

IIT JEE 2011

Part 1 Chemistry

1. Correct Answer: (D)

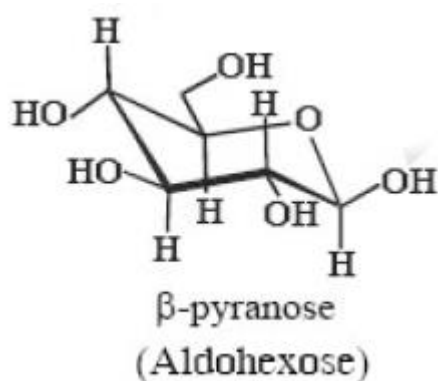
Haematite Fe_2O_3

oxidation State of Fe = III

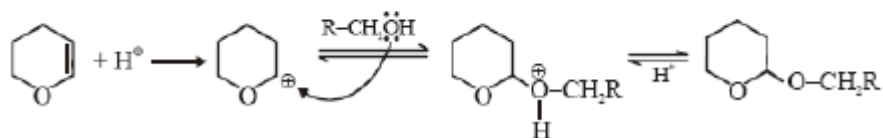
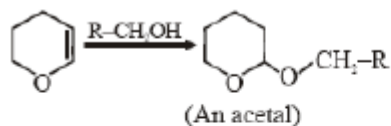
Magnetite Fe_3O_4 ($\text{FeO} \cdot \text{Fe}_2\text{O}_3$)

oxidation State of Fe = II, III

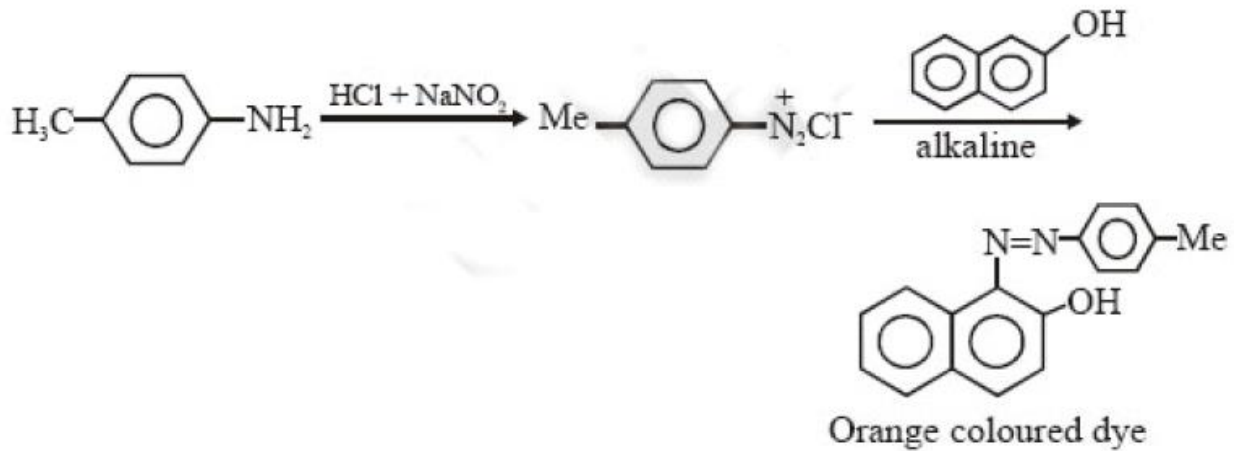
2. Correct Answer: (B)



3. Correct Answer: (B)



4. Correct Answer: (C)



5. Correct Answer: (A)

$$\begin{aligned} \Delta T_f &= m \times K_f \times i \\ &= \frac{0.1/329}{100} \times 1000 \times 1.86 \times 4 \\ &= 0.02261 \\ &= 2.3 \times 10^{-2} \\ T_f &= 0 - \Delta T_f = -2.3 \times 10^{-2} \text{ } ^\circ\text{C} \end{aligned}$$

