11/04/2025

Phase-2
CODE-D

Aakash
Medical | IIT-JEE | Foundations

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FINAL TEST SERIES for NEET-2025

MM : 720 **Test - 5** **Time : 180 Mins.**

Answers

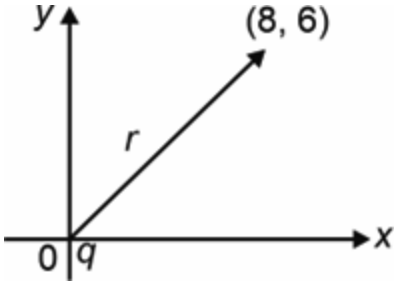
1. (4)	37. (1)	73. (4)	109. (1)	145. (2)
2. (2)	38. (2)	74. (1)	110. (4)	146. (3)
3. (2)	39. (2)	75. (1)	111. (3)	147. (4)
4. (1)	40. (4)	76. (1)	112. (2)	148. (4)
5. (3)	41. (2)	77. (2)	113. (3)	149. (3)
6. (2)	42. (4)	78. (2)	114. (3)	150. (2)
7. (1)	43. (2)	79. (1)	115. (3)	151. (4)
8. (3)	44. (3)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

Hints and Solutions

PHYSICS

(1) **Answer :** (4)
Solution:
$v = at$
$K.E = \frac{1}{2}mv^2$
$= \frac{1}{2} \times m \times a^2 \times t^2$
K.E. $\propto t^2$
$\frac{k_1}{k_2} = \frac{t_1^2}{t_2^2}$
$\frac{50}{k_2} = \frac{4}{16} \Rightarrow k_2 = 50 \times 4$
= 200 J

(2) **Answer :** (2)
Solution:

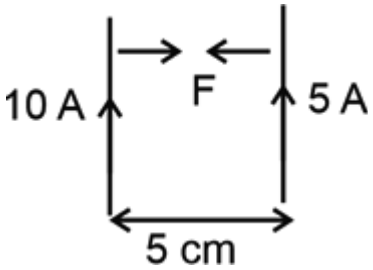


$\left|\vec{r}\right| = \sqrt{8^2 + 6^2}$
= 10 m
$V = \frac{kq}{r}$
$= \frac{9 \times 10^9 \times 10 \times 10^{-6}}{10}$
$= 9 \times 10^3$ V

(3) **Answer :** (2)
Solution:
$B_1 = \mu_0 H$
$B_2 = \mu H = \mu_0(1 + \chi)H$
Percentage increase = $\frac{B_2 - B_1}{B_1} \times 100$
$= \frac{\mu_0 \chi H}{\mu_0 H} \times 100$
$= 2 \times 10^{-5} \times 100$
$= 2 \times 10^{-3}$

(4) **Answer :** (1)
Solution:
B_0 is only due to circular section
$B_0 = \frac{\mu_0 i}{4R}$
$= \frac{\mu_0 i}{4R} \otimes$

(5) **Answer :** (3)
Solution:

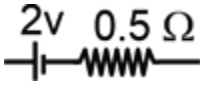


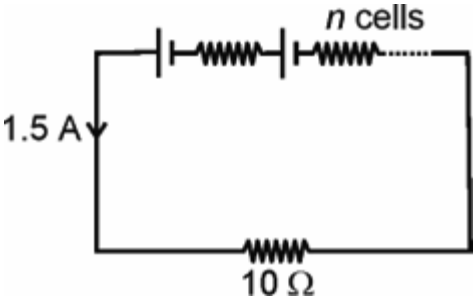
$F = \frac{\mu_0 i_1 i_2 l}{2\pi \mathrm{d}}$, attractive

$F = \frac{4\pi \times 10^{-7} \times 10 \times 5}{2\pi \times 5 \times 10^{-2}} \times 20 \times 10^{-2}$

$= 4 \times 10^{-5}$ N

(6) **Answer :** (2)
Solution:
Each cell





$i = \frac{n\varepsilon}{R+nr}$

$\Rightarrow \frac{3}{2} = \frac{n \times 2}{10 + n0.5}$

$\Rightarrow 30 + \frac{3}{2}n = 4n$

$\Rightarrow$ 30 = 2.5 n

$\Rightarrow n$ = 12

(7) **Answer :** (1)
Solution:
μ_r is greater than 1 for paramagnetic substance
and $\chi_m = \mu_r - 1$
$\chi_m > 0$

(8) **Answer :** (3)
Solution:

$T = 2\pi\sqrt{\frac{I}{MB}}$

$T^2 = 4\pi^2 \left(\frac{I}{MB}\right)$

$\Rightarrow 4 = 4 \times 10 \times \frac{4 \times 10^{-4}}{10^{-2} B}$

$\Rightarrow B = \frac{16 \times 10^{-3}}{4 \times 10^{-2}}$

$B = 4 \times 10^{-1}$ T
= 0.4 T

(9) **Answer :** (3)
Solution:
Apply energy conservation,
initial charge on system = final charge on system
$\Rightarrow CV_i = (C_1 + C_2) V_C$
$\Rightarrow 6 \times 10 = 9 V_C$

$\Rightarrow V_C = \frac{60}{9} = \frac{20}{3}$ V

⇒ Final charge on 6 μF capacitor = $6 \times 10^{-6} V_C$

= $6 \times \frac{20}{3} \times 10^{-6}$

= 40 μ*C*

(10) Answer : (2)
Solution:

$\Delta V = -\int \vec{E} . d\vec{r}$

∴ In the direction of electric field, potential decreases.
⇒ Two equipotential surfaces can't intersect
⇒ Electric potential energy of a system of point charges can be zero.

(11) Answer : (2)
Solution:

$V = \frac{k.\vec{p}.\vec{r}}{r^3}$

$= \frac{kp\cos\theta}{r^2}$

$= \frac{9\times10^9\times10^{-9}}{25\times10^{-4}} \times \frac{3}{5}$

$= \frac{27\times10^4}{125}$

= 2.16 kV

(12) Answer : (2)
Solution:
Specific resistance of the conductor depends on material and temperature.

(13) Answer : (2)
Solution:

$T = 2\pi\sqrt{\frac{I}{MB}}$

$T \propto \sqrt{\frac{I}{M}}$

$\frac{T'}{T} = \sqrt{\frac{I}{4M} \times \frac{M}{I}} = \frac{1}{2}$

T' = 2 s

(14) Answer : (4)
Solution:
Direction of magnetic moment of the loop is along area vector

i.e. angle between $\vec{M}$ and $\vec{B}$ is zero

$\tau = \vec{M} \times \vec{B}$

= zero

(15) Answer : (2)
Solution:
Since battery is disconnected, therefore charge stored across capacitor remain same.

