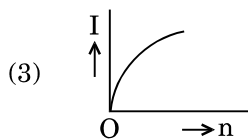
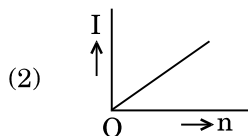
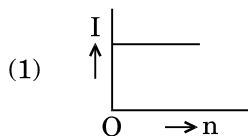
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Centre Superintendent : _____

1. A carbon resistor of $(47 \pm 4.7) \text{ k}\Omega$ is to be marked with rings of different colours for its identification. The colour code sequence will be

- (1) Violet – Yellow – Orange – Silver
- (2) Yellow – Violet – Orange – Silver
- (3) Yellow – Green – Violet – Gold
- (4) Green – Orange – Violet – Gold

2. A battery consists of a variable number 'n' of identical cells (having internal resistance 'r' each) which are connected in series. The terminals of the battery are short-circuited and the current I is measured. Which of the graphs shows the correct relationship between I and n?



3. A set of 'n' equal resistors, of value 'R' each, are connected in series to a battery of emf 'E' and internal resistance 'R'. The current drawn is I. Now, the 'n' resistors are connected in parallel to the same battery. Then the current drawn from battery becomes 10 I. The value of 'n' is

- (1) 10
- (2) 11
- (3) 20
- (4) 9

4. An electron falls from rest through a vertical distance h in a uniform and vertically upward directed electric field E. The direction of electric field is now reversed, keeping its magnitude the same. A proton is allowed to fall from rest in it through the same vertical distance h. The time of fall of the electron, in comparison to the time of fall of the proton is

- (1) smaller
- (2) 5 times greater
- (3) 10 times greater
- (4) equal

5. A tuning fork is used to produce resonance in a glass tube. The length of the air column in this tube can be adjusted by a variable piston. At room temperature of 27°C two successive resonances are produced at 20 cm and 73 cm of column length. If the frequency of the tuning fork is 320 Hz, the velocity of sound in air at 27°C is

- (1) 330 m/s
- (2) 339 m/s
- (3) 350 m/s
- (4) 300 m/s

6. A pendulum is hung from the roof of a sufficiently high building and is moving freely to and fro like a simple harmonic oscillator. The acceleration of the bob of the pendulum is 20 m/s^2 at a distance of 5 m from the mean position. The time period of oscillation is

- (1) $2\pi \text{ s}$
- (2) $\pi \text{ s}$
- (3) 2 s
- (4) 1 s

7. The electrostatic force between the metal plates of an isolated parallel plate capacitor C having a charge Q and area A, is

- (1) independent of the distance between the plates.
- (2) linearly proportional to the distance between the plates.
- (3) proportional to the square root of the distance between the plates.
- (4) inversely proportional to the distance between the plates.

8. An electron of mass m with an initial velocity $\vec{V} = V_0 \hat{i}$ ($V_0 > 0$) enters an electric field $\vec{E} = -E_0 \hat{i}$ ($E_0 = \text{constant} > 0$) at $t = 0$. If λ_0 is its de-Broglie wavelength initially, then its de-Broglie wavelength at time t is

- (1) $\frac{\lambda_0}{\left(1 + \frac{eE_0 t}{mV_0}\right)}$
 (2) $\lambda_0 \left(1 + \frac{eE_0 t}{mV_0}\right)$
 (3) $\lambda_0 t$
 (4) λ_0

9. When the light of frequency $2\nu_0$ (where ν_0 is threshold frequency), is incident on a metal plate, the maximum velocity of electrons emitted is v_1 . When the frequency of the incident radiation is increased to $5\nu_0$, the maximum velocity of electrons emitted from the same plate is v_2 . The ratio of v_1 to v_2 is

- (1) 1 : 2
 (2) 1 : 4
 (3) 4 : 1
 (4) 2 : 1

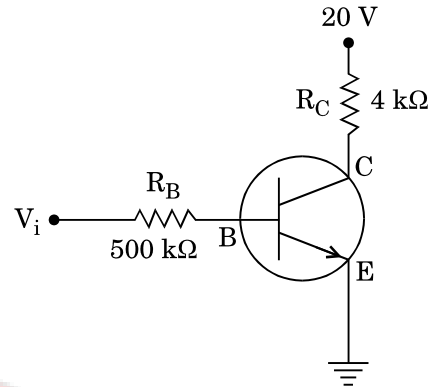
10. For a radioactive material, half-life is 10 minutes. If initially there are 600 number of nuclei, the time taken (in minutes) for the disintegration of 450 nuclei is

- (1) 20
 (2) 10
 (3) 30
 (4) 15

11. The ratio of kinetic energy to the total energy of an electron in a Bohr orbit of the hydrogen atom, is

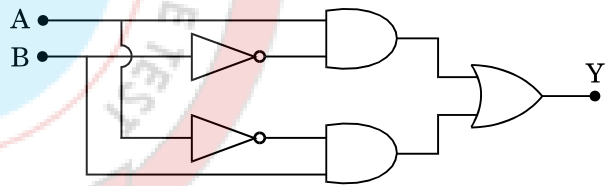
- (1) 1 : 1
 (2) 1 : -1
 (3) 2 : -1
 (4) 1 : -2

12. In the circuit shown in the figure, the input voltage V_i is 20 V, $V_{BE} = 0$ and $V_{CE} = 0$. The values of I_B , I_C and β are given by



- (1) $I_B = 40 \mu\text{A}$, $I_C = 10 \text{ mA}$, $\beta = 250$
 (2) $I_B = 25 \mu\text{A}$, $I_C = 5 \text{ mA}$, $\beta = 200$
 (3) $I_B = 20 \mu\text{A}$, $I_C = 5 \text{ mA}$, $\beta = 250$
 (4) $I_B = 40 \mu\text{A}$, $I_C = 5 \text{ mA}$, $\beta = 125$

13. In the combination of the following gates the output Y can be written in terms of inputs A and B as

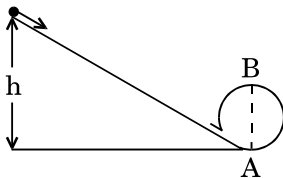


- (1) $\overline{A \cdot B}$
 (2) $A \cdot \bar{B} + \bar{A} \cdot B$
 (3) $\overline{A \cdot B} + A \cdot B$
 (4) $\overline{A + B}$

14. In a p-n junction diode, change in temperature due to heating

- (1) affects only reverse resistance
 (2) affects only forward resistance
 (3) does not affect resistance of p-n junction
 (4) affects the overall $V - I$ characteristics of p-n junction

15. A body initially at rest and sliding along a frictionless track from a height h (as shown in the figure) just completes a vertical circle of diameter $AB = D$. The height h is equal to



- (1) $\frac{3}{2}D$
 (2) D
 (3) $\frac{7}{5}D$
 (4) $\frac{5}{4}D$
16. Three objects, A : (a solid sphere), B : (a thin circular disk) and C : (a circular ring), each have the same mass M and radius R . They all spin with the same angular speed ω about their own symmetry axes. The amounts of work (W) required to bring them to rest, would satisfy the relation
- (1) $W_C > W_B > W_A$
 (2) $W_A > W_B > W_C$
 (3) $W_B > W_A > W_C$
 (4) $W_A > W_C > W_B$
17. A moving block having mass m , collides with another stationary block having mass $4m$. The lighter block comes to rest after collision. When the initial velocity of the lighter block is v , then the value of coefficient of restitution (e) will be
- (1) 0.5
 (2) 0.25
 (3) 0.8
 (4) 0.4
18. Which one of the following statements is **incorrect** ?
- (1) Rolling friction is smaller than sliding friction.
 (2) Limiting value of static friction is directly proportional to normal reaction.
 (3) Frictional force opposes the relative motion.
 (4) Coefficient of sliding friction has dimensions of length.

