IIT-JEE-2012

PAPER-1

CHEMISTRY

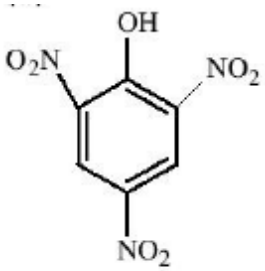
21. Sol. (B)

$$X = 8\times\frac{1}{8}+6\times\frac{1}{2}=4$$

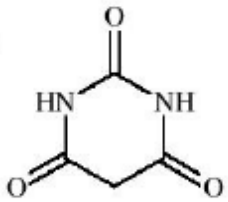
$$M = 4\times\frac{1}{4}+1=2$$

So, unit cell formula of the compound is M_2X_4 and the empirical formula of the compound is MX_2.

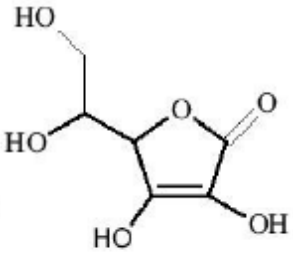
22. Sol. (D)



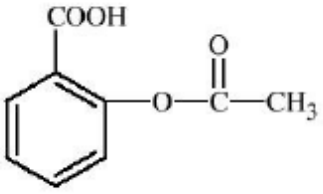
(Picric Acid)



(Barbituric Acid)



(Ascorbic Acid)



(Asprin)

23. Sol. (D)

$$\left[Co\left(H_2O\right)_4\left(NH_3\right)_2\right]Cl_3$$

Diarnminetetraaquacobalt (III) chloride

24. Sol. (B)

$$\overset{sp^2}{H_2C}=\overset{sp}{C}=\overset{sp^2}{CH_2}$$

25. Sol. (C)

As per Bohr's postulate,

$$mvr=\frac{nh}{2\pi}$$

So, $v=\frac{nh}{2\pi mr}$

$$KE=\frac{1}{2}mv^2$$

So, $KE=\frac{1}{2}m\left(\frac{nh}{2\pi mr}\right)^2$

Since, $r=\frac{a_0\times n^2}{z}$

So, for 2^{nd} Bohr orbit

$$r=\frac{a_0\times 2^2}{1}=4a_0$$

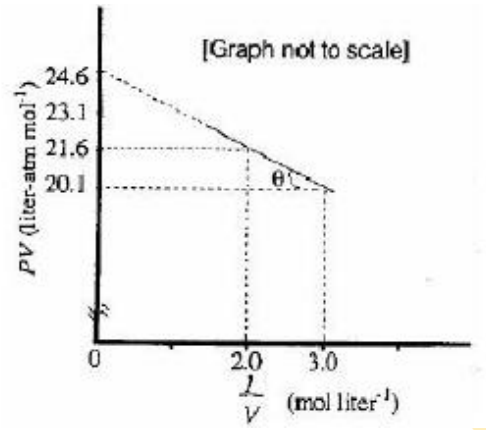
$$KE=\frac{1}{2}m\left(\frac{2^2h^2}{4\pi^2m^2\times\left(4a_0\right)^2}\right)$$

$$KE=\frac{h^2}{32\pi^2ma_0^2}$$

26. Sol. (B)

$\overset{+5}{HNO_3}, \overset{+2}{NO}, \overset{0}{N_2}, \overset{-3}{NH_4Cl}$

27. Sol. (C)



Van der Waal equation for 1 mole pf real gas is,

$$\left(P+\frac{a}{V^2}\right)(V-b)=RT$$

But, $b=0$ (given)

