Instructions:
(i) Use blue/black ballpoint pen only to darken the appropriate circle.
(ii) Mark should be dark and should completely fill the circle.
(iii) Dark only one circle for each entry.
(iv) Dark the circle in the space provided only.
(v) Rough work must not be done on the Answer sheet and do not use white-fluid or any other rubbing material on Answer sheet.
(vi) Each question carries 4 marks. For every wrong response 1 mark shall be deducted from total score.

PHYSICS

Choose the correct answer:

1. If $v$ is speed, $r$ is radius and $g$ is acceleration due to gravity, which of the following is dimensionless?
   
   (1) $\frac{v^2 r}{g}$
   
   (2) $\frac{v^2 g}{r}$
   
   (3) $\frac{v^2}{rg}$
   
   (4) $v^2 rg$

2. For a man running horizontally along east at speed of 4 km/hr, the rain appears to fall vertically. If he doubles his speed the rain appears to hit him at an angle at 30° with vertical. The original speed and direction of rain will be
   
   (1) 4 km/hr, 30° with vertical towards east
   
   (2) 4 km/hr, 30° with vertical towards west
   
   (3) 8 km/hr, 30° with vertical towards east
   
   (4) 8 km/hr, 30° with vertical towards west

3. The rod as shown in figure starts slipping. The speed of the lower end, at the instant when speed of upper end is 3 m/s and rod makes an angle of 30° with x-axis is

   (1) 3 m/s
   
   (2) $\sqrt{3}$ m/s
   
   (3) 2 m/s
   
   (4) $\sqrt{2}$ m/s

4. On the horizontal surface of truck a block of mass 2 kg is placed and coefficient of friction between the block and surface is ($\mu_s = 0.6$). If truck starts moving with acceleration 4 m/s², then frictional force on the block will be ($g = 10$ m/s²)
   
   (1) 12 N
   
   (2) 10 N
   
   (3) 6 N
   
   (4) 8 N
5. A man is supplying a power of 500 W at an instant on a massless string as shown in figure. If at that instant speed of block is 10 m/s and increasing at the rate of 10 m/s\(^2\). Then the mass of block is

(1) 2.5 kg (2) 4 kg
(3) 6 kg (4) 1 kg

6. A particle of mass 2 kg moves on the x-axis under the influence of force of attraction acting towards the origin given by \(\vec{F} = -\frac{4}{x^2}\hat{i}\). If the particle starts from rest at \(x = 4\) m, the speed it will attain to reach the point \(x = 2\) m will be

(1) 1 m/s (2) 2 m/s
(3) \(\frac{3}{2}\) m/s
(4) \(\frac{1}{2}\) m/s

7. A ring of radius \(R\) is rolling over rough horizontal surface with velocity \(v_0\). Two points located at A and B on rim of ring. The angular velocity of point A w.r.t. point B will be

(1) \(\frac{v_0}{2R}\) (2) \(\frac{v_0}{R}\)
(3) \(\frac{v_0}{\sqrt{2}R}\)
(4) \(\frac{\sqrt{2}v_0}{R}\)

8. Two point masses \(m\) and \(2m\) are joined by light rod of length \(d\). The moment of inertia of the system about an axis passing through its centre of mass and making an angle 30° with the light rod will be

(1) \(\frac{md^2}{3}\) (2) \(\frac{md^2}{6}\)
(3) \(\frac{md^2}{4}\)
(4) \(\frac{md^2}{2}\)

9. A particle is moving along the x-axis under the influence of a force given by \(F = -5x + 15\). At \(t = 0\), the particle is located at \(x = 6\) and is having zero velocity. It takes 0.5 seconds to reach the origin for the first time. The equation of motion of particle can be represented by

(1) \(x = 3 + 3\cos\pi t\) (2) \(x = 3\cos\pi t\)
(3) \(x = 3 + 3\sin\pi t\) (4) \(x = 3 + 3\cos(2\pi t)\)

10. Particle A and B are dropped to fall towards the earth from a height 2 \(R_e\) (\(R_e\) = radius of earth) from surface of earth. If the particles are dropped simultaneously but from two locations which are slightly away from one another, then the separation between the particles (ignore gravitational interaction between the particles)

(1) Decrease (2) Increase
(3) Remains same (4) Becomes zero immediately after released

11. A window whose area is 2 m\(^2\) open on a street where the street noise results in an intensity level of 60 dB at the window. If an acoustic absorber is fitted at the window, the energy from the street will it collect in 10 hours will be

(1) 36 mJ (2) 48 mJ
(3) 72 mJ (4) 24 mJ
12. Two potentiometer wires $W_1$ and $W_2$ of equal length $l$ connected to a battery of emf $E_p$ and internal resistance ‘$r$’ through two switches $S_1$ and $S_2$. A battery of emf $E$ is balanced on these potentiometer wires. If potentiometer wire $W_1$ is of resistance $2r$ and balancing length on $W_1$ is $\frac{l}{2}$ when only switch $S_1$ is closed and $S_2$ is open. On closing $S_2$ and opening $S_1$ the balancing length on $W_2$ is found to be $(\frac{2l}{3})$, the resistance of the potentiometer $W_2$ will be

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

13. An ideal diatomic gas is at pressure $4 \times 10^5$ N/m$^2$. Energy density (energy per unit volume) of the ideal diatomic gas is

(1) $5 \times 10^5$ J/m$^3$  
(2) $8 \times 10^5$ J/m$^3$  
(3) $10 \times 10^5$ J/m$^3$  
(4) $3 \times 10^5$ J/m$^3$

14. The frequency of fundamental tone in a closed pipe is

(1) Same as the fundamental frequency of an open tube of same length  
(2) Exactly half the frequency of fundamental tone of open tube of same length and diameter  
(3) Same as that of the first overtone of an open tube of same length  
(4) None of these

15. For the travelling harmonic wave $y(x, t) = 2.0 \cos \frac{2\pi}{100} (10t - 0.00080x + 0.35)$ where $x$ and $y$ are in cm and $t$ in second. The phase difference between oscillatory motion of two points separated by a distance $4$ m will be

(1) $9.4\pi$ rad  
(2) $2.4\pi$ rad  
(3) $6.4\pi$ rad  
(4) $7.4\pi$ rad

16. Two rods one is semi circular of thermal conductivity $K_1$ and other is straight of thermal conductivity $K_2$ and of same cross-sectional area are joined as shown in figure. The point $A$ and $B$ are maintained at same temperature difference. If rate of flow of heat is same in two rods then $\frac{K_1}{K_2}$ is

(1) $\pi : 2$  
(2) $2 : \pi$  
(3) $1 : 2$  
(4) $3 : 2$

17. A spring-block system undergoes simple harmonic motion on smooth horizontal surface. The block is now given some positive charge and a uniform horizontal electric field to the right is switched on as a result of

(1) The time period of oscillation will increase  
(2) The time period of oscillation will remains unaffected  
(3) The mean position of simple harmonic motion will shift to the right  
(4) Both (2) and (3)

18. The latent heat of vaporisation of water is more than latent heat of fusion of ice, because

(1) On vaporisation much larger increase in volume takes place  
(2) Increase in kinetic energy is much smaller on boiling  
(3) Kinetic energy decrease on boiling  
(4) Volume decreases when the ice melts

19. The emissive power of a black body at $T = 300$ K is $100$ W/m$^2$. Consider a body $B$ of area $A = 10$ m$^2$, coefficient of reflectivity $r = 0.3$ and absorptivity $a = 0.2$. If its temperature is 300 K, then markout the correct statement.

(1) The emissive power of $B$ is $20$ W/m$^2$  
(2) The emissive power of $B$ is $200$ W/m$^2$  
(3) The power emitted by $B$ is $20$ W  
(4) The power emitted by $B$ is $180$ W
20. For the indicator diagram given below, correct statement is

![Indicator Diagram]

(1) Cycle-II is heat engine cycle
(2) No net work is done on the gas in cycle-I
(3) Work done is positive for cycle-I
(4) Work done is positive for cycle-II

21. A liquid is contained in a vertical tube of semi-circular cross-section as shown in figure. The contact angle is zero. The force of surface tension on the straight part and force of surface tension on the curved part are in ratio

![Figure]

(1) 1 : 1  
(2) $2 : \pi$
(3) 1 : 2
(4) $\pi : 2$

22. Two blocks of masses 1 kg and 2 kg are connected by a metal wire going over a smooth pulley as shown in figure. The breaking stress of the metal is $2 \times 10^9$ N/m². What should be the minimum radius of the wire used if it is not to break? Take $g = 10$ m/s²

![Figure]

(1) $4.6 \times 10^{-5}$ m  
(2) $4.6 \times 10^{-6}$ m
(3) $46 \times 10^{-6}$ m  
(4) $4.6 \times 10^{-7}$ m

23. The viscous force per unit area acting between two layers of a liquid is given by $\frac{F}{A} = -\eta \frac{dv}{dx}$. This $\frac{F}{A}$ may be called

(1) Tangential stress  
(2) Volume stress
(3) Longitudinal stress  
(4) Pressure

24. The radius of a coil decreases steadily at the rate of $10^{-2}$ m/s. A constant and uniform magnetic field of induction $10^{-3}$ Wb/m² acts perpendicular to the plane of the coil. The radius of the coil when the induced emf in the coil is 2 mV, is

(1) $\frac{10}{\pi}$ m
(2) $\frac{100}{\pi}$ m
(3) $\frac{50}{\pi}$ m
(4) $\frac{200}{\pi}$ m

25. A set of $n$ resistors each of resistance $R$ are connected in series to a battery of emf $E$ and internal resistance $R$ then a current $I$ is observed to flow. If these $n$ resistors are connected in parallel to the same battery, it is observed that current increased by 5 times then the value of $n$ will be

(1) 10
(2) 15
(3) 5
(4) 8

26. Among the following, the hydrogen spectral lines that lie in ultraviolet region of electromagnetic spectrum is

(1) Lyman series
(2) Paschen series
(3) Brackett series
(4) Pfund series

27. Half life of a radioactive nuclei is 5.6 days. After how many days will $\frac{19}{20}$ th fraction of the sample decays?

