# PACE-IIT & MEDICAL

## ANSWER KEY FOR MAJOR TEST- 01 (FOR 2025 ASPIRANTS) 30th July 2023

| | | | | |
|---|---|---|---|---|
| 1. (1) | 2. (2) | 3. (2) | 4. (2) | 5. (2) |
| 6. (3) | 7. (3) | 8. (2) | 9. (3) | 10. (1) |
| 11. (4) | 12. (4) | 13. (4) | 14. (2) | 15. (1) |
| 16. (3) | 17. (1) | 18. (3) | 19. (4) | 20. (3) |
| 21. (1) | 22. (2) | 23. (2) | 24. (1) | 25. (3) |
| 26. (4) | 27. (1) | 28. (4) | 29. (2) | 30. (3) |
| 31. (3) | 32. (1) | 33. (2) | 34. (3) | 35. (2) |
| 36. (1) | 37. (4) | 38. (1) | 39. (2) | 40. (3) |
| 41. (4) | 42. (4) | 43. (2) | 44. (2) | 45. (2) |
| 46. (1) | 47. (3) | 48. (4) | 49. (2) | 50. (4) |
| 51. (2) | 52. (3) | 53. (2) | 54. (1) | 55. (2) |
| 56. (4) | 57. (3) | 58. (2) | 59. (2) | 60. (4) |
| 61. (4) | 62. (3) | 63. (3) | 64. (4) | 65. (4) |
| 66. (2) | 67. (1) | 68. (4) | 69. (1) | 70. (3) |
| 71. (1) | 72. (2) | 73. (1) | 74. (3) | 75. (1) |
| 76. (4) | 77. (3) | 78. (2) | 79. (4) | 80. (3) |
| 81. (4) | 82. (3) | 83. (2) | 84. (4) | 85. (3) |
| 86. (2) | 87. (4) | 88. (2) | 89. (4) | 90. (3) |
| 91. (1) | 92. (1) | 93. (1) | 94. (1) | 95. (3) |
| 96. (2) | 97. (2) | 98. (2) | 99. (1) | 100. (1) |
| 101. (4) | 102. (4) | 103. (2) | 104. (4) | 105. (1) |
| 106. (2) | 107. (3) | 108. (1) | 109. (3) | 110. (2) |
| 111. (2) | 112. (2) | 113. (4) | 114. (2) | 115. (1) |
| 116. (2) | 117. (2) | 118. (2) | 119. (3) | 120. (1) |
| 121. (4) | 122. (3) | 123. (1) | 124. (4) | 125. (1) |
| 126. (3) | 127. (2) | 128. (2) | 129. (2) | 130. (1) |
| 131. (1) | 132. (4) | 133. (1) | 134. (3) | 135. (2) |
| 136. (3) | 137. (1) | 138. (2) | 139. (2) | 140. (3) |
| 141. (2) | 142. (4) | 143. (2) | 144. (1) | 145. (2) |
| 146. (4) | 147. (1) | 148. (1) | 149. (1) | 150. (1) |
| 151. (2) | 152. (4) | 153. (3) | 154. (3) | 155. (4) |
| 156. (4) | 157. (3) | 158. (4) | 159. (3) | 160. (4) |
| 161. (4) | 162. (1) | 163. (2) | 164. (3) | 165. (3) |
| 166. (1) | 167. (2) | 168. (3) | 169. (1) | 170. (3) |
| 171. (1) | 172. (2) | 173. (1) | 174. (2) | 175. (1) |
| 176. (2) | 177. (2) | 178. (4) | 179. (2) | 180. (1) |
| 181. (2) | 182. (3) | 183. (3) | 184. (2) | 185. (3) |
| 186. (3) | 187. (4) | 188. (4) | 189. (4) | 190. (3) |
| 191. (4) | 192. (2) | 193. (2) | 194. (4) | 195. (4) |
| 196. (3) | 197. (2) | 198. (2) | 199. (3) | 200. (2) |

## Solutions

1. (1)

$\vec{P} = \frac{1}{\sqrt{2}}\hat{i} + \frac{1}{\sqrt{2}}\hat{j} \therefore |\vec{P}| = \sqrt{\left(\frac{1}{\sqrt{2}}\right)^2 + \left(\frac{1}{\sqrt{2}}\right)^2} = 1$

$\therefore$ it is a unit vector.