19. The moment of the force, $\vec{F} = 4\hat{i} + 5\hat{j} - 6\hat{k}$ at $(2, 0, -3)$, about the point $(2, -2, -2)$, is given by
- (1) $-8\hat{i} - 4\hat{j} - 7\hat{k}$
 (2) $-4\hat{i} - \hat{j} - 8\hat{k}$
 (3) $-7\hat{i} - 8\hat{j} - 4\hat{k}$
 (4) $-7\hat{i} - 4\hat{j} - 8\hat{k}$

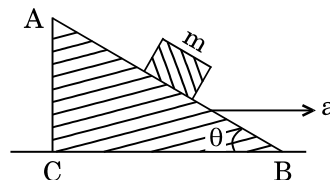
20. A toy car with charge q moves on a frictionless horizontal plane surface under the influence of a uniform electric field \vec{E} . Due to the force $q\vec{E}$, its velocity increases from 0 to 6 m/s in one second duration. At that instant the direction of the field is reversed. The car continues to move for two more seconds under the influence of this field. The average velocity and the average speed of the toy car between 0 to 3 seconds are respectively

- (1) 2 m/s, 4 m/s
 (2) 1 m/s, 3 m/s
 (3) 1 m/s, 3.5 m/s
 (4) 1.5 m/s, 3 m/s

21. A student measured the diameter of a small steel ball using a screw gauge of least count 0.001 cm. The main scale reading is 5 mm and zero of circular scale division coincides with 25 divisions above the reference level. If screw gauge has a zero error of -0.004 cm, the correct diameter of the ball is

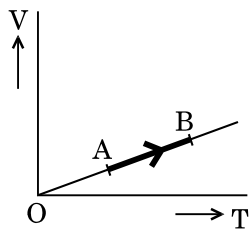
- (1) 0.521 cm
 (2) 0.525 cm
 (3) 0.053 cm
 (4) 0.529 cm

22. A block of mass m is placed on a smooth inclined wedge ABC of inclination θ as shown in the figure. The wedge is given an acceleration ' a ' towards the right. The relation between a and θ for the block to remain stationary on the wedge is



- (1) $a = \frac{g}{\operatorname{cosec} \theta}$
 (2) $a = \frac{g}{\sin \theta}$
 (3) $a = g \cos \theta$
 (4) $a = g \tan \theta$

23. The volume (V) of a monatomic gas varies with its temperature (T), as shown in the graph. The ratio of work done by the gas, to the heat absorbed by it, when it undergoes a change from state A to state B, is



- (1) $\frac{2}{5}$
 (2) $\frac{2}{3}$
 (3) $\frac{1}{3}$
 (4) $\frac{2}{7}$
24. The fundamental frequency in an open organ pipe is equal to the third harmonic of a closed organ pipe. If the length of the closed organ pipe is 20 cm, the length of the open organ pipe is
- (1) 13.2 cm
 (2) 8 cm
 (3) 12.5 cm
 (4) 16 cm
25. At what temperature will the rms speed of oxygen molecules become just sufficient for escaping from the Earth's atmosphere?
 (Given :
 Mass of oxygen molecule (m) = 2.76×10^{-26} kg
 Boltzmann's constant $k_B = 1.38 \times 10^{-23}$ J K $^{-1}$)
- (1) 2.508×10^4 K
 (2) 8.360×10^4 K
 (3) 5.016×10^4 K
 (4) 1.254×10^4 K
26. The efficiency of an ideal heat engine working between the freezing point and boiling point of water, is
- (1) 26.8%
 (2) 20%
 (3) 6.25%
 (4) 12.5%

27. Unpolarised light is incident from air on a plane surface of a material of refractive index ' μ '. At a particular angle of incidence ' i ', it is found that the reflected and refracted rays are perpendicular to each other. Which of the following options is correct for this situation?

- (1) Reflected light is polarised with its electric vector parallel to the plane of incidence
 (2) Reflected light is polarised with its electric vector perpendicular to the plane of incidence
 (3) $i = \sin^{-1}\left(\frac{1}{\mu}\right)$
 (4) $i = \tan^{-1}\left(\frac{1}{\mu}\right)$

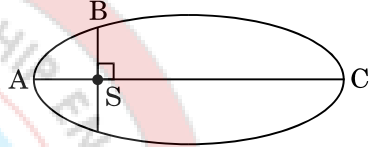
28. In Young's double slit experiment the separation between the slits is 2 mm, the wavelength λ of the light used is 5896 Å and distance D between the screen and slits is 100 cm. It is found that the angular width of the fringes is 0.20° . To increase the fringe angular width to 0.21° (with same λ and D) the separation between the slits needs to be changed to

- (1) 1.8 mm
 (2) 1.9 mm
 (3) 2.1 mm
 (4) 1.7 mm

29. An astronomical refracting telescope will have large angular magnification and high angular resolution, when it has an objective lens of

- (1) small focal length and large diameter
 (2) large focal length and small diameter
 (3) large focal length and large diameter
 (4) small focal length and small diameter

30. An em wave is propagating in a medium with a velocity $\vec{V} = V \hat{i}$. The instantaneous oscillating electric field of this em wave is along +y axis. Then the direction of oscillating magnetic field of the em wave will be along
- (1) - z direction
 - (2) + z direction
 - (3) - y direction
 - (4) - x direction
31. The refractive index of the material of a prism is $\sqrt{2}$ and the angle of the prism is 30° . One of the two refracting surfaces of the prism is made a mirror inwards, by silver coating. A beam of monochromatic light entering the prism from the other face will retrace its path (after reflection from the silvered surface) if its angle of incidence on the prism is
- (1) 60°
 - (2) 45°
 - (3) 30°
 - (4) zero
32. An object is placed at a distance of 40 cm from a concave mirror of focal length 15 cm. If the object is displaced through a distance of 20 cm towards the mirror, the displacement of the image will be
- (1) 30 cm away from the mirror
 - (2) 36 cm away from the mirror
 - (3) 30 cm towards the mirror
 - (4) 36 cm towards the mirror
33. The magnetic potential energy stored in a certain inductor is 25 mJ, when the current in the inductor is 60 mA. This inductor is of inductance
- (1) 0.138 H
 - (2) 138.88 H
 - (3) 1.389 H
 - (4) 13.89 H
34. Current sensitivity of a moving coil galvanometer is 5 div/mA and its voltage sensitivity (angular deflection per unit voltage applied) is 20 div/V. The resistance of the galvanometer is
- (1) 40 Ω
 - (2) 25 Ω
 - (3) 250 Ω
 - (4) 500 Ω
35. A metallic rod of mass per unit length 0.5 kg m^{-1} is lying horizontally on a smooth inclined plane which makes an angle of 30° with the horizontal. The rod is not allowed to slide down by flowing a current through it when a magnetic field of induction 0.25 T is acting on it in the vertical direction. The current flowing in the rod to keep it stationary is
- (1) 7.14 A
 - (2) 5.98 A
 - (3) 14.76 A
 - (4) 11.32 A
36. An inductor 20 mH, a capacitor 100 μF and a resistor 50 Ω are connected in series across a source of emf, $V = 10 \sin 314 t$. The power loss in the circuit is
- (1) 0.79 W
 - (2) 0.43 W
 - (3) 2.74 W
 - (4) 1.13 W
37. A thin diamagnetic rod is placed vertically between the poles of an electromagnet. When the current in the electromagnet is switched on, then the diamagnetic rod is pushed up, out of the horizontal magnetic field. Hence the rod gains gravitational potential energy. The work required to do this comes from
- (1) the current source
 - (2) the magnetic field
 - (3) the lattice structure of the material of the rod
 - (4) the induced electric field due to the changing magnetic field