$\ln \left( \frac{20}{19} \right) = 4.32$

(1) 27.3
(2) 31.9
(3) 30.1
(4) 24.2
28. The interference pattern is obtained with two coherent light sources of intensity ratio 4. In the interference pattern, ratio \( \frac{l_{\text{max}} - l_{\text{min}}}{l_{\text{max}}} \) will be

(1) 4 : 3  
(2) 1 : 9  
(3) 8 : 9  
(4) 5 : 4

29. Which voltmeter will give non-zero reading at resonance?

![Diagram of a circuit with three voltmeters V₁, V₂, and V₃.]

(1) Only V₁  
(2) Only V₂  
(3) Both V₁ and V₃  
(4) Both V₁ and V₂

30. A non-conducting disc of radius \( R \) charged uniformly over one side with surface charge density \( \sigma \) rotate about its geometrical axis with an angular velocity \( \omega \). The magnetic moment of the disc is

(1) \( \frac{\omega \pi \sigma R^4}{3} \)  
(2) \( \frac{\omega \pi \sigma R^4}{4} \)  
(3) \( \frac{\omega \pi \sigma R^4}{2} \)  
(4) \( \omega \pi \sigma R^4 \)

31. The magnetic susceptibility of a magnetic material at 227°C is \(-0.00002\). Then magnetic susceptibility of material at 727°C will be

(1) \(-0.00002\)  
(2) \(-0.00004\)  
(3) \(-0.00001\)  
(4) \(-0.00008\)

32. All straight wires are very long. Both \( AB \) and \( CD \) are arcs of the same circle, both subtending right angles at the centre \( O \). Then the magnetic field at \( O \) is

![Diagram of a right-angled triangle with current \( i \) at point \( O \).]

(1) \( \frac{\mu_0 i}{4\pi R} \)  
(2) \( \frac{3\mu_0 i}{4\pi R} \)  
(3) \( \frac{\mu_0 i}{2\pi R} \)  
(4) \( \frac{\mu_0 i}{2\pi R} (\pi + 1) \)

33. In a plane electromagnetic wave the electric field oscillates sinusoidly at a frequency of \( 2 \times 10^{10} \) Hz and amplitude of 48 V/m. The frequency of oscillation of magnetic field will be

(1) \( 2 \times 10^8 \) Hz  
(2) \( 16 \times 10^{-10} \) Hz  
(3) \( 2 \times 10^{10} \) Hz  
(4) \( 16 \times 10^8 \) Hz

34. A charge \( Q \) is situated at the corner of the cube. The electric flux through the cube will be

(1) \( \frac{Q}{2\epsilon_0} \)  
(2) \( \frac{Q}{4\epsilon_0} \)  
(3) \( \frac{Q}{\epsilon_0} \)  
(4) \( \frac{Q}{8\epsilon_0} \)

35. The capacity of a parallel plate capacitor depends on

(1) The metal used to make the plate  
(2) The thickness of the plates  
(3) The potential applied across the plates  
(4) The separation between the plates

36. A prism of refractive index \( \mu \) and refracting angle \( \theta \) is placed in the minimum deviation position. If the angle of minimum deviation is \( \theta \), then the value of \( \theta \) in term of \( \mu \) is

(1) \( \sin^{-1} \left( \frac{\mu}{2} \right) \)  
(2) \( \sin^{-1} \left( \frac{\mu}{\sqrt{2}} \right) \)  
(3) \( 2\cos^{-1} \left( \frac{\mu}{2} \right) \)  
(4) \( \cos^{-1} \left( \frac{\mu}{\sqrt{2}} \right) \)

37. The magnifying power of an astronomical telescope for normal adjustment is 10 and the length of telescope is 110 cm. The magnifying power of the telescope when image is formed at the least distance of distinct vision is

(1) 14  
(2) 48  
(3) 28  
(4) 52

38. The condition of observing Fraunhalfer diffraction, from a single slit is that the wavefront incident on the slit must be

(1) Spherical  
(2) Elliptical  
(3) Cylindrical  
(4) Elliptical
39. A potential barrier $V$ volts exists across $P-N$ junction. The thickness of the depletion region is $'d'$. An electron with velocity $'v_0'$ approaches $P-N$ junction from $P$ side. The velocity of electron crossing the junction is

\[
\begin{align*}
(1) \quad & \sqrt{v_0^2 + \frac{2Ve}{m}} \\
(2) \quad & \sqrt{v_0^2 - \frac{2Ve}{m}} \\
(3) \quad & v_0 \\
(4) \quad & \sqrt{\frac{2Ve}{m}}
\end{align*}
\]

40. For the given operational amplifier circuit, the value of output ($V_0$) will be

\[
\begin{align*}
V_2 &= 0.1 \text{ V} \\
V_1 &= 0.4 \text{ V}
\end{align*}
\]

\[
\begin{align*}
(1) \quad & 0.5 \text{ V} \\
(2) \quad & 2.5 \text{ V} \\
(3) \quad & 2 \text{ V} \\
(4) \quad & 1.2 \text{ V}
\end{align*}
\]

41. If $y_1 = \overline{A} + A$ and $y_2 = A \cdot \overline{A}$ then value of $y_1 + y_2$ in boolean algebra is

\[
\begin{align*}
(1) \quad & 1 \\
(2) \quad & \text{Zero} \\
(3) \quad & A \\
(4) \quad & \overline{A}
\end{align*}
\]

42. When a monochromatic point source of light is at a distance of 0.2 m from a photoelectric cell, the cut-off voltage and saturation current are respectively 0.6 V and 18.0 mA. If the same source placed 0.6 m away from the photoelectric cell, then

\[
\begin{align*}
(1) \quad & \text{The stopping potential will be 0.2 V} \\
(2) \quad & \text{The stopping potential will be 0.6 V} \\
(3) \quad & \text{The saturation current will be 2.0 mA} \\
(4) \quad & \text{Both (2) and (3)}
\end{align*}
\]

43. Nuclear reaction obey the law of conservation of

\[
\begin{align*}
(1) \quad & \text{Charge} \\
(2) \quad & \text{Momentum} \\
(3) \quad & \text{Mass-energy} \\
(4) \quad & \text{All of these}
\end{align*}
\]

44. After the emission of one $\alpha$-particle followed by two $-\beta$ particles from $^{238}_{92}U$, the number of neutrons in the newly formed nucleus is

\[
\begin{align*}
(1) \quad & 142 \\
(2) \quad & 140 \\
(3) \quad & 144 \\
(4) \quad & 146
\end{align*}
\]

45. An $\alpha$-particle of energy 5 MeV is scattered through 180º by a fixed uranium nucleus. The closest distance is in order of

\[
\begin{align*}
(1) \quad & 1 \text{ Å} \\
(2) \quad & 10^{-10} \text{ cm} \\
(3) \quad & 10^{-12} \text{ cm} \\
(4) \quad & 10^{-16} \text{ cm}
\end{align*}
\]

46. $1/\lambda$ of NH$_3$ gas at STP weighs

\[
\begin{align*}
(1) \quad & 1.43 \text{ g} \\
(2) \quad & 2.24 \text{ g} \\
(3) \quad & 0.76 \text{ g} \\
(4) \quad & 1.12 \text{ g}
\end{align*}
\]

47. If equivalent mass of a metal 'M' is 12, molar mass (in g) of its sulphate MSO$_4$ would be

\[
\begin{align*}
(1) \quad & 60 \\
(2) \quad & 120 \\
(3) \quad & 72 \\
(4) \quad & 96
\end{align*}
\]

48. Ratio of radii of first and second Bohr orbits of He$^+$ ion is

\[
\begin{align*}
(1) \quad & 1 : 1 \\
(2) \quad & 1 : 2 \\
(3) \quad & 2 : 1 \\
(4) \quad & 1 : 4
\end{align*}
\]

49. Total number of orbitals in third energy level of an atom is

\[
\begin{align*}
(1) \quad & 3 \\
(2) \quad & 9 \\
(3) \quad & 7 \\
(4) \quad & 10
\end{align*}
\]

50. Ratio of average molar kinetic energies of CH$_4$ and CO$_2$ at same temperature is

\[
\begin{align*}
(1) \quad & 2 : 11 \\
(2) \quad & 11 : 2 \\
(3) \quad & 1 : 1 \\
(4) \quad & 8 : 11
\end{align*}
\]

51. Temperature at which real gases obey ideal gas laws over an appreciable range of pressure is called

\[
\begin{align*}
(1) \quad & \text{Boyle's temperature} \\
(2) \quad & \text{Critical temperature} \\
(3) \quad & \text{Standard temperature} \\
(4) \quad & \text{Inversion temperature}
\end{align*}
\]

