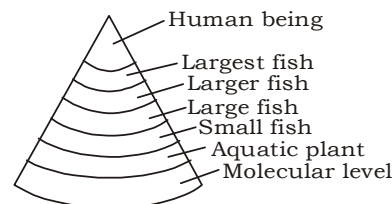


# CHEMISTRY

## Single correct Choice Type

This section contains 45 questions numbered 1 to 45. Each question has 4 choices (a), (b), (c) and (d) out of which ONLY ONE is correct.

1. The statement that is not correct for periodic classification of elements is
- The properties of elements are periodic function of their atomic numbers
  - Non-metallic elements are less in number than metallic elements
  - For transition elements, the 3d orbitals are filled with electrons after 3p orbitals and before 4s orbitals
  - the first ionization enthalpies of elements generally increase with increase in atomic number as we go along a period



Which is the most appropriate statement about the figure?

2. Match the column I with column II and mark the appropriate choice

**Column I**

- $C_2H_2$
- $SF_6$
- $SO_2$
- $IF_7$

**Column II**

- $sp^3d^2$  hybridisation
- $sp^3d^3$  hybridisation
- $sp$  hybridisation
- $sp^2$  hybridisation

- (A)  $\rightarrow$  (i), (B)  $\rightarrow$  (iii), (C)  $\rightarrow$  (ii), (D)  $\rightarrow$  (iv)
- (A)  $\rightarrow$  (iii), (B)  $\rightarrow$  (i), (C)  $\rightarrow$  (iv), (D)  $\rightarrow$  (ii)
- (A)  $\rightarrow$  (ii), (B)  $\rightarrow$  (iii), (C)  $\rightarrow$  (i), (D)  $\rightarrow$  (iv)
- (A)  $\rightarrow$  (iv), (B)  $\rightarrow$  (i), (C)  $\rightarrow$  (iii), (D)  $\rightarrow$  (ii)

3. The appearance of colour in solid alkali metal halides is generally due to

- Schottky defect
- Frenkel defect
- Interstitial position
- F-centres

4. The amount of heat evolved when 0.50 mole of HCl is mixed with 0.30 mole of NaOH solution is

- 57.1 kJ
- 28.55 kJ
- 11.42 kJ
- 17.13 kJ

5. Which of the following is a true structure of  $H_2O_2$  in solid phase?

- 
- 

- 
- 

6. Match the column I with column II and mark the appropriate choice.

**Column I**

- Borax - bead
- Inorganic benzene
- Antiseptic
- Bridged hydrogens

**Column II**

- Alum
- Diborane
- Metaborate
- Borazole

- (A)  $\rightarrow$  (ii), (B)  $\rightarrow$  (i), (C)  $\rightarrow$  (iii), (D)  $\rightarrow$  (iv)
- (A)  $\rightarrow$  (iv), (B)  $\rightarrow$  (iii), (C)  $\rightarrow$  (ii), (D)  $\rightarrow$  (i)
- (A)  $\rightarrow$  (ii), (B)  $\rightarrow$  (iv), (C)  $\rightarrow$  (i), (D)  $\rightarrow$  (iii)
- (A)  $\rightarrow$  (iii), (B)  $\rightarrow$  (iv), (C)  $\rightarrow$  (i), (D)  $\rightarrow$  (ii)

7. Study the given diagram and answer the following question.

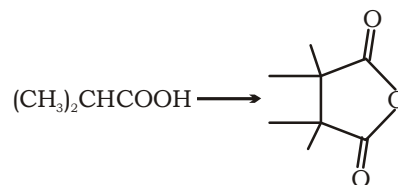
- The trophic levels decrease from molecular level to human beings.
- At each trophic level the pollutants get approximately 10 times concentrated.
- The level of pollutants is maximum at molecular level and minimum is human beings.
- Repeated use to toxins reduces its concentration at highest level.

8. Which has the highest boiling point?
- 0.1 M  $Na_2SO_4$
  - 0.1 M  $C_6H_{12}O_6$  (glucose)
  - 0.1 M  $MgCl_2$
  - 0.1 M  $Al(NO_3)_3$

9. In the reaction,  $A \rightarrow \text{product}$ ,  $\frac{-dA}{dt} = K_1A$ . If we start with 10 M of A, then after one natural life time, concentration of A decreased to

- 5 m
- 2.5 m
- $\frac{10 \text{ m}}{e}$
- $\frac{10 \text{ m}}{e^2}$

10. The correct set of reagents for the following conversion is



- $P_2O_5/\Delta, P_4/I_2, Na$
- $P_4/I_2, Na, P_2O_5/\Delta$
- $P_2O_5, NaBH_4$
- $P_4/I_2, Na, \text{conc. } H_2SO_4$

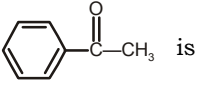
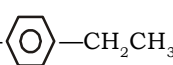
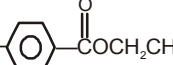
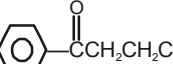
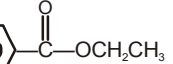
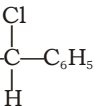
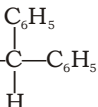
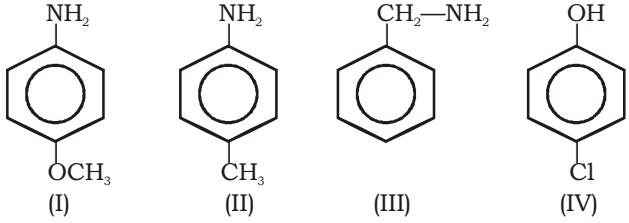
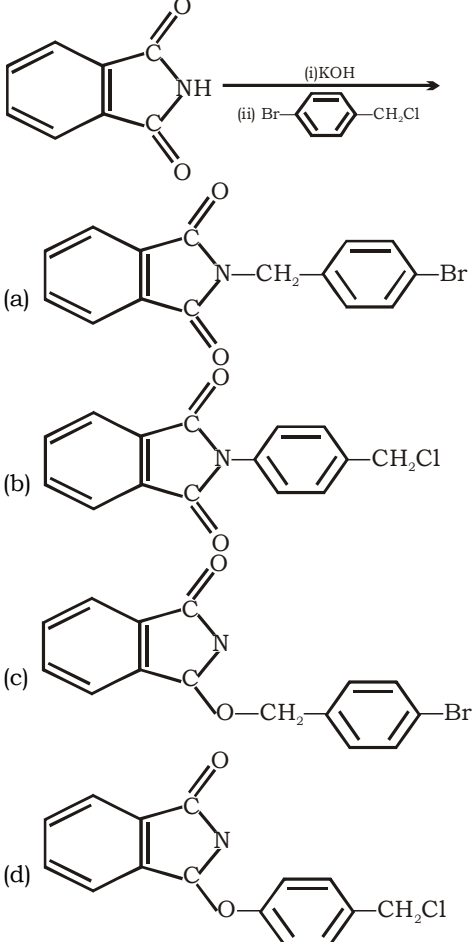
11. Correct order of increasing C - O bond length of  $CO, CO_3^{2-}, CO_2$  is