38. A small sphere of radius 'r' falls from rest in a viscous liquid. As a result, heat is produced due to viscous force. The rate of production of heat when the sphere attains its terminal velocity, is proportional to
- (1) r^3
 - (2) r^2
 - (3) r^5
 - (4) r^4
39. The power radiated by a black body is P and it radiates maximum energy at wavelength, λ_0 . If the temperature of the black body is now changed so that it radiates maximum energy at wavelength $\frac{3}{4}\lambda_0$, the power radiated by it becomes nP. The value of n is
- (1) $\frac{3}{4}$
 - (2) $\frac{4}{3}$
 - (3) $\frac{256}{81}$
 - (4) $\frac{81}{256}$
40. A sample of 0.1 g of water at 100°C and normal pressure ($1.013 \times 10^5 \text{ Nm}^{-2}$) requires 54 cal of heat energy to convert to steam at 100°C . If the volume of the steam produced is 167.1 cc, the change in internal energy of the sample, is
- (1) 104.3 J
 - (2) 208.7 J
 - (3) 42.2 J
 - (4) 84.5 J
41. Two wires are made of the same material and have the same volume. The first wire has cross-sectional area A and the second wire has cross-sectional area 3A. If the length of the first wire is increased by Δl on applying a force F, how much force is needed to stretch the second wire by the same amount ?
- (1) 9 F
 - (2) 6 F
 - (3) 4 F
 - (4) F
42. A solid sphere is rotating freely about its symmetry axis in free space. The radius of the sphere is increased keeping its mass same. Which of the following physical quantities would remain constant for the sphere ?
- (1) Angular velocity
 - (2) Moment of inertia
 - (3) Rotational kinetic energy
 - (4) Angular momentum
43. The kinetic energies of a planet in an elliptical orbit about the Sun, at positions A, B and C are K_A , K_B and K_C , respectively. AC is the major axis and SB is perpendicular to AC at the position of the Sun S as shown in the figure. Then
- 
- (1) $K_A < K_B < K_C$
 - (2) $K_A > K_B > K_C$
 - (3) $K_B < K_A < K_C$
 - (4) $K_B > K_A > K_C$
44. A solid sphere is in rolling motion. In rolling motion a body possesses translational kinetic energy (K_t) as well as rotational kinetic energy (K_r) simultaneously. The ratio $K_t : (K_t + K_r)$ for the sphere is
- (1) 7 : 10
 - (2) 5 : 7
 - (3) 10 : 7
 - (4) 2 : 5
45. If the mass of the Sun were ten times smaller and the universal gravitational constant were ten times larger in magnitude, which of the following is **not** correct ?
- (1) Raindrops will fall faster.
 - (2) Walking on the ground would become more difficult.
 - (3) Time period of a simple pendulum on the Earth would decrease.
 - (4) 'g' on the Earth will not change.

46. Which of the following is an amino acid derived hormone ?
- (1) Epinephrine
 - (2) Ecdysone
 - (3) Estradiol
 - (4) Estriol
47. Which of the following structures or regions is **incorrectly** paired with its function ?
- (1) Medulla oblongata : controls respiration and cardiovascular reflexes.
 - (2) Limbic system : consists of fibre tracts that interconnect different regions of brain; controls movement.
 - (3) Hypothalamus : production of releasing hormones and regulation of temperature, hunger and thirst.
 - (4) Corpus callosum : band of fibers connecting left and right cerebral hemispheres.
48. The transparent lens in the human eye is held in its place by
- (1) ligaments attached to the ciliary body
 - (2) ligaments attached to the iris
 - (3) smooth muscles attached to the iris
 - (4) smooth muscles attached to the ciliary body
49. Which of the following hormones can play a significant role in osteoporosis ?
- (1) Aldosterone and Prolactin
 - (2) Progesterone and Aldosterone
 - (3) Estrogen and Parathyroid hormone
 - (4) Parathyroid hormone and Prolactin
50. Ciliates differ from all other protozoans in
- (1) using flagella for locomotion
 - (2) having a contractile vacuole for removing excess water
 - (3) using pseudopodia for capturing prey
 - (4) having two types of nuclei
51. Identify the vertebrate group of animals characterized by crop and gizzard in its digestive system.
- (1) Amphibia
 - (2) Reptilia
 - (3) Aves
 - (4) Osteichthyes
52. Which of the following organisms are known as chief producers in the oceans ?
- (1) Dinoflagellates
 - (2) Diatoms
 - (3) Cyanobacteria
 - (4) Euglenoids
53. Which one of these animals is **not** a homeotherm ?
- (1) *Macropus*
 - (2) *Chelone*
 - (3) *Camelus*
 - (4) *Psittacula*
54. Which of the following animals does **not** undergo metamorphosis ?
- (1) Earthworm
 - (2) Tunicate
 - (3) Moth
 - (4) Starfish
55. Which of the following features is used to identify a male cockroach from a female cockroach ?
- (1) Presence of a boat shaped sternum on the 9th abdominal segment
 - (2) Presence of caudal styles
 - (3) Forewings with darker tegmina
 - (4) Presence of anal cerci

56. Which one of the following population interactions is widely used in medical science for the production of antibiotics ?

- (1) Commensalism
- (2) Mutualism
- (3) Parasitism
- (4) Amensalism

57. All of the following are included in 'Ex-situ conservation' *except*

- (1) Wildlife safari parks
- (2) Sacred groves
- (3) Botanical gardens
- (4) Seed banks

58. Match the items given in Column I with those in Column II and select the **correct** option given below :

Column I

Column II

- | | |
|----------------------|--------------------------|
| a. Eutrophication | i. UV-B radiation |
| b. Sanitary landfill | ii. Deforestation |
| c. Snow blindness | iii. Nutrient enrichment |
| d. Jhum cultivation | iv. Waste disposal |

a **b** **c** **d**

- | | | | |
|---------|-----|-----|-----|
| (1) ii | i | iii | iv |
| (2) i | iii | iv | ii |
| (3) iii | iv | i | ii |
| (4) i | ii | iv | iii |

59. In a growing population of a country,

- (1) pre-reproductive individuals are more than the reproductive individuals.
- (2) reproductive individuals are less than the post-reproductive individuals.
- (3) reproductive and pre-reproductive individuals are equal in number.
- (4) pre-reproductive individuals are less than the reproductive individuals.

60. Which part of poppy plant is used to obtain the drug "Smack" ?

- (1) Flowers
- (2) Latex
- (3) Roots
- (4) Leaves

61. Hormones secreted by the placenta to maintain pregnancy are

- (1) hCG, hPL, progesterones, prolactin
- (2) hCG, hPL, estrogens, relaxin, oxytocin
- (3) hCG, hPL, progesterones, estrogens
- (4) hCG, progesterones, estrogens, glucocorticoids

62. The contraceptive 'SAHEL' is

- (1) blocks estrogen receptors in the uterus, preventing eggs from getting implanted.
- (2) increases the concentration of estrogen and prevents ovulation in females.
- (3) is an IUD.
- (4) is a post-coital contraceptive.

63. The amnion of mammalian embryo is derived from

- (1) ectoderm and mesoderm
- (2) endoderm and mesoderm
- (3) mesoderm and trophoblast
- (4) ectoderm and endoderm

64. The difference between spermiogenesis and spermiation is

- (1) In spermiogenesis spermatids are formed, while in spermiation spermatozoa are formed.
- (2) In spermiogenesis spermatozoa are formed, while in spermiation spermatids are formed.
- (3) In spermiogenesis spermatozoa from sertoli cells are released into the cavity of seminiferous tubules, while in spermiation spermatozoa are formed.
- (4) In spermiogenesis spermatozoa are formed, while in spermiation spermatozoa are released from sertoli cells into the cavity of seminiferous tubules.