$$\Rightarrow\left(P+\frac{a}{V^2}\right)(V)=RT$$

$$\therefore PV=-a\times\frac{1}{V}+RT \quad \text{K (i)}$$

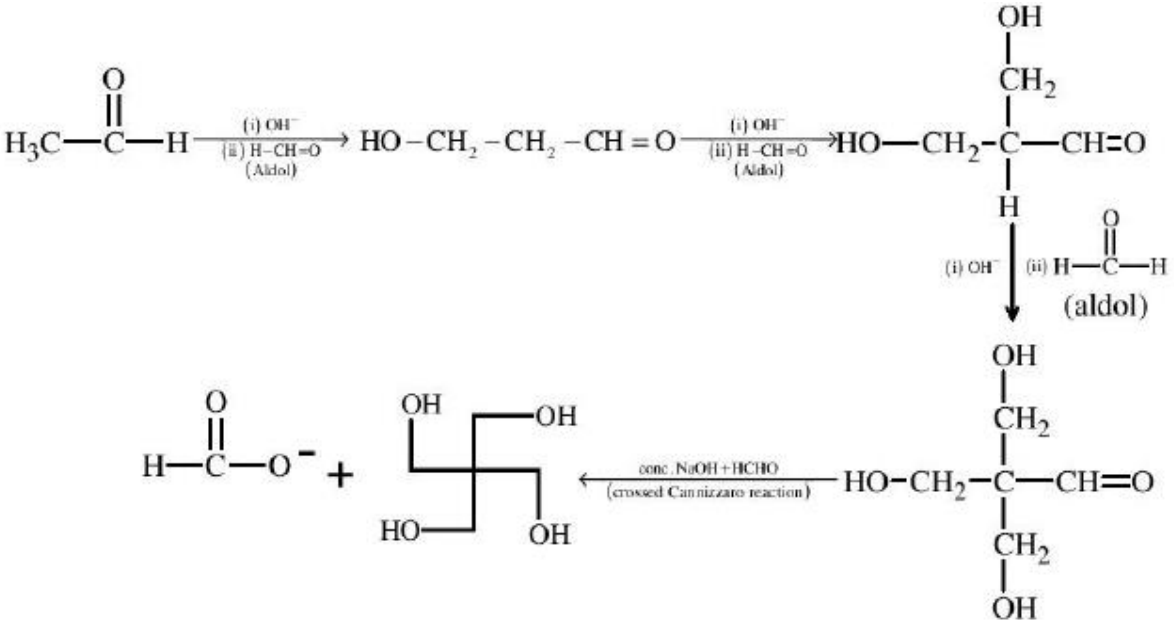
$y=mx+c$

$Slope=\tan(\pi-\theta)=-a$

So, $\tan\theta=a=\frac{21.6-20.1}{3-2}=1.5$

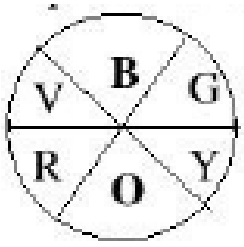
Or, $\tan\theta=\frac{24.6-20.1}{3-0}=1.5$

28. Sol. (C)

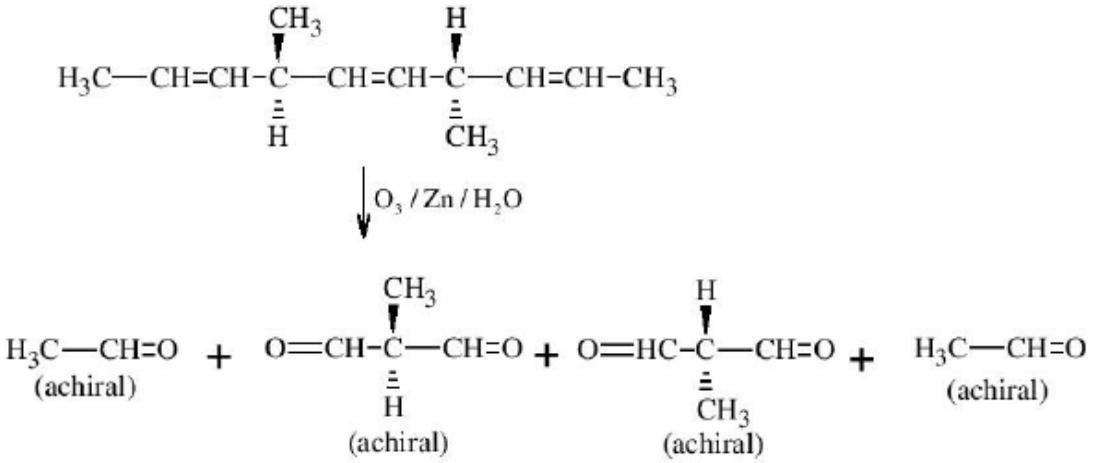


29. Sol. (A)

Aqueous solution of copper sulphate absorbs orange red light and appears blue (complementary colour)



30. Sol. (A)



31. Sol. (A, C, D)

$$HX+AgNO_3 \rightarrow AgX\downarrow +HNO_3 \left(X=Cl, Br, I\right)$$

$$AgX+2Na_2S_2O_3 \rightarrow Na_3\left[Ag\left(S_2O_3\right)_2\right]+NaX$$

32. Sol. (B,D)

(A) Both are soluble in $NaOH$, hence **inseparable.**

(B) Only benzoic acid $\left(C_6H_5COOH\right)$ is soluble in $NaOH$ and $NaHCO_3$, while benzyl alcohol $\left(C_6H_5CH_2OH\right)$ is not. Hence, **separable.**

(C) Although *NaOH* can enable separation between benzyl alcohol $\left(C_6H_5CH_2OH\right)$ and phenol $\left(C_6H_5OH\right)$ as only the later is soluble in $NaOH$. However, in $NaHCO_3$, both are insoluble. Hence, **inseparable**.