⇒ $C = \frac{A\varepsilon_0}{d}$, since *d* increases, so capacitance decreases

⇒ $U = \frac{Q2}{2C}$, increases

⇒ $\frac{Q}{V} = C$, decreases

(16) Answer : (2)
Solution:

⇒ Ampere's law → $\oint \vec{B} . \mathrm{d}\, \vec{l} = \mu_0 i_{\text{enclosed}}$

⇒ Lorentz force → $q[\vec{E} + \vec{v} \times \vec{B}]$

⇒ Torque on circular current carrying loop in uniform magnetic field → $i[\vec{A} \times \vec{B}]$

⇒ Force per unit length between parallel current carrying wires → $\frac{\mu_0 i_1 i_2}{2\pi d}$

(17) Answer : (2)
Solution:
Electric field due to infinitely long straight wire at a distance *r* is
$E = \frac{2k\lambda}{r}$
= $\frac{2\times 9\times 10^9}{10} \times \frac{3}{2} \times 10^4$
= 27×10^{12} N/C
F = *qE*
= 10 × 27 × 10^{12}
= 27 × 10^{13} N

(18) Answer : (1)
Solution:
$E = \frac{-\partial V}{\partial x}\hat{i} - \frac{\partial V}{dy}\hat{j}$
= $-[-2xy-2]\hat{i} - \left[-x^2\right]\ \hat{j}$
$E = \left(2xy+2\right)\hat{i} + x^2\ \hat{j}$
E at (1 m, 2 m) = $\left(4+2\right)\hat{i} + 1\hat{j}$
= $\left(6\hat{i}+\hat{j}\right)$ V/m

(19) Answer : (4)
Solution:
Electric field at inside point due to non-conducting solid sphere
$E = \frac{kQr}{R^3}$

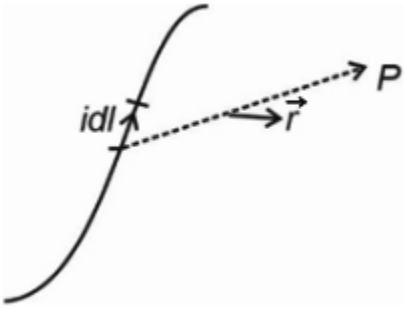
(20) Answer : (1)
Solution:
Equivalent resistance in parallel combination is smaller than the smallest resistance connected in parallel.

(21) Answer : (2)
Solution:
Since potential difference between *B* and *D* is zero
Therefore , $\frac{12}{4} = \frac{x}{1}$
⇒ *x* = 3 Ω

(22) Answer : (1)
Solution:
Electric field at centre due to uniformly charged ring is zero
$\therefore\ \vec{E}_{APB} + \vec{E}_{ADCB} = 0$
$\vec{E}_{ADCB} = -\vec{E}_{APB}$
= E_0 towards OP

(23) Answer : (1)
Solution:
$\vec{F} \perp \vec{B}$
⇒ $\vec{a} \perp \vec{B}$
So $\vec{a} \cdot \vec{B} = 0$
$\left(x\,\hat{i}+3\hat{j}\right)\cdot\left(4\hat{i}+3\hat{j}\right)\times 10^{-3} = 0$
4*x* + 9 = 0
$x = -\frac{9}{4}$

(24) Answer : (4)
Solution:



From Biot-savart law

$d\vec{B} = \frac{\mu_0}{4\pi}\frac{i\vec{dl}\times\vec{r}}{r^3}$

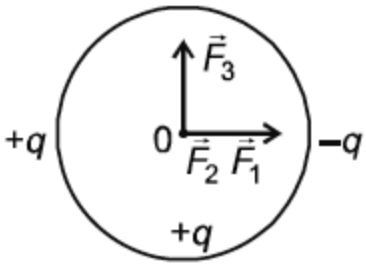
(25) Answer : (3)
Solution:
Magnetic moment M = NIA
= NI. πr^2
$M \propto r^2 \Rightarrow \frac{M_1}{M_2} = \frac{1}{4}$
$\Rightarrow M_2 = 4\,M_1$

(26) Answer : (4)
Solution:
$\vec{\tau} = \vec{M}\times\vec{B}$
= NIABsinθ

(27) Answer : (3)
Hint:
Potential of a spherical system is equal to $\frac{kQ}{r}$
Solution:
Charge on the bubble will remain constant.
Therefore $V \propto \frac{1}{r}$
$\frac{V_i}{V_f} = \frac{r_f}{r_i} \Rightarrow \frac{6}{V_f} = \frac{3r}{r}$
$\Rightarrow V_f = 2$ V

(28) Answer : (3)
Solution:
Current carrying wire produces a non-uniform magnetic field around it. So force acting on different current element of rod will be different. Force at nearer end will be maximum and at farther end will be minimum, so rod experience both force as well as torque, so it will translate as well as rotate.

(29) Answer : (2)
Hint:
$F = \frac{kq_1q_2}{r^2}$
Solution:



$\vec{F} = F_3\hat{j} + F_2\hat{i} + F_1\hat{i}$
$= \frac{kQq}{r^2}\hat{j} + \frac{kQq}{r^2}\hat{i} + \frac{kQq}{r^2}\hat{i} = \frac{2kQq}{r^2}\hat{i} + \frac{kQq}{r^2}\hat{j}$

(30) Answer : (4)

Solution:

Time taken to complete one revolution $T = \frac{2\pi m}{qB}$

Time taken to complete half revolution $\frac{T}{2} = \frac{\pi m}{qB}$

(31) Answer : (3)

Solution:

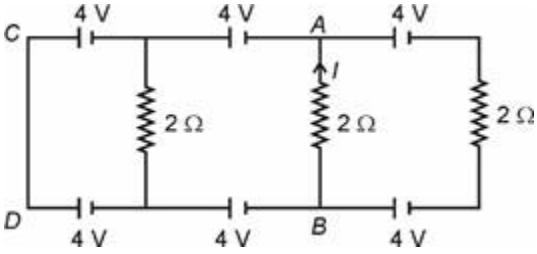
$\frac{10}{30} = \frac{x}{70}$

$x = \frac{70}{3}\ \Omega$

x = 23.3 Ω

(32) Answer : (4)

Solution:



By K.V.L. in a loop ACDBA

+ 4 + 4 – 4 – 4 – 2I = 0

I = 0.

(33) Answer : (2)

Solution:

Potential difference across R should be 2 V, when galvanometer shows zero deflection.

