REPEATERS SCREENING TEST - 21-04-24

QUESTION BOOKLET CODE

A

P + C + M - ANSWER KEY

PHYSICS

1. 1 $F \propto q_1 q_2$

Ist case

$q_1 = +7mC$

$q_2 = -5mC$

IInd case

$q_1 = +7\ mC - 2mC = +5mC$

$q_2 = -5mC - 2mC = -7mC$

2. 3 $\tau_{max} = PE = q\,(2l)\,E$

3. 2

4. 4

5. 3 $B = \frac{\mu_0 i}{2\pi r}$

6. 3

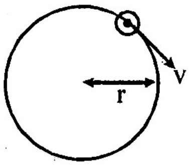
7. 1

Magnetic moment $\mu = niA$

Where n = number of turns of the current loop

i = current; Since the orbiting electron behaves as current loop of current i, we can write

$$i = \frac{e}{T} = \frac{e}{\frac{2\pi r}{v}} = \frac{ev}{2\pi r}$$



A = area of the loop $= \pi r^2$

$$\Rightarrow \mu = (1)\left(\frac{ev}{2\pi r}\right)(\pi r^2) \Rightarrow \mu = \frac{evr}{2}$$

8. 4 $x \alpha \frac{1}{T}$

9. 1

10. 2

11. 2

12. 4

13. 4

14. 4 $C = \sin^{-1}\left(\frac{v_1}{v_2}\right) = \sin^{-1}\left(\frac{1.8\times10^8}{2.4\times10^8}\right) = \sin^{-1}\left(\frac{3}{4}\right)$

15. 1 $$n = \frac{\sin(i)}{\sin\left(\frac{i}{2}\right)} = \frac{2\sin\left(\frac{i}{2}\right)\cos\left(\frac{i}{2}\right)}{\sin\left(\frac{i}{2}\right)};$$

$$n = 2\cos\left(\frac{i}{2}\right); \quad i = 2\cos^{-1}\left(\frac{n}{2}\right)$$

16. 3 $$\sin c = \frac{n_2}{n_1} = \frac{\lambda_1}{\lambda_2}; \quad \sin c = \frac{3500}{7000} = \frac{1}{2} \quad \therefore c = 30^{\circ}$$

17. 3

18. 2 30^0

$tanp = n = \sqrt{3}; p = 60^0$; *At the polarising angle reflected and refracted beams are mutually perpendicular*

19. 2 Slope = *h*/*e*. Here, *h* and *e* are constants. Therefore, the slope is same for all metals and independent of the intensity of incident radiation.

20. 1 We have

$$E_k = hf - hf_0$$

and $$(E_k)' = 2hf - hf_0$$

Therefore, $$\frac{(E_k)' + E_k}{E_k} = \frac{3hf - 2hf_0}{hf - hf_0} = \frac{3f - 2f_0}{f - f_0}$$

$$\frac{(E_k)'}{E_k} = \frac{3f - 2f_0}{f - f_0} - 1 = \frac{3f - 2f_0 - f + f_0}{f - f_0}$$

$$\frac{(E_k)'}{E_k} = \frac{2f - f_0}{f - f_0} = \frac{2f - 2f_0}{f - f_0} + \frac{f_0}{f - f_0}$$

$$\frac{(E_k)'}{E_k} = 2 + \left(\frac{f_0}{f - f_0}\right)E_k$$

Therefore, $$(E_k)' = 2E_k + \left(\frac{f_0}{f - f_0}\right)E_k$$

21. 4 We have

$$\lambda = \frac{h}{mv}$$

$$m_\beta < m_p < m_n < m_\alpha \Rightarrow \lambda_\beta < \lambda_p < \lambda_n < \lambda_\alpha$$

22. 2 $r \propto n^2$

23. 2 No. of spectral lines $= \frac{n(n-1)}{2} = \frac{4(4-1)}{2} = 6$

24. 2 $\text{B.E.} = \Delta mc^2$ and B.E. per nucleons $= \frac{\text{B.E.}}{\text{mass no.}}$

25. 2 $r \propto A^{1/3} \Rightarrow \frac{r_1}{r_2} = \left(\frac{A_1}{A_2}\right)^{1/3}$

$$\Rightarrow \frac{3}{5} = \left(\frac{27}{A}\right)^{1/3} \Rightarrow \frac{27}{125} = \frac{27}{A}$$

$A = 125$

Number of nuclei in atom X = A–52 = 125–52 = 73

26. 2

27. 2 p-type is obtained by doping with trivalent impurity atoms

28. 2

29. 3 The intermediate image in a compound microscope is real, inverted and magnified.