65. Which of the following options correctly represents the lung conditions in asthma and emphysema, respectively ?

- (1) Inflammation of bronchioles; Decreased respiratory surface
- (2) Increased number of bronchioles; Increased respiratory surface
- (3) Increased respiratory surface; Inflammation of bronchioles
- (4) Decreased respiratory surface; Inflammation of bronchioles

66. Match the items given in Column I with those in Column II and select the **correct** option given below :

Column I

Column II

- | | |
|--------------------|--|
| a. Tricuspid valve | i. Between left atrium and left ventricle |
| b. Bicuspid valve | ii. Between right ventricle and pulmonary artery |
| c. Semilunar valve | iii. Between right atrium and right ventricle |

a b c

- | | | |
|---------|-----|-----|
| (1) iii | i | ii |
| (2) i | iii | ii |
| (3) i | ii | iii |
| (4) ii | i | iii |

67. Match the items given in Column I with those in Column II and select the **correct** option given below :

Column I

Column II

- | | |
|-------------------------------|--------------------|
| a. Tidal volume | i. 2500 – 3000 mL |
| b. Inspiratory Reserve volume | ii. 1100 – 1200 mL |
| c. Expiratory Reserve volume | iii. 500 – 550 mL |
| d. Residual volume | iv. 1000 – 1100 mL |

a b c d

- | | | | |
|---------|-----|----|-----|
| (1) iii | ii | i | iv |
| (2) iii | i | iv | ii |
| (3) i | iv | ii | iii |
| (4) iv | iii | ii | i |

68. Match the items given in Column I with those in Column II and select the **correct** option given below :

Column I

Column II

- | | |
|-------------------------|--|
| a. Glycosuria | i. Accumulation of uric acid in joints |
| b. Gout | ii. Mass of crystallised salts within the kidney |
| c. Renal calculi | iii. Inflammation in glomeruli |
| d. Glomerular nephritis | iv. Presence of glucose in urine |

a b c d

- | | | | |
|---------|-----|-----|-----|
| (1) iii | ii | iv | i |
| (2) i | ii | iii | iv |
| (3) ii | iii | i | iv |
| (4) iv | i | ii | iii |

69. Match the items given in Column I with those in Column II and select the **correct** option given below :

Column I

Column II

(Function)

(Part of Excretory System)

- | | |
|---------------------------|-------------------------------|
| a. Ultrafiltration | i. Henle's loop |
| b. Concentration of urine | ii. Ureter |
| c. Transport of urine | iii. Urinary bladder |
| d. Storage of urine | iv. Malpighian corpuscle |
| | v. Proximal convoluted tubule |

a b c d

- | | | | |
|--------|----|----|-----|
| (1) iv | v | ii | iii |
| (2) iv | i | ii | iii |
| (3) v | iv | i | ii |
| (4) v | iv | i | iii |

70. Which of the following events does **not** occur in rough endoplasmic reticulum ?
- (1) Protein folding
 - (2) Protein glycosylation
 - (3) Cleavage of signal peptide
 - (4) Phospholipid synthesis
71. Which of these statements is **incorrect** ?
- (1) Enzymes of TCA cycle are present in mitochondrial matrix.
 - (2) Glycolysis occurs in cytosol.
 - (3) Glycolysis operates as long as it is supplied with NAD that can pick up hydrogen atoms.
 - (4) Oxidative phosphorylation takes place in outer mitochondrial membrane.
72. Nissl bodies are mainly composed of
- (1) Proteins and lipids
 - (2) DNA and RNA
 - (3) Nucleic acids and SER
 - (4) Free ribosomes and RER
73. Which of the following terms describe human dentition ?
- (1) Thecodont, Diphodont, Homodont
 - (2) Thecodont, Diphodont, Heterodont
 - (3) Pleurodont, Monophodont, Homodont
 - (4) Pleurodont, Diphodont, Heterodont
74. Select the **incorrect** match :
- (1) Lampbrush – Diplotene bivalents chromosomes
 - (2) Allosomes – Sex chromosomes
 - (3) Submetacentric – L-shaped chromosomes
 - (4) Polytene – Oocytes of amphibians chromosomes
75. Many ribosomes may associate with a single mRNA to form multiple copies of a polypeptide simultaneously. Such strings of ribosomes are termed as
- (1) Polysome
 - (2) Polyhedral bodies
 - (3) Plastidome
 - (4) Nucleosome
76. All of the following are part of an operon **except**
- (1) an operator
 - (2) structural genes
 - (3) an enhancer
 - (4) a promoter
77. Match the items given in Column I with those in Column II and select the **correct** option given below :
- | <i>Column I</i> | <i>Column II</i> |
|------------------------|------------------------------------|
| a. Proliferative Phase | i. Breakdown of endometrial lining |
| b. Secretory Phase | ii. Follicular Phase |
| c. Menstruation | iii. Luteal Phase |
- | | a | b | c |
|---------|----------|----------|----------|
| (1) iii | ii | i | i |
| (2) i | iii | ii | ii |
| (3) ii | iii | i | i |
| (4) iii | i | ii | ii |
78. According to Hugo de Vries, the mechanism of evolution is
- (1) Multiple step mutations
 - (2) Saltation
 - (3) Phenotypic variations
 - (4) Minor mutations
79. A woman has an X-linked condition on one of her X chromosomes. This chromosome can be inherited by
- (1) Only daughters
 - (2) Only sons
 - (3) Only grandchildren
 - (4) Both sons and daughters
80. AGGTATCGCAT is a sequence from the coding strand of a gene. What will be the corresponding sequence of the transcribed mRNA ?
- (1) AGGUAUCGCAU
 - (2) UGGTUTCGCAT
 - (3) ACCUAUGC GAU
 - (4) UCCAUAGCGUA

81. Which of the following gastric cells indirectly help in erythropoiesis ?

- (1) Chief cells
- (2) Mucous cells
- (3) Goblet cells
- (4) Parietal cells

82. Match the items given in Column I with those in Column II and select the **correct** option given below :

Column I

Column II

- | | |
|---------------|------------------------|
| a. Fibrinogen | i. Osmotic balance |
| b. Globulin | ii. Blood clotting |
| c. Albumin | iii. Defence mechanism |

a b c

- | | | |
|---------|-----|-----|
| (1) iii | ii | i |
| (2) i | ii | iii |
| (3) i | iii | ii |
| (4) ii | iii | i |

83. Which of the following is an occupational respiratory disorder ?

- (1) Anthracis
- (2) Silicosis
- (3) Botulism
- (4) Emphysema

84. Calcium is important in skeletal muscle contraction because it

- (1) binds to troponin to remove the masking of active sites on actin for myosin.
- (2) activates the myosin ATPase by binding to it.
- (3) detaches the myosin head from the actin filament.
- (4) prevents the formation of bonds between the myosin cross bridges and the actin filament.

85. Which of the following is **not** an autoimmune disease ?

- (1) Psoriasis
- (2) Rheumatoid arthritis
- (3) Alzheimer's disease
- (4) Vitiligo

86. Among the following sets of examples for divergent evolution, select the **incorrect** option :

- (1) Forelimbs of man, bat and cheetah
- (2) Heart of bat, man and cheetah
- (3) Brain of bat, man and cheetah
- (4) Eye of octopus, bat and man

87. Conversion of milk to curd improves its nutritional value by increasing the amount of

- (1) Vitamin D
- (2) Vitamin A
- (3) Vitamin B₁₂
- (4) Vitamin E

88. In which disease does mosquito transmitted pathogen cause chronic inflammation of lymphatic vessels ?

- (1) Elephantiasis
- (2) Ascariasis
- (3) Ringworm disease
- (4) Amoebiasis

89. The similarity of bone structure in the forelimbs of many vertebrates is an example of

- (1) Homology
- (2) Analogy
- (3) Convergent evolution
- (4) Adaptive radiation

90. Which of the following characteristics represent 'Inheritance of blood groups' in humans ?

- a. Dominance
 - b. Co-dominance
 - c. Multiple allele
 - d. Incomplete dominance
 - e. Polygenic inheritance
- (1) b, c and e
 - (2) a, b and c
 - (3) b, d and e
 - (4) a, c and e