⇒ Current in branch 400 Ω $(I) = \frac{8}{400} = 20$ mA

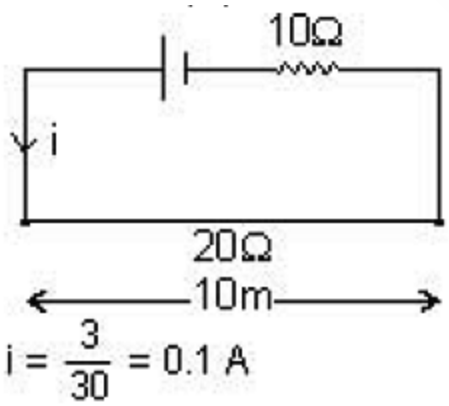
⇒ Potential difference across R

$20 \times 10^{-3} \times R = 2$

$\Rightarrow \boxed{R = 100\ \Omega}$

(34) Answer : (3)

Solution:



$i = \frac{3}{30} = 0.1\ \text{A}$

Let potential difference across 10 m long wire is V,

V = 0.1 × 20 = 2 volt

∴ Potential gradient = $\frac{2}{10} = 0.2\ \text{Volt/m}$

(35) Answer : (3)

Solution:

$W = PE\ (\cos\theta_i - \cos\theta_f)$

where $\theta_i = 0°$ and $\theta_f = 180°$

∴ $W = 2PE$

(36) Answer : (2)

Solution:

$\frac{1}{R_{eq}} = \frac{1}{8} + \frac{1}{12} + \frac{1}{24} = \frac{3+2+1}{24} = \frac{1}{4}$

$\Rightarrow R_{eq} = 4\ \Omega$

(37) Answer : (1)

Solution:

$\frac{20}{n} = 4$

Thus, $n = 5$

(38) Answer : (2)

Solution:

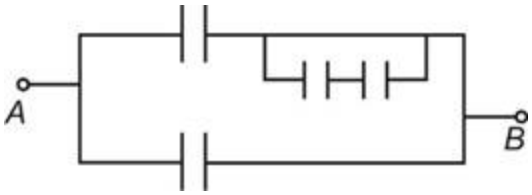
on stretching $R \propto L^2$

$R' = (2)^2 \times 10 = 40\ \Omega$

$R_{AB} = \frac{20\times 20}{(20+20)} = 10\ \Omega$

(39) Answer : (2)

Solution:



$C_{eff} = C + C = 2C$

(40) Answer : (4)

Solution:

$C_{eq} = \frac{4\times 2}{4+2} = \frac{4}{3}\mu F$

V = 12 V

$\therefore Q = C_{eq} \times V = \frac{4}{3} \times 12 = 16\mu C$

(41) Answer : (2)

Solution:

Common potential $V_C = \frac{C_1V_1 + C_2V_2}{C_1 + C_2} = \frac{Q_{initial}}{C_1 + C_2}$

Initially, equivalent capacitance,

$C_{eq} = \frac{2\times 5}{2+5}\mu F = \frac{10}{7}\mu F$

$\therefore$ Charge stored $Q_{initial} = C_{eq}.V$

$= \frac{10}{7} \times 10^{-6} \times 7 = 10\ \mu C$

With the switch closed;

$Q_{net} = 10 + (-10) = 0$

$V = 0$

(42) Answer : (4)

Solution:

Equipotential surfaces have the same value of potential at all points on that surface.

(43) Answer : (2)

Solution:

The electric force on the positive charge acts in the direction of electric field while electric field intensity varies from point to point due to a point charge.

(44) Answer : (3)

Solution:

Ferromagnetic substance follow the Curie – Weiss law $\chi = \frac{C}{T - T_C}$

(45) Answer : (4)

Solution:
Inside bar magnet, lines of force are from south to north.

SECTION-A

CHEMISTRY

(46) Answer : (2)
Solution:
Terminal alkenes are less stable

$$\underset{(2\alpha-\text{Hydrogen})}{H_3C-CH_2-CH=CH_2}$$

less statble

$$\underset{(6\alpha-\text{Hydrogen})}{CH_3-HC=CH-CH_2}$$

more statble

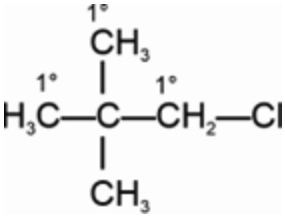
More stable alkene has lower heat of hydrogenation.

(47) Answer : (1)
Solution:

$$\% \text{ of Br} = \frac{80 \times 0.188}{188 \times 0.5} \times 100$$

= 16%

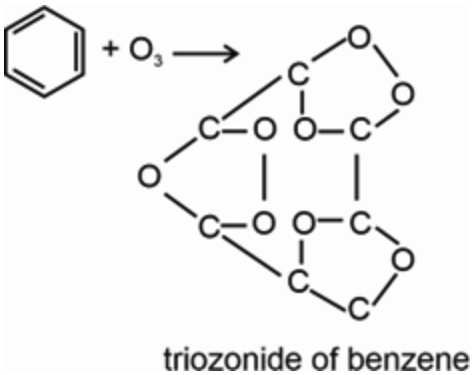
(48) Answer : (4)
Solution:



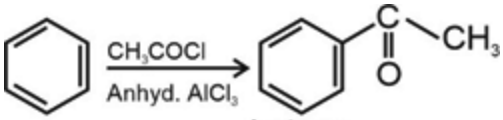
(49) Answer : (4)
Solution:

$$CaC_2 \xrightarrow[\Delta]{H_2O} C_2H_2 \xrightarrow[873\ K]{\text{Red hot Fe Tube}} C_6H_6$$

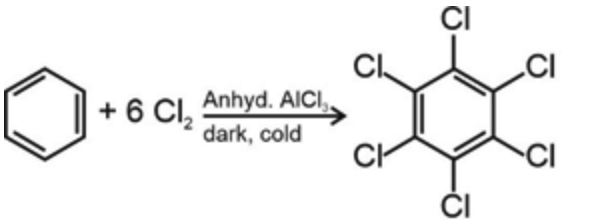
(Cyclic polymerisation)



triozonide of benzene

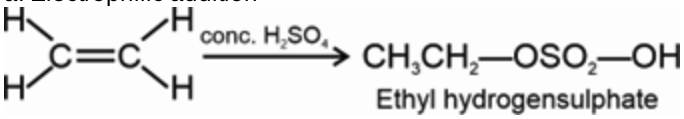


ketone



Hexachloro benzene

(50) Answer : (4)
Solution:
a. Electrophilic addition



Ethyl hydrogensulphate

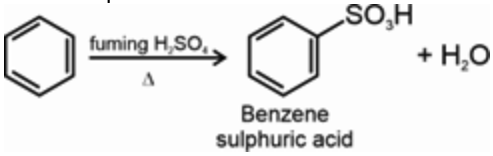
b. Free radial addition

$$CH_3 - HC = CH_2 + HBr \xrightarrow{(C_6H_5\,CO)_2O_2} \underset{\text{(Major)}}{CH_3\,CH_2\,CH_2\,Br}$$