- $CO_3^{2-} < CO_2 < CO$
- $CO_2 < CO_3^{2-} < CO$
- $CO < CO_3^{2-} < CO_2$
- $CO < CO_2 < CO_3^{2-}$

12. The true statement for the acids of phosphorus,  $H_3PO_2, H_3PO_3$  and  $H_3PO_4$  is

- the order of their acidity is  $H_3PO_2 > H_3PO_3 > H_3PO_4$
- all of them are reducing in nature
- all of them are tribasic acids
- the geometry of phosphours is tetrahedral in all the three

13. In Williamson's synthesis, ethoxy ethane is prepared by  
 (a) heating sodium ethoxide with ethyl bromide  
 (b) passing ethanol over heated alumina  
 (c) treating ethyl alcohol with excess of conc.  $\text{H}_2\text{SO}_4$  at 430 - 440 K  
 (d) heating ethanol with dry  $\text{Ag}_2\text{O}$
14. Butyne-1 on oxidation with hot alkaline  $\text{KMnO}_4$  would give  
 (a)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$   
 (b)  $\text{CH}_3\text{CH}_2\text{COOH}$   
 (c)  $\text{CH}_3\text{CH}_2\text{COOH} + \text{CO}_2 + \text{H}_2\text{O}$   
 (d)  $\text{CH}_3\text{CH}_2\text{COOH} = \text{HCOOH}$
15. The enthalpies of all elements in their standard states are  
 (a) unity  
 (b) zero  
 (c)  $< 0$   
 (d) different for each element
16. Heating mixture of  $\text{Cu}_2\text{O}$  and  $\text{Cu}_2\text{S}$  will give  
 (a)  $\text{Cu}_2\text{SO}_3$  (b)  $\text{CuO} + \text{CuS}$   
 (c)  $\text{Cu} + \text{SO}_3$  (d)  $\text{Cu} + \text{SO}_2$
17. At a certain temperature, the first order rate constant,  $k_1$  is found to be smaller than the second order rate constant,  $k_2$ . If the energy of activation,  $E_1$  of the first order reaction is greater than energy of activation,  $E_2$  of the second order reaction then with increase in temperature  
 (a)  $k_1$  will increase faster than  $k_2$ , but always will remain less than  $k_2$   
 (b)  $k_2$  will increase faster than  $k_1$   
 (c)  $k_1$  will increase faster than  $k_2$  and becomes equal to  $k_2$   
 (d)  $k_1$  will increase faster than  $k_2$  and becomes greater than  $k_2$
18.  $(\text{CH}_3)_2\text{C}=\text{O} + \text{HCN} \xrightarrow{\text{H}^+} \xrightarrow{\text{H}_3\text{O}^+} \xrightarrow[\text{(ii) PCl}_5]{\text{(i) H}_2\text{SO}_4} \xrightarrow[\text{(ii) H}_2\text{O}_2, \text{OH}^-]{\text{(i) BH}_3\text{-THF}} \text{product}$   
 The final predominant product is  
 (a)  $\text{HOCH}_2-\underset{\text{CH}_3}{\text{CH}}-\text{COOH}$  (b)  $\text{CH}_3-\overset{\text{OH}}{\text{C}}-\text{COOH}$   
 (c)  $\text{CH}_3-\overset{\text{OH}}{\text{C}}-\text{CH}_3$  (d)  $\text{CH}_3\text{CH}_2-\overset{\text{O}}{\parallel}{\text{C}}-\overset{\text{O}}{\parallel}{\text{C}}-\text{OH}$
19. **Assertion (A)**  $\text{S}_{\text{N}}1$  reaction is basically a solvolysis reaction.  
**Reason (R)** Polar protic solvents help the substrate to ionise and by the way get involved in  $\text{S}_{\text{N}}1$  reaction.  
 (a) If both Assertion and Reason are true and the Reason is the correct explanation of the Assertion  
 (b) If both Assertion and Reason are true but the Reason is not the correct explanation of the Assertion  
 (c) If Assertion is true but Reason is false  
 (d) If both Assertion and Reason are false.
20. For which of the following pairs, magnetic moment is same?  
 (a)  $\text{MnCl}_2, \text{CuSO}_4$  (b)  $\text{CuCl}_2, \text{TiCl}_3$   
 (c)  $\text{TiO}_2, \text{CuSO}_4$  (d)  $\text{TiCl}_3, \text{NiCl}_2$
21. The reduction potential at pH = 14 for the  $\text{Cu}^{2+}/\text{Cu}$  couples is  
 [Given,  $E_{\text{Cu}^{2+}/\text{Cu}}^0 = 0.34\text{V}$ ;  $K_{\text{sp}}[\text{Cu}(\text{OH})_2] = 1 \times 10^{-19}$ ]  
 (a) 0.34V (b) -0.34 V  
 (c) 0.22 V (d) -0.22 V
22. The emf of Daniell cell at 298 K is  $E_1$   
 $\text{Zn} | \text{ZnSO}_4 (0.01\text{ M}) || \text{CuSO}_4 (1.0\text{ M}) | \text{Cu}$   
 When the concentration of  $\text{ZnSO}_4$  is 1.0 M and that of  $\text{CuSO}_4$  is 0.01 M, the emf changed to  $E_2$ . What is the relation between  $E_1$  and  $E_2$ ?  
 (a)  $E_1 = E_2$  (b)  $E_1 = 0 \neq E_2$   
 (c)  $E_1 > E_2$  (d)  $E_1 < E_2$
23. On adding 0.1 solution each of  $[\text{Ag}^+]$ ,  $[\text{Ba}^{2+}]$ ,  $[\text{Ca}^{2+}]$  in a  $\text{Na}_2\text{SO}_4$  solution, species first precipitated is  
 [ $K_{\text{sp}} \text{BaSO}_4 = 10^{-11}$ ,  $K_{\text{sp}} \text{CaSO}_4 = 10^{-6}$ ,  $K_{\text{sp}} \text{Ag}_2\text{SO}_4 = 10^{-5}$ ]  
 (a)  $\text{Ag}_2\text{SO}_4$  (b)  $\text{BaSO}_4$   
 (c)  $\text{CaSO}_4$  (d) All of these
24. Which of the following sets of quantum numbers represents the highest energy of an atom?  
 (a)  $n = 4, l = 0, m = 0, s = +\frac{1}{2}$   
 (b)  $n = 3, l = 0, m = 0, s = +\frac{1}{2}$   
 (c)  $n = 3, l = 1, m = 1, s = +\frac{1}{2}$   
 (d)  $n = 3, l = 2, m = 1, s = +\frac{1}{2}$
25. The N-O-N bond angle is maximum in  
 (a)  $\text{NO}_2^+$  (b)  $\text{NO}_2$   
 (c)  $\text{NO}_2^-$  (d)  $\text{N}_2\text{O}_3$
26. At Boyle temperature,  
 (a) The effects of the repulsive and attractive intermolecular forces just offset each other  
 (b) The repulsive intermolecular forces are greater than the attractive intermolecular forces  
 (c) The repulsive intermolecular forces are less than the attractive intermolecular forces  
 (d)  $b - \frac{a}{RT} > 0$
27. A plot of the Gibbs energy of a reaction-mixture against the extent of the reaction is  
 (a) Minimum at equilibrium  
 (b) Zero at equilibrium  
 (c) Equal to  $\Delta H - T\Delta S$  at equilibrium  
 (d) Maximum at equilibrium