2. (2)

$\text{From } v^2 = u^2 + 2aS \Rightarrow 0 = u^2 + 2aS$

$\Rightarrow a = \frac{-u^2}{2S} = \frac{-(20)^2}{2\times 10} = -20 m/s^2$

3. (2)

$y = \sqrt{x}\ln x$

$\frac{dy}{dx} = \frac{\ln x}{2\sqrt{x}} + \frac{\sqrt{x}}{x} = \frac{\ln x + 2}{2\sqrt{x}}$

4. (2)

Total time of motion is 2 min 20 sec = 140 sec

As time period of circular motion is 40 sec so in 140 sec. athlete will complete 3.5 revolution i.e., He will be at diametrically opposite point i.e., displacement = 2R

5. (2)

6. (3)

The vertical component of velocity of projection

$= -50\sin 30^\circ = -25 m/s$

$h = ut + \frac{1}{2}gt^2 \Rightarrow 70 = -25t + \frac{1}{2}\times 10t^2$

$\Rightarrow 70 = -25t + 5t^2 \Rightarrow t^2 - 5t - 14 = 0 \Rightarrow t = -2s \text{ and } 7s$

Since, $t = -2s$ is not valid $\therefore t = 7s$

7. (3)

$H = \frac{u^2 \sin^2\theta}{2g}$

According to problem $\frac{u_1^2 \sin^2 45^\circ}{2g} = \frac{u_2^2 \sin^2 60^\circ}{2g}$

$\Rightarrow \frac{u_1^2}{u_2^2} = \frac{\sin^2 60^\circ}{\sin^2 45^\circ} \Rightarrow \frac{u_1}{u_\rightarrow} = \frac{\sqrt{3}/2}{1/\sqrt{2}} = \sqrt{\frac{3}{2}}$

8. (2)

Magnitude of unit vector = 1

$\Rightarrow \sqrt{(0.5)^2 + (0.8)^2 + c^2 = 1}$

9. (3)

$$S_n = u + \frac{a}{2}(2n-1) \Rightarrow 1.2 = 0 + \frac{a}{2}(2\times 6 - 1)$$

$$\Rightarrow a = \frac{1.2\times 2}{11} = 0.218\,m/s^2$$

10. (1)

11. (4)

$$\text{Average speed} = \frac{\text{Total distance}}{\text{Total time}} = \frac{x}{t_1 + t_2}$$

$$= \frac{x}{\frac{x/3}{v_1} + \frac{2x/3}{v_2}} = \frac{1}{\frac{1}{3\times 20} + \frac{2}{3\times 60}} = 36\,km/hr$$

12. (4)

$$\int_0^{\pi/4} \sin x\,dx - \int_0^{\pi/4} \cos x\,dx + \int_0^{\pi/4} \sec^2 x\,dx$$

$$= \left[-\cos x\right]_0^{\pi/4} - \left[\sin x\right]_0^{\pi/4} + \left[\tan x\right]_0^{\pi/4}$$

$$= \frac{-1}{\sqrt{2}} + 1 - \frac{1}{\sqrt{2}} + 1 = 2 - \frac{2}{\sqrt{2}}$$

$$= 2 - \sqrt{2}$$

13. (4)

The given vectors are parallel $\left(\vec{B} = 2\vec{A}\right)$

Hence their cross product is zero. Thus (a) is correct.

$$|\vec{A}| = \sqrt{(3)^2 + (4)^2} = 5$$

$$|\vec{B}| = \sqrt{(6)^2 + (8)^2} = 10$$

(b) is correct

(c) is also correct.

$\vec{A}.\vec{B} = 50.$ thus option (d) is incorrect

14. (2)

15. (1)

$$S_n = u - \frac{a}{2}(2n-1) = 10 - \frac{2}{2}(2\times 5 - 1) = 1\ m$$

16. (3)

$$\frac{dx}{dt} = 2at - 3bt^2 \Rightarrow \frac{d^2x}{dt^2} = 2a - 6bt = 0 \Rightarrow t = \frac{a}{3b}$$

17. (1)

$$v = 3t^2 - 2t + 5$$

$$\Rightarrow dS = 3\int t^2 dt - 2\int t\,dt + 5\int dt$$

$$\left[S\right]_0^S = 3\left[\frac{t^3}{3}\right]_2^3 - 2\left[\frac{t^2}{2}\right]_2^3 + 5\left[t\right]_2^3$$

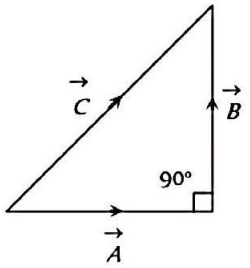
$$S = (27-8) - (9-4) + 5(3-2)$$

$$S = 19 - 5 + 5 = 19$$

18. (3)

$C = \sqrt{A^2 + B^2}$

The angle between A and B is $\frac{\pi}{2}$




19. (4)

Velocity along X-axis $v_x = \frac{dx}{dt} = 2at$

Velocity along Y-axis $v_y = \frac{dy}{dt} = 2bt$

Magnitude of velocity of the particle,

$v = \sqrt{v_x^2 + v_y^2} = 2t\sqrt{a^2 + b^2}$

20. (3)

Given vectors can be rewritten as $\vec{A} = 2\hat{i} + 3\hat{j} + 8\hat{k}$ and $\vec{B} = -4\hat{i} + 4\hat{j} + \alpha\hat{k}$

Dot product of these vectors should be equal to zero because they are perpendicular.