91. Which of the following flowers only once in its life-time ?
- (1) Bamboo species
 - (2) Jackfruit
 - (3) Mango
 - (4) Papaya
92. Which of the following pairs is **wrongly** matched ?
- (1) Starch synthesis in pea : Multiple alleles
 - (2) ABO blood grouping : Co-dominance
 - (3) XO type sex determination : Grasshopper
 - (4) T.H. Morgan : Linkage
93. Select the **correct** statement :
- (1) Franklin Stahl coined the term "linkage".
 - (2) Punnett square was developed by a British scientist.
 - (3) Spliceosomes take part in translation.
 - (4) Transduction was discovered by S. Altman.
94. The experimental proof for semiconservative replication of DNA was first shown in a
- (1) Fungus
 - (2) Bacterium
 - (3) Plant
 - (4) Virus
95. Offsets are produced by
- (1) Meiotic divisions
 - (2) Mitotic divisions
 - (3) Parthenocarpy
 - (4) Parthenogenesis
96. Which of the following has proved helpful in preserving pollen as fossils ?
- (1) Pollenkitt
 - (2) Cellulosic intine
 - (3) Oil content
 - (4) Sporopollenin
97. Select the **correct** match :
- (1) Alec Jeffreys – *Streptococcus pneumoniae*
 - (2) Alfred Hershey and Martha Chase – TMV
 - (3) Matthew Meselson and F. Stahl – *Pisum sativum*
 - (4) Francois Jacob and Jacques Monod – *Lac operon*
98. In India, the organisation responsible for assessing the safety of introducing genetically modified organisms for public use is
- (1) Indian Council of Medical Research (ICMR)
 - (2) Council for Scientific and Industrial Research (CSIR)
 - (3) Research Committee on Genetic Manipulation (RCGM)
 - (4) Genetic Engineering Appraisal Committee (GEAC)
99. Which of the following is commonly used as a vector for introducing a DNA fragment in human lymphocytes ?
- (1) Retrovirus
 - (2) Ti plasmid
 - (3) λ phage
 - (4) pBR 322
100. The correct order of steps in Polymerase Chain Reaction (PCR) is
- (1) Extension, Denaturation, Annealing
 - (2) Annealing, Extension, Denaturation
 - (3) Denaturation, Extension, Annealing
 - (4) Denaturation, Annealing, Extension
101. A 'new' variety of rice was patented by a foreign company, though such varieties have been present in India for a long time. This is related to
- (1) Co-667
 - (2) Sharbati Sonora
 - (3) Lerma Rojo
 - (4) Basmati
102. Select the **correct** match :
- (1) Ribozyme – Nucleic acid
 - (2) $F_2 \times$ Recessive parent – Dihybrid cross
 - (3) T.H. Morgan – Transduction
 - (4) G. Mendel – Transformation
103. Use of bioresources by multinational companies and organisations without authorisation from the concerned country and its people is called
- (1) Bio-infringement
 - (2) Biopiracy
 - (3) Biodegradation
 - (4) Bioexploitation

- 104.** Natality refers to
- (1) Death rate
 - (2) Birth rate
 - (3) Number of individuals leaving the habitat
 - (4) Number of individuals entering a habitat
- 105.** Niche is
- (1) all the biological factors in the organism's environment
 - (2) the physical space where an organism lives
 - (3) the range of temperature that the organism needs to live
 - (4) the functional role played by the organism where it lives
- 106.** What type of ecological pyramid would be obtained with the following data ?
 Secondary consumer : 120 g
 Primary consumer : 60 g
 Primary producer : 10 g
- (1) Inverted pyramid of biomass
 - (2) Pyramid of energy
 - (3) Upright pyramid of numbers
 - (4) Upright pyramid of biomass
- 107.** In stratosphere, which of the following elements acts as a catalyst in degradation of ozone and release of molecular oxygen ?
- (1) Carbon
 - (2) Cl
 - (3) Fe
 - (4) Oxygen
- 108.** World Ozone Day is celebrated on
- (1) 5th June
 - (2) 21st April
 - (3) 16th September
 - (4) 22nd April
- 109.** Which of the following is a secondary pollutant ?
- (1) CO
 - (2) CO₂
 - (3) SO₂
 - (4) O₃
- 110.** The two functional groups characteristic of sugars are
- (1) hydroxyl and methyl
 - (2) carbonyl and methyl
 - (3) carbonyl and phosphate
 - (4) carbonyl and hydroxyl
- 111.** Which among the following is **not** a prokaryote ?
- (1) *Saccharomyces*
 - (2) *Mycobacterium*
 - (3) *Nostoc*
 - (4) *Oscillatoria*
- 112.** Stomatal movement is **not** affected by
- (1) Temperature
 - (2) Light
 - (3) O₂ concentration
 - (4) CO₂ concentration
- 113.** Which of the following is **not** a product of light reaction of photosynthesis ?
- (1) ATP
 - (2) NADH
 - (3) NADPH
 - (4) Oxygen
- 114.** The Golgi complex participates in
- (1) Fatty acid breakdown
 - (2) Formation of secretory vesicles
 - (3) Respiration in bacteria
 - (4) Activation of amino acid
- 115.** Which of the following is true for nucleolus ?
- (1) Larger nucleoli are present in dividing cells.
 - (2) It is a membrane-bound structure.
 - (3) It takes part in spindle formation.
 - (4) It is a site for active ribosomal RNA synthesis.
- 116.** The stage during which separation of the paired homologous chromosomes begins is
- (1) Pachytene
 - (2) Diplotene
 - (3) Diakinesis
 - (4) Zygotene
- 117.** Stomata in grass leaf are
- (1) Dumb-bell shaped
 - (2) Kidney shaped
 - (3) Rectangular
 - (4) Barrel shaped

118. Casparian strips occur in

- (1) Epidermis
- (2) Pericycle
- (3) Cortex
- (4) Endodermis

119. Plants having little or no secondary growth are

- (1) Grasses
- (2) Deciduous angiosperms
- (3) Conifers
- (4) Cycads

120. Pneumatophores occur in

- (1) Halophytes
- (2) Free-floating hydrophytes
- (3) Carnivorous plants
- (4) Submerged hydrophytes

121. Sweet potato is a modified

- (1) Stem
- (2) Adventitious root
- (3) Tap root
- (4) Rhizome

122. Secondary xylem and phloem in dicot stem are produced by

- (1) Apical meristems
- (2) Vascular cambium
- (3) Phellogen
- (4) Axillary meristems

123. Which of the following statements is **correct** ?

- (1) Ovules are not enclosed by ovary wall in gymnosperms.
- (2) *Selaginella* is heterosporous, while *Salvinia* is homosporous.
- (3) Horsetails are gymnosperms.
- (4) Stems are usually unbranched in both *Cycas* and *Cedrus*.

124. Select the **wrong** statement :

- (1) Cell wall is present in members of Fungi and Plantae.
- (2) Mushrooms belong to Basidiomycetes.
- (3) Pseudopodia are locomotory and feeding structures in Sporozoans.
- (4) Mitochondria are the powerhouse of the cell in all kingdoms except Monera.

125. Winged pollen grains are present in

- (1) Mustard
- (2) *Cycas*
- (3) Mango
- (4) *Pinus*

126. After karyogamy followed by meiosis, spores are produced exogenously in

- (1) *Neurospora*
- (2) *Alternaria*
- (3) *Agaricus*
- (4) *Saccharomyces*

127. Match the items given in Column I with those in Column II and select the **correct** option given below :

Column I	Column II
a. Herbarium	i. It is a place having a collection of preserved plants and animals.
b. Key	ii. A list that enumerates methodically all the species found in an area with brief description aiding identification.
c. Museum	iii. Is a place where dried and pressed plant specimens mounted on sheets are kept.
d. Catalogue	iv. A booklet containing a list of characters and their alternates which are helpful in identification of various taxa.

	a	b	c	d
(1)	i	iv	iii	ii
(2)	iii	ii	i	iv
(3)	ii	iv	iii	i
(4)	iii	iv	i	ii

128. Which one is **wrongly** matched ?

- (1) Uniflagellate gametes – *Polysiphonia*
- (2) Biflagellate zoospores – Brown algae
- (3) Gemma cups – *Marchantia*
- (4) Unicellular organism – *Chlorella*