28. Micelles are  
 (a) Emulsion cum gel (b) Associated colloids  
 (c) Adsorbed catalysts (d) Ideal solutions
29. Which of the following is arranged in order of increasing density?  
 (a)  $\text{Ne} < \text{Cl}_2 < \text{N}_2 < \text{O}_2$  (b)  $\text{N}_2 < \text{O}_2 < \text{Ne} < \text{Cl}_2$   
 (c)  $\text{Cl}_2 < \text{Ne} < \text{O}_2 < \text{N}_2$  (d)  $\text{Cl}_2 < \text{N}_2 < \text{O}_2 < \text{Ne}$
30. The structure of ozone involves  
 (a) Delocalized three-centre  $\sigma$ -bonding  
 (b) Delocalized three-centre  $\pi$ -bonding  
 (c) Delocalized three-centre  $\sigma$ - as well as  $\pi$ -bonding  
 (d) Localized  $\pi$ -bonding
31. Which of the following is a pseudohalide ion?  
 (a)  $\text{N}_3^-$  (b)  $\text{ONC}^-$   
 (c)  $\text{SCN}^-$  (d) All of these
32. The extraction of silver from its ore involving KCN, air and an active metal is known as  
 (a) Pattinson's process  
 (b) The amalgamation process  
 (c) The McArthur-Forrest process  
 (d) Parke's process
33. The IUPAC name for  $\text{K}_2[\text{Cr}(\text{CN})_2\text{O}_2(\text{O}_2)\text{NH}_3]$  is  
 (a) Potassium amminedicyanodioxoperoxochromate (VI)  
 (b) Potassium amminedicyanotetroxochromium (II)  
 (c) Potassium amminedicyanochromate (IV)  
 (d) Potassium amminocyanodiperoxochromate (VI)
34. How many geometrical isomers are possible for the square-planar complex  
 $[\text{Pt}(\text{NO}_2)(\text{py})(\text{NH}_3)(\text{NH}_2\text{OH})]\text{NO}_2$ ?  
 (a) Four (b) Five  
 (c) Eight (d) Three
35. The IUPAC name of  is  
 (a) Phenylethanone (b) Methylphenylketone  
 (c) Acetophenone (d) Phenylemethylketone
36. The final product (III) obtained in the sequence of reactions p-chlorotoluene  $\xrightarrow[2. \text{H}^+]{1. \text{KMnO}_4, \text{OH}^-}$  I  $\xrightarrow{\text{SOCl}_2}$  II  $\xrightarrow{\text{CH}_3\text{CH}_2\text{OH}}$  III is  
 (a)  (b)   
 (c)  (d) 
37. A Friedel-Crafts reaction of benzene with chloroform produces  
 (a)  $\text{C}_6\text{H}_5\text{CHCl}_2$  (b)   
 (c)  (d) all of these
38. Wavelength of red light is absorbed by the complex  
 (a)  $[\text{Cu}(\text{CN})_4]^{2-}$  (b)  $[\text{Cu}(\text{NH}_3)_4]^{2+}$   
 (c)  $\text{CuSO}_4$  (d)  $\text{Cu}(\text{CN})_2$
39. Which of the following is a biodegradable polymer?  
 (a) Cellulose (b) Polythene  
 (c) Polyvinyl chloride (d) Nylon-6
40. 
- The correct decreasing order of  $pK_a$  is:  
 (a)  $\text{II} > \text{IV} > \text{I} > \text{III}$  (b)  $\text{IV} > \text{II} > \text{III} > \text{I}$   
 (c)  $\text{III} > \text{II} > \text{IV} > \text{I}$  (d)  $\text{IV} > \text{II} > \text{I} > \text{III}$
41. Lanthanide for which +II and +III oxidation states are common is  
 (a) La (b) Nd  
 (c) Ce (d) Eu
42. The major product of the following reaction is  