$\therefore \vec{A}.\vec{B} = -8 + 12 + 8\alpha = 0 \Rightarrow 8\alpha = -4 \Rightarrow \alpha - 1/2$

21. (1)

The maximum distance covered by the vehicle before coming to rest = $\frac{v^2}{2a} = \frac{(15)^2}{2(0.3)}$ =375 m

The corresponding time $= t = \frac{v}{a} = \frac{15}{0.3} = 50\text{sec}$

$\therefore$ The distance of the vehicle from the traffic signal after one minute = $400 - 375 = 25\text{m}$

22. (2)

Relative velocity of bird w.r.t train = $25 + 5 = 30\text{m/s}$

Time taken by the bird to cross the train $t = \frac{210}{30} = 7\text{sec}$

23. (2)

Let $\vec{A} = 2\hat{i} + 3\hat{j} - \hat{k}$ and $\vec{B} = -4\hat{i} - 6\hat{j} + \lambda\hat{k}$

$\vec{A}$ and $\vec{B}$ are parallel to each other

$\frac{a_1}{b_1} = \frac{a_2}{b_2} = \frac{a_3}{b_3}$ i.e. $\frac{2}{-4} = \frac{3}{-6} = \frac{-1}{\lambda} \Rightarrow \lambda = 2$

24. (1)

$y = \frac{x^2 + \sec x}{\ln x}$

$\frac{dy}{dx} = \frac{(\ln x)(2x + \sec x \tan x) - \frac{(x^2 + \sec x)}{x}}{(\ln x)^2}$

$\frac{dy}{dx} = \frac{(x \ln x)(2x + \sec x \tan x) - (x^2 + \sec x)}{x \ln^2 x}$

25. (3)

For maximum/minimum value $\frac{dy}{dx}=0\Rightarrow 5(2x)-2(1)+0=0\Rightarrow x=\frac{1}{5}$, Now at $x=\frac{d^2y}{dx^2}=10$ which is positive so y has minimum value at $x=\frac{1}{5}$. Therefore $y_{min}=5\left(\frac{1}{5}\right)^2-2\left(\frac{1}{5}\right)+1=\frac{4}{5}$

26. (4)

$v=u+at=10+2\times 4=18m/sec$

27. (1)

$y=\frac{x^3}{3}-\ln x+4x$

$\frac{dy}{dx}=x^2-\frac{1}{x}+4$

$\frac{d^2y}{dx^2}=2x+\frac{1}{x^2}=2(2)+\frac{1}{(2)^2}$

$\frac{d^2y}{dx^2}=\frac{17}{4}$

28. (4)

$v=\frac{ds}{dt}=3t^2-12t+3$ and $a=\frac{dv}{dt}=6t-12$

29. (2)

Let $\vec{A}.\left(\vec{B}\times\vec{A}\right)=\vec{A}.\vec{C}$

Here $\vec{C}=\vec{B}\times\vec{A}$ which is perpendicular to both vector $\vec{A}$ and $\vec{B}\therefore\vec{A}\vec{C}=0$

30. (3)

31. (3)

We know that $\vec{A}\times\vec{B}=-\left(\vec{B}\times\vec{A}\right)$ because the angle between these two is always $90^o$.

But if the angle between $\vec{A}$ and $\vec{B}$ is 0 or $\pi$. Then

$\vec{A}\times\vec{B}=\vec{B}\times\vec{A}=0$

32. (1)

$S=\int_0^3 vdt=\int_0^3 kt\,dt=\left[\frac{1}{2}kt^2\right]_0^3=\frac{1}{2}\times 2\times 9=9m$

33. (2)

$$\vec{A}\times\vec{B}=\begin{vmatrix}\hat{i} & \hat{j} & \hat{k}\\ 3 & 1 & 2\\ 2 & -2 & 4\end{vmatrix}$$

$=(1\times 4-2\times -2)\hat{i}+(2\times 2-4\times 3)\hat{j}+(3\times -2-1\times 2)\hat{k}$

$=8\hat{i}-8\hat{j}-8\hat{k}$

$\therefore$ Magnitude of $\vec{A}\times\vec{B}=|\vec{A}\times\vec{B}|=\sqrt{(8)^2+(-8)^2+(-8)^2}$

$=8\sqrt{3}$

34. (3)

Let L be the length of escalator.