c. β-elimination

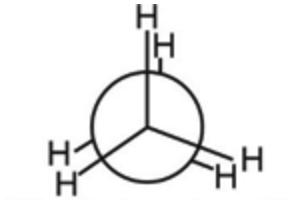
$$Cl\,H_2C{-}CH_3 \xrightarrow[\Delta]{\text{alc. kOH}} \underset{\text{Ethene}}{CH_2 = CH_2}$$

d. Electrophilic substitution



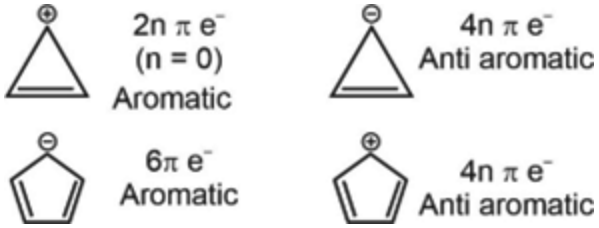
Benzene
sulphuric acid

(51) Answer : (4)
Solution:



Dihedral angle = 0°

(52) Answer : (3)
Solution:

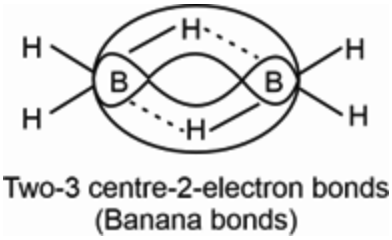


(53) Answer : (1)
Solution:
Order of First ionisation enthalpy
C > Si > Ge > Pb > Sn
Order of boiling point.
Si > Ge> Sn > Pb.

(54) Answer : (1)
Solution:
Boric acid is a weak monobasic acid. It is not a protonic acid but acts as a Lewis acid by accepting electrons from a hydroxyl ion.

$B(OH)_3 + 2HOH \rightarrow [B(OH)_4]^- + H_3O^+$

(55) Answer : (2)
Solution:



Two-3 centre-2-electron bonds
(Banana bonds)

(56) Answer : (3)
Solution:
Producer gas — CO + N_2
Water gas — CO + H_2
Inorganic benzene — $B_3N_3H_6$
Borax — $Na_2B_4O_7.10H_2O$

(57) Answer : (1)
Solution:
Stability of +1 oxidation state progressively increases for heavier elements Al < Ga < In < Tl.

(58) Answer : (3)
Solution:
CO forms carboxyhaemoglobin with blood which is 300 times more stable as compared oxygen haemoglobin complex (Oxyhaemoglobin).

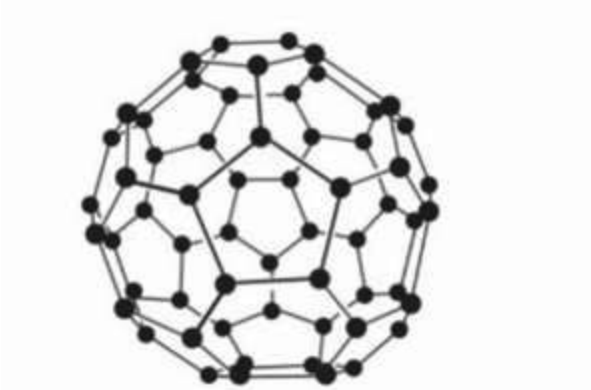
(59) Answer : (3)
Solution:
GeO_2 is an acidic oxide.

(60) Answer : (1)
Solution:
Due to unavailability of d-orbitals, & small size, B does not form BF_6^{3-} ion.

(61) Answer : (3)
Solution:
Due to good extent of back bonding in BF_3, vacant orbital of Boron gets occupied which leads to less nature as Lewis acid.
Order of extent of Back-bonding $BF_3 > BCl_3 > BBr_3$
Nature as Lewis acid:
$BBr_3 > BCl_3 > BF_3$

(62) Answer : (1)
Solution:
Basic structural unit of silicates is SiO_4^{4-} .

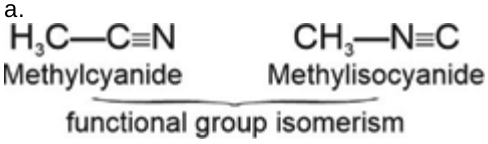
(63) Answer : (3)
Hint:
Structure of C_{60}



The structure of C_{60} Buckminster-fullerene : Note that molecule has the shape of a soccer ball (football)

Solution:
It contains twenty six-membered rings and twelve five-membered rings. A six membered ring is fused with six or five membered rings but a five membered ring can only fuse with six membered rings. All the carbon atoms are equal and they undergo sp^2 hybridisation.

(64) **Answer :** (2)
Solution:
a.



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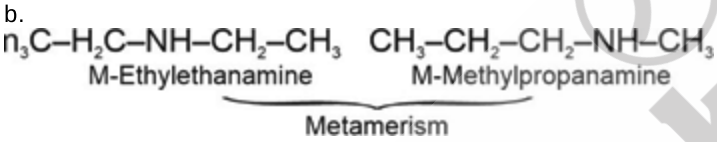
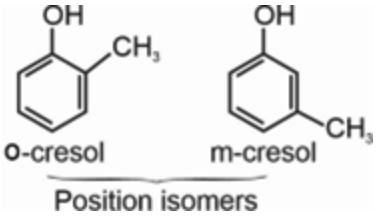
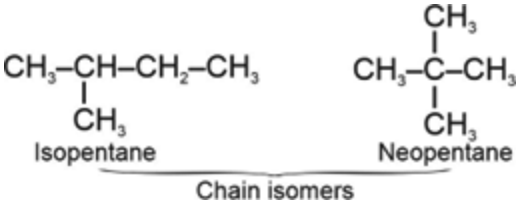


c.

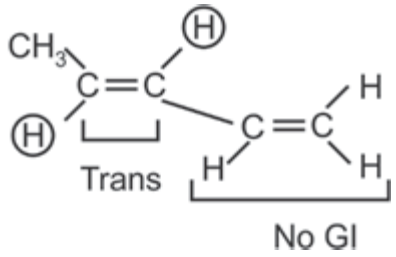


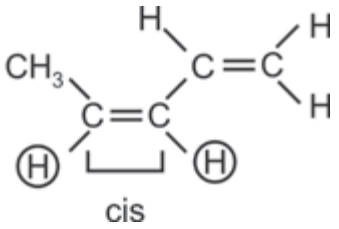
d.