43. Density of a 2.05 M solution of acetic acid in water is 1.02 g/mL. The molality of the solution is:  
 (a) 1.14 mol kg<sup>-1</sup> (b) 3.28 mol kg<sup>-1</sup>  
 (c) 2.28 mol kg<sup>-1</sup> (d) 0.44 mol kg<sup>-1</sup>
44. Gold numbers of protective colloids A, B, C and D are 0.50, 0.01, 0.10 and 0.005, respectively. The correct order of their protective powers is:  
 (a) D < A < C < B (b) C < B < D < A  
 (c) A < C < B < D (d) B < D < A < C
45. Which of the following order of energies of molecular orbitals of N<sub>2</sub> is correct?  
 (a)  $(\pi 2p_y) < (\sigma 2p_z) < (\pi^* 2p_x) \approx (\pi^* 2p_y)$   
 (b)  $(\pi 2p_y) > (\sigma 2p_z) > (\pi^* 2p_x) \approx (\pi^* 2p_y)$   
 (c)  $(\pi 2p_y) < (\sigma 2p_z) > (\pi^* 2p_x) \approx (\pi^* 2p_y)$   
 (d)  $(\pi 2p_y) > (\sigma 2p_z) < (\pi^* 2p_x) \approx (\pi^* 2p_y)$

## PHYSICS

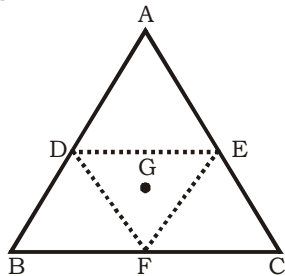
### Single correct Choice Type

*This section contains 45 questions numbered 46 to 90. Each question has 4 choices (a), (b), (c) and (d) out of which ONLY ONE is correct.*

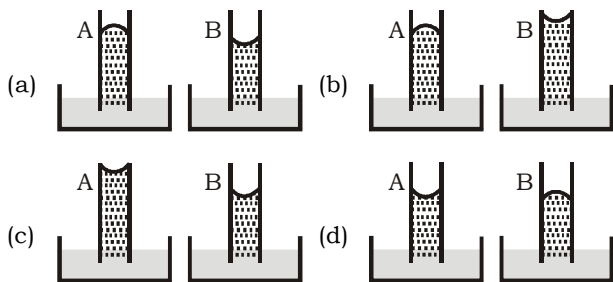
46. Of the following quantities, which one has dimensions different from the remaining three?  
 (a) Energy per unit volume  
 (b) Force per unit area  
 (c) Product of voltage and charge per unit volume  
 (d) Angular momentum
47. The position  $x$  of a particle with respect to time  $t$  along  $x$ -axis is given by  $x=9t^2-t^3$  where  $x$  is in meters and  $t$  in seconds. What will be the position of this particle when it achieves maximum speed along the  $+x$  direction?  
 (a) 54 m (b) 81 m  
 (c) 24 m (d) 32 m
48. The vector sum of two forces is perpendicular to their vector differences. In that case, the forces  
 (a) are equal to each other  
 (b) are equal to each other in magnitude  
 (c) are not equal to each other in magnitude  
 (d) cannot be predicted
49. A car of mass 1000 kg negotiates a banked curve of radius 90m on a frictionless road. If the banking angle is 45°, the speed of the car is  
 (a) 20ms<sup>-1</sup> (b) 30 ms<sup>-1</sup>  
 (c) 5ms<sup>-1</sup> (d) 10ms<sup>-1</sup>
50. The heart of a man pumps 5 litres of blood through the arteries the per minute at a pressure of 150 mm of mercury. If the density of mercury be 13.6x10<sup>3</sup> kg/m<sup>3</sup> and  $g=10$  m/s<sup>2</sup> then power (in watt) is  
 (a) 3.0 (B) 1.50  
 (c) 1.70 (d) 2.35
51. A disc and a sphere of same radius but different masses roll off on two inclined planes of the same altitude and length. Which one of the two objects gets to the bottom of the plane first?  
 (a) Both reach at the same time  
 (b) Depends on their masses  
 (c) Disc  
 (d) sphere
52. The moment of inertia of a body about a given axis is 1.2 kg m<sup>2</sup>. Initially, the body is at rest. In order to produce a rotational kinetic energy of 1500 joule, an angular acceleration of 25 radian/sec<sup>2</sup> must be applied about that axis for a duration of  
 (a) 4s (b) 2s  
 (c) 8s (d) 10s
53. The acceleration due to gravity on the planet A is 9 times the acceleration due to gravity on planet B. A man jumps to a height of 2 m on the surface of A. What is the height of jump by the same person on the planet B?  
 (a) 2/9 m (b) 18 m  
 (c) 6 m (d) 2/3 m
54. A cylindrical metallic rod in thermal contact with two reservoirs of heat at its two ends conduct an amount of heat  $Q$  in time  $t$ . The metallic rod is melted and the the radius material is formed into a rod of half the radius of the original rod. What is the amount of heat conducted by the new rod when placed in thermal contact with the two reservoirs in time  $t$ ?  
 (a)  $Q/4$  (b)  $Q/16$   
 (c)  $2Q$  (d)  $Q/2$
55. A gas is compressed isothermally to half its initial volume. The same gas is compressed separately through an adiabatic process until its volume is again reduced to half. Then  
 (a) Compressing the gas isothermally or adiabatically will require the same amount of work  
 (b) Which of the case (whether compression through isothermal or through adiabatic process) requires more work will depend upon the atomicity of the gas  
 (c) Compressing the gas isothermally will require more work to be done.  
 (d) Compressing the gas thorough adiabatic process will require more work to be done
56. The degrees of freedom of a triatomic gas is  
 (a) 6 (b) 4  
 (c) 2 (d) 8
57. A body of mass  $m$  is attached to the lower end of a spring whose upper end is fixed. The spring has negligible mass. When the mass  $m$  is slightly pulled down and released, it oscillates with a time period of 3s. When the mass  $m$  is increased by 1 kg the time period of oscillations becomes 5s. The value of  $m$  in kg is  
 (a) 3/4 (b) 4/3  
 (c) 16/9 (d) 9/16
58. In case of a forced vibration, the resonance peak becomes very sharp when the  
 (a) damping force is small  
 (b) resorting force is small  
 (c) applied periodic force is small