$\therefore$ Relative speed = $\frac{L}{90}+\frac{L}{60}=\frac{L}{36}$

$\therefore$ Time taken to walk up the moving escalator $=\left(\frac{L}{L/36}\right)=36\text{sec}$

35. (2)

$a=\sqrt{a_x^2+a_y^2}=\left[\left(\frac{d^2x}{dt^2}\right)^2+\left(\frac{d^2y}{dt^2}\right)^2\right]^{\frac{1}{2}}$

Here $\frac{d^2y}{dt^2}=0$. Hence $a=\frac{d^2x}{dt^2}=8\text{m}/\text{s}^2$

36. (1)

Distance travelled = area under the v–t curve

$=\frac{20\times2}{2}+20\times2+20\times1+\frac{20\times1}{2}+\frac{20\times1}{2}$ = 100 m

37. (4)

Total distance $=130+120=250\text{m}$

Relative velocity = $30-(-20)=50\text{m}/\text{s}$

Hence $t=250/50=5\text{s}$

38. (1)

$\int\frac{3x^2+2}{x^3+2x+8}dx$

Let, $P=x^3+2x+8$

$\frac{dP}{dx}=3x^2+2$

$\Rightarrow\frac{3x^2+2}{x^3+2x+8}dx=\int\frac{dP}{P}=\ln P+C$

$=\ln\left(x^3+2x+8\right)+C$

39. (2)

As $S=ut+\frac{1}{2}at^2\ \therefore S_1=\frac{1}{2}a(10)^2=50a$ ....(i)

As v = u + at $\therefore$ velocity acquired by particle in 10 sec

$v=a\times10$

For next 10 sec, $S_2=(10a)\times10+\frac{1}{2}(a)\times(10)^2$

$S_2=150a$ ….(ii)

From (i) and (ii) $S_1 = S_2 / 3$

40. (3)

$\int_0^1 3x^2dx-\int_0^1 2xdx+\int_0^1 4dx$

$=\left[3\left(\frac{x^3}{3}\right)\right]_0^1-\left[2\left(\frac{x^2}{2}\right)\right]_0^1+[4x]_0^1$

$=1-1+4=4$

41. (4)

42. (4)

$\vec{A}\times\vec{B}$ is a vector perpendicular to plane $\vec{A}+\vec{B}$ and hence perpendicular to $\vec{A}+\vec{B}$.

43. (2)

Here v = 144 km / h = 40 m / s

$v = u + at \Rightarrow 40 = 0 + 20\times a \Rightarrow a = 2m/s^2$

$\therefore s = \frac{1}{2}at^2 = \frac{1}{2}\times 2\times 2(20)^2 = 400m$

44. (2)

$$\text{Time} = \frac{\text{Total length}}{\text{Relative velocity}} = \frac{50+50}{10+15} = \frac{100}{25} = 4\text{sec}$$

45. (2)

$$\vec{\tau} = \vec{r}\times\vec{F} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 3 & 2 & 3 \\ 2 & -3 & 4 \end{vmatrix}$$

$$= \left[(2\times 4)-(3\times -3)\right]\hat{i} + \left[(2\times 3)-(3\times 4)\right]\hat{j}$$

$$+\left[(3\times -3)-(2\times 2)\right]\hat{k} = 17\hat{i} - 6\hat{j} - 13\hat{k}$$

46. (1)

Effective speed of the bullet

= speed of bullet + speed of police jeep

$= 180m/s + 45km/h = (180 + 12.5)m/s = 192.5m/s$

Speed of thief's jeep = 153 km/h = 42.5 m/s

Velocity of bullet w.r.t thief's car = 192.5 – 42.5 = 150 m/s

47. (3)

$y = \ln P^2 = 1\ln P$

$\Rightarrow \frac{dy}{dP} = \frac{2}{P}$

$x = \frac{P^3}{3} \Rightarrow \frac{dx}{dP} = P^2 x$

$\frac{dy}{dx} = \frac{dy}{dP}\times\frac{dP}{dx} = \frac{2}{P}\times\frac{1}{P^2} = \frac{2}{P^3}$

48. (4)

Let $|\vec{A}| = |\vec{B}| = a$ then $|\vec{C}| = \sqrt{2}a$

Given that $\vec{A}+\vec{B}+\vec{C} = 0$ or $\vec{A}+\vec{B} = -\vec{C}$

Taking self product, we have

$(\vec{A}+\vec{B}).(\vec{A}+\vec{B}) = (-\vec{C}).(-\vec{C})$ or $A^2 + B^2 + 2\vec{A}\vec{B} = C^2$