52. pH of mixture of 500 ml 0.1 M CH$_3$COOH and 250 ml 0.1 M NaOH solution is (given pK$_a$ of acetic acid is 4.74)

\[
\begin{align*}
(1) \quad & 5.74 \\
(2) \quad & 5.04 \\
(3) \quad & 4.74 \\
(4) \quad & 11.74
\end{align*}
\]
53. (i) \( A(g) + B(g) \rightleftharpoons C(g) \)
(ii) \( C(g) = D(g) \)
Above two equilibria co-exist in a closed container. If few moles of C has been added at constant temperature, then select the correct statement(s)
(1) Moles of A will be increased
(2) Moles of B will be increased
(3) Moles of D will be increased
(4) All of these
54. Polar molecule is
(1) \( \text{PCl}_5 \)  
(2) \( \text{XeF}_4 \) 
(3) \( \text{NO}_2 \)  
(4) \( \text{BeCl}_2 \)
55. Select an option with incorrect match of given molecule/ion and its shape
(1) \( \text{SO}_3 \); Trigonal planar
(2) \( \text{NO}_3^- \); Pyramidal
(3) \( \text{I}_2^- \); Linear
(4) \( \text{NF}_3 \); Pyramidal
56. Boron shows diagonal relationship with
(1) Lithium  
(2) Aluminium  
(3) Silicon  
(4) Sodium
57. Molar solubility of AgCl at 25°C is \( 1 \times 10^{-5} \text{mol/} \ell \) . Its solubility in 0.05 M NaCl solution is
(1) \( 10^{-5} \text{ M} \)  
(2) \( 2 \times 10^{-6} \text{ M} \) 
(3) \( 2 \times 10^{-9} \text{ M} \)  
(4) \( 2 \times 10^{-3} \text{ M} \)
58. Common ion effect is not observed in which of the following mixtures?
(1) \( \text{CH}_3\text{COOH} + \text{CH}_3\text{COONa} \)
(2) \( \text{HCN} + \text{NaCN} \)
(3) \( \text{NH}_4\text{OH} + \text{NH}_4\text{Cl} \)
(4) \( \text{HCl} + \text{NaCl} \)
59. Oxidation state of P in \( \text{NaH}_2\text{PO}_2 \) is
(1) +1  
(2) +3  
(3) +5  
(4) +4
60. In the following balanced equation,
\[
a\text{Zn} + b\text{NO}_3^- \xrightarrow{\text{Basic medium}} c\text{Zn}^{2+} + d\text{NH}_4^+
\]
ratio of \( b \) to \( c \) is
(1) \( 1 : 4 \)  
(2) \( 1 : 1 \) 
(3) \( 4 : 7 \)  
(4) \( 1 : 10 \)
61. Ortho and para hydrogen differ in
(1) Electron spin  
(2) Nuclear spin  
(3) Molar mass  
(4) Densities
62. 20 volume \( \text{H}_2\text{O}_2 \) solution has its strength
(1) 2\%  
(2) 3\%  
(3) 6\%  
(4) 11.2\%
63. Most soluble hydroxide in water is
(1) \( \text{Mg(OH)}_2 \)  
(2) \( \text{Ca(OH)}_2 \) 
(3) \( \text{Ba(OH)}_2 \)  
(4) \( \text{Sr(OH)}_2 \)
64. Select the correct match regarding composition of Portland cement
(1) \( \text{CaO} \rightarrow 10 \text{ to 20\%} \)  
(2) \( \text{SiO}_2 \rightarrow 20 \text{ to 25\%} \) 
(3) \( \text{Al}_2\text{O}_3 \rightarrow 30 \text{ to 40\%} \)  
(4) \( \text{Fe}_2\text{O}_3 \rightarrow 10 \text{ to 20\%} \)
65. Number of Boron atom(s) having \( sp^3 \) hybridisation in borax molecule is
(1) 2  
(2) 3  
(3) 4  
(4) 1
66. 0.5 g of an organic substance was kjeldahlised and the ammonia released was neutralised by 100 ml 0.1 M HCl. Percentage of nitrogen in the compound is
(1) 14\%  
(2) 42\%  
(3) 28\%  
(4) 72\%
67. Strongest +I effect is shown by
(1) \( -\text{CH}_3 \)  
(2) \( -\text{OH} \)  
(3) \( -\text{CH}_2 \)  
(4) \( -\bar{\text{O}} \)
68. Correct order of stability of following carbocations is
\[
\text{CH}_3\text{CH}_2\text{CH}_3 \quad \text{CH}_3\text{O}^+\text{CH}^+\text{CH}_3 \quad \text{CH}_2^+-\text{CH}_2\text{OH}^+
\]
(1) \( \text{I} > \text{III} > \text{II} \)  
(2) \( \text{II} > \text{I} > \text{III} \) 
(3) \( \text{II} > \text{III} > \text{I} \)  
(4) \( \text{III} > \text{I} > \text{II} \)
69. Order of ease of dehydration of above alcohols in acidic medium is

(1) 1 > 2 > 3  
(2) 2 > 3 > 1  
(3) 1 > 3 > 2  
(4) 3 > 1 > 2

70. Compound (y) is

(1)  
(2)  
(3)  
(4)  

71. Which one is most reactive towards S_N1 reaction?

(1) Ph–CH=CH–Br  
(2) Ph–CH–CH=Br  
(3) Br–CH–Br  
(4) Br–CH=Br

72. An ether is not easily prepared in which of the following reaction?

(1) CH_3Cl + CH_3OH → CH_3COCH_3  
(2) CH_2=CHCl + CH_3OH → CH_2=CHCH_3OH  
(3) Ph–Cl + CH_3OH → Ph–CH(OMe)  
(4) Both (2) and (3)

73. Strongest nucleophile among the following is

(1) CH_3^-  
(2) NH_2^-  
(3) OH^-  
(4) F^-  

74. In the reaction Ph – MgBr + Ph – OH → Major product formed is

(1) Ph–OPh  
(2) PhH  
(3)  
(4)  

75. Most acidic compound among the following is

(1)  
(2)  
(3)  
(4)  

76. Compound (z) is

(1)  
(2)  
(3)  
(4)  

77. Product (P) is

(1) CHBr_3  
(2) CH_3–Br  
(3) CH_4  
(4) CH_3–CH_3

78. In the reaction R CN → (x) → (y)

compound (y) may be

(1) An aldehyde  
(2) A ketone  
(3) An alcohol  
(4) An ether
79. Suitable pH range maintained in the above reaction to get a better yield is
   (1) 2 – 5  
   (2) 5 – 6  
   (3) 9 – 10  
   (4) 12 – 14

80. Glucose $\xrightarrow{\text{RedP,H}_2}$, Product formed is
   (1) Hexanoic acid  
   (2) n – Hexane  
   (3) n – Pentane  
   (4) Acetone

81. Water soluble vitamin is
   (1) Vitamin - A  
   (2) Vitamin - D  
   (3) Vitamin - K  
   (4) Vitamin - C

82. Caprolactam is the monomer of
   (1) Nylon - 6  
   (2) Nylon - 6, 6  
   (3) Nylon - 2 - nylon - 6  
   (4) Dacron

83. Which of the following artificial sweeteners does not contain an amide linkage?
   (1) Sucralose  
   (2) Aspartame  
   (3) Saccharin  
   (4) Alitame

84. Molar conductivities $\Lambda_m$ at infinite dilution of NaCl, HCl and CH₃COONa are x, y and z respectively, $\Lambda_m$ for CH₃COOH will be
   (1) $x + y + z$  
   (2) $x + y - z$  
   (3) $y + z - x$  
   (4) $z + x - y$

85. Total charge required to reduce 1 mole of Cr₂O₇²⁻ to Cr³⁺ ions is
   (1) 6 F  
   (2) 3 F  
   (3) 2 F  
   (4) 5 F

86. E° values for Li⁺/Li, Pb²⁺/Pb, Cu²⁺/Cu and Sn²⁺/Sn are -3.05 V, -0.13 V, +0.34 V and -0.14 V respectively. Least reducing power is of
   (1) Li  
   (2) Pb  
   (3) Sn  
   (4) Cu

87. Effective number of atoms in fcc unit cell is
   (1) 1  
   (2) 2  
   (3) 4  
   (4) 6

88. For a reaction $2A + B \rightarrow$ product, rate law is given as $r = k[A]^1[B]^2$. What will be the order of reaction if A is taken in excess?
   (1) 1  
   (2) $\frac{1}{2}$  
   (3) $\frac{3}{2}$  
   (4) Zero

89. The maximum power to precipitate CdS sol is of
   (1) Al₂(SO₄)₃  
   (2) NaCl  
   (3) KCl  
   (4) BaCl₂

90. van't Hoff factor for aqueous Na₂SO₄ solution with degree of ionisation $\alpha = 0.75$, is
   (1) 1  
   (2) 1.5  
   (3) 2.5  
   (4) 3

91. The cytoskeleton in a cell are involved in all of the given functions, **except**
   (1) Mechanical support  
   (2) Protein synthesis  
   (3) Maintenance of the shape of the cell  
   (4) Motility

92. Who concluded that presence of cell wall is unique character of the plant cells?
   (1) Matthias Schleiden  
   (2) Theodore Schwann  
   (3) Rudolf Virchow  
   (4) Robert Brown

93. During which stage of prophase I of meiosis I, condensation and coiling of chromatin fibres begin to form distinct chromosomes which gradually visible under the light microscope
   (1) Leptotene  
   (2) Zygotene  
   (3) Pachytene  
   (4) Diplotene

94. Cells remain metabolically active but no longer proliferate in which of the given phase of cell cycle?
   (1) Mitotic phase  
   (2) Synthesis phase  
   (3) Quiescent phase  
   (4) Gap 1 phase
95. Select the incorrect statement w.r.t universal rules of nomenclature.
   (1) Biological names are generally in Latin and written in italics
   (2) The first word in a biological name represents the species while the second component denotes genus
   (3) Both the words in a biological name, when handwritten, are separately underlined
   (4) The genus in the biological name starts with a capital letter while the specific epithet starts with a small letter

96. Select the incorrect taxonomic category w.r.t wheat
   (1) Genus – *Triticum*
   (2) Order – Poales
   (3) Class – Dicotyledonae
   (4) Division - Angiospermae

97. Which of the given is acellular and causes bovine spongiform encephalopathy (BSE) in cattles?
   (1) Bacteriophage
   (2) Prions
   (3) Viroid
   (4) TMV

98. Comma-shaped bacteria are
   (1) Bacillus
   (2) Coccus
   (3) Vibrium
   (4) Spirillum

99. \( \sum \) \( \oplus \) \( k_{(5)}^{} \) \( C_{(5)} \) \( A_{(5)} \) \( G_{(2)} \) is the floral formula of
   (1) *Petunia*
   (2) *Colchicum*
   (3) *Aloe*
   (4) *Trifolium*