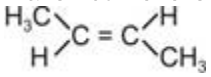
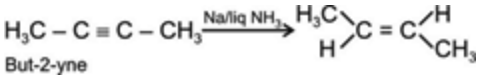


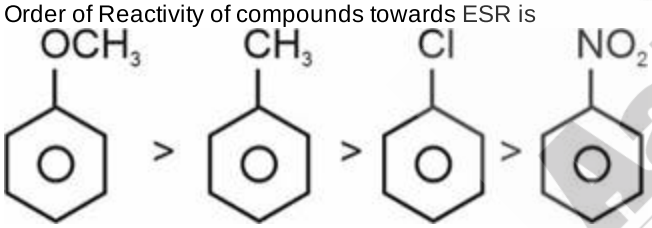
(65) **Answer :** (4)
Solution:
BN is known as inorganic graphite and has structure similar to graphite.

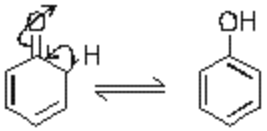
(66) **Answer :** (3)
Hint:
Terminal alkenes do not show geometrical isomerism.
Solution:

I. 

II. 

(67) Answer : (1)
Hint:
Trans-But-2-ene is

Solution:


(68) Answer : (1)
Hint:
Electron donating groups increase the electron density on benzene hence increases its reactivity towards electrophilic substitution reactions.
Solution:
Order of Reactivity of compounds towards ESR is


(69) Answer : (1)
Hint:
Phenol mainly exist in its enol form due to aromatic character in enol form.
Solution:


(70) Answer : (4)
Hint:
Propyne contains acidic hydrogen
Solution:
• All alkynes are colourless
• Alkynes are immiscible with water but soluble in organic solvents like ethers, carbon tetrachloride and benzene.
• $CH_3–C\equiv C–H + NaNH_2 \rightarrow CH_3–C\equiv C^-Na^+ + NH_3$

(71) Answer : (1)
Hint:
Methane on oxidation in the presence of Cu at 573 K and 100 atm gives methanol.
Solution:

- $2\,CH_4 + O_2 \xrightarrow{Cu\ /523\,K/100\ atm} \underset{\text{Methanol}}{2\,CH_3\,OH}$
- $CH_4 + O_2 \xrightarrow[\Delta]{Mo_2\,O_3} \underset{\text{Methanal}}{HCHO} + H_2O$

(72) **Answer :** (1)
Hint:
In Kolbe's process, electrolysis of sodium/ potassium salts of carboxylic acids produces alkanes.
Solution:

$2RCOONa + 2H_2O \xrightarrow{electrolysis} R - R + 2CO_2 + 2NaOH + H_2$
Hence, alkanes containing even number of C–atoms can be prepared.

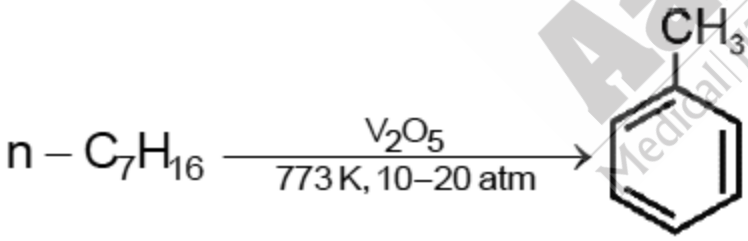
(73) **Answer :** (4)
Hint:
Mercury (II) catalysed hydration of ethyne and produces ethanal as major product.
Solution:

• $R - C \equiv C - H \xrightarrow{Na} R - C \equiv C^{-}Na^{+} + \frac{1}{2}H_2$
• Carbon of ethyne is more electronegative, so electrons of C – H bond are concentrated towards C and proton can be easily abstracted.

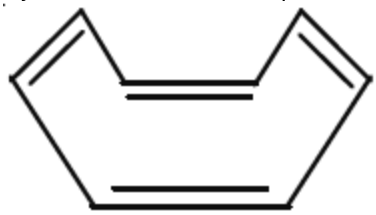
(74) **Answer :** (1)
Hint:
Nitration is an electrophilic substitution reaction, so it will take place on the electron-rich site.
Solution:
The most electron rich site is para of first ring because of +M effect of –NH group, leading to the substitution reaction.

(75) **Answer :** (1)
Solution:
Peroxide effect proceeds via free radical mechanism and only addition of HBr to unsymmetrical alkene takes place via this mechanism.

(76) **Answer :** (1)
Hint:
V_2O_5 at 500°C and 10-20 atm leads to aromatisation.
Solution:



(77) **Answer :** (2)
Solution:
Cyclooctatetraene is non-planar tub shaped compounds



It has 8π electrons

(78) **Answer :** (2)
Solution:
Because of symmetrical structure, crystal packing in neopentane is more efficient as compared to hexane.

(79) **Answer :** (1)
Solution:
Vicinal dihalide on heating with zinc dust forms an alkene.

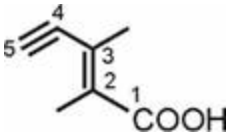
(80) **Answer :** (2)
Solution:
Ammonium phosphomolybdate:
$(NH_4)_3PO_4.12\ MoO_3$.

(81) **Answer :** (4)
Hint:
% of $N = \frac{1.4 \times meq.of\ NH_3}{Mass\ of\ compound}$
Solution:
Meq. of NH_3 = meq. of H_2SO_4
= (0.1 × 2) × 100 = 20
% of $N = \frac{1.4 \times 20}{0.75} = 37.33$•

(82) **Answer :** (3)
Hint:
No α-hydrogen is present in $(CH_3)_3\overset{+}{C}CH_2$

(83) **Answer :** (4)
Hint:
Resonance stabilisation energy is the difference in the energy between actual structure and the lowest energy canonical form
Solution:
Resonance stabilisation energy is the difference in the energy between actual structure and the lowest energy canonical form

(84) **Answer :** (3)
Hint:
–COOH has first priority in functional groups
Solution:



2,3-dimethylpent-2-en-4-ynoic acid

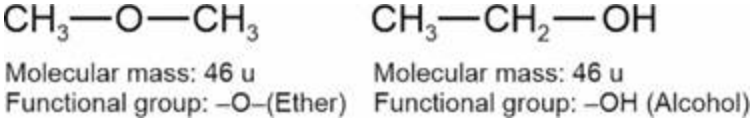
(85) **Answer :** (2)
Solution:
Answer (2)

Product	Reactant
$O = C_{sp} = O$	$H - \underset{sp}{C} \equiv \underset{sp}{C} - H$

(86) **Answer :** (1)
Hint:
Ammonium phosphomolybdate is yellow coloured compound.
Solution:

Species	Colour
$Fe_4[Fe(CN)_6]_3 \cdot xH_2O$	Prussian blue
$[Fe(CN)_5NOS]^{4-}$	Violet
$[Fe(SCN)]^{2+}$	Blood red
$(NH_4)_3PO_4 \cdot 12MoO_3$	Yellow

(87) **Answer :** (1)
Hint:
Compounds having same molecular formula but different functional groups are called functional group isomers.
Solution:



Both the carbon atoms in ethanol are similar so there is no possibility to shift –OH group for position isomerism.