$a^2 + a^2 + 2a^2\cos\theta = 2a^2$

$\therefore \cos\theta = 0$ or $\theta = 90^o$

So angle between $\vec{A}$ and $\vec{B} = 90^o$

Again $\vec{B}+\vec{C} = -\vec{A}$

Or $(\vec{B}+\vec{C}).(\vec{B}+\vec{C}) = (-\vec{A}).(-\vec{A})$ or $B^2 + C^2 + 2\vec{B}.\vec{C} = A^2$

or $a^2 + 2a^2 + 2\sqrt{2}a^2\cos\varphi = a^2$

$\cos\varphi = \frac{-1}{\sqrt{2}}$ or $= 135^o$

$\therefore$ angle between $\vec{B}$ and $\vec{C} = 135^o$

Similarly, angle between $\vec{C}$ and $\vec{A}$ is $135^o$

49. (2)

$\vec{A} = \hat{j} + 3\hat{k}, \vec{B} = \hat{i} + 2\hat{j} - \hat{k}$

$$\vec{C} = \vec{A} \times \vec{B} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0 & 1 & 3 \\ 1 & 2 & -1 \end{vmatrix} = -7\hat{i} + 3\hat{j} - \hat{k}$$

Hence area = $\left|\vec{C}\right| = \sqrt{49+9+1} = \sqrt{59}$ sq unit

50. (4)

$R = 4H\cot\theta$, if $R = 4\sqrt{3}H$ then $\cot\theta = \sqrt{3} \Rightarrow \theta = 30^o$

51. (2)

8g of S is present in 100 g

32 g of S is present in $\frac{100}{8} \times 32 = 400$g

$\therefore$ Least molecular mass when the molecule contains one atom of S = 400.

52. A huge difference between $I.E_3$ and $I.E_4$ indicates the presence of 3 valence electrons in the metal.

53. Atomic radius decreases along a period from left to right due to increase in Zeff

54. (1)

For $n = 6$

$6s \rightarrow 4f \rightarrow 5d \rightarrow 6p$

55. (2)

$N_2(g) + 3H_2(g) = 2NH_3(g)$

30L 30L

1L of $N_2$ reacts with 3 L of $H_2$ to give 2L of $NH_3$

Then, $H_2$ is limiting reagent.

10 L of $N_2$ will react with 30 L$H_2$ to form 20 L $NH_3$

Since actual yield is 50%

$\therefore NH_3$ formed $= 10$L

$N_2$ reacted = 5 L, unreacted = 30 – 5 = 25L

$H_2$ reacted = 15L, unreacted = 30 – 5 = 15L

$\therefore$ Mixture will contain, 10 L $NH_3$, 25 L $N_2$ and 15 L $H_2$

56. (4)

(A) $\frac{5}{22.4} \times N_A$ (B) $\frac{0.5}{2} \times N_A$ (C) $\frac{10}{32} \times N_A$ (D) $\frac{15}{22.4} \times N_A$

(D) contains maximum number of atoms

57. Ionisation energy 1st is the energy required to remove an electron from an isolated gaseous atom.

58. (2)

44g of $CO_2$ at STP $= 22.7$L

4.4g of $CO_2$ at STP $= 2.27$L

59. For the conversion $H \rightarrow H^+$ energy will be required to remove the electron.

60. (4)
Vol. of He = 50 = 1
Vol. of $CH_4$ = 50 = 1

$$\frac{\text{No. of molecules of He}}{\text{No. of molecules of } CH_4} = \frac{1}{1}$$

$$\frac{\text{Mass of He}}{\text{Mass of } CH_4} = \frac{4}{16} = \frac{1}{4}$$

% of $CH_4$ in mixture = $\frac{4 \times 100}{5} = 80.0\%$

61. (4)

$$\underset{224g}{PbO} + \underset{73g}{2HCl} \longrightarrow PbCl_2 + H_2O$$

Here, HCl is in excess and therefore, PbO is limiting reactant.
224 g of PbO give = 1 mol of $PbCl_2$

$$\therefore 6.5g \text{ of PbO will give } = \frac{1}{224} \times 6.5$$
$$= 0.029 mol$$

62. no. of Mg atoms in 0.02 gm atoms = 0.02 $N_A$ Energy to ionize 1 atom of $Mg = \frac{x \times 10^3 J}{0.02 N_A}$

63. (3)

$$\underset{\substack{22.4L \\ \text{at N.T.P.}}}{C_3H_8(g)} + \underset{\substack{5\times22.4L \\ \text{at N.T.P.}}}{5O_2(g)} \longrightarrow 3CO_2 + 4H_2O(l)$$

64. Metals lose electrons to form a cation the radius of a cation is always smaller than the neutral atom.

65. (4)

Carbon = 75%
Hydrogen = 100 – 75 = 25%

| Element | % composition | At. mass | Moles of atom | Moles ratio |
|---|---|---|---|---|
| C | 75 | 12 | $\frac{75}{12}$ = 6.25 | $\frac{6.25}{6.25}$ =1 |
| H | 25 | 1 | $\frac{25}{1}$ = 25 | $\frac{25.0}{6.25}$ = 4 |

∴ Empirical formula = $CH_4$.