- (d) quality factor is small
59. The driver of a car travelling with speed 30 m/s towards a hill sounds a horn of frequency 600 Hz. If the velocity of sound in air is 330 m/s, the frequency of reflected sound as heard by driver is  
 (a) 555.5 Hz (b) 720 Hz  
 (c) 500 Hz (d) 550 Hz
60. For production of beats the two source must have  
 (a) different frequencies and same amplitude  
 (b) different frequencies  
 (c) different frequencies, same amplitude and same phase  
 (d) different frequencies and same phase
61. A charge Q is enclosed by a Gaussian spherical surface of radius R. If the radius is doubled, then the outward electric flux will  
 (a) increase four times (b) be reduced to half  
 (c) remain the same (d) be doubled
62. A hollow metallic sphere of radius 10 cm is charged such that potential of its surface is 80V. The potential at the centre of the sphere would be  
 (a) 80 V (b) 800 V  
 (c) 0 (d) 8 V
63. If voltage across a bulb rated 220 volt 100 watt drops by 2.5% of its rated value, the percentage of the rated value by which the power would decrease is  
 (a) 20% (b) 2.5%  
 (c) 5% (d) 10%
64. The resistance of a discharge tube is  
 (a) non-ohmic (b) ohmic  
 (c) zero (d) both b and c
65. A metallic rod of mass per unit length  $0.5 \text{ kgm}^{-1}$  is lying horizontally on a smooth inclined plane which makes an angle of  $30^\circ$  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  
 (a) 7.14 A (b) 5.98 A  
 (c) 14.76 A (d) 11.32 A
66. The resistance of an ammeter is  $13 \Omega$  and its scale is graduated for a current upto 100 amps. After an additional shunt has been connected to this ammeter it becomes possible to measure currents upto 750 amperes by this meter. The value of shunt-resistance is  
 (a)  $2 \Omega$  (b)  $0.2 \Omega$   
 (c)  $2k \Omega$  (d)  $20 \Omega$
67. A positively charged particle moving due East enters a region of uniform magnetic field directed vertically upwards. This particle will  
 (a) move in a circular path with a decreased speed  
 (b) move in a circular path with a uniform speed  
 (c) get deflected in vertically upward direction  
 (d) move in circular path with an increased speed
68. The magnetic susceptibility is negative for  
 (a) ferromagnetic material only  
 (b) paramagnetic and ferromagnetic materials  
 (c) diamagnetic material only  
 (d) paramagnetic material only
69. A current of 2.5A flows through a coil of inductance 5H. The magnetic flux linked with the coil is  
 (a) 0.5 Wb (b) 12.5 Wb  
 (c) zero (d) 2 Wb
70. The time constant of C-R circuit is  
 (a)  $1/CR$  (b)  $C/R$   
 (c)  $CR$  (d)  $R/C$
71. In total internal reflection where the angle of incidence is equal to the critical angle for the pair of media in contact, what will be angle of refraction?  
 (a)  $90^\circ$   
 (b)  $180^\circ$   
 (c)  $0^\circ$   
 (d) equal to angle of incidence
72. Optical fibre are based on  
 (a) total internal reflection  
 (b) less scattering  
 (c) refraction  
 (d) less absorption coefficient
73. The de-Broglie wavelength of a neutron in thermal equilibrium with heavy water at a temperature T (kelvin) and mass m is  
 (a)  $\frac{h}{\sqrt{3mkT}}$  (b)  $\frac{2h}{\sqrt{3mkT}}$   
 (c)  $\frac{2h}{\sqrt{mkT}}$  (d)  $\frac{h}{\sqrt{mkT}}$
74. Which one among the following shows particle nature of light?  
 (a) photo electric effect (b) interference  
 (c) refraction (d) polarization
75. The wavelength of the first line of Lyman series for hydrogen atom is equal to that of the second line of Balmer series for a hydrogen like ion. The atomic number Z of hydrogen like ion is  
 (a) 3 (b) 4  
 (c) 1 (d) 2
76. Half life of a radioactive element is 12.5 hour and its quantity is 256 g. After how much time its quantity will remain 1g?  
 (a) 50 hrs (b) 100 hrs  
 (c) 150 hrs (d) 200 hrs
77. In the nucleus of  ${}_{11}\text{Na}^{23}$ , the number of protons, neutrons and electrons are  
 (a) 11, 12, 0 (b) 23, 12, 11  
 (c) 12, 11, 0 (d) 23, 11, 12
78. In a common emitter transistor amplifier the audio signal voltage across the collector is 3V. The resistance of collector is  $3k \Omega$ . If current gain is 100 and the base resistance is  $2k \Omega$ , the voltage and power gain of the amplifier is  
 (a) 15 and 200 (b) 150 and 15000  
 (c) 20 and 2000 (d) 200 and 1000
79. Zener diode is used for  
 (a) amplification  
 (b) rectification  
 (c) stabilisation  
 (d) producing oscillation in an oscillator

80. A p-n junction diode can be used as  
 (a) condenser (b) regulator  
 (c) amplifier (d) rectifier
81. An equilateral triangle  $ABC$  is cut from a thin solid sheet of wood. (see figure)  $D$ ,  $E$  and  $F$  are the mid points of its sides as shown and  $G$  is the centre of the triangle. The moment of inertia of the triangle about an axis passing through  $G$  and perpendicular to the plane of the triangle is  $I_0$ . If the smaller triangle  $DEF$  is removed from  $ABC$ , the moment of inertia of the remaining figure about the same axis is  $I$ . Then