(88) Answer : (2)
Hint:
Lone pair of electrons on sulphur atom also takes part in conjugation.
Solution:
Total 6 electrons are in conjugation in case of thiophene as it is an aromatic compound.

(89) Answer : (3)
Hint:
Tropylium cation is an aromatic species.
Solution:

, cyclopentadienyl cation is an antiaromatic species.

(90) Answer : (2)
Hint:

$$\%\ \text{of N} = \frac{28}{22400} \times \frac{\text{Volume of } N_2 \left(\text{at STP}\right)}{\text{wt. of compound}} \times 100$$

Solution:

$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$

(Experiment condition) (STP condition)

$\frac{(725-25)\times 60}{300} = \frac{760\times V_2}{273}$

$\because$ Volume of N_2 (at STP) = 50.29 ml

$\therefore\ \%\ \text{of N} = \frac{28}{22400} \times \frac{50.29}{0.28} \times 100 = 22.45\ \%$

BOTANY

(91) Answer : (3)
Solution:
Theodore Schwann, a British zoologist studied different types of animal cells and reported that cells had a thin outer layer which is known as the plasma membrane. The cytoplasm is the main arena of cellular activities in both the plant and animal cells.

(92) Answer : (3)
Solution:
Mesosomes are formed by the invagination of plasma membrane into the cell.

(93) Answer : (4)
Solution:
A small circular DNA outside the genomic DNA is called plasmid. Plasmid DNA confers certain unique phenotypic characters to bacteria.

(94) Answer : (3)
Solution:
Ribosomes are composed of rRNA and proteins.

(95) Answer : (2)
Solution:

The C_3 plants show saturation of photosynthetic process when CO_2 concentration is beyond 450 $\mu l L^{-1}$.

(96) Answer : (3)
Solution:
Higher plants lack centriole. Aster is formed by centriole in animals, fungi and certain plants.

(97) Answer : (2)
Solution:
Elaioplasts is involved in storage of fats and oils in castor.

(98) Answer : (3)
Solution:
RER is frequently observed in the cells actively involved in protein synthesis and secretion. A number of proteins synthesised by ribosomes on the endoplasmic reticulum are modified in the cisternae of Golgi apparatus.
The endomembrane system include E.R., golgi complex, lysosomes and vacuoles.

(99) Answer : (1)
Solution:
Interphase represents the most active stage of the cell cycle where both cell growth and DNA replication occur.
Interkinesis is a metabolic stage between telophase I and prophase II where DNA replication does not occur..

(100) Answer : (4)
Solution:
DNA replication and chromosomal duplication occurs in S phase.

(101) Answer : (2)
Solution:
Prophase – Spireme stage
Metaphase – Congression
Anaphase – Formation of interzonal fibres
Telophase – Mitotic spindle disappear

(102) Answer : (2)
Solution:
The recombination is enzyme mediated process. An enzyme called recombinase is involved in this process and it occurs in Pachytene.

(103) Answer : (4)
Solution:
In oocyte of some vertebrates, diplotene lasts for month or years.

(104) Answer : (2)
Solution:
In meiosis, karyokinesis occurs twice, but DNA replicates once only.

(105) Answer : (3)
Solution:
Tetrad is clearly visible at Pachytene stage.

(106) Answer : (3)
Solution:
Chemiosmosis process requires a membrane, a proton pump, a proton gradient and ATP synthase.

(107) Answer : (1)
Solution:
- Jan Ingenhousz – He showed that sunlight is essential for the plants.
- Julius von Sachs – Found that glucose is made in the green parts of plants.
- T.W. Engelmann – Experiment helps in describing the first action spectrum of photosynthesis.
- Ruben, Kamen *et al* – Proved that O_2 evolved during light reaction comes from H_2O.

(108) Answer : (2)
Solution:
The first stable product in C_4 pathway is oxaloacetic acid.

(109) Answer : (1)
Solution:
Glycocalyx as a loose sheath is called slime layer and glycocalyx as a thick and tough covering is called capsule.

(110) Answer : (4)
Solution:
Cytoskeleton is an elaborate network of filamentous proteinaceous structure consisting of microtubules and microfilaments.

(111) Answer : (3)
Hint:
Nucleoplasm is a transparent, semi-fluid and colloidal substance inside the nucleus.
Solution:
The nuclear matrix or the nucleoplasm contains nucleolus and chromatin.

(112) Answer : (2)
Solution:

Plasmodesmata are not dead components of cell wall, they form channels that interconnect the cytoplasms of neighbouring plant cells and they are living.

(113) Answer : (3)
Solution:
A bivalent (tetrad) is a pair of homologous chromosomes made up of 4 chromatids.

(114) Answer : (3)
Solution:
Vesicles fuses with convex (cis)face of Golgi body.

(115) Answer : (3)
Solution:
Regeneration step in Calvin cycle requires one molecule of ATP.

(116) Answer : (3)
Solution:
Plastocyanin transfer electrons from $Cytb_6f$ to PS I.

(117) Answer : (2)
Solution:
The plant or internal factors are dependent on the genetic predisposition and the growth of the plant. At any point, the rate of photosynthesis will be determined by the factor available at sub-optimal levels.

(118) Answer : (4)
Solution:
The gap between meiosis I and meiosis II is interkinesis.
During interkinesis DNA replication does not occur.

(119) Answer : (4)
Hint:
The diagram represents anaphase of mitosis.
Solution:
In anaphase, splitting of centromere and separation of chromatids occur which enables movement of splitted chromatids to the opposite poles.

(120) Answer : (2)
Solution:
Moll's half leaf experiment showed that CO_2 was required for photosynthesis.