66. Valence electrons in W = 3
Valence electrons in X = 2
Valency of Y = 2
Valency of Z = 1

67. The given order is correct for $I.E_1$

68. (4)

$$\text{Molarity of solution} = \frac{25.3 \times 1000}{106 \times 250}$$
$$= 0.955 \text{ M}$$

$$Na_2CO_3 \longrightarrow 2Na^+ + CO_3^{2+}$$

$\left[Na^+\right] = 2 \times 0.955M = 1.910M$

$\left[CO_3^{2-}\right] = 0.955M$

69. (1)

$$\text{Moles of urea} = \frac{6.02 \times 10^{20}}{6.02 \times 10^{23}} = 10^{-3}$$

$$\text{Molarity} = \frac{10^{-3}}{100} \times 1000 = 0.01M$$

70.

71. (1)

16.9 % $AgNO_3$ solution means that 16.9 g of $AgNO_3$ is present in 100 mL of solution. 50 mL of solution contains $AgNO_3$

$$= \frac{16.9}{100} \times 50$$

$$= 8.45g$$

or $\frac{8.45}{170} = 0.049mol$

5.8% NaCl solution means that 5.8 g of NaCl is present in 100 mL of solution.
50 mL of solution contains NaCl

$$= \frac{5.8}{100} \times 50 = 2.9g$$

Or $\frac{29}{58.5} = 0.049mol$

$AgNO_3 + NaCl \longrightarrow AgCl + NaNO_3$

1 mol of $AgNO_3$ combines with 1 mol of NaCl to give 1 mol of AgCl
0.049 mol of AgNO3 combines with 0.049
Mol of NaCl to give AgCl

$$= 0.049 mol$$

$$= 0.049 \times 143.5$$

$$= 7g$$

72. Magnetic quantum numbers can take values from $-l$,……O,……..$+l$

73. Down a group the atomic radius increases due to increase in number of shells.

74. The values of 'm' give the no. of orbitals (orientation) in a subshell.

75. (1)

24 g of magnesium require 16 g oxygen

$\therefore$ 0.56 Oxygen requires = $\frac{24}{16} \times 0.56$

$$= 0.84g$$

Amount of magnesium left = $1 - 0.84$

= 0.16 g

76. (4)

$$\text{Size} \propto \text{negative charge} \quad \frac{1}{\text{positive charge}}$$

So correct order is :
$C^- > C > C^+$
$Fe^{+3} < Fe^{+2} < Fe$
$Mn^{+7} < Mn^{+6} < Mn^{+4}$

77. The I.P of Na is more than K due to its smaller size

78. (2)

$E_1 = 2.18\times10^{-18}\text{ J atom}^{-1}$

$E_4 = \dfrac{2.18\times10^{-18}}{16}$

$= 0.136\times10^{-18}\text{ J atom}$

Energy released = $(2.18-0.136)\times10^{-18}\text{ J atom}^{-1}$

$= 2.044\times10^{-18}\text{ J atom}^{-1}$

Now $h\upsilon = E$

$\upsilon = \dfrac{E}{h} = \dfrac{2.044\times10^{-18}}{6.625\times10^{-34}}$

$= 3.08\times10^{15}\text{ s}^{-1}$

79. $r_n = 0.529\times\dfrac{n^2}{Z}$

$\dfrac{A_2}{A_1} = \dfrac{\pi r_2^2}{\pi r_1^2} = \left(\dfrac{\pi\times0.529\times2^2}{\pi\times0.529\times12}\right)^2 = \dfrac{16}{1}r$

80. F is the most electronegative element in the periodic table
Electron affinity of Cl is the highest
Fe can show variable oxidation states due to d electrons
He has inest gas configuration and is the smallest in its group.

81.

82. Moving across a period the basic strength of oxides decreases and acidic strength increases.

83.