30. 1 $M = \frac{f_o}{f_e} = \frac{200}{5} = 40$

CHEMISTRY

31. 3

32. 2

33. 4

34. 4

35. 1

36. 1

37. 4

38. 1 In $KMnO_4$ Mn is in +7 oxidation state

39. 4

40. 3

41. 3 Only chlorobenzene and bromobenzene are prepared by Sand Meyer’s reaction

42. 3

43. 2

44. 1

45. 3 Carbonyl compounds containing α-hydrogen atom give aldol condensation

46. 4 Lactose and maltose are disaccharides

47. 4

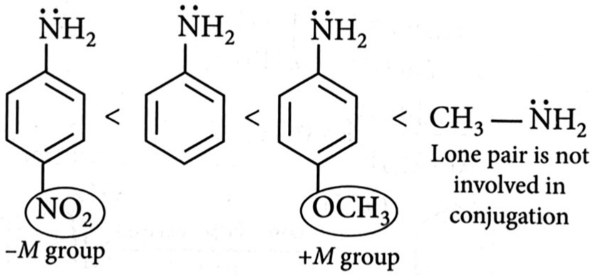
48. 3 D and L have no relation with the optical rotation. Carbohydrate having D-configuration may be either dextrorotatory or laevorotatory e.g., D-(+)-glucose is dextrorotatory while D-(-)–fructose is laevorotatory.

49. 3

50. 2

51. 3

52. 4 Aromatic amines like aniline are less basic than aliphatic amines because of the involvement of lone pair of electrons in resonance with the aromatic ring which now becomes less available for donation. In substituted aromatic amines, electron withdrawing groups decrease the basic character and electron releasing groups increase the basic character.



53. 4
54. 1
55. 2
56. 4 Amines have an unshared pair of electrons on nitrogen atom due to which they behave as Lewis bases
57. 4 Aniline itself does not undergo Friedel-Crafts reaction because amino group of aniline acts as a base and forms salt with Lewis acid, $AlCl_3$ etc, $C_6H_5\overset{\oplus}{N}H_2.AlCl_3^-$

58. 4 We know that, $K_b = \frac{\Delta T_b \times W_1 \times MW_2}{1000 \times W_2}$

For CCl_4; $K_b = \frac{0.201 \times 50 \times 128}{1000 \times 0.2563} = 5.019$

$$MW_2 = \frac{1000 \times K_b \times W_2}{\Delta T_b \times W_1} = \frac{1000 \times 5.019 \times 0.6216}{0.647 \times 50} = 96.44 \text{ g}$$

59. 2 The solution containing *n*-heptane and ethanol shows non-ideal behaviour with positive deviation from Raoult's law. This is because the ethanol molecules are held together by strong H-bonds, however the forces between *n*-heptane and ethanol are not very strong, as a result they easily vapourise showing higher vapour pressure than expected.

60. 4

BIOLOGY

61. 4
62. 2

63.	1
64.	3
65.	4
66.	2
67.	1
68.	2
69.	2
70.	1
71.	4
72.	2
73.	2
74.	2
75.	3
76.	4
77.	3
78.	1
79.	1
80.	4
81.	4
82.	2
83.	3
84.	1
85.	2
86.	2
87.	4
88.	2
89.	3
90.	1

MATHEMATICS

91.	3
92.	4
93.	2
94.	3
95.	4
96.	2
97.	1
98.	3
99.	1
100.	1
101.	1
102.	1
103.	1
104.	3
105.	2
106.	4
107.	1
108.	2

109. 1
110. 4
111. 1
112. 3
113. 4
114. 1
115. 2
116. 1
117. 4
118. 4
119. 1
120. 2