- (a)  $I' = \frac{3}{4} I_0$  (B)  $I' = \frac{15}{16} I_0$   
 (c)  $I' = \frac{I_0}{4}$  (D)  $I' = \frac{9}{16} I_0$
82. Average density of the earth  
 (a) does not depend on  $g$   
 (b) is a complex function of  $g$   
 (c) is directly proportional to  $g$   
 (d) is inversely proportional to  $g$
83. When 100 g of a liquid  $A$  at  $100^\circ\text{C}$  is added to 50 g of a liquid  $B$  at temperature  $75^\circ\text{C}$ , the temperature of the mixture becomes  $90^\circ\text{C}$ . The temperature of the mixture, if 100 g of liquid  $A$  at  $100^\circ\text{C}$  is added to 50 g of liquid  $B$  at  $50^\circ\text{C}$  will be  
 (a)  $60^\circ\text{C}$  (b)  $80^\circ\text{C}$   
 (c)  $70^\circ\text{C}$  (d)  $85^\circ\text{C}$
84. A capillary tube (A) is dipped in water. Another identical tube (B) is dipped in a soap-water solution. Which of the following shows the relative nature of the liquid columns in the two tubes?



85. A diatomic gas with rigid molecules does 10 J of work when expanded at constant pressure. What would be the heat energy absorbed by the gas, in this process?  
 (a) 25 J (b) 35 J  
 (c) 30 J (d) 40 J
86.  $n$  moles of an ideal gas with constant volume heat capacity  $C_V$  undergo an isobaric expansion by certain volume. The ratio of the work done in the process, to the heat supplied is  
 (a)  $\frac{4nR}{C_V + nR}$  (b)  $\frac{4nR}{C_V - nR}$   
 (c)  $\frac{nR}{C_V - nR}$  (d)  $\frac{nR}{C_V + nR}$
87. The number density of molecules of a gas depends on their distance  $r$  from the origin as,  $n(r) = n_0 e^{-ar^4}$ . Then, the total number molecules is proportional to  
 (a)  $n_0 \alpha^{-3/4}$  (b)  $\sqrt{n_0} \alpha^{1/2}$   
 (c)  $n_0 \alpha^{1/4}$  (d)  $n_0 \alpha^{-3}$
88. Two cars  $A$  and  $B$  are moving away from each other in opposite directions. Both the cars are moving with a speed of  $20 \text{ ms}^{-1}$  with respect to the ground. If an observer in car  $A$  detects a frequency 2000 Hz of the sound coming from car  $B$ , what is the natural frequency of the sound source in car  $B$ ? (speed of sound in air =  $340 \text{ ms}^{-1}$ )  
 (a) 2060 Hz (b) 2250 Hz  
 (c) 2300 Hz (d) 2150 Hz
89. A particle is executing simple harmonic motion (SHM) of amplitude  $A$ , along the  $X$ -axis, about  $x = 0$ . When its potential energy (PE) equals kinetic energy (KE), the position of the particle will be  
 (a)  $A$  (b)  $\frac{A}{2}$   
 (c)  $\frac{A}{2\sqrt{2}}$  (d)  $\frac{A}{\sqrt{2}}$
90. Three charges  $+Q$ ,  $q$ ,  $+Q$  are placed respectively at distance  $\theta$ ,  $\frac{d}{2}$  and  $d$  from the origin on the  $X$ -axis. If the net force experienced by  $+Q$  placed at  $x = 0$  is zero then value of  $q$  is

- (a)  $\frac{+Q}{2}$  (b)  $\frac{+Q}{4}$   
 (c)  $\frac{-Q}{2}$  (d)  $\frac{-Q}{4}$

# BIOLOGY

## Single correct Choice Type

This section contains 90 questions numbered 91 to 180. Each question has 4 choices (a), (b), (c) and (d) out of which ONLY ONE is correct.

91. New systematics introduced by Sir Julian Huxley is also called  
(a) phenetics (b) cladistics  
(c) biosystematics (d) numerical taxonomy
92. Binomial nomenclature was first issued in  
(a) systema naturae (b) Genera Plantarum  
(c) solarium Melongena (d) species plantarum
93. Highest number of antibiotics are produced by  
(a) Bacillus (b) Penicillium  
(c) Streptomyces (d) Cephalosporum
94. What are episomes?  
(a) Hereditary DNA of bacterial cell  
(b) Extrachromosomal hereditary material of bacteria associated with nucleoid  
(c) Modification of the cell membrane performing respiration  
(d) None of the above
95. African sleeping sickness is caused by  
(a) Trypanosoma (b) Leishmania  
(c) Latimeria (d) Plasmodium
96. Which one of the following has haplontic life cycle?  
(a) Funaria (b) Polytrichum  
(c) Ustilago (d) Wheat
97. Mycorrhiza is found in  
(a) oligotrophic soil (b) eutrophic soil  
(c) Both (a) and (b) (d) None of these
98. St. Anthony's fire disease is caused by  
(a) bacteria (b) fungus  
(c) nematodes (d) polychaete
99. Identify the correct pair that shows the double stranded RNA among the following  
(a) cauliflower mosaic virus and dahlia mosaic virus  
(b) polio virus and wound tumour virus  
(c) wound tumour virus and reovirus  
(d) tobacco mosaic virus and reovirus
100. Calyptra develops from  
(a) venter wall of archegonium  
(b) outgrowth of gametophyte  
(c) neck wall of archegonium  
(d) paraphysis of the archegonial branch
101. 'Club moss' belongs to  
(a) Algae (b) Pteridophyta  
(c) Fungi (d) Bryophyta
102. Select one of the following pairs of important features distinguishing Gnetum from Cycas and Pinus and showing affinities with angiosperms  
(a) the absence of resin duct and leaf venation  
(b) the presence of vessel elements and the absence of archegonia  
(c) perianth and two integuments  
(d) embryo development and apical meristem
103. Ovules of gymnosperm is  
(a) bitegmic (b) unitegmic  
(c) naked (d) Both (b) and (c)
104. Hydra possesses  
(a) one testis and one ovary  
(b) one testis and many ovaries  
(c) many testes and many ovaries  
(d) many testes and one ovary
105. 'Triploblastic, unsegmented, acoelomate exhibiting bilateral symmetry and reproducing both asexually and sexually, with some parasitic forms'.  
The above description is the characteristic of phylum  
(a) Annelida (b) Ctenophora  
(c) Cnidaria (d) Platyhelminthes
106. The dioecious animal is  
(a) liver fluke (b) hookworm  
(c) tapeworm (d) earthworm
107. Tubefeet are the locomotory organs of  
(a) Platyhelminthes (b) Echinodermata  
(c) Mollusca (d) Arthropoda
108. Neopallium is found in the brain of  
(a) amphibian (b) advanced reptiles  
(c) mammals (d) both b and c
109. Small branches produced from lower 2-3 nodes in jowar are called  
(a) culm (b) prop roots  
(c) ligule (d) tillers
110. The leaves are modified into spines in  
(a) Nepenthes (b) Opuntia  
(c) Australian Acacia (d) Utricularia
111. The capitulum type of inflorescence is found in  
(a) marigold (b) salvia  
(c) Euphorbia (d) Jasmine
112. A simple one seeded fruit in which pericarp is fused with seed coat is  
(a) achene (b) caryopsis  
(c) cypsela (d) nut
113. An example of a seed with endosperm, perisperm and caruncle is  
(a) cotton (b) coffee  
(c) lily (d) castor
114. Scientific name of sunflower is  
(a) Hibiscus rosa-sinensis  
(b) Solanum nigrum  
(c) Oryza sativa  
(d) Helianthus
115. The cells without nuclei are present in  
(a) vascular cambium (b) root hair  
(c) companion cell (d) members of sieve tube
116. The type of epithelium seen in the walls of blood vessels is  
(a) squamous epithelium  
(b) columnar epithelium  
(c) ciliated epithelium  
(d) cuboidal epithelium
117. Major protein of connective tissue is  
(a) melanin (b) collagen  
(c) keratin (d) myosin
118. Which of the following statement is incorrect?  
(a) Cockroaches exhibit mosaic vision with less sensitivity and more resolution  
(b) A mushroom shaped gland is present in the 6-7th abdominal segments of male cockroach  
(c) A pair of spermatheca is present in 6th segment of female cockroach  
(d) Female cockroach possess sixteen ovarioles in the ovaries