84. (4)

According to Bohr postulates

$$m\upsilon r = \frac{nh}{2\pi}$$

Or $\upsilon = \dfrac{nh}{2\pi mr}$

No. of revolutions per sec

$$= \frac{\text{Velocity}}{\text{Circumfrence of the orbit}}$$

$$= \frac{\upsilon}{2\pi r}$$

$$= \frac{nh}{2\pi mr}\times\frac{1}{2\pi r} = \frac{nh}{4\pi^2 mr^2}$$

85. For isoelectronic species the size decreases with decreases in –ve change and increase in +ve change due to increase in Zeff.

86. (2)

$$E \propto \frac{1}{n^2}$$

$$E_2 \propto \frac{1}{4}$$

$$E_4 \propto \frac{1}{16}$$

$$\frac{E_2}{E_4} = \frac{16}{4}$$

$$-\frac{328}{E_4} = 4$$

$$\therefore E_4 = -\frac{328}{4} = -82\,kJ\,mol^{-1}$$

87. (4)

No. of unpaired electrons:

$Cu^{2+}\{Ar]3d^9 = 1$

$Ni^{2+}\{Ar]3d^8 = 2$

$Fe^{3+}\{Ar]3d^5 = 5$

$Cr^{3+}\{Ar]3d^3 = 3$

Correct order of unpaired electrons:

$Fe^{3+} > Cr^{3+} > Ni^{2+} > Cu^{2+}$

88. The $I.E_1$ of Al is lower than Mg due to the higher penetration of S-electrons than P-electrons

89. (4)

$$\Delta x = 0.1\times10^{-10}$$

$$= 10^{-11}\,m$$

$$\Delta\upsilon = \frac{h}{4\pi m\Delta x}$$

$$= \frac{6.626\times10^{-34}}{4\times3.14\times9.11\times10^{-31}\times10^{-11}}$$

$$= 5.79\times10^{6}\,ms^{-1}$$

90. (3)

$$r_n = \frac{52.9n^2}{z}$$

For $He^+$, Z = 2

$$\therefore r_1 = \frac{52.9\times1^2}{2}$$

$$= 26.5pm.$$

91. (1)

$\frac{1}{2}m\upsilon^2 = K.E$

$m\upsilon^2 = 2K.E$

$m^2\upsilon^2 = 2m\,K.E$

or $m\upsilon = \sqrt{2mKE}$

$\therefore \lambda = \frac{h}{m\upsilon} = \frac{6.626\times10^{-34}}{\sqrt{2\times0.5\times1}}$

$= 6.626\times10^{-34}\,m$

92. (1)

$\Delta p = m\Delta\upsilon = 1\times10-18g\,cms^{-1}$

or $\Delta\upsilon = \frac{1\times10^{-18}}{9\times10^{-28}}$

$= 1\times10^{9}\,cms^{-1}$

93. (1)

No. of d-electrons in $Fe^{2+}$ [Ar] $3d^6 = 6$

No. of p-electrons in Cl : $1s^2\ 2s^2\ 2p^6,\ 3s^2\ 3p^5 = 11$

No. of d-electrons in Fe : [Ar] $3d^6 = 6$

No. of p-electrons in Ne : $1s^2\ 2s^2\ 2p^6 = 6$

No. of s-electrons in Mg : $1s^2\ 2s^2\ 2p^6\ 2s^2 = 6$

94. I.E decreases down a group because of addition of new shells which increases the distance between the nucleus and outer electrons.

95. Orbital angular momentum $= \sqrt{l(l+1)}\frac{h}{2\pi}$

96. (2)

Average atomic mass of X

$= 0.9\times200 + 0.08\times199 + 0.02\times202$

$= 180 + 15.92 + 404 = 199.96$

$\approx 200amu$

97. Cu, Ag, Au are used for making coins.

98. (2)

1 m aqueous solution means l mol of solute is present in 1000 g of water

$\therefore$ Moles of solute = 1 mole

Moles of water = $\frac{1000}{18} = 55.55mol$

Mole fraction of solute = $\frac{1}{1+55.55} = 0.0177$

99. The energy required for half mole = $\Delta H$

$\therefore$ For 1 mole $= 2\Delta H$

I.E per atom = $\frac{2\Delta H}{N_A}$

100. (1)

