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Aakash National Talent Hunt Exam 2021
(For Class XII Studying moving to XII Passed)

SAMPLE PAPER

Time : 1 Hour

ANSWERS

MM : 90

Physics	Chemistry	Mathematics
1. (2)	12. (2)	23. (4)
2. (4)	13. (2)	24. (3)
3. (2)	14. (2)	25. (4)
4. (3)	15. (1)	26. (3)
5. (1)	16. (3)	27. (2)
6. (1, 3)	17. (1, 2, 3, 4)	28. (2)
7. (1, 3)	18. (1, 3, 4)	29. (1, 2, 3)
8. (2)	19. (1)	30. (2, 3)
9. (3)	20. (2)	31. (2, 3)
10. (3)	21. (1)	32. (3)
11. A → (Q)	22. A → (P, Q)	33. (4)
B → (P)	B → (P, R)	34. (1)
C → (P)	C → (P, S)	35. A → (Q)
D → (R)	D → (P)	B → (S)
		C → (R)
		D → (Q)



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PHYSICS

1. Answer (2)

$$\frac{q^2}{4\pi\epsilon_0 d^2} = qE_0$$

2. Answer (4)

$$I = \frac{V_0}{R} e^{-t/RC}$$

$$\frac{2V_0}{3R} = \frac{V_0}{R} e^{-t/RC}$$

$$t_0 = RC \ln \left[\frac{3}{2} \right]$$

3. Answer (2)

$\vec{F} \perp \vec{v}$, path will be circular.

4. Answer (3)

$$I = a - bt$$

$$Q = \int_0^{t_0} (a - bt) dt$$

$$t_0 = \frac{a}{b}$$

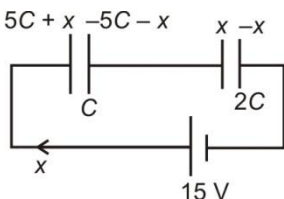
$$Q = \frac{a^2}{2b}$$

5. Answer (1)

$$\tan \phi = \frac{X_L - X_C}{R} = 1$$

$$\phi = \frac{\pi}{4}$$

6. Answer (1, 3)



$$\frac{5C + x}{C} + \frac{x}{2C} = 15$$

$$\Rightarrow x = \frac{20}{3}C$$

7. Answer (1, 3)

$$\tau = \frac{1}{R} = \frac{1}{2}$$

$$I = 5(1 - e^{-\frac{R}{L}t})$$

$$I = 5\left(1 - \frac{1}{4}\right) = \frac{15}{4} \text{ A}$$

8. Answer (2)

9. Answer (3)

Solution for Q. Nos. 8 & 9

$$Q = \int_0^R 4\pi r^2 ar^2 dr$$

$$Q = \frac{4\pi a R^5}{5}$$

$$a = \frac{5Q}{4\pi R^5}$$

$$E \cdot 4\pi \frac{R^2}{4} = \frac{4\pi \times 5Q}{4\pi R^5 \times 5} \times \frac{R^5}{32}$$

$$E = \frac{Q}{32\pi\epsilon_0 R^2}$$

10. Answer (3)

Theoretical

11. Answer A(Q); B(P); C(P); D(R)

Apply principle of superposition.

CHEMISTRY

12. Answer (2)

Cu^{2+} and Fe^{3+} are paramagnetic, while MnO is anti-ferromagnetic.

13. Answer (2)

\therefore Vapour pressure of solution B is lesser than that of A.

\therefore Solute in solution A is lesser.

$$P^\circ - P_S \propto x_B$$

14. Answer (2)

MnO_2 is the catalyst for the reaction.

15. Answer (1)

The correct order of electronegativity is $\text{O} > \text{S} > \text{Se} > \text{Te} > \text{Po}$

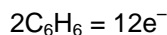
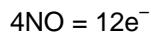
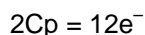
16. Answer (3)

Mn^{2+} is pink

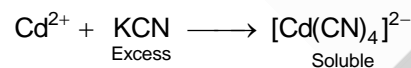
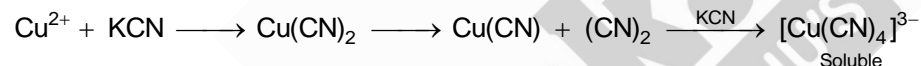
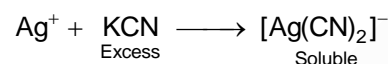
$E_{\text{Mn}^{+3}/\text{Mn}^{+2}}^0$ is positive

It is paramagnetic

17. Answer (1, 2, 3, 4)



18. Answer (1, 3, 4)



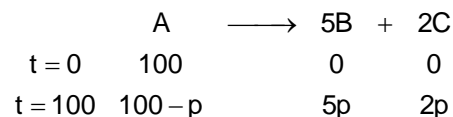
19. Answer (1)

By considering the stoichiometry it can be predicted that 1 mole of A will give 7 moles of the products at the end of the reaction.

\therefore 100 mmHg pressure of A will give 500 mmHg of B and 200 mmHg of C.

20. Answer (2)

$$Kt = \ln \frac{P_0}{P_0 - P}$$



$$100 + 6p = 200$$

$$p = \frac{100}{6}$$

$$K \times 100 = \ln \frac{100}{100 - \frac{100}{6}}$$

$$K = \frac{1}{100} \ln \frac{6}{5}$$

21. Answer (1)

Frequency of light absorbed depends upon the magnitude of CFSE.