129. Which one of the following plants shows a very close relationship with a species of moth, where none of the two can complete its life cycle without the other ?
- (1) *Hydrilla*
 - (2) *Yucca*
 - (3) Banana
 - (4) *Viola*
130. Pollen grains can be stored for several years in liquid nitrogen having a temperature of
- (1) -120°C
 - (2) -80°C
 - (3) -196°C
 - (4) -160°C
131. Which of the following elements is responsible for maintaining turgor in cells ?
- (1) Magnesium
 - (2) Sodium
 - (3) Potassium
 - (4) Calcium
132. Double fertilization is
- (1) Fusion of two male gametes of a pollen tube with two different eggs
 - (2) Fusion of one male gamete with two polar nuclei
 - (3) Fusion of two male gametes with one egg
 - (4) Syngamy and triple fusion
133. Oxygen is **not** produced during photosynthesis by
- (1) Green sulphur bacteria
 - (2) *Nostoc*
 - (3) *Cycas*
 - (4) *Chara*
134. What is the role of NAD^+ in cellular respiration ?
- (1) It functions as an enzyme.
 - (2) It functions as an electron carrier.
 - (3) It is a nucleotide source for ATP synthesis.
 - (4) It is the final electron acceptor for anaerobic respiration.
135. In which of the following forms is iron absorbed by plants ?
- (1) Ferric
 - (2) Ferrous
 - (3) Free element
 - (4) Both ferric and ferrous
136. Which of the following statements is **not** true for halogens ?
- (1) All form monobasic oxyacids.
 - (2) All are oxidizing agents.
 - (3) All but fluorine show positive oxidation states.
 - (4) Chlorine has the highest electron-gain enthalpy.
137. Considering Ellingham diagram, which of the following metals can be used to reduce alumina ?
- (1) Fe
 - (2) Zn
 - (3) Mg
 - (4) Cu
138. In the structure of ClF_3 , the number of lone pairs of electrons on central atom 'Cl' is
- (1) one
 - (2) two
 - (3) four
 - (4) three
139. The correct order of atomic radii in group 13 elements is
- (1) $\text{B} < \text{Al} < \text{In} < \text{Ga} < \text{Tl}$
 - (2) $\text{B} < \text{Al} < \text{Ga} < \text{In} < \text{Tl}$
 - (3) $\text{B} < \text{Ga} < \text{Al} < \text{Tl} < \text{In}$
 - (4) $\text{B} < \text{Ga} < \text{Al} < \text{In} < \text{Tl}$
140. The correct order of N-compounds in its decreasing order of oxidation states is
- (1) $\text{HNO}_3, \text{NO}, \text{N}_2, \text{NH}_4\text{Cl}$
 - (2) $\text{HNO}_3, \text{NO}, \text{NH}_4\text{Cl}, \text{N}_2$
 - (3) $\text{HNO}_3, \text{NH}_4\text{Cl}, \text{NO}, \text{N}_2$
 - (4) $\text{NH}_4\text{Cl}, \text{N}_2, \text{NO}, \text{HNO}_3$
141. Which one of the following elements is unable to form MF_6^{3-} ion ?
- (1) Ga
 - (2) Al
 - (3) B
 - (4) In

142. The compound A on treatment with Na gives B, and with PCl_5 gives C. B and C react together to give diethyl ether. A, B and C are in the order
- (1) $\text{C}_2\text{H}_5\text{OH}$, C_2H_6 , $\text{C}_2\text{H}_5\text{Cl}$
 - (2) $\text{C}_2\text{H}_5\text{OH}$, $\text{C}_2\text{H}_5\text{Cl}$, $\text{C}_2\text{H}_5\text{ONa}$
 - (3) $\text{C}_2\text{H}_5\text{Cl}$, C_2H_6 , $\text{C}_2\text{H}_5\text{OH}$
 - (4) $\text{C}_2\text{H}_5\text{OH}$, $\text{C}_2\text{H}_5\text{ONa}$, $\text{C}_2\text{H}_5\text{Cl}$
143. Hydrocarbon (A) reacts with bromine by substitution to form an alkyl bromide which by Wurtz reaction is converted to gaseous hydrocarbon containing less than four carbon atoms. (A) is
- (1) $\text{CH} \equiv \text{CH}$
 - (2) $\text{CH}_2 = \text{CH}_2$
 - (3) $\text{CH}_3 - \text{CH}_3$
 - (4) CH_4
144. The compound C_7H_8 undergoes the following reactions :
- $$\text{C}_7\text{H}_8 \xrightarrow{3 \text{ Cl}_2 / \Delta} \text{A} \xrightarrow{\text{Br}_2 / \text{Fe}} \text{B} \xrightarrow{\text{Zn} / \text{HCl}} \text{C}$$
- The product 'C' is
- (1) *m*-bromotoluene
 - (2) *o*-bromotoluene
 - (3) 3-bromo-2,4,6-trichlorotoluene
 - (4) *p*-bromotoluene
145. Which oxide of nitrogen is **not** a common pollutant introduced into the atmosphere both due to natural and human activity ?
- (1) N_2O_5
 - (2) NO_2
 - (3) N_2O
 - (4) NO
146. Following solutions were prepared by mixing different volumes of NaOH and HCl of different concentrations :
- 60 mL $\frac{\text{M}}{10}$ HCl + 40 mL $\frac{\text{M}}{10}$ NaOH
 - 55 mL $\frac{\text{M}}{10}$ HCl + 45 mL $\frac{\text{M}}{10}$ NaOH
 - 75 mL $\frac{\text{M}}{5}$ HCl + 25 mL $\frac{\text{M}}{5}$ NaOH
 - 100 mL $\frac{\text{M}}{10}$ HCl + 100 mL $\frac{\text{M}}{10}$ NaOH
- pH of which one of them will be equal to 1 ?
- (1) b
 - (2) a
 - (3) d
 - (4) c
147. On which of the following properties does the coagulating power of an ion depend ?
- (1) The magnitude of the charge on the ion alone
 - (2) Size of the ion alone
 - (3) Both magnitude and sign of the charge on the ion
 - (4) The sign of charge on the ion alone
148. The solubility of BaSO_4 in water is $2.42 \times 10^{-3} \text{ gL}^{-1}$ at 298 K. The value of its solubility product (K_{sp}) will be
(Given molar mass of $\text{BaSO}_4 = 233 \text{ g mol}^{-1}$)
- (1) $1.08 \times 10^{-10} \text{ mol}^2 \text{ L}^{-2}$
 - (2) $1.08 \times 10^{-12} \text{ mol}^2 \text{ L}^{-2}$
 - (3) $1.08 \times 10^{-14} \text{ mol}^2 \text{ L}^{-2}$
 - (4) $1.08 \times 10^{-8} \text{ mol}^2 \text{ L}^{-2}$
149. Given van der Waals constant for NH_3 , H_2 , O_2 and CO_2 are respectively 4.17, 0.244, 1.36 and 3.59, which one of the following gases is most easily liquefied ?
- (1) NH_3
 - (2) H_2
 - (3) O_2
 - (4) CO_2

150. Match the metal ions given in Column I with the spin magnetic moments of the ions given in Column II and assign the **correct** code :

Column I		Column II	
a. Co^{3+}	i. $\sqrt{8}$ B.M.		
b. Cr^{3+}	ii. $\sqrt{35}$ B.M.		
c. Fe^{3+}	iii. $\sqrt{3}$ B.M.		
d. Ni^{2+}	iv. $\sqrt{24}$ B.M.		
	v. $\sqrt{15}$ B.M.		

	a	b	c	d
(1)	iv	v	ii	i
(2)	i	ii	iii	iv
(3)	iv	i	ii	iii
(4)	iii	v	i	ii

151. Iron carbonyl, $\text{Fe}(\text{CO})_5$ is

- (1) tetranuclear
- (2) mononuclear
- (3) trinuclear
- (4) dinuclear

152. The geometry and magnetic behaviour of the complex $[\text{Ni}(\text{CO})_4]$ are

- (1) square planar geometry and diamagnetic
- (2) tetrahedral geometry and diamagnetic
- (3) square planar geometry and paramagnetic
- (4) tetrahedral geometry and paramagnetic