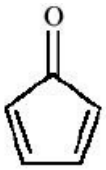
(D) α-phenyl acetic acid $\left(C_6H_5CH_2COOH\right)$ is soluble in $NaOH$ and $NaHCO_3$. While benzyl alcohol $\left(C_6H_5CH_2OH\right)$ is not Hence, **separable.**

33. Sol. (A, C)

$\Delta S_{x\to z} = \Delta S_{x\to y} + \Delta S_{y\to z}$ [entropy(S) is a state function, hence additive]

$w_{x\to y\to z} = w_{x\to y}$ (work done in $Y \to Z$ is zero as it is an isochoric process)

34. Sol. (B, C)

Compound  and  being antiaromatic are unstable at room temperature.

35. Sol. (A, D)

Lyophobic colloids are stable due to preferential adsorption of ions on their surface from solution and potential difference between the fixed layer and the diffused layer of opposite charges around the colloidal particles that makes lyophobic sol stable.

36. Sol. (8)

Stock solution of HCl $= 29.2\%(w/w)$

$$\textit{Molarity of stock of HCL} = \frac{29.2\times1000\times1.25}{36.5\times100}$$

If volume of stock solution required $= V$ ml

$$V\times\frac{29.2}{36.5}\times\frac{1000}{80} = 200\times0.4$$

$$\Rightarrow V = 8\,\text{ml}$$

37. Sol. (4)

Peptides with isoelectric point $(pI) > 7$, would exist as cation in neutral solution $(pH = 7)$. IV, VI, VIII and IX

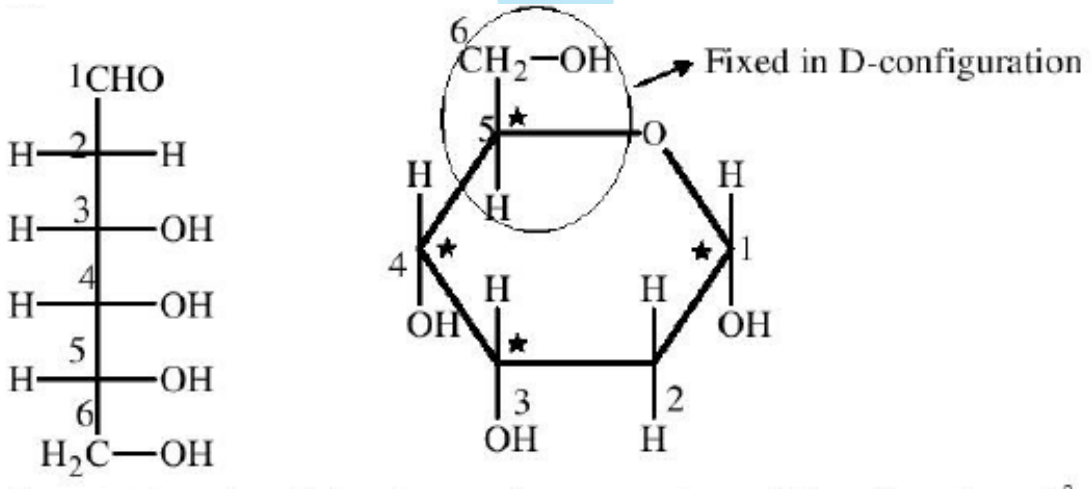
38. Sol. (9)

$$t_{1/8} = \frac{2.303 \log 8}{k} = \frac{2.303 \times 3 \log 2}{k}$$

$$t_{1/10} = \frac{2.303}{k} \log 10 = \frac{2.303}{k}$$

$$\left[\frac{t_{1/8}}{t_{1/10}}\right] \times 10 = \frac{\left(\frac{2.303 \times 3 \log 2}{k}\right)}{\left(\frac{2.303}{k}\right)} \times 10 = 9$$

39. Sol. (8)



Hence *total number of stereoisomers in pyranose form of* $D-$*configuration* $= 2^3 = 8$

40. Sol. (8)

$${}^{63}_{29}Cu + {}_{1}H^{1} \rightarrow 6\,{}_{0}n^{1} + {}^{4}_{2}He + 2\,{}_{1}H^{1} + {}^{A}_{z}X$$

Mass number: $63+1=1\times6+4+1\times2+A$

$A=64-12=52$

Atomic number: $29+1=6\times0+2+2\times1+Z$

$Z=30-4=26$

${}^{A}_{Z}X={}^{52}_{26}Fe$

Hence X is in group '8 ' in the periodic table.