100. Axile placentation is seen in
   (1) Lemon
   (2) Pea
   (3) Argemone
   (4) Primrose

101. Match column I with column II

<table>
<thead>
<tr>
<th>Column I</th>
<th>Column II</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Stomata</td>
<td>(i) Prevent loss of water</td>
</tr>
<tr>
<td>B. Cuticle</td>
<td>(ii) Regulate transpiration and gaseous exchange</td>
</tr>
<tr>
<td>C. Mesophyll</td>
<td>(iii) Involved in secondary growth</td>
</tr>
<tr>
<td>D. Cork cambium</td>
<td>(iv) Possesses chloroplasts and carry out photosynthesis</td>
</tr>
</tbody>
</table>

102. The inward curling of leaves to minimise water loss in grasses is due to the presence of
   (1) Bulliform cell
   (2) Mesophyll cell
   (3) Bundle sheath cell
   (4) Pith

103. The stored food very similar to amylopectin and glycogen in structure, is characteristic feature of which of the given algae?
   (1) *Polysiphonia*
   (2) *Fucus*
   (3) *Laminaria*
   (4) *Ulithrix*

104. The ploidy level of rhizoids, seta and capsule in *Funaria* respectively are
   (1) n, n and 2n
   (2) n, 2n, and 2n
   (3) 2n, 2n, and n
   (4) 2n, n and n

105. Select the correct sequence of tissues w.r.t. pathway of water movement in the root.
   (1) Epidermis → Pericycle → Endodermis → Cortex → Xylem
   (2) Epidermis → Cortex → Endodermis → Pericycle → Xylem
   (3) Xylem → Endodermis → Pericycle → Cortex → Epidermis
   (4) Cortex → Pericycle → Epidermis → Xylem → Endodermis
106. In the given diagram, four cells A, B, C and D are interconnected. In which of the given cells, net movement of water is zero?
(1) A and B  (2) A and D
(3) B and C  (4) C and D

107. Deficiency of which of the given elements usually cause necrosis in plants?
(1) N, K, Mg, Mo  (2) S, Fe, Mn, Zn
(3) Ca, Mg, Cu, K  (4) N, K, S, Mo

108. The element involved in the metabolism of urea is mainly
(1) Nickel  (2) Chlorine
(3) Molybdenum  (4) Boron

109. Major limiting factor influencing the rate of photosynthesis is
(1) Light  (2) CO₂ concentration
(3) Temperature  (4) Water

110. Which of the given is first stable compound in C₃-cycle?
(1) 3–PGA  (2) OAA
(3) Phosphoenolpyruvate  (4) RuBP

111. What is the net gain of ATP molecules from each molecule of glucose which undergoes fermentation?
(1) 36 ATP  (2) 38 ATP
(3) 2 ATP  (4) 12 ATP

112. Raw material for the synthesis of carotenoids is
(1) Acetyl CoA  (2) Succinyl CoA
(3) OAA  (4) α-KGA

113. Mathematically, arithmetic growth of plants is expressed by
(1) \( W_1 = W_0 e^{rt} \)  (2) \( L_t = L_0 + rt \)
(3) \( L_t = L_0 \times rt \)  (4) \( W_1 = W_0 \times rt \)

114. Select the incorrect match
(1) Indole compounds - Auxin
(2) Terpenes - Ethylene
(3) Adenine derivatives - Kinetin
(4) Derivatives of carotenoids - ABA

115. Gemmule formation is seen in
(1) Sponge  (2) Hydra
(3) Penicillium  (4) Chlamydomonas

116. Main plant body is haploid in
(1) Algae  (2) Pteridophytes
(3) Gymnosperms  (4) Angiosperms

117. The given below figure is a typical dicot embryo. What do A, B and C represent respectively?

118. Cells in which layer of anther are ephemeral?
(1) Epidermis  (2) Endothecium
(3) Middle layer  (4) Tapetum
119. How many maximum types of gametes can be obtained when an individual has two heterozygous pairs (AaBb)
(1) 2 (2) 3
(3) 4 (4) 9

120. What is the genetic disorder in which female has chromosome complement 44 + XO and such females are sterile with short stature, rudimentary ovaries and NO menstrual cycle?
(1) Klinefelter’s syndrome
(2) Down’s syndrome
(3) Turner’s syndrome
(4) Edward syndrome

121. Select the incorrect match
(1) RNA polymerase II – hn RNA
(2) Rho factor – Initiation of transcription
(3) DNA gyrase – Topoisomerase activity
(4) Aminoacyl tRNA synthetase – Activation of amino acids

122. Select the incorrect statement w.r.t VNTRs.
(1) Show very high degree of polymorphism
(2) Surrounded by conserved restriction sites
(3) Are microsatellites
(4) Size varies from 0.1 to 20 kb

123. The capacity to generate a whole plant from any cell/explant is called
(1) Totipotency
(2) Somatic hybridisation
(3) Biofortification
(4) Plant breeding

124. Potato was produced as a result of
(1) Biofortification  (2) Protoplast fusion
(3) Meristem culture  (4) Mutation

125. Which of the given bacteria play very beneficial role in checking disease causing microbes in our stomach?
(1) Lactic acid bacteria (LAB)
(2) Methanococcus
(3) Streptococcus
(4) Propionibacterium shermanii

126. Alcoholic beverages produced without distillation are
(1) Wine and beer (2) Wine and whisky
(3) Whisky and rum (4) Brandy and rum

127. Order of different age group in the urn-shaped age pyramid for human population will be
(1) Pre-reproductive > Reproductive > Post – reproductive
(2) Pre-reproductive = Reproductive > Post – reproductive
(3) Pre-reproductive < Reproductive > Post – reproductive
(4) Pre-reproductive ≥ Reproductive = Post – reproductive

128. The number of individuals of the same species entering the habitat from elsewhere during the time period under consideration refers to
(1) Natality  (2) Mortality
(3) Immigration  (4) Emigration

129. In forest ecosystem, bottom strata or layer is occupied by
(1) Trees only
(2) Herbs only
(3) Both shrubs and trees
(4) Both herbs and grasses

130. Pioneer species on rocks are usually
(1) Lichens (2) Bryophytes
(3) Shrubs  (4) Earthworm

131. Which of the given vertebrates are maximum in global biodiversity?
(1) Mammals (2) Birds
(3) Amphibians  (4) Fishes

132. Rivet popper hypothesis’ was given by
(1) David Tilman
(2) Paul Ehrlich
(3) Alexander von Humboldt
(4) Lindeman

133. Select the incorrect statement w.r.t. ‘Terror of Bengal’
(1) It is alien species introduced in India
(2) They are the plants of water hyacinth \((Eichhornia crassipes)\)
(3) Grow abundantly in eutrophic water bodies
(4) Maintains ecosystem dynamics of water body
134. Match the Column I with column II

<table>
<thead>
<tr>
<th>Column I</th>
<th>Column II</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Ramesh Chandra Dagar</td>
<td>Wild life protection award (i)</td>
<td>(iv)</td>
<td>(iii)</td>
<td>(i)</td>
<td>(ii)</td>
</tr>
<tr>
<td>B. Ahmed Khan</td>
<td>Appiko movement (ii)</td>
<td>(iii)</td>
<td>(ii)</td>
<td>(iv)</td>
<td>(i)</td>
</tr>
<tr>
<td>C. Amrita Devi Bishnoi</td>
<td>Remedy for plastic waste (iii)</td>
<td>(ii)</td>
<td>(i)</td>
<td>(iii)</td>
<td>(iv)</td>
</tr>
<tr>
<td>D. Pandurang Hagde</td>
<td>Integrated organic farming (iv)</td>
<td>(i)</td>
<td>(iii)</td>
<td>(ii)</td>
<td>(iv)</td>
</tr>
</tbody>
</table>

135. The international initiative to control the emission of ozone – depleting substance is

1. (1) Montreal protocol
2. (2) Kyoto protocol
3. (3) Doha amendment
4. (4) The Earth summit

136. Maximum life span is the characteristic of _____A____ and life expectancy is the characteristic of a _____B____.
Select the option which fills A and B correctly.

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>Population</td>
</tr>
<tr>
<td>(2)</td>
<td>Species</td>
</tr>
<tr>
<td>(3)</td>
<td>Individual</td>
</tr>
<tr>
<td>(4)</td>
<td>Population</td>
</tr>
</tbody>
</table>

137. Clones are genetically identical individuals and are product of

1. Sexual reproduction
2. Asexual reproduction
3. Mutation
4. Paedogenesis

138. Birth canal is formed during parturition by female accessory ducts namely

1. Uterus and cervix
2. Cervix and labia majora
3. Cervical canal and vagina
4. Oviduct and uterus

139. Read statements A and B w.r.t. gestation in a human female and choose the correct option.

(A) During 5th month of gestation, foetus starts to move within uterus.
(B) Foetal ejection reflex triggers release of oxytocin from foetal pituitary gland to induce labour pain.