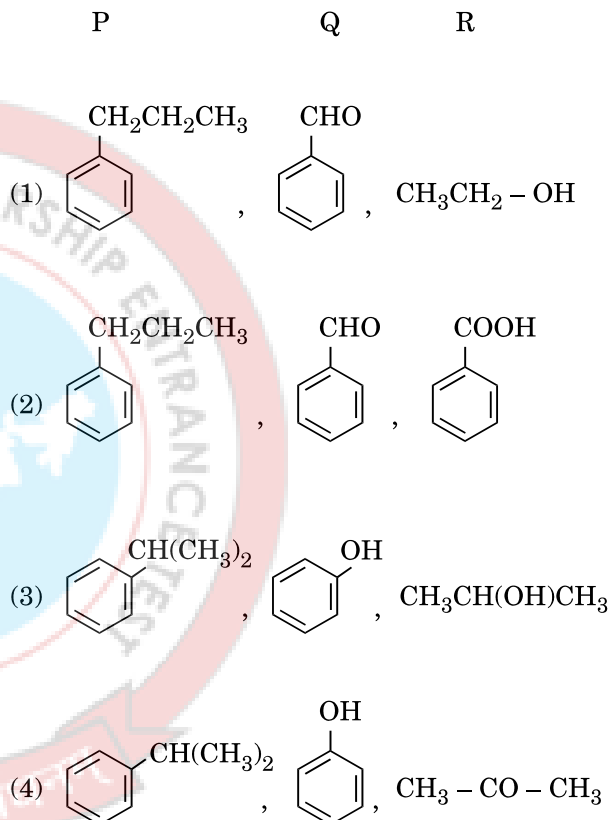
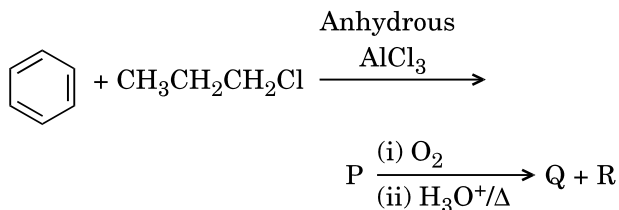
153. Which one of the following ions exhibits d-d transition and paramagnetism as well ?

- (1) CrO_4^{2-}
- (2) $\text{Cr}_2\text{O}_7^{2-}$
- (3) MnO_4^-
- (4) MnO_4^{2-}

154. The type of isomerism shown by the complex $[\text{CoCl}_2(\text{en})_2]$ is

- (1) Geometrical isomerism
- (2) Coordination isomerism
- (3) Ionization isomerism
- (4) Linkage isomerism

155. Identify the major products P, Q and R in the following sequence of reactions :



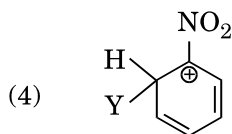
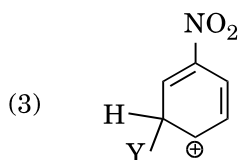
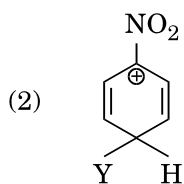
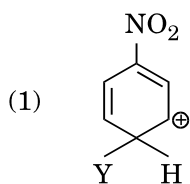
156. Which of the following compounds can form a zwitterion ?

- (1) Aniline
- (2) Acetanilide
- (3) Benzoic acid
- (4) Glycine

157. Which of the following molecules represents the order of hybridisation sp^2 , sp^2 , sp , sp from left to right atoms ?

- (1) $HC \equiv C - C \equiv CH$
- (2) $CH_2 = CH - C \equiv CH$
- (3) $CH_2 = CH - CH = CH_2$
- (4) $CH_3 - CH = CH - CH_3$

158. Which of the following carbocations is expected to be most stable ?



159. Which of the following is correct with respect to -I effect of the substituents ? (R = alkyl)

- (1) $-NH_2 < -OR < -F$
- (2) $-NR_2 < -OR < -F$
- (3) $-NH_2 > -OR > -F$
- (4) $-NR_2 > -OR > -F$

160. Magnesium reacts with an element (X) to form an ionic compound. If the ground state electronic configuration of (X) is $1s^2 2s^2 2p^3$, the simplest formula for this compound is

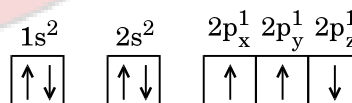
- (1) Mg_2X_3
- (2) MgX_2
- (3) Mg_2X
- (4) Mg_3X_2

161. Iron exhibits bcc structure at room temperature. Above $900^\circ C$, it transforms to fcc structure. The ratio of density of iron at room temperature to that at $900^\circ C$ (assuming molar mass and atomic radii of iron remains constant with temperature) is

- (1) $\frac{\sqrt{3}}{\sqrt{2}}$
- (2) $\frac{4\sqrt{3}}{3\sqrt{2}}$
- (3) $\frac{3\sqrt{3}}{4\sqrt{2}}$
- (4) $\frac{1}{2}$

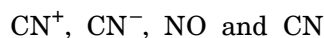
162. Which one is a *wrong* statement ?

- (1) Total orbital angular momentum of electron in 's' orbital is equal to zero.
- (2) An orbital is designated by three quantum numbers while an electron in an atom is designated by four quantum numbers.
- (3) The electronic configuration of N atom is



- (4) The value of m for d_{z^2} is zero.

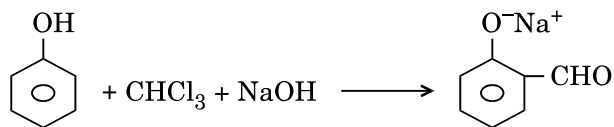
163. Consider the following species :



Which one of these will have the highest bond order ?

- (1) NO
- (2) CN^-
- (3) CN^+
- (4) CN

164. In the reaction



the electrophile involved is

- (1) dichloromethyl cation (CHCl_2^+)
- (2) formyl cation (CHO^+)
- (3) dichloromethyl anion (CHCl_2^-)
- (4) dichlorocarbene ($:\text{CCl}_2$)

165. Carboxylic acids have higher boiling points than aldehydes, ketones and even alcohols of comparable molecular mass. It is due to their

- (1) formation of intramolecular H-bonding
- (2) formation of carboxylate ion
- (3) more extensive association of carboxylic acid via van der Waals force of attraction
- (4) formation of intermolecular H-bonding

166. Compound A, $\text{C}_8\text{H}_{10}\text{O}$, is found to react with NaOI (produced by reacting Y with NaOH) and yields a yellow precipitate with characteristic smell.

A and Y are respectively

- (1) $\text{H}_3\text{C}-\text{C}_6\text{H}_4-\text{CH}_2-\text{OH}$ and I_2
- (2) $\text{C}_6\text{H}_5-\text{CH}_2-\text{CH}_2-\text{OH}$ and I_2
- (3) $\text{C}_6\text{H}_5-\text{CH}(\text{OH})-\text{CH}_3$ and I_2
- (4) $\text{CH}_3-\text{C}_6\text{H}_3(\text{OH})-\text{CH}_3$ and I_2

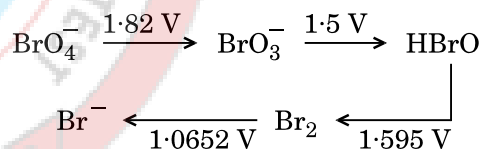
167. The correct difference between first- and second-order reactions is that

- (1) the rate of a first-order reaction does not depend on reactant concentrations; the rate of a second-order reaction does depend on reactant concentrations
- (2) the half-life of a first-order reaction does not depend on $[\text{A}]_0$; the half-life of a second-order reaction does depend on $[\text{A}]_0$
- (3) a first-order reaction can be catalyzed; a second-order reaction cannot be catalyzed
- (4) the rate of a first-order reaction does depend on reactant concentrations; the rate of a second-order reaction does not depend on reactant concentrations