119. Frogs lack  
 (a) incisors (b) premolars  
 (c) molars (d) All of these
120. In a chloroplast, the highest number of protons are found in  
 (a) lumen of thylakoids (b) intermembrane space  
 (c) antennae complex (d) stroma
121. Protein synthesis takes place in  
 (a) ribosome (b) chloroplast  
 (c) mitochondria (d) Golgi bodies
122. 'Ramchandran plot' is used to confirm the structure of  
 (a) RNA (b) proteins  
 (c) triacylglycerides (d) DNA
123. Which one is diamino dicarboxylic amino acid?  
 (a) Cystine (b) Lysine  
 (c) Cysteine (d) Aspartic acid
124. Select the incorrect statement  
 (a) The building blocks of lipids are amino acids  
 (b) Majority of enzymes contain a non protein part called the prosthetic group  
 (c) The thylakoids are arranged one above the other like a stack of coins forming a granum  
 (d) Crossing over occurs at pachytene stage of meiosis-I  
 (e) Steroids are complex compounds commonly found in cell membranes and animal hormones
125. A non proteinaceous enzyme is  
 (a) lysozyme (b) ribozyme  
 (c) ligase (d) deoxyribonuclease
126. The lock and key theory of enzyme structure and function was proposed by  
 (a) Morgan (b) Robertson  
 (c) Brown (d) Fischer
127. Most cytogenic activities occur during  
 (a) interphase (b) telophase  
 (c) prophase (d) anaphase
128. If we ignore the effect of crossing over, how many different haploid cells arise by meiosis in a diploid cell having  $2n=12$ ?  
 (a) 8 (b) 16  
 (c) 32 (d) 64
129. Root hairs absorb water from the soil on account of  
 (a) turgor pressure (b) osmosis  
 (c) suction pressure (d) root pressure
130. When a plasmolysed cell is placed in a hypotonic solution then water will move inside the cell. Which force causes this?  
 (a) DPD (b) OP  
 (c) WP (d) None of these
131. Transpiration facilitates  
 (a) electrolyte balance  
 (b) opening of stomata  
 (c) absorption of water by roots  
 (d) excretion of minerals
132. Direction of translocation of organic food or solutes is  
 (a) upward (b) downward  
 (c) radial (d) All of these
133. The number of essential nutrients needed in plants is  
 (a) 17 (b) 16  
 (c) 15 (d) 14
134. What is common between chloroplasts, chromoplasts and leucoplasts?  
 (a) The presence of pigments  
 (b) Possession of thylakoids and grana  
 (c) Storage of starch, proteins and lipids  
 (d) Ability to multiply by a fission like process
135. The first acceptor of electrons from an excited chlorophyll molecule of photosystem-II is  
 (a) cytochrome (b) iron-sulphur protein  
 (c) ferredoxin (d) plastoquinone
136. The ATP production in photosynthesis is called  
 (a) phototropism (b) phosphorylation  
 (c) photo-oxidation (d) photophosphorylation
137. Product of glycolysis is  
 (a) citric acid (b) dihydroxy acetone  
 (c) pyruvic acid (d) phosphoenol pyruvate
138. Aerobic respiratory pathway is appropriately termed as  
 (a) catabolic (b) parabolic  
 (c) amphibolic (d) anabolic
139. When respiratory quotient is less than 1.0 in a respiratory metabolism, it means that  
 (a) carbohydrates are used as respiratory substrate  
 (b) volume of carbon dioxide evolved is less than volume of oxygen consumed  
 (c) volume of carbon dioxide evolved is more than volume of oxygen consumed  
 (d) volume of carbon dioxide evolved is equal to volume of oxygen consumed
140. What number of ATP is produced when a molecule of glucose undergoes fermentation?  
 (a) 4 (b) 36  
 (c) 2 (d) 38
141. What causes a green plant exposed to the light on only one side, to bend towards the source of light as it grows?  
 (a) Green plants need light to perform photosynthesis  
 (b) Green plants seek light because they are phototropic  
 (c) Light stimulates plant cells on the lighted side to grow faster  
 (d) Auxin accumulates on the shaded side, stimulating greater cell elongation there
142. Which phytohormone has viral inhibitory property?  
 (a) IAA (b)  $GA_3$   
 (c) ABA (d) 2,4-D
143. Beta vulgaris is a  
 (a) short day plant (b) long day plant  
 (c) day neutral plant (d) intermediate plant
144. Crypts of Leiberkuhn are present in  
 (a) small intestine (b) liver  
 (c) stomach (d) colon
145. Ptyalin is inactivated by a component of gastric juice known as  
 (a) pepsin (b) mucus  
 (c) renin (d) HCl
146. Part of bile juice useful in digestion is  
 (a) bile salt (b) bile pigment  
 (c) bile matrix (d) All of these
147. Skin is an accessory organ of respiration in  
 (a) human (b) frog  
 (c) rabbit (d) lizard
148. After a deep inspiration and maximum expiration, the capacity of lungs is known as  
 (a) vital capacity (b) tidal volume  
 (c) IRV (d) ERV
149. The percentage of oxygen in inhaled air is about  
 (a) 21% (b) 16%  
 (c) 79% (d) 4%