(121) Answer : (2)
Solution:
Calvin cycle or C_3 cycle is present in all photosynthetic plants.

$$\left.\begin{matrix}\text{Kranz anatomy}\\ \text{Double carboxylation}\end{matrix}\right\} \bullet\ C_4 \text{ plants}$$

Scotoactive stomata } CAM plants

(122) Answer : (4)
Hint:
OEC is associated with PS II. It is related to splitting of H_2O.
Solution:
OEC is located on the inner side of the thylakoid membrane. OEC provides electrons to PS II.

(123) Answer : (3)
Solution:
Non-cyclic photophosphorylation (Z-scheme) is not only connected with ATP synthesis but also with production of NADPH.

(124) Answer : (3)
Solution:
- Rough endoplasmic reticulum – Protein synthesis and secretion
- Smooth endoplasmic reticulum – Detoxification of drug
- Golgi apparatus – Glycosidation of lipids
- Lysosomes – Hydrolytic enzymes

(125) Answer : (3)
Solution:
Kranz anatomy is one of the characteristics of the leaves of monocot plant. E.g. Sugarcane.

(126) Answer : (1)

Solution:
Photorespiration is initiated in chloroplast.

(127) Answer : (3)
Solution:
Cells at the end of prophase, when viewed under the microscope, do not show Golgi complexes, endoplasmic reticulum, nucleolus and the nuclear envelope.

(128) Answer : (3)
Solution:
Tropical plants have a higher temperature optimum than the plants adapted to temperate climates.

(129) Answer : (2)
Hint:
Mitochondria are semi-autonomous cell organelles as they can synthesize some of their own proteins.
Solution:
Mitochondria can synthesize their proteins because they have DNA, RNA, ribosomes and components required for protein synthesis.

(130) Answer : (2)
Solution:
In animal cell, during S-phase, centriole duplicates in cytoplasm and DNA replicates inside nucleus.

(131) Answer : (2)
Solution:
Dyad of cells produced due to meiosis I have haploid nuclei.

(132) Answer : (1)
Solution:
In animals cytokinesis is achieved by furrow formation.

(133) Answer : (4)
Hint:
Telophase II is the last stage of meiosis II.
Solution:
Meiosis ends with telophase II in which the two groups of chromosomes get enclosed by separate nuclear envelope.

(134) Answer : (4)
Hint:
C_3 plants show photorespiration.
Solution:
In C_4 plants, photorespiration does not occur. This is because these plants have a mechanism that increases the concentration of CO_2 at the enzyme site. During the C_4 pathway, when the C_4 acid from the mesophyll cells is broken down in the bundle sheath cells, it releases CO_2 – this results in increasing the intracellular concentration of CO_2. This in turn, ensures that the RuBisCO functions as a carboxylase minimising the oxygenase activity. Thus, the productivity and yields are better in C_4 plants as compared to C_3 plants.

(135) Answer : (4)
Solution:
The structures A, B, C and D are Golgi complex, vacuole, cell wall and mitochondrion respectively.
Xanthophylls are found in chromoplasts. Mitochondria have enzymes for respiration.

ZOOLOGY

(136) Answer : (1)
Solution:
Neutrophils, eosinophils and basophils are the three different types of granulocytes, while lymphocytes and monocytes are agranulocytes.

(137) Answer : (1)
Solution:
The descending limb of loop of Henle is permeable to water but almost impermeable to electrolytes. This concentrates the filtrate as it moves down. The ascending limb is impermeable to water but allows transport of electrolytes actively or passively.

(138) Answer : (3)

Solution:
The opening between the right atrium and the right ventricle is guarded by a valve formed of three muscular flaps or cusps, the tricuspid valve; whereas a bicuspid or mitral valve guards the opening between the left atrium and the left ventricle. Amphibians and reptiles (except crocodiles) have a 3-chambered heart with two atria and a single ventricle, whereas crocodiles, birds and mammals possess a 4-chambered heart with two atria and two ventricles.

(139) Answer : (2)
Solution:
Fishes have a 2-chambered heart with an atrium and a ventricle. In fishes, the heart pumps out deoxygenated blood which is oxygenated by the gills and supplied to the body parts from where deoxygenated blood is returned to the heart (single circulation).*Petromyzon*, *Scoliodon* and *Clarias* are the members of the super class Pisces. *Balaenoptera* is the scientific name of blue whale and it is a mammal.

(140) Answer : (4)
Solution:
The left ventricle has the thickest muscular wall because it has to pump blood to various body parts.
SAN is present in the right upper corner of the right atrium.
AVN is present in the lower left corner of the right atrium.

(141) Answer : (2)
Solution:
The Malpighian corpuscle, PCT and DCT of the nephron are situated in the cortical region of the kidneys whereas the loop of Henle dips into the medulla. In some of the nephrons, the loop of Henle is very long and runs deep into the medulla. These nephrons are called juxta medullary nephrons.

(142) Answer : (4)
Solution:
The SAN generates action potentials which stimulate both atria to undergo simultaneous contraction. The action potential is conducted to the ventricular side by AVN and AV bundles. Removal of AVN will cause contraction of both atria and ventricles at the same time.

(143) Answer : (3)
Solution:
By counting the number of QRS-complexes that occur in a given time period, one can determine the heart rate of an individual.

(144) Answer : (4)
Solution:
Pheretima (earthworm) is an annelid and possesses nephridia as the excretory structure. Most annelids have a closed circulatory system.

(145) Answer : (2)
Hint:
Primary lymphoid organ
Solution:
RBCs are formed in bone marrow in adults. Thymus and heart do not participate in erythropoiesis.

(146) Answer : (3)
Solution:
The first heart sound (lub) is associated with the closure of the tricuspid and bicuspid valves whereas the second heart sound (dub) is associated with the closure of the semilunar valves.

(147) Answer : (4)
Solution:
The DCTs of many nephrons open into the common collecting duct. Many of which ultimately open into the renal pelvis through the medullary pyramids.

(148) Answer : (4)
Solution:

Substances like glucose, amino acids, Na^+, *etc.*, in the filtrate are reabsorbed actively whereas the nitrogenous wastes are absorbed by passive transport. Reabsorption of water also occurs passively in the initial segments of the nephron.

(149) Answer : (3)
Solution:
An adult human excretes, on an average 1 to 1.5 litres of urine everyday. On an average, 25-30 gm of urea is excreted out per day.

(150) Answer : (2)
Solution:

On an average, 1100-1200 mL of blood is filtered by the kidneys per minute which constitutes roughly 1/5th of the blood pumped out by each ventricle of the heart in a minute (5040 mL). GFR in a healthy individual is approximately 125 mL/minute, *i.e.*, 180 litres per day. Our lungs remove large amounts of CO_2 (approximately 200mL/ minute) and also significant quantities of water every day.

(151) Answer : (4)

Hint:
Double walled membranous bag is called pericardium.