6. Correct Answer: (D)

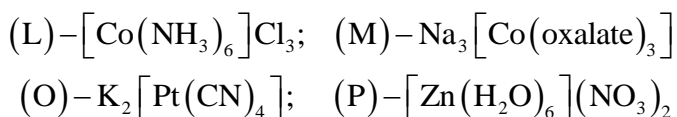
$$\begin{aligned} 2\text{Fe}_{(s)} + \text{O}_{2(g)} + 4\text{H}^+_{(aq)} &\rightarrow 2\text{Fe}^{2+}_{(aq)} + 2\text{H}_2\text{O}(\ell) \\ E &= E^\circ - \frac{0.06}{n} \log \frac{[\text{Fe}^{2+}]}{P_{\text{O}_2} \cdot [\text{H}^+]^4} \\ &= 1.67 - \frac{0.06}{4} \log \frac{(10^{-3})^2}{0.1 \times (10^{-3})^4} \\ E &= 1.67 - \frac{0.06}{4} \log 10^7 \\ &= 1.67 - \frac{0.06}{4} \times 7 \\ &= 1.67 - \frac{0.06}{4} \times 7 \\ &= 1.67 - 0.105 \\ &= 1.565\text{V} \\ \square & 1.57\text{V} \end{aligned}$$

7. Correct Answer: (A)

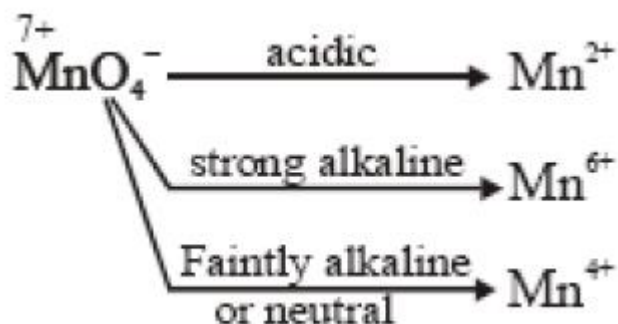
CuS and HgS will be precipitated when H₂S is passed through aqueous solution containing Mn²⁺, Ni²⁺, Cu²⁺ and Hg²⁺ ions in acidic medium.

8. Correct Answer: (C)

Diamagnetic complexes are-



9. Correct Answer: (A,C,D)



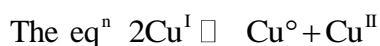
10. Correct Answer: (A,B,D)

$$A_t = A_0 e^{-kt}$$

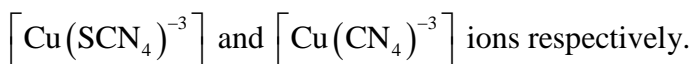
for option (D) $\frac{1}{t_{1/2}} \ln \frac{100}{50} = \frac{1}{t_{99.6\%}} \ln \frac{100}{0.4}$

$$\frac{t_{99.6}}{t_{1/2}} = \frac{\ln 250}{\ln 2} = 7.965 \approx 8$$

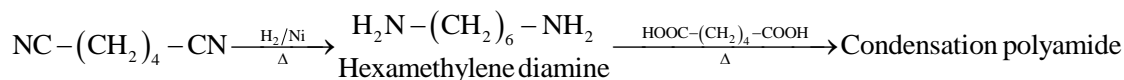
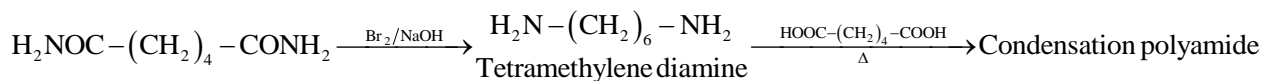
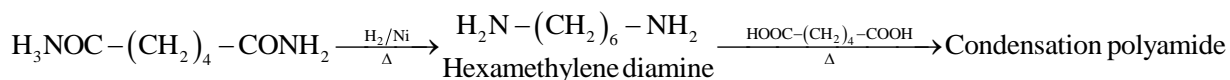
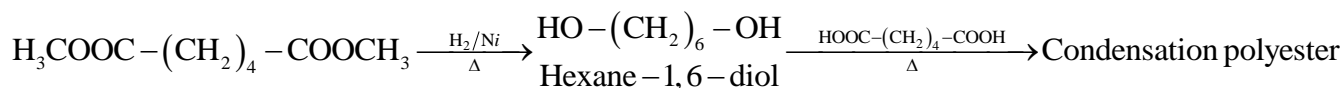
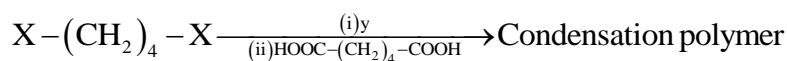
11. Correct Answer: (B,C,D)



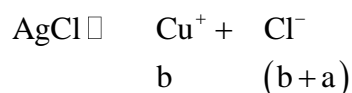
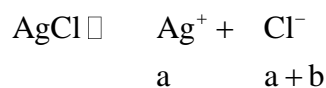
shifts towards left in the presence of Cl⁻, SCN⁻, and CN⁻ due to formation of CuCl(ppt).