140. Which of the following is not a sexually transmitted disease?

1. Syphilis
2. AIDS
3. Hepatitis - B
4. Amoebiasis

141. During evolution through geological periods, all of the following possibly evolved from thecodonts except

1. Crocodiles
2. Dinosaurs
3. Birds
4. Snakes

142. Which of the following is considered as a missing link between reptiles and birds?

1. Triceratops
2. Archaeopteryx
3. Seymouria
4. Ichthyosaurus

143. Which of the following is mismatch?

1. Charles Darwin – Branching descent and natural selection
2. Lamarck – Theory of use and disuse
3. Hugo de Vries – Mutation theory
4. A.R Wallace – Theory of Panspermia

144. Type of natural selection in which more individuals acquire value other than the mean character value is termed

1. Stabilizing selection
2. Balancing selection
3. Directional selection
4. Disruptive selection
145. Hardy Weinberg equilibrium will be disturbed by the presence of all the following except
   (1) Gene flow  (2) Recombination  
   (3) Random mating  (4) Genetic drift

146. Eye of *Octopus* and mammals exhibit
   (1) Homology  (2) Divergent evolution  
   (3) Adaptive radiation  (4) Analogy

147. Select incorrect statement w.r.t pathogens –
   (1) They can cause diseases in organisms
   (2) Multiply in body of host and interfere with vital activities
   (3) Pathogens are unable to adapt to life within body of host
   (4) Most parasites are pathogens

148. Match column A with column B and select the option containing all correct matches.

<table>
<thead>
<tr>
<th>Column – A</th>
<th>Column – B</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) B - lymphocytes</td>
<td>a. Primary immune response</td>
</tr>
<tr>
<td>(ii) T - lymphocytes</td>
<td>b. Anamnestic immune response</td>
</tr>
<tr>
<td>(iii) Ig M</td>
<td>c. Humoral immune response</td>
</tr>
<tr>
<td>(iv) Ig G</td>
<td>d. Cell mediated immunity</td>
</tr>
</tbody>
</table>

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

149. Which of the following is usually not considered carcinogenic?
   (1) Ionizing radiations
   (2) Nonionizing radiations
   (3) Viral infections
   (4) Bacterial infections

150. Read statements A and B w.r.t HIV infections and choose a correct option given below
   **Statement – A:** A widely used diagnostic test for AIDS is ELISA.
   **Statement – B:** HIV infection may make patients more vulnerable to infection by oncogenic viruses.

   (1) Both statements ‘A’ and ‘B’ are correct.
   (2) Both statements ‘A’ and ‘B’ are incorrect.
   (3) Statement ‘A’ is correct and ‘B’ is incorrect.
   (4) Statement ‘A’ is incorrect and ‘B’ is correct.

151. Choose an option given below which is correctly matched w.r.t plants and drugs obtained from them.
   (1) *Papaver somniferum* – Opioids
   (2) *Erythroxylum coca* – Atropine
   (3) *Atropa belladona* – Marijuana
   (4) *Cannabis sativa* – Crack

152. Which of the following breeding methods in cattle increases homozygosity?
   (1) Inbreeding  (2) Out-breeding
   (3) Out-crossing  (4) Cross-breeding

153. Rearing of more than two species of only fishes in same water body based on their feeding habits is called
   (1) Monoculture  (2) Polyculture
   (3) Apiculture  (4) Sericulture

154. A bioreactor does not contain
   (1) Agitator system
   (2) Oxygen delivery system
   (3) Foam control system
   (4) Product purification system

155. The key tools used in construction of recombinant DNA are
   (1) Exonucleases only
   (2) Restriction endonucleases and ligases
   (3) Restriction endonucleases and gyrases
   (4) DNA polymerase only

156. C – peptide of human insulin is
   (1) A part of mature insulin molecule
   (2) Responsible for formation of disulphide bridges between chain A and C in mature insulin
   (3) Removed during maturation of pro–insulin to mature insulin.
   (4) Responsible for its biological activity
157. Which of the following is wrong for Bt toxin?
   (1) Crystals of Bt toxin produced by some bacteria kill the bacteria themselves
   (2) crylAb is effective against corn borer
   (3) Bt toxin is not harmful to mammals
   (4) crylAc is effective against cotton bollworms

158. Connective tissue is
   (1) Ectodermal in origin with intracellular space
   (2) Mesodermal in origin without intercellular spaces
   (3) Ectodermal in origin with intercellular spaces
   (4) Mesodermal in origin with intercellular spaces

159. Which one is correctly matched?
   (1) Serotonin – Anticoagulant
   (2) Histamine – Vasoconstrictor
   (3) Heparin – Vasodilator
   (4) Chondrin – Matrix of cartilage

160. Select incorrect statement with respect to biomolecules
   (1) Lipids are not strictly biomacromolecules.
   (2) Lipids, proteins and nucleic acids are obtained in retentate after chemical analysis.
   (3) Proteins are polymers of amino acids and are considered as homopolymers.
   (4) Haemoglobin is tetrameric conjugated protein having quaternary structure.

161. Study the following statements.
   a. The substrate binds to the active site of an enzyme.
   b. A triglyceride molecule is made up of one glycerol and three fatty acid molecules.
   c. The active site of enzyme breaks the chemical bonds of products.
   d. Coenzymes are tightly bound to the apoenzyme.

Select the option which includes all correct statements.
   (1) a and c
   (2) b and c
   (3) a and b
   (4) a, c and d

162. Graph plotted between pO₂ and percentage saturation of normal haemoglobin, fetal haemoglobin and myoglobin are shown below. Identify A, B and C and choose option with all correct representations.

163. CO₂ dissociates from carbaminohaemoglobin when
   (1) pCO₂ is high and pO₂ is low
   (2) pO₂ is high and pCO₂ is low
   (3) pCO₂ and pO₂ are equal
   (4) A small amount of CO is present

164. When breast feeding is replaced by less nutritive food low in proteins and calories, the infants below age of one year are likely to suffer from
   (1) Marasmus
   (2) Rickets
   (3) Kwashiorkar
   (4) Pellagra

165. The wall of alimentary canal from oesophagus to rectum possesses four layers. The sequence of these layers from outside to inside is
   (1) Serosa – mucosa – submucosa
       – muscularis
   (2) Muscularis – serosa – mucosa
       – submucosa
   (3) Serosa – muscularis – submucosa
       – mucosa
   (4) Mucosa – submucosa – muscularis
       – serosa
166. Heart beat increases at the time of interview due to secretion of an adrenal hormone in our body known as
(1) Acetylcholine  (2) Adrenaline
(3) Cortisol  (4) ACTH

167. A part of circulatory system that transports deoxygenated blood from heart to the lungs and brings oxygenated blood back to the heart is referred to as
(1) Pulmonary circulation  (2) Coronary circulation
(3) Systemic circulation  (4) Single circulatory system

168. In given figure of Malpighian body, identify A, B, C and D.

![Diagram of Malpighian body]

Choose option which correctly represent A, B, C and D.

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>Afferent arteriole</td>
<td>Efferent arteriole</td>
<td>Bowman’s capsule</td>
<td>PCT</td>
</tr>
<tr>
<td>(2)</td>
<td>Afferent arteriole</td>
<td>Bowman’s capsule</td>
<td>PCT</td>
<td>Efferent arteriole</td>
</tr>
<tr>
<td>(3)</td>
<td>J.G cells</td>
<td>Renal capsule</td>
<td>ciliated cuboidal epithelium</td>
<td>Efferent arteriole</td>
</tr>
<tr>
<td>(4)</td>
<td>Afferent arteriole</td>
<td>Malpighian body</td>
<td>Loop of Henle</td>
<td>Effernet arteriole</td>
</tr>
</tbody>
</table>

169. In haemodialysis,
(1) Blood is drained from a convenient artery
(2) Blood is drained from a convenient vein
(3) Dialysing fluid has exactly same composition as that of blood
(4) Cellophane tube is not required

170. Cell aggregate body plan is exhibited by
(1) Sponges  (2) Cnidarians
(3) Flatworms  (4) Roundworms

171. Segmentation is not a salient feature of
(1) Annelids  (2) Arthropods
(3) Echinoderms  (4) Chordates

172. Read following statements carefully.
(a) Schwann cells are microglia in CNS responsible for formation of myelin sheath.
(b) Action potential refers to depolarisation observed due to stimulus received by a neuron
(c) Neurotransmitters are responsible for conduction of impulse through gap junctions across electrical synapse.
(d) Neurilemma is present around both myelinated and unmyelinated nerve fibres in PNS.

Choose the option containing all incorrect statements.
(1) a and b
(2) b and c
(3) c and d
(4) a and c

173. Select correct statement.
(1) Olfactory epithelium of nose has chemoreceptors and olfactory substances are dissolved in secretion of Bowman’s gland.
(2) Fovea in retina contains only cones and blind spot contains only rods.
(3) Depolarisation of sensory hair cells on tympanic membrane take place due to efflux of Na⁺ ions.
(4) All papillae present on upper surface of tongue contain taste buds.

174. Muscular dystrophy is a congenital disorder characterised by
(1) Progressive degeneration of skeletal muscles
(2) Excessive convulsions
(3) Shaking and trembling
(4) Damage to cardiac muscles only
175. Match the following and choose the correct option.

<table>
<thead>
<tr>
<th>Column – I</th>
<th>Column – II</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Hinge joint</td>
<td>(i) Between humerus and pectoral girdle</td>
</tr>
<tr>
<td>b. Pivot joint</td>
<td>(ii) Between carpals and metacarpals of thumb</td>
</tr>
<tr>
<td>c. Gliding joint</td>
<td>(iii) Between the carpals</td>
</tr>
<tr>
<td>d. Saddle joint</td>
<td>(iv) Between atlas and axis vertebrae</td>
</tr>
<tr>
<td>e. Ball and socket joint</td>
<td>(v) Knee joint</td>
</tr>
</tbody>
</table>

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

176. Secretin

(1) Stimulates enzyme secretion by pancreas and inhibits acid secretion in stomach.
(2) Stimulates bicarbonate secretion in pancreatic juice and inhibits gastric secretion.
(3) Inhibits bicarbonate secretion by pancreas and acid secretion in stomach.
(4) Stimulates acid secretion in stomach and potentiate action of CCK.