150. Blood leaving the liver and going towards heart is rich in  
 (a) bile (b) urea  
 (c) ammonia (d) oxygen
151. Pacemaker is  
 (a) instrument for measuring heartbeat  
 (b) instrument for measuring pulse rate  
 (c) AV node that provides impulse for heartbeat  
 (d) sino-auricular node that provides impulse for heartbeat
152. Erythropoietin is secreted from  
 (a) pituitary gland (b) pancreas  
 (c) adrenal gland (d) kidney
153. Urine is concentrated in  
 (a) kidney (b) liver  
 (c) colon (d) heart
154. Humerus fitting into the glenoid cavity is example of  
 (a) ball and socket joint  
 (b) pivot joint  
 (c) peg and socket joint  
 (d) condyloid joint
155. Bones become fragile in  
 (a) osteoporosis (b) gout  
 (c) arthritis (d) None of these
156. Inhibin is composed of  
 (a) glycoprotein (b) lipoprotein  
 (c) steroid (d) amino acid derivative
157. Due to deficiency of which hormone, bones become weak in female?  
 (a) ACTH (b) TSH  
 (c) Progesterone (d) Oestrogen
158. Decrease in the calcium level in blood is caused by  
 (a) prolactin (b) calcitonin  
 (c) adrenocorticotropin (d) oxytocin
159. Which is not involved as second messenger in  $Ca^{2+}$  mediated hormone  
 (a) cAMP (b) DAG  
 (c) Phospholipase (d)  $IP_3$
160. A bisexual flower which never opens, is known as  
 (a) autogamous (b) cleistogamous  
 (c) homogamous (d) allogamous
161. The outermost layer of maize endosperm is known as  
 (a) perisperm (b) aleurone  
 (c) tapetum (d) endothelium
162. Number of chromosomes present in secondary spermatocyte is  
 (a) 22 (b) 23  
 (c) 24 (d) 25
163. Nebenkern is a part of  
 (a) human ovum (b) foetus  
 (c) human sperm (d) Graafian follicle
164. The egg of frog is  
 (a) telolecithal (b) microlecithal  
 (c) alecithal (d) centrolecithal
165. The permissible use of the technique aminocentesis is for  
 (a) detecting sex of the unborn foetus  
 (b) artificial insemination  
 (c) transfer of embryo into the uterus of a surrogate mother  
 (d) detecting any genetic abnormality
166. When a dihybrid cross is fit into a Punnett square with 16 boxes, the maximum number of different phenotypes available, are  
 (a) 8 (b) 4  
 (c) 2 (d) 16
167. Chromosome walking is  
 (a) used in genetic mapping  
 (b) observed during mitosis  
 (c) to see position of ribosomes on nuclear membrane  
 (d) to check the expression of mutant genes
168. The recessive gene that always produce its effect, is  
 (a) pleiotropic gene (b) complementary gene  
 (c) holandric gene (d) supplementary gene
169. The deficiency of ADH receptor leads to  
 (a) diabetes mellitus (b) glycosuria  
 (c) diabetes insipidus (d) nephrogenic diabetes
170. The RNA primer is used in  
 (a) translation (b) replication  
 (c) conjugation (d) transformation
171. Which is present at 5' end of eukaryotic mRNA?  
 (a) Poly-A tail (b) Modified C at 5'  
 (c) 7 mG (d) Poly-C
172. The transcription unit is  
 (a) TATA box to start point  
 (b) TATA box to stop codon  
 (c) start point to stop codon  
 (d) 35 sequence to start point
173. In the lac operon system,  $\beta$ -galactosidase is coded by  
 (a) a-gene (b) i-gene  
 (c) l-gene (d) z-gene
174. What is common to whale, seal and shark?  
 (a) Seasonal migration  
 (b) Thick subcutaneous fat  
 (c) Convergent evolution  
 (d) Homeothermy
175. Which one is linked to evolution?  
 (a) Extinction (b) Competition  
 (c) Variation (d) Reproduction
176. Gonorrhoea is caused by  
 (a) Treponema pallidum  
 (b) Entamoeba gingivalis  
 (c) Mycobacterium leprae  
 (d) Neisseria gonorrhoeae
177. Antigen binding site in an antibody is found between  
 (a) two light chains  
 (b) two heavy chains  
 (c) one heavy and one light chain  
 (d) either between two light chain or between one heavy and one light chain depending upon the nature of antigen
178. Explant before organogenesis is  
 (a) photosynthetic (b) autotrophic  
 (c) heteromorphic (d) heterotrophic
179. Non-symbiotic nitrogen-fixation takes place by  
 (a) Anabaena, Nostoc, Rhizobium  
 (b) Nostoc, Azobacter, Clostridium  
 (c) Azobacter, Nitrosomonas, Rhizobium  
 (d) Anabaena, Nitrosomonas, Pseudomonas
180. Humus is present in  
 (a) horizon-A (b) horizon-O  
 (c) horizon-B (d) horizon-C