Solution:
Heart is protected by a double walled membranous bag, pericardium, enclosing the pericardial fluid. Pleural fluid is present between double layered pleura.

(152) Answer : (1)

Solution:
In majority of nephrons, the loop of Henle is too short and extends only very little into the medulla. Such nephrons are called cortical nephrons. In some of the nephrons, the loop of Henle is very long and runs deep into the medulla. These nephrons are called juxta medullary nephrons.

(153) Answer : (2)

Solution:
The outer layer of kidney is a tough capsule. Inside the kidney, there are two zones, an outer cortex and an inner medulla. The medulla is divided into a few conical masses (medullary pyramids) projecting into the calyces (sing.: calyx). The cortex extends in between the medullary pyramids as renal columns called Columns of Bertini.

(154) Answer : (3)

Hint:
Fibrous connective tissue is present in external layer.

Solution:
Each artery and vein consists of three layers; an inner lining of squamous endothelium, the tunica intima, a middle layer of smooth muscle and elastic fibres, the tunica media, and an external layer of fibrous connective tissue with collagen fibres, the tunica externa. The tunica media is comparatively thin in the veins.

(155) Answer : (4)

Hint:
Lymph lacks RBCs.

Solution:
Erythrocytes play a significant role in transport of respiratory gases. Lymphocytes are responsible for immune response of the body. Fat absorption in lacteals takes place through lymph.

(156) Answer : (3)

Hint:
Cardiac output is the volume of blood pumped out by each ventricle per minute.

Solution:
Cardiac output = Stroke volume × Heart rate
For a normal human, cardiac output = 70 mL × 72 beats/minute = 5040 mL/min $\simeq$5 L/min.

(157) Answer : (3)

Hint:
Largest cell of the blood

Solution:
Neutrophils and monocytes are phagocytic in function. Erythrocytes or red blood cells play a significant role in transport of respiratory gases.
Eosinophils resist infections and are also associated with allergic reactions.
Basophils are involved in inflammatory reactions.

(158) Answer : (4)

Solution:
72 cardiac cycles are performed per minute. Our heart beats 72 times per minute normally.

(159) Answer : (3)

Solution:
In pulmonary circulation, deoxygenated blood is oxygenated in the lungs and from the lungs, the oxygenated blood returns to the left atrium.

(160) Answer : (2)

Solution:
In blood, RBC count is 5.5 million/mm^3, WBC count is 6000-8000/mm^3 and platelets are 1.5 – 3.5 lakhs/mm^3.

(161) Answer : (2)

Hint:
These blood vessels carry deoxygenated blood.
Solution:
Blood must pass through pulmonary circulation in order to flow from right atrium to left atrium.

(162) Answer : (3)
Solution:
The body has the ability to alter the stroke volume as well as the heart rate hence, cardiac output too.
Rise in cardiac output is to enhance the supply of nutrients and oxygen to the contracting muscles.
The athlete has to perform more work compared to that of an ordinary man. For performing those physical activities, more blood flow is required.
The cardiac output of an athlete will be much higher than that of an ordinary man.

(163) Answer : (3)
Solution:
Nodal tissue is a part of heart wall itself.

(164) Answer : (3)
Hint:
Indicative of diabetes mellitus
Solution:
Glycosuria is the presence of glucose in urine. Glycosuria and ketonuria are indicative of diabetes mellitus.
Glomerulonephritis is inflammation of glomeruli within the kidney.

(165) Answer : (1)
Solution:
Selective secretion of H^+ and NH_3 occurs in PCT.
Selective secretion of H^+, K^+ and NH_3 occurs in DCT.
Selective secretion of H^+ and K^+ occurs in collecting duct.

(166) Answer : (4)
Solution:
Descending limb of loop of Henle is permeable to water and almost impermeable to electrolytes.

(167) Answer : (4)
Solution:
Antidiuretic hormone or vasopressin is involved in vasoconstriction.
Angiotensin-II causes secretion of ADH and prevent diuresis.

(168) Answer : (3)
Solution:
The process of secretion of metabolic wastes by tubular cells into the filtrate is called tubular secretion. It includes secretion of K^+ , H^+ , ammonia, drugs, toxins, *etc*.

(169) Answer : (4)
Solution:
Dialysing fluid used in haemodialysing unit contains same composition as that of blood plasma but lacks nitrogenous waste products.

(170) Answer : (3)
Solution:
The later phase of ventricular systole causes increased pressure inside them which leads to opening of semilunar valves and flow of blood in aorta and pulmonary artery.

(171) Answer : (1)
Solution:
Thickness of kidney is 2-3 cm. Ureter, blood vessels and nerves enter kidney through hilum.

(172) Answer : (2)
Hint:
Angina is more common in middle-aged and elderly people.
Solution:

Heart failure	– Heart is not pumping blood effectively enough to meet the needs of the body.
Heart attack	– Heart muscle is suddenly damaged by an inadequate blood supply.
Cardiac arrest	– When heart stops beating.
Angina	– Acute chest pain appears when not enough oxygen is reaching to the heart muscles.

(173) Answer : (3)

Solution:

Basophils have S-shaped nucleus and secrete histamine, heparin and serotonin. They are also involved in inflammatory reactions.

(174) Answer : (3)

Solution:

Lizard is a reptile. It has 3-chambered heart and exhibits incomplete double circulation.

(175) Answer : (3)

Solution:

* Reptiles, land snails, birds and insects are uricotelic animals.
* Bony fishes and aquatic amphibians are ammonotelic animals.
* Terrestrial amphibians and marine fishes are ureotelic animals.

(176) Answer : (3)

Solution:

ANF opposes the regulation by RAAS. It can cause vasodilation and thereby decrease the blood pressure.

(177) Answer : (4)

Hint:

It promotes loss of Na^+ from the body.

Solution:

ANF increases Na^+ excretion causing water to be lost along with Na^+, hence its secretion will not occur in case of dehydration. All other hormones given in the options increase absorption of Na^+ directly or indirectly.

(178) Answer : (3)

Solution:

In ureotelic organisms, some amount of urea may be retained in the kidney matrix to maintain a desired osmolarity.

(179) Answer : (1)

Hint:

Lungs remove significant amount of H_2O everyday.

Solution:

Liver is the largest gland in our body. It secretes bile containing substances like bilirubin, biliverdin, cholesterol, degraded steroid hormones, *etc*.

• The primary function of sweat glands is to facilitate cooling effect on the body surface.

(180) Answer : (2)

Solution:

Ammonia produced by metabolism is converted into urea in the liver of ureotelic animals and released into the blood which is filtered and excreted out by the kidneys.