177. Choose mismatch w.r.t hormones and their deficiency diseases.

(1) Growth hormone – Acromegaly
(2) Parathormone – Tetany
(3) Thyroxine – Myxoedema
(4) Vasopressin – Diabetes insipidus

178. Which of the following is not a true fish?

(1) Fighting fish
(2) Dog fish
(3) Saw fish
(4) Devil fish

179. Which of the following statements is incorrect?

(1) In cockroaches and prawns, excretion of waste materials occurs through malpighian tubules.
(2) Ctenophores exhibit bioluminescence.
(3) Protonephridia are responsible for excretion in *Fasciola* and *Amphioxus*.
(4) Earthworms are hermaphrodite yet cross fertilisation occurs.

180. Choose the structure not found in a male cockroach.

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

1. Answer (3)
   \[ \frac{v^2}{rg} = (LT^{-1})^2 \]
   \[ rg = L \times LT^{-2} \]
   \[ = L^0T^0M^0 \]

2. Answer (3)
   \[ \vec{v}_r = a \hat{i} - b \hat{j} \]
   \[ \vec{v}_{mr} = (a - 4) \hat{i} - b \hat{j} \] (in first condition)
   \[ a - 4 = 0 \]
   \[ a = 4 \text{ km/hr} \]
   \[ \vec{v}_{mr}' = (4 - 8) \hat{i} - b \hat{j} \] (in second condition)
   \[ = -4 \hat{i} - b \hat{j} \]
   \[ \tan 30^\circ = \frac{4}{b} \]
   \[ \frac{1}{\sqrt{3}} = \frac{4}{b} \]
   \[ b = 4 \sqrt{3} \]
   \[ \vec{v}_{rg} = 4 \hat{i} - 4 \sqrt{3} \hat{j} \]

3. Answer (2)
   \[ |\vec{v}_{rg}| = \sqrt{4^2 + (-4\sqrt{3})^2} \]
   \[ = 8 \text{ km/hr} \]
   \[ v_{rg}\cos\theta = 4 \]
   \[ \cos \theta = \frac{1}{2} \]
   \[ \theta = 60^\circ \]

4. Answer (4)
   \[ f_{\text{max}} = \mu_sN \]
   \[ = 0.6 \times 2 \times 10 \]
   \[ = 12 \text{ N} \]
   \[ F_A = ma \]
   \[ = 2 \times 4 \]
   \[ = 8 \text{ N} \]
   \[ F_A < f_{\text{max}} \]
   \[ f = F_A \]
   \[ = 8 \text{ N} \]
5. Answer (1)

\[ T - mg = ma \]
\[ T = 20m \]
\[ P = \bar{T} \cdot \bar{v} \]
\[ 500 = 20m \times 10 \]
\[ m = 2.5 \text{ kg} \]

6. Answer (1)

\[ F = \frac{-dU}{dx} \]
\[ -dU = \frac{4}{x^2} \cdot dx \]
\[ U_f - U_i = \int_4^2 4x^{-2}dx \]
\[ U_f - U_i = 4 \left[ \frac{1}{x} \right]_4^2 \]
\[ U_f - U_i = 4 \left[ \frac{1}{2} - \frac{1}{4} \right] \]
\[ (U_f - U_i) = 1 \]

Loss of potential = Gain in kinetic energy

\[ 1 = \frac{1}{2} \times 2 \times v^2 \]
\[ v = 1 \text{ m/s} \]

7. Answer (2)

\[ v_{AB} = 2v_0 \]
\[ \omega_{AB} = \frac{v_{AB}}{2R} \]
\[ = \frac{2v_0}{2R} \]
\[ = \frac{v_0}{R} \]

8. Answer (2)

\[ r_1 = \frac{m \times 0 + 2md}{3m} \]
\[ r_1 = \frac{2d}{3} \]
\[ r_2 = d - \frac{2d}{3} \]
\[ = \frac{d}{3} \]
\[ l = m \left( \frac{2d}{3} \sin 30^\circ \right)^2 + 2m \left( \frac{d}{3} \sin 30^\circ \right)^2 \]
\[ l = \frac{md^2}{9} + \frac{md^2}{18} \]
\[ = \frac{3md^2}{18} \]
\[ = \frac{md^2}{6} \]

9. Answer (4)

From equation : \( k = 5 \)

As at \( t = 0.5 \text{ sec} \), the particle reaches the origin for the first time.

Substituting \( t = 0.5 \text{ sec} \) in both equation \( x = 3 + 3\cos \left( \frac{\pi}{2} \cdot \frac{1}{2} \right) = 3 \) not satisfied and \( x = 3 + 3\cos \left( 2\pi \cdot \frac{1}{2} \right) = 0 \) satisfied

Hence, the equation of particle is \( x = 3 + 3\cos(2\pi t) \)

10. Answer (1)

The gravitational force is towards the centre of the earth. Therefore separation decrease.
11. Answer (3)

\[ L = 10 \log \frac{I}{I_0} \]

\[ 10 \log \frac{I}{I_0} = 60 \]

\[ \log \frac{I}{I_0} = 6 \]

\[ \frac{I}{I_0} = 10^6 \]

\[ I = 10^{-6} \text{ W/m}^2 \]

Power = \( I A \)

\[ = 2 \times 10^{-6} \]

\[ E = 2 \times 10^{-6} \times 10 \times 60 \times 60 \]

\[ = 72 \text{ mJ} \]

12. Answer (1)

When \( S_1 \) is closed and \( S_2 \) is opened

\[ I = \frac{E_p}{3r} \]

\[ E = lr_1 \]

\[ E = I \times \frac{1}{2} \times \frac{2r}{r} \]

\[ E = \frac{E_p}{3} \]

When \( S_2 \) is opened and \( S_1 \) is closed

\[ I = \frac{E_p}{r_1 + r} \]

\[ E = I \times r_2 \]

\[ = I \times \frac{2l}{3} \times \frac{r_1}{l} \]

\[ = \frac{2E_p r_1}{3(r_1 + r)} \]

\[ \frac{E_p}{3} = \frac{2E_p r_1}{3(r_1 + r)} \]

\[ r_1 + r = 2r_1 \]

\[ r_1 = r \]

13. Answer (3)

\[ U = \frac{1}{2} n f RT \]

\[ PV = nRT \]

\[ \frac{U}{V} = \frac{1}{2} \left( \frac{nRT}{V} \right) \times f \]

\[ = \frac{1}{2} P \times f \]

\[ = \frac{1}{2} \times 4 \times 10^8 \times 5 \]

\[ = 10 \times 10^6 \text{ J/m}^3 \]

14. Answer (4)

The first over tone in a closed pipe have frequency \( f = \frac{3v}{4l} \).

15. Answer (3)

\[ y(x, t) = 2.0 \cos (20 \pi t - 2 \pi \times 0.008x + 2 \pi \times 0.35) \]

\[ \Delta \phi = 2\pi \frac{8 \times 10^{-3} \times 4}{10^{-2}} \]

\[ \Delta \phi = 6.4 \pi \]

16. Answer (1)

\[ \left( \frac{dQ}{dt} \right)_1 = \left( \frac{dQ}{dt} \right)_2 \]

\[ K_1 A \Delta T \]

\[ l_1 \]

\[ = K_2 A \Delta T \]

\[ l_2 \]

\[ \frac{K_1}{K_2} = \frac{l_1}{l_2} \]

\[ = \frac{\pi R}{2R} \]

\[ = \pi : 2 \]

17. Answer (4)

\[ T = 2\pi \sqrt{\frac{m}{k}} \] remains uncharged

Mean position shift rightward.

18. Answer (1)

The latent heat of vaporisation of water is more than latent heat of fusion of ice because on vaporisation much larger increase in volume takes place.
19. Answer (1)

For a body emissivity = absorptivity = 0.2

\[ \frac{E_b}{a_b} = \frac{E_B}{a_B} \]

\[ \frac{100}{1} = \frac{E_B}{a_B} \]

\[ \Rightarrow E_B = 0.2 \times 100 \]

\[ = 20 \text{ W/m}^2 \]

20. Answer (3)

Cycle-I is clockwise therefore work done will be positive for cycle-I.

21. Answer (2)

\[ F_{\text{flat}} = T \times 2R \]

\[ F_{\text{curved}} = T \times \pi R \]

\[ \frac{F_{\text{flat}}}{F_{\text{curved}}} = \frac{T \times 2R}{T \times \pi R} \]

\[ = \frac{2}{\pi} \]

22. Answer (1)

The stress in the wire = \( \frac{\text{Tension}}{\text{Area of cross-section}} \)

To avoid breaking, this stress should not exceed the breaking stress.

Let the tension in the wire be \( T \).

The equation of motion of the two blocks are

\[ T - 10 \text{ N} = (1 \text{ kg})a \]

\[ 20\text{ N} - T = (2 \text{ kg})a \]

Eliminating 'a' from these equations

\[ T = \left( \frac{40}{3} \right) \text{ N} \]

Stress = \( \frac{(40/3) \text{ N}}{\pi r^2} \)

If the minimum radius needed to avoid breaking is \( r \), \( 2 \times 10^9 = \frac{40 / 3}{\pi r^2} \)

\[ r = 4.6 \times 10^{-5} \text{ m} \]

23. Answer (1)

\[ F = -\eta \frac{dv}{dx} \]

Here \( F \) is a tangential force between two layers of liquid it mean \( \frac{F}{A} \) will be tangential stress.