12. Correct Answer: (A,B,C,D)



13. Correct Answer: (7)



$$\frac{K_{\text{sp}}(\text{AgCl})}{K_{\text{sp}}(\text{CuCl})} = \frac{a(a+b)}{b(b+a)} = \frac{a}{b} = \frac{[\text{Ag}^+]}{[\text{Cu}^+]} = \frac{1.6 \times 10^{-10}}{10^{-6}} = 1.6 \times 10^{-4}$$

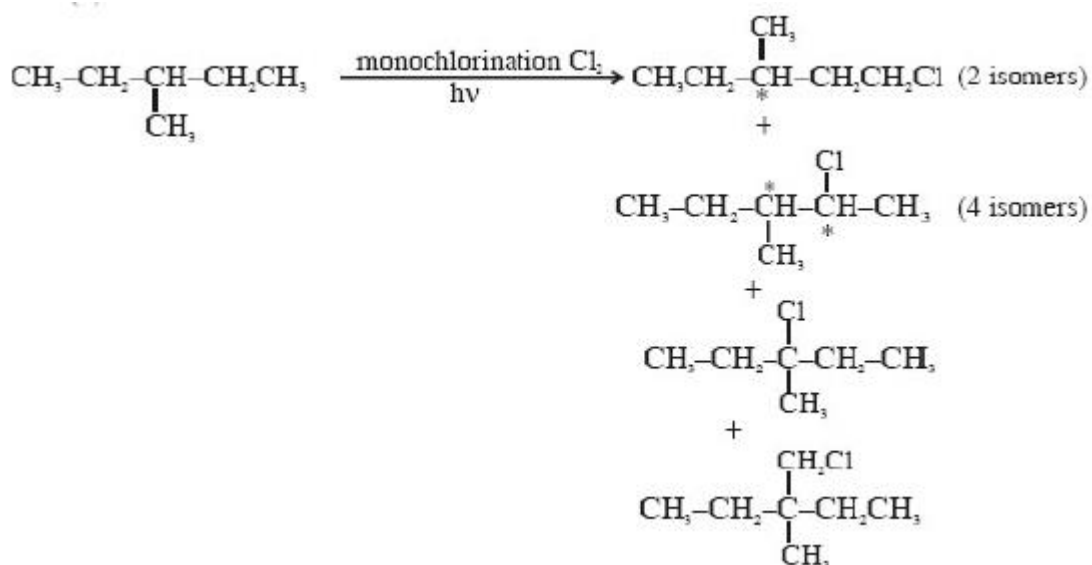
Since $a \ll b$
 $\therefore b^2 = 10^{-6} \Rightarrow b = 10^{-3}$

and $a \times b = 1.6 \times 10^{-10}$

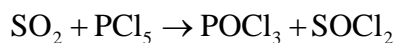
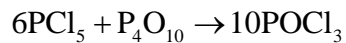
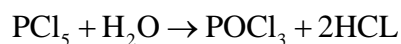
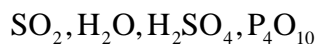
$$a = 1.6 \times 10^{-7} = 1.6 \times 10^{-x}$$

so $x = 7$

14. Correct Answer: (8)



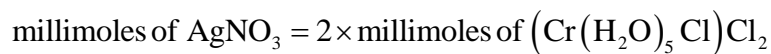
15. Correct Answer: (4)



16. Correct Answer: (8)

In a truncated octahedron, there are 14 faces (8 regular hexagonal and 6 square). 36 edges and 24 vertices.