22. Answer A(P, Q); B(P, R); C(P, S); D(P)

$$E_{\text{cell}}^{\circ} = 0$$

$$E_{\text{cell}} = -\frac{0.06}{2} \log \frac{[\text{H}^+]_{\text{anode}}^2 P_{\text{H}_2, \text{cathode}}}{[\text{H}^+]_{\text{cathode}}^2 P_{\text{H}_2, \text{anode}}}$$

For weak acid

$$\begin{array}{l} [\text{H}^+] = C\alpha \\ K_a = C\alpha^2 \end{array} \quad \left| \begin{array}{l} \alpha = \sqrt{\frac{K_a}{C}} \\ C\alpha = \sqrt{C.K_a} \end{array} \right.$$

$$(A) E_{\text{cell}} = -\frac{0.06}{2} \log \frac{[10^{-3}]^2 \times 1}{(0.1)^2 \times 2} = 0.13 \text{ V}$$

$$(B) E_{\text{cell}} = -0.06 \log \frac{10^{-3}}{10^{-4}} = -0.06 \text{ V}$$

$$(C) E_{\text{cell}} = -0.06 \log \frac{10^{-4} \times 2}{10^{-1} \times 2} = 0.18 \text{ V}$$

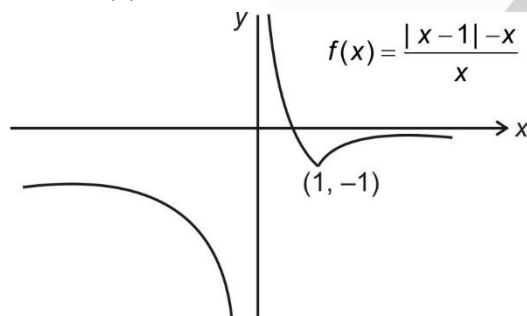
$$(D) E_{\text{cell}} = -0.06 \log \frac{10^{-4} \times 2}{10^{-4} \times 2} = 0$$

MATHEMATICS

23. Answer (4)

(2, 2), (3, 3) and (2, 1) to be added.

24. Answer (3)



i.e., non-differentiable at $x = 1$

25. Answer (4)

$$f(x) = \sin 2x + \cos x$$

$$f'(x) = 2\cos 2x - \sin x$$

$$f'\left(\frac{\pi}{3}\right) = 2\cos \frac{2\pi}{3} - \sin \frac{\pi}{3} = -1 - \frac{\sqrt{3}}{2}$$

26. Answer (3)

$$\frac{dy}{dx} = \sec^2 x \Big|_{x=\frac{\pi}{4}} = 2$$

$$\therefore T \equiv y - 1 = 2\left(x - \frac{\pi}{4}\right)$$

For x-intercept, $y = 0$

$$\Rightarrow x = \frac{\pi}{4} - \frac{1}{2}$$

27. Answer (2)

$$\int \frac{\cot x}{\sqrt{\sin x}} dx = \int \frac{\cos x}{(\sin x)^{3/2}} dx$$

Put $\sin x = t$

$$\cos x dx = dt$$

$$\Rightarrow \int \frac{dt}{t^{3/2}} = \frac{-2}{\sqrt{\sin x}} + c$$

28. Answer (2)

$$I = \int_{-1}^0 (x^3 - x) dx + \int_0^1 (x - x^3) dx$$

$$= \left(\frac{x^4}{4} - \frac{x^2}{2} \right) \Big|_{-1}^0 + \left(\frac{x^2}{2} - \frac{x^4}{4} \right) \Big|_0^1$$

$$= 0 - \left(\frac{1}{4} - \frac{1}{2} \right) + \left(\frac{1}{2} - \frac{1}{4} \right) - 0$$

$$= \frac{1}{4} + \frac{1}{4} = \frac{1}{2}$$

29. Answer (1, 2, 3)

$$A = \int_0^1 2\sqrt{x} dx = \frac{2x^{3/2}}{\frac{3}{2}} \Big|_0^1 = \frac{4}{3}$$

30. Answer (2, 3)

$$f'(x) = \frac{2(x^2 - 1)}{(x^2 + x + 1)^2} > 0$$

$$\Rightarrow x \in (-\infty, -1) \cup (1, \infty)$$

31. Answer (2, 3)

$$|A| = 6 - 4 = 2 = |\text{adj}(A)|$$

$$\det(A^{-1}) = \frac{1}{2}$$

32. Answer (3)

33. Answer (4)

Solution for Q. Nos. 32 & 33

$$A = 4\pi R^2$$

$$\frac{dA}{dt} = 8\pi R \frac{dR}{dt} = 160\pi \text{ cm}^2/\text{s}$$

$$V = \frac{4}{3}\pi R^3 = 4\pi R^2 \frac{dR}{dt} = 400\pi \text{ cm}^3/\text{s}$$

34. Answer (1)

As $\tan x \in R$ and domain of $\tan^{-1}x$ is $x \in R$

We have, $\tan \tan^{-1}x = x \forall x \in R$

35. Answer A(Q); B(S); C(R); D(Q)

(A) $2I = \frac{\pi}{2} \Rightarrow I = \frac{\pi}{4}$

(B) $x = \frac{\pi}{8}$

(C) $\det(A) = \frac{\pi}{2} - \frac{\pi}{3} = \frac{\pi}{6}$

(D) $\frac{\pi}{2} - \frac{\pi}{4} = \frac{\pi}{4}$



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