$\Delta x = \Delta p$

Now $\Delta x.\Delta p = \frac{h}{4\pi}$

$$\Delta p.\Delta p = \frac{h}{4\pi}$$

or $(\Delta p)^2 = \frac{h}{4\pi}$

$$\Delta p = \frac{1}{2}\sqrt{\frac{h}{\pi}}$$

or $m\Delta\upsilon = \frac{1}{2}\sqrt{\frac{h}{\pi}}$

$\therefore \Delta\upsilon = \frac{1}{2m}\sqrt{\frac{h}{\pi}}$

101. XI NCERT Pg. 19

102. XI NCERT Pg. 23,24

103. XI NCERT Pg. 26

104. XI NCERT Pg. 23

105. XI NCERT Pg. 23

106. XI NCERT Pg. 4

107. XI NCERT Pg. 23, 24

108. XI NCERT Pg. 19

109. XI NCERT Pg. 10

110. XI NCERT Pg. 20

111. XI NCERT Pg. 21

112. XI NCERT Pg. 20

113. XI NCERT Pg. 24

114. XI NCERT Pg. 11

115. XI NCERT Pg. 24

116. XI NCERT Pg. 11

117. XI NCERT Pg. 23

118. XI NCERT Pg. 12

119. XI NCERT Pg. 26

120. XI NCERT Pg. 11, 12

121. XI NCERT Pg. 21

122. XI NCERT Pg. 10

123. XI NCERT Pg. 26

124. XI NCERT Pg. 25

125. XI NCERT Pg. 6

126. XI NCERT Pg. 19

127. XI NCERT Pg. 27

128. XI NCERT Pg. 27

129. XI NCERT Pg. 21

130. XI NCERT Pg. 11

131. XI NCERT Pg. 23,24

132.

133. XI NCERT Pg. 24

134. XI NCERT Pg. 11

135. XI NCERT Pg. 20

136. XI NCERT Pg. 4

137. XI NCERT Pg. 4

138. XI NCERT Pg. 4

139. XI NCERT Pg. 25

140. XI NCERT Pg. 5

141. XI NCERT Pg. 6

142. XI NCERT Pg. 7

143. XI NCERT Pg. 23

144. XI NCERT Pg. 23

145. XI NCERT Pg. 24

146. XI NCERT Pg. 24

147. XI NCERT Pg. 24

148. XI NCERT Pg. 23

149. XI NCERT Pg. 21

150. XI NCERT Pg. 19

151. XI NCERT pg 49. They possess cell aggregate type of body plan

152.

153. XI NCERT pg 55. Clarias is a bony fish.

154.

155. XI NCERT pg 47,48

156. Saccoglossus- Hemichordates-marine and hence show external fertilisation.

157. Bone-matrix is solid and non-pliable

158. Given animal is Sea horse-bony fish with 2 chambered heart and cycloid scales.

159. XI NCERT pg 104. Pubic symphysis- fibrous cartilage.

160. XI NCERT pg 50,51,52. Pleurobrachia- Ctenophora

161. XI NCERT pg 101,102.Bones provide support to help in movement .

162. Platyhelminthes are endoparasites with incomplete digestive system.

163. Squamous epithelium is mainly involved in diffusion.

164.

165. XI NCERT pg 59. Only birds and mammals heart is 4-chambered to separate deoxygenated blood from oxygenated blood.

166. Bronchioles is lined by ciliated epithelium.

167. XI NCERT pg 57

168. Dog fish is cartilaginous and hence lack air bladder.

169. Schwann cells are type of neuroglial cells.

170. XI NCERT pg 59,60

171. XI NCERT pg 57. Amphibians respire through skin.

172. Areolar is loose connective tissue, vascular and matrix containing fibres.

173. XI NCERT pg 50,51

174. Mammals are mostly viviparous. Reptiles except crocodile have a three-chambered heart. Only bony fishes have gills covered by an operculum

175. XI NCERT pg 56,57

176. XI NCERT pg 53. Arthropods show external segments.

177. Salivary gland is an exocrine gland.

178. XI NCERT pg102,2$^{nd}$ para, last line .Inner lining of ducts of salivary glands has compound epithelium.

179. XI NCERT pg 52. Segmentation seen in Annelids ,arthropods, chordates.Organ system and bilateral symmetry show by many. Setae seen only in annelids for locomotion.

180. XI NCERT pg 104. Chondrocytes –- cartilage

181. All muscles have contractile proteins myosin and actin.

182. XI NCERT pg 49, 52, 53,54

183. XI NCERT pg 104, fibroblasts –connective tissue ,loose or dense

184. XI NCERT pg 52, 53,54. Circulatory system in arthropods is of open type.

185. Blood is a specialised connective tissue which does not contains collagen. The goblet cells of epithelial tissue secretes mucous

186.

187. XI NCERT pg 50

188.

189. XI NCERT pg 51. Fertilisation is external.

190. XI NCERT pg 58. Pinna seen only in mammals.

191. XI NCERT pg 118, 1st line.

192. XI NCERT pg 102, 2nd para

193. XI NCERT pg 50,53,54

194. XI NCERT pg 57

195. Birds show internal fertilization.

196. XI NCERT pg 104

197.

198.

199. Nephron- Simple epithelium.

200. Pheretima is an annelid.