168. Among CaH_2 , BeH_2 , BaH_2 , the order of ionic character is

- (1) $\text{BeH}_2 < \text{CaH}_2 < \text{BaH}_2$
- (2) $\text{CaH}_2 < \text{BeH}_2 < \text{BaH}_2$
- (3) $\text{BeH}_2 < \text{BaH}_2 < \text{CaH}_2$
- (4) $\text{BaH}_2 < \text{BeH}_2 < \text{CaH}_2$

169. Consider the change in oxidation state of Bromine corresponding to different emf values as shown in the diagram below :



Then the species undergoing disproportionation is

- (1) BrO_3^-
- (2) BrO_4^-
- (3) Br_2
- (4) HBrO

170. In which case is the number of molecules of water maximum ?

- (1) 18 mL of water
- (2) 0.18 g of water
- (3) 0.00224 L of water vapours at 1 atm and 273 K
- (4) 10^{-3} mol of water

171. Regarding cross-linked or network polymers, which of the following statements is **incorrect** ?

- (1) They contain covalent bonds between various linear polymer chains.
- (2) They are formed from bi- and tri-functional monomers.
- (3) Examples are bakelite and melamine.
- (4) They contain strong covalent bonds in their polymer chains.

172. Nitration of aniline in strong acidic medium also gives m-nitroaniline because

- (1) In spite of substituents nitro group always goes to only m-position.
- (2) In electrophilic substitution reactions amino group is meta directive.
- (3) In absence of substituents nitro group always goes to m-position.
- (4) In acidic (strong) medium aniline is present as anilinium ion.

173. Which of the following oxides is most acidic in nature ?

- (1) MgO
- (2) BeO
- (3) BaO
- (4) CaO

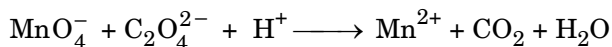
174. The difference between amylose and amylopectin is

- (1) Amylopectin have 1 → 4 α-linkage and 1 → 6 α-linkage
- (2) Amylose have 1 → 4 α-linkage and 1 → 6 β-linkage
- (3) Amylopectin have 1 → 4 α-linkage and 1 → 6 β-linkage
- (4) Amylose is made up of glucose and galactose

175. A mixture of 2.3 g formic acid and 4.5 g oxalic acid is treated with conc. H₂SO₄. The evolved gaseous mixture is passed through KOH pellets. Weight (in g) of the remaining product at STP will be

- (1) 1.4
- (2) 3.0
- (3) 2.8
- (4) 4.4

176. For the redox reaction



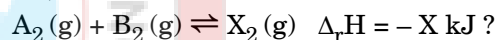
the correct coefficients of the reactants for the balanced equation are

- | | MnO ₄ ⁻ | C ₂ O ₄ ²⁻ | H ⁺ |
|-----|-------------------------------|---|----------------|
| (1) | 16 | 5 | 2 |
| (2) | 2 | 5 | 16 |
| (3) | 2 | 16 | 5 |
| (4) | 5 | 16 | 2 |

177. The correction factor 'a' to the ideal gas equation corresponds to

- (1) density of the gas molecules
- (2) volume of the gas molecules
- (3) electric field present between the gas molecules
- (4) forces of attraction between the gas molecules

178. Which one of the following conditions will favour maximum formation of the product in the reaction,



- (1) Low temperature and high pressure
- (2) Low temperature and low pressure
- (3) High temperature and high pressure
- (4) High temperature and low pressure

179. The bond dissociation energies of X₂, Y₂ and XY are in the ratio of 1 : 0.5 : 1. ΔH for the formation of XY is -200 kJ mol⁻¹. The bond dissociation energy of X₂ will be

- (1) 200 kJ mol⁻¹
- (2) 100 kJ mol⁻¹
- (3) 800 kJ mol⁻¹
- (4) 400 kJ mol⁻¹

180. When initial concentration of the reactant is doubled, the half-life period of a zero order reaction

- (1) is halved
- (2) is doubled
- (3) is tripled
- (4) remains unchanged

SPACE FOR ROUGH WORK

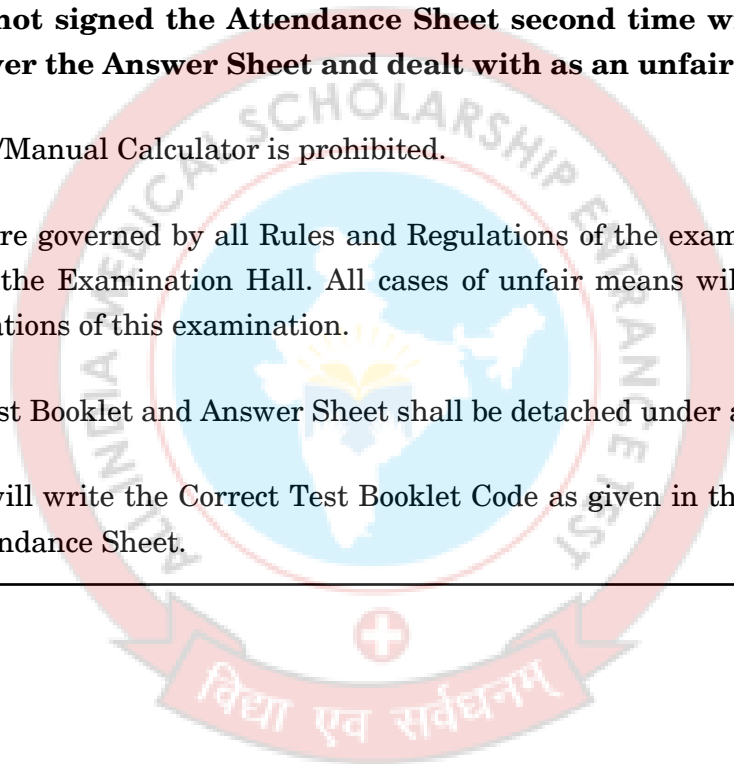


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Read carefully the following instructions :

1. Each candidate must show on demand his/her Admit Card to the Invigilator.
2. No candidate, without special permission of the Superintendent or Invigilator, would leave his/her seat.
3. The candidates should not leave the Examination Hall without handing over their Answer Sheet to the Invigilator on duty and sign the Attendance Sheet twice. **Cases where a candidate has not signed the Attendance Sheet second time will be deemed not to have handed over the Answer Sheet and dealt with as an unfair means case.**
4. Use of Electronic/Manual Calculator is prohibited.
5. The candidates are governed by all Rules and Regulations of the examination with regard to their conduct in the Examination Hall. All cases of unfair means will be dealt with as per Rules and Regulations of this examination.
6. No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.
7. The candidates will write the Correct Test Booklet Code as given in the Test Booklet/Answer Sheet in the Attendance Sheet.



CODE :- ACHLA Set :- DD

QNO	ANS	QNO	ANS	QNO	ANS	QNO	ANS
1	2	46	4	91	2	136	1
2	1	47	1	92	2	137	4
3	2	48	1	93	1	138	3
4	1	49	3	94	1	139	3
5	3	50	3	95	4	140	1
6	4	51	3	96	3	141	2
7	1	52	4	97	3	142	1
8	4	53	2	98	1	143	4
9	2	54	1	99	4	144	3
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11	1	56	3	101	3	146	4
12	2	57	3	102	2	147	4
13	3	58	1	103	4	148	4
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22	1	67	1	112	4	157	4
23	2	68	2	113	4	158	4
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25	4	70	2	115	1	160	1
26	4	71	1	116	2	161	2
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36	1	81	1	126	1	171	4
37	1	82	2	127	3	172	1
38	4	83	3	128	4	173	4
39	1	84	2	129	1	174	3
40	4	85	2	130	1	175	1
41	2	86	2	131	4	176	2
42	4	87	4	132	2	177	1
43	2	88	1	133	3	178	4
44	4	89	2	134	1	179	2
45	4	90	4	135	2	180	1