24. Answer (2)

\[ \phi = BA \]

\[ \phi = B\pi r^2 \]

\[ \varepsilon = \frac{-d\phi}{dt} \]

\[ \varepsilon = B\pi 2r \frac{dr}{dt} \]

\[ 2 \times 10^{-3} = 10^{-3} \times \pi \times 2 \times r \times 10^{-2} \]

\[ r = \frac{100}{\pi} \text{ m} \]

25. Answer (3)

\[ I = \frac{E}{R + nR} \]

\[ I_1 = \frac{E}{R + \frac{R}{n}} \]

\[ I_1 = 5I \]

\[ \frac{E}{R + \frac{R}{n}} = \frac{5E}{R + nR} \]

\[ R + nR = 5R + \frac{5R}{n} \]

\[ nR \left( \frac{5R}{n} - 4R \right) = 0 \]

\[ n^2R - 4nR - 5R = 0 \]

\[ n = \frac{4R \pm \sqrt{16R^2 + 20R^2}}{2R} \]

\[ = \frac{4R + 6R}{2R} \]

\[ = 5 \]

26. Answer (1)

Lyman series lie in ultraviolet region of electromagnetic spectrum.
27. Answer (4)

\[ N = N_0 e^{-\lambda t} \]
\[ \frac{N}{N_0} = e^{-\lambda t} \]
\[ \frac{1}{20} = e^{-\lambda t} \]
\[ \lambda t = \ln 20 \]
\[ \ln 2 \times t = \ln 20 \]
\[ t = \frac{\ln 20}{\ln 2} \times 5.6 \]
\[ = 24.2 \]

28. Answer (3)

\[ I_{\text{max}} = \left( \sqrt{I} + \sqrt{4I} \right)^2 \]
\[ = 9I \]
\[ I_{\text{min}} = \left( \sqrt{4I} - \sqrt{I} \right)^2 \]
\[ = I \]
\[ \frac{I_{\text{max}} - I_{\text{min}}}{I_{\text{max}}} = \frac{9I - I}{9I} \]
\[ = \frac{8}{9} \]

29. Answer (4)

At resonance net potential drop across inductor and capacitor will be zero potential drop will be only across resistor therefore reading of voltmeter \( V_1 \) and \( V_2 \) will be non zero.

30. Answer (2)

\[ M = \frac{qL}{2m} \]
\[ L = \frac{mR^2}{2} \omega \]
\[ M = \frac{q}{2m} \times \frac{mR^2}{2} \omega \]
\[ = \frac{qR^2 \omega}{4} \]
\[ = \frac{\sigma \pi R^4 \omega}{4} \]

31. Answer (1)

Magnetic susceptibility of diamagnetic material is negative which is independent on temperature.

32. Answer (3)

Field due to \( AA' = \frac{\mu_0 i}{4\pi R} \)

Field due to \( BB' \)

Field due to \( CC' \) - field due to \( DD' = 0 \)

Field due to \( BA = \frac{\mu_0 i}{8R} \)

Field due to \( CD = -\frac{\mu_0 i}{8R} \)

\[ \therefore \text{Net field at} \ O = \frac{\mu_0 i}{2\pi R} \]

33. Answer (3)

Frequency of electric field and magnetic field in the EM wave will be same.

34. Answer (4)

\[ \phi = \frac{q_{\text{inside}}}{\epsilon_0} = \frac{Q}{8\epsilon_0} \]

35. Answer (4)

\[ C = \frac{A\epsilon_0}{d} \]

Capacitance of the plate depends on area of the plate, medium between the plates and distance between the plates.

36. Answer (3)

\[ \mu = \frac{\sin \left( \frac{A + A}{2} \right)}{\sin \left( \frac{A}{2} \right)} \]

\[ \Rightarrow \mu = 2 \cos \frac{A}{2} \]

\[ A = 2 \cos^{-1} \left( \frac{\mu}{2} \right) \]

37. Answer (1)

\[ M_1 = \frac{-f_0}{f_e} \]
\[ 10 = \frac{-f_0}{f_e} \]
\[ L_e = f_0 + f_e \]
\[ 110 = 10f_0 + f_e \]
\[ f_e = 10 \text{ cm} \]
38. Answer (2)
If a very small opaque disc is placed in the path of monochromatic light. It geometrical shadow has dark point at the centre surrounded by alternate bright and dark rings.

39. Answer (1)
\[
\begin{align*}
p & \quad N \\
\begin{array}{cccc}
+ & - & + & - \\
- & + & - & + \\
+ & - & + & - \\
- & + & - & +
\end{array}
\end{align*}
\]
direction of electric field across barrier will be from \(N\) type to \(P\) type therefore force will be in the direction of velocity.

\[v^2 = u^2 + 2a\]

40. Answer (4)
\[
\begin{align*}
V_2 &= 0.1 \text{ V} \\
V_1 &= 0.4 \text{ V} \\
V_0 &= \frac{1}{2}m(v_1^2 - v_2^2)
\end{align*}
\]
From superposition principle

41. Answer (1)
\[
y = y_1 + y_2 = (A + \bar{A}) + A \cdot \bar{A} = 1 + 0 = 1
\]

42. Answer (4)
Stopping potential remains same as frequency remains same. Saturation current is directly proportional to intensity of light i.e. \(i \propto \frac{1}{r^2}\).

43. Answer (4)
Nuclear reaction obey the law of conservation of mass, energy, charge and momentum.

44. Answer (4)
\[
{}^{238}_{92}U \rightarrow 2p^{\alpha +} + {}^{234}_{88}X
\]
\[
N_P + N_n = 234 \\
N_P = 88 \\
88 + N_n = 234 \\
N_n = 234 - 88 = 146
\]

45. Answer (3)
\[
\frac{1}{2}mv_0^2 = \frac{q_1q_2}{4\pi\varepsilon_0 r}
\]

46. Answer (3)
\[
22.4 \text{ L NH}_3(\text{g}) \text{ at STP weights } 17 \text{ g} \\
\therefore 1 \text{ L NH}_3(\text{g}) \text{ at STP weighs } \frac{17}{22.4} = 0.76 \text{ g}
\]

47. Answer (2)
In, MSO₄, Valency of metal = 2
\[
\therefore \text{ Molar mass of MSO}_4 = (12 \times 2) + 96 = 120 \text{ g/mol}
\]

48. Answer (4)
\[
r_n = 0.529 \frac{n^2}{Z}, \quad \frac{r_1}{r_2} = \frac{(1)^2}{(2)^2} = 1:4
\]

49. Answer (2)
Number of orbitals = \(n^2 = 9\)

50. Answer (3)
Molar K.E depends on temperature only.
51. Answer (1)
At Boyle’s temperature, real gas behaves ideally.

52. Answer (3)
\[
\text{CH}_3\text{COOH} + \text{NaOH} \rightleftharpoons \text{CH}_3\text{COONa} + \text{H}_2\text{O}
\]
\[
t = 0 \quad 50 \text{ meq} \quad 25 \text{ meq} \quad 0 \quad 0
\]
at eq \quad 25 \text{ meq} \quad 0 \quad 25 \text{ meq} \quad 0
\[
\therefore \quad \text{pH} = \text{pka} + \log \left( \frac{[\text{salt}]}{[\text{acid}]} \right) \Rightarrow \text{pH} = \text{pka} = 4.74
\]

53. Answer (4)
Increasing reactant concentration will increase product concentration.

54. Answer (3)
\[
\text{has bent structure.}
\]

55. Answer (2)

56. Answer (3)
B \rightarrow Si shows diagonal relationship.

57. Answer (3)
\[
K_{sp} = s^2 = (10^{-5})^2 = 10^{-10}
\]
Now, new solubility of AgCl in 0.05 M NaCl solution is
\[
K_{sp} = \frac{10^{-10}}{0.05} = 2 \times 10^{-10} \text{M}
\]

58. Answer (4)
Strong acid/base are not affected by presence of common ion.

59. Answer (1)
\[
\text{NaH}_2\text{PO}_2; 1 + 2 + x - 4 = 0
\]
\[
\therefore \quad x = 1
\]

60. Answer (1)
\[
4\text{Zn} + \text{NO}_3^- + 7\text{H}_2\text{O} \rightarrow 4\text{Zn}^{2+} + \text{NH}_4^+ + 10\text{OH}^-
\]

61. Answer (2)
Nuclear (proton) spins are different for ortho and para H\text{2}.

62. Answer (3)
\[
20 \text{ volume } \text{H}_2\text{O}_2 = \frac{20}{11.2} \times \frac{34}{10} = 6\%
\]

63. Answer (3)
Basic strength of alkaline earth metal hydroxides increases down the group.

64. Answer (2)
In cement, % of CaO is 50-60%.
% of Al\text{2}O\text{3} is 5-10%, % of Fe\text{2}O\text{3} is 1-2.

65. Answer (1)
Borax has two $sp^3$ hybridized and two $sp^2$ hybridized – B atoms.

66. Answer (3)
\[
\% \text{N} = \frac{1.4\text{N}}{\text{W}} = \frac{1.4 \times 10}{0.5} = 28\%
\]

67. Answer (3)
+I effect: \text{CH}_2^- > \text{CH}_3^- > \text{CH}_2 > \text{OH}

68. Answer (2)
\[
\text{CH}_3\text{=CH}_{\because} \cdots \text{CH}-\text{CH}_3 \leftrightarrow \text{CH}_3\text{=CH}_{\because} \cdots \text{CH} = \text{CH}_3
\]
is resonance stabilized (back bonding).

69. Answer (3)

70. Answer (3)

71. Answer (2)
Greater is the stability of carbocation formed greater is rate of $S_N1$ reaction.

72. Answer (4)
\[
\text{F}^- \text{ is weakest while } \text{CH}_3^- \text{ is strongest nucleophile.}
\]
74. Answer (2)

\[ \text{R MgX} \xrightarrow{\text{H}^-} \text{R - H} \]

75. Answer (2)

\[ \text{NO}_2^- \text{is resonance stabilized.} \]

76. Answer (3)

77. Answer (1)

78. Answer (3)

\[ \text{RCN} \xrightarrow{\text{LiAlH}_4} \text{RCH}_2\text{NH}_2 \xrightarrow{(i) \text{NaNO}_2, \text{HCl}} \xrightarrow{(ii) \text{H}_2\text{O}} \text{RCH}_2\text{OH} \]

79. Answer (3)

Slightly alkaline medium is required for the reaction.

80. Answer (2)

Glucose + HI \xrightarrow{\text{Red P}} \text{n-Hexane}

81. Answer (4)

82. Answer (1)

Caprolactam is monomer of nylon – 6.