17. Correct Answer: (6)

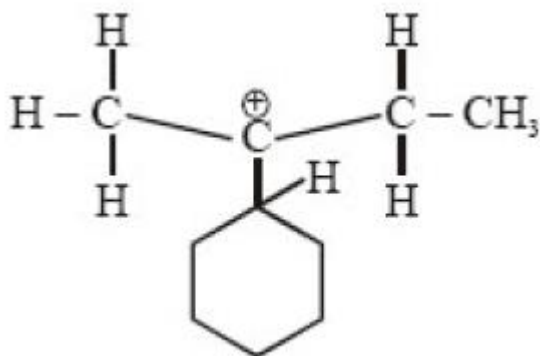


$$0.1 \times V = 30 \times 2 \times 0.1 = 0.6$$

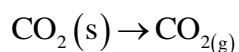
$$V = 6\text{mL}$$

18. Correct Answer: (6)

The contributing hyperconjugating structures (involving C–H bonds) are = 6 No. of α -H = 6



19. Correct Answer: (A) → (p, r, s); (B) → (r, s); (C) → (t); (D) → (q, t)



phase transition

$$\Delta H > 0, \Delta S > 0$$

20. Correct Answer: (A) → (r,s,t); (B) → (p,s,t); (C) → (r,s); (D) → (q, r)

21. Correct Answer: (C)

When $\theta = 0^\circ$, maximum light is transmitted. At $\theta > \theta_c$ (critical angle), no further light is transmitted

22. Correct Answer: (A)

Time period of spring block system depends on spring constant and mass of block.

On applying electric field only the equilibrium position gets shifted.

23. Correct Answer: (C)

$$= P \frac{M}{\frac{4}{3}\pi r^3}, 100 \times \frac{\Delta P}{P} = \left(\frac{\Delta}{M} + \frac{3\Delta r}{r} \right) \times 100$$

$$\Delta r = \text{least count} = 0.01 \Rightarrow r = 2.72$$

$$\frac{\Delta P}{P} \times 100 = 2\% + \left(3 \times \frac{0.01}{2070} \right) \times 100 = 3.1\%$$

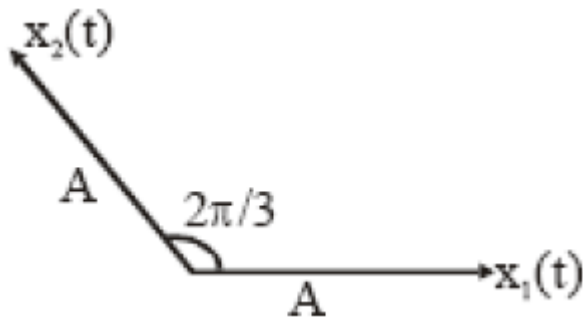
24. Correct Answer: (D)

$$0.01V = 0.2u + 0.01 \times u$$

Time of flight $t = 1s$; Range for ball $= u \times t \Rightarrow u = 20 \text{ m/s}$

25. Correct Answer: (C)

26. Correct Answer: (B)



$$x_1(t) + x_2(t) + x_3(t) = 0$$

$x_3(t)$ has to be such that resultant is zero

So it should make $\frac{4\pi}{3}$ from $x_1(t)$ anticlockwise.

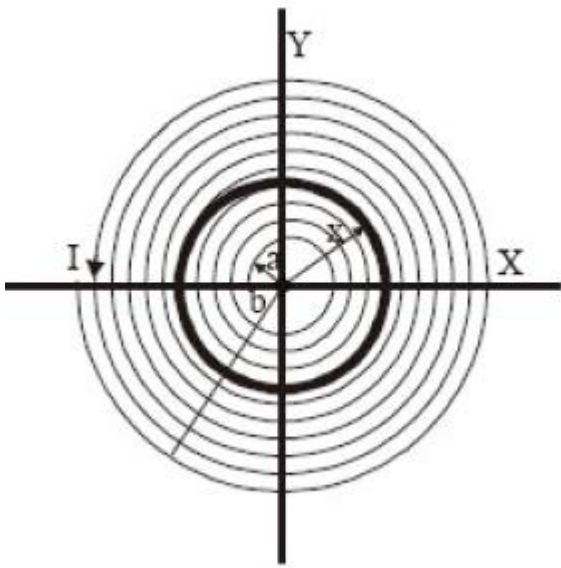
27. Correct Answer: (A)

Taking an elemental strip of radius x and width dx

$$\text{Area of strip} = 2\pi x dx$$

$$\text{Number of turns through area} = \frac{N}{b-a} dx$$

$$\int dB = \int_a^b \frac{\mu_0 \frac{N}{(b-a)} I dx}{2x} = \frac{\mu_0 N I \ln\left(\frac{b}{a}\right)}{2(b-a)}$$



28. Correct Answer: (B)

KE of object $\frac{1}{2}mv^2$ when it moves with satellite ; PE of object $= -mv^2$

At the time of ejection $KE + PE = 0$ to make it escape from gravitational pull.

$KE = mv^2$.