83. Answer (1)

Sucralose does not contain an amide bonding.

84. Answer (3)

\[ \Lambda_{\text{CH}_5\text{COOH}} + \Lambda_{\text{HCl}} - \Lambda_{\text{NaCl}} \]

85. Answer (1)

\[ \text{Cr}_2\text{O}_7^{2-} + 6\text{e}^- + 14\text{H}^+ \rightarrow 2\text{Cr}^{3+} + 7\text{H}_2\text{O} \]

86. Answer (4)

More the reduction potential, lesser will be reducing power.

87. Answer (3)

\[ Z = \frac{1}{2} \times 6 + \frac{1}{8} \times 8 = 4 \]

88. Answer (2)

Order w.r.t. A become zero at excess concentration of A.

89. Answer (1)

CdS is a negative colloid.

90. Answer (3)

\[ \text{Na}_2\text{SO}_4 \rightleftharpoons 2\text{Na}^+ + \text{SO}_4^{2-} \]

\[ 1 - 0.75 \quad 1.5 \quad 0.75 \]

\[ = 0.25 \]

\[ \therefore i = 0.25 + 1.5 + 0.75 = 2.5 \]

91. Answer (2)

Protein synthesis is associated with ribosomal activity.

92. Answer (2)

93. Answer (1)

94. Answer (3)

Quiescent phase is also known as G_0 – phase.

95. Answer (2)

The first word in a biological name, represents the genus while the second component denotes the specific epithet.

96. Answer (3)

Wheat is categorised under class monocotyledonae.

97. Answer (2)

98. Answer (3)

Rod shaped – Bacillus

Spherical shape – Coccus

Spiral shape – Spirillum

Commo shaped – Vibrio

99. Answer (1)

Petunia is an ornamental plant of family Solanacea with floral formula.

\[ \sum G_{(2)} \]

100. Answer (1)

\[ \sum A_{(5)} \]
100. Answer (1)
101. Answer (2)
102. Answer (1)
103. Answer (1)

Polysiphonia is a red alga. In red algae (Rhodophyceae), the food is stored as floridean starch which is very similar to amlopectin and glycogen in structure.

104. Answer (2)

In Funaria, rhizoids represents gametophyte. Whereas, seta and capsule represents sporophyte.

105. Answer (2)
106. Answer (1)

Cell A and B have equal $\psi_w$

107. Answer (3)
108. Answer (1)
109. Answer (2)

CO$_2$ concentration is very low in environment hence play a limiting factor in photosynthesis

110. Answer (1)
111. Answer (3)
112. Answer (1)
113. Answer (2)
114. Answer (2)

Terpene is precursor for gibberellins

115. Answer (1)
116. Answer (1)
117. Answer (3)
118. Answer (3)

119. Answer (3)
120. Answer (3)

XO–Turner's syndrome

121. Answer (2)

Rho-factor is required for termination of transcription.

122. Answer (3)

VNTRs are minisatellites.

123. Answer (1)
124. Answer (2)
125. Answer (1)
126. Answer (1)

Whisky, brandy and rum are produced by distillation.

127. Answer (3)
128. Answer (3)
129. Answer (4)

Trees occupy top vertical layer of a forest, shrubs occupy the second layer and herbs and grasses occupy the bottom layer.

130. Answer (1)
131. Answer (4)
132. Answer (2)
133. Answer (4)

Water hyacinth leads to an imbalance in the ecosystem dynamics

134. Answer (1)
135. Answer (1)

Montreal protocol was signed at Montreal (Canada) in 1987 (effective in 1989) to control the emission of ozone–depleting substances (ODS).

136. Answer (2)

Maximum life span is characteristic of a species and life expectancy is the characteristic of a population.

137. Answer (2)

Clones are product of asexual reproduction so they are genetically identical to each other. There are variations in sexual reproduction due to crossing over during gametogenesis.

138. Answer (3)

Just before parturition, cervix becomes soft under effect of hormone relaxin and dilates. Both cervical canal and vagina together form birth canal for delivery of child.

139. Answer (3)

Foetal ejection reflex triggers maternal pituitary to release oxytocin. Receptors for oxytocin are situated in myometrium. It acts on uterine muscle fibres for forceful contraction to induce labor pain.
140. Answer (4)
Amoebiasis is a protozoan disease transmitted through contaminated food and water.

141. Answer (4)
Snakes evolved in Jurassic period from lizards (sauropsids).

142. Answer (2)
Archaeopteryx is considered as missing link between reptiles and birds. The connecting links which are not alive are known as missing links.

143. Answer (4)
Theory of Panspermia for origin of life was proposed by Arrhenius. Wallace along with Darwin supported “struggle for existence and survival of the fittest”.

144. Answer (3)
In balancing / stabilizing selection more individuals acquire mean character value whereas in disruptive selection more individuals acquire character values other than mean character value on both extremities.

145. Answer (3)
Random mating ensures that the population remains in equilibrium.

146. Answer (4)
Analogy is the result of convergent evolution.

147. Answer (3)
Pathogens have to adapt to life within the host.

148. Answer (4)
B lymphocytes are responsible for humoral immunity and T lymphocytes for CMI. IgM is first formed antibody against any antigen in our body.

149. Answer (4)
Bacterial infections are not considered carcinogenic.

150. Answer (1)
HIV infected patients are more likely to suffer from Kaposi’s sarcoma.

151. Answer (1)
Erythroxylum coca – Cocaine or crack
Atropa belladonna – Atropine
Cannabis sativa – Marijuana

152. Answer (1)
Continuous closed breeding called inbreeding is responsible for inbreeding depression to reduce fertility and productivity of new breed. Out-crossing is helpful to overcome inbreeding depression.

153. Answer (2)
Aquaculture is rearing of useful aquatic plants and animals such as fishes, prawns, shrimps, lobsters, etc. Rearing of honey bee is apiculture and fishery is catching, processing and selling of fish, shellfish or other aquatic animals.

154. Answer (4)
A bioreactor has an agitator system, an oxygen delivery system, a foam control system, temperature and pH regulator system but does not contain/involve methods for downstream.

155. Answer (2)
Restriction endonucleases are used to cut DNA at particular palindromic sequences whereas ligases are used to join sticky ends. So, they are used as a tools in making recombinant DNA.

156. Answer (3)
Both A and B polypeptide chains of insulin are linked together with the help of disulphide bonds. C-peptide is removed during maturation of pro-insulin into insulin.

157. Answer (1)
Endotoxins produced and accumulated in bacteria are protoxins so do not harm them. After ingestion by insects, it is cleaved by proteases in alkaline medium to form a toxic derived protein that damages gut epithelium. It is quickly digested in mammals so not harmful.

158. Answer (4)
Connective tissues are mesodermal in origin with intercellular spaces and connect various organs of the body with each other. They also form covering around various organs of the body.

159. Answer (4)
Chondrin is a protein present in the matrix of cartilage. Heparin is anticoagulant, serotonin is vasoconstrictor and histamine is vasodilator synthesized by mast cells.

160. Answer (3)
Proteins are polymers of different types of amino acids, hence considered as heteropolymers.
161. Answer (3)
The active site of enzyme breaks the chemical bonds of substrate to form enzyme substrate complex. Coenzymes are loosely bound to apoenzymes.

162. Answer (1)
O₂ dissociation curve for myoglobin is rectangular hyperbolic and for fetal haemoglobin is shifted more towards left than haemoglobin.

163. Answer (2)
Carbaminohaemoglobin is dissociated at lung alveolar surface where pO₂ is high and pCO₂ is low.

164. Answer (1)
Protein-energy malnutrition below one year of age causes marasmus and only protein malnutrition between 1-5 years of age causes kwashiorkor.

165. Answer (3)
Serosa is outermost and mucosa in innermost layer of alimentary canal from oesophagus to rectum.

166. Answer (2)
Adrenaline is considered as emergency hormone synthesized more during any stress situation like interview as anti stress hormone.

167. Answer (1)
The chambers of heart related with lungs through pulmonary vessels together form pulmonary circulation.

168. Answer (2)
A – J.G cells in afferent arteriole  
B – Bowman’s capsule formed by simple squamous cells  
C – PCT – Formed by simple cuboidal epithelium containing microvilli giving brush border appearance  
D – Efferent arteriole formed by simple squamous epithelium

169. Answer (1)
Blood is drained from a convenient artery. Dialysis fluid has same composition as that of plasma except nitrogenous wastes. Cellophane tube is required.

170. Answer (1)
Cnidarians and flatworms represent blind sac body plan and in roundworms, tube within tube body plan.

171. Answer (3)
True segmentation is exhibited by annelids, arthropods and chordates.

172. Answer (4)
Schwann cells are macroglia in PNS responsible for formation of myelin sheath. Neurotransmitters are not required in electrical synapse. Transmission of impulse takes place across synapses through gap junctions.

173. Answer (1)
Blindspot does not contain rods and cones. Depolarisation of sensory hair cells on basilar membrane takes place due to influx of K⁺ ions from endolymph. Only few papillae contain taste buds.

174. Answer (1)
Progressive degeneration of skeletal muscle occurs in muscular dystrophy.

175. Answer (1)

a – (v), b – (iv), c – (iii), d – (ii), e – (i)

176. Answer (2)
Secretin stimulates bicarbonate secretion in pancreatic juice acting on pancreatic acini and inhibits secretion of gastric juice.

177. Answer (1)
Acromegaly is caused due to hypersecretion of growth hormone in adulthood.

178. Answer (4)
Octopus is commonly known as devil fish placed in phylum mollusca. So, it is not a true fish.

179. Answer (1)
Malpighian tubule is excretory organ in cockroaches whereas antennal glands or green glands are excretory organ in prawns.

180. Answer (4)
Spermatheca is responsible for temporary storage of sperms only in female cockroach.