# JEE MAIN SEP 2020 (MEMORY BASED) | 3RD Sep. SHIFT-1

**Note: The answers are based on memory based questions which may be incomplete and incorrect.**

**1.** Find atomic number of unnilennium.

(1) 101 (2) 107 (3) 109 (4) 119

Ans. (3)

Sol. 1 + 0 + 9 = 109

un + nil + enn + ium = unnilennium

**2.** Gas released when Au and Pt are dissolved aqua-regia.

(1) NO (2) $N_2$ (3) $N_2O_3$ (4) $N_2O_5$

Ans. (1)

Sol. $Au + 4H^+ + NO_3^- + 4Cl^- \longrightarrow AuCl_4^- + NO + 2H_2O$

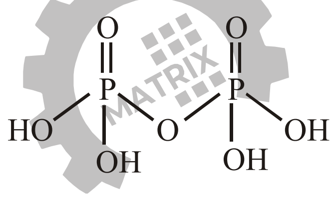
$3Pt + 16H^+ + NO_3^- + 18Cl^- \longrightarrow 3PtCl_6^{2-} + 4NO + 8H_2O$

**3.** In Pyrophoshoric acid how many P = O, P–OH and P–O–P bonds are present.

(1) 4, 2, 1 (2) 2, 4, 1 (3) 3, 0, 2 (4) 2, 2, 1

Ans. (2)

Sol.




**4.** How glycerol can be separated in soap industry.

(1) Distillation under reduced pressure (2) Fractional distillation

(3) Differential extraction (4) Steam distillation

Ans. (1)

Sol. Glycerol can be separated from spent lye in soap industry by distillation under reduced pressure.

**5.** Thermal power plants leads to

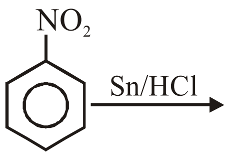
(1) Acid rain (2) Depletion of ozone layer

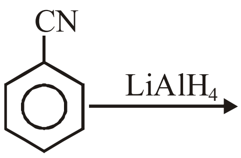
(3) Eutrophication (4) Blue baby syndrome

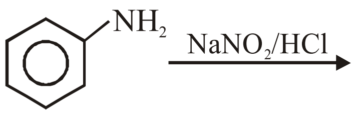
Ans. (1)

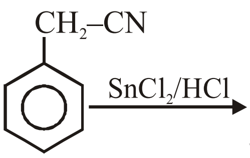
Sol. Acid rain is by product of activities that emit oxides of S/N by burning fossil fuels in thermal power plants.

**6.** Product of which of the following reaction is not determined by kjeldahl method.

(a) 


(b) 


(c) 


(d) 

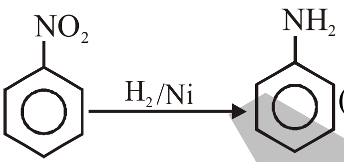

(1) (a) and (b) Only

(2) (b) and (c) Only

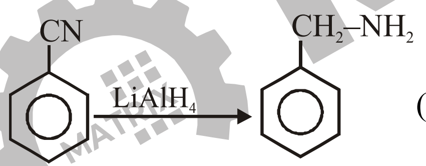
(3) (c) Only

(4) (c) and (d) Only

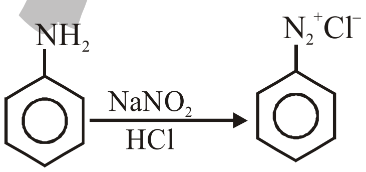
Ans. (4)

Sol. (a) 

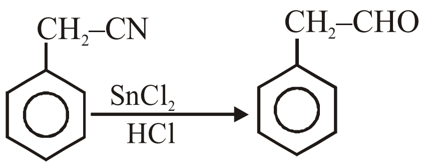
( wil give positive Kjeldhal test due to presence of $-NH_2$ group)

(b) 

(N –present in product so will show Kjeldhal Test)

(c) 

($-N_2^+$ Never show Kjeldhal Test)

(d) 

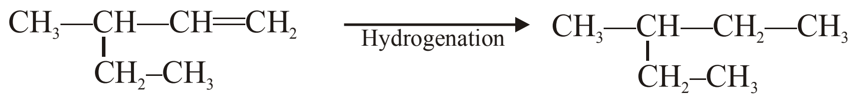
(N-abscent, So will not show Kjeldhal Test)

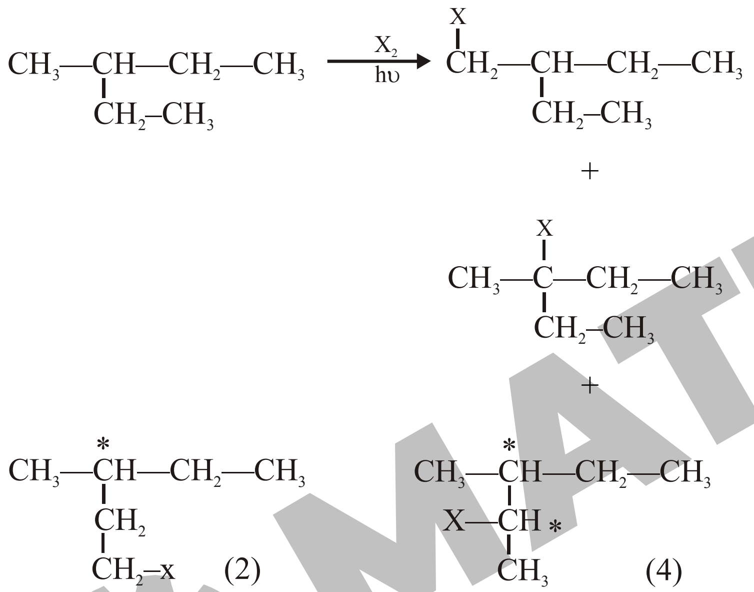
**7.** A is a smallest optically active alkene which on hydrogenation produces B. Find the number of isomers including stereoisomers of the product formed on monohalogenation of B.

(1) 2 (2) 5 (3) 7 (4) 8

Ans. (4)

Sol.





* represent chiral carbon

(2) (4)

**8.** Boiling point of water is 373 K then the boiling point of $H_2S$ is.

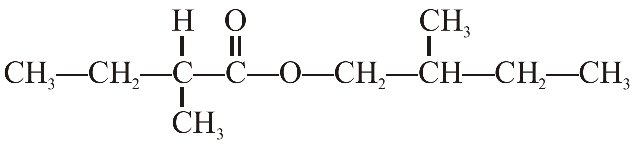
(1) > 373 K (2) < 300 K

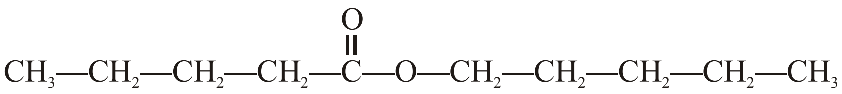
(3) 373 K (4) More than 300K, thenboiling point of $H_2S$ is.

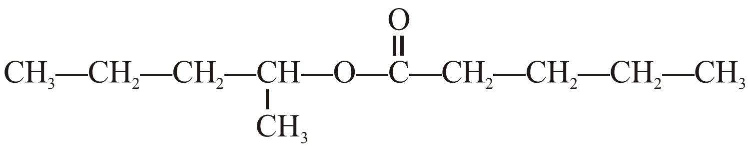
Ans. (2)

Sol. Boiling point of $H_2S$ < 300 K (213 K)(because of H-bonding boiling point of $H_2O$ is greater than $H_2S$ )

**9.** $C_{10}H_{18}O_2$ (A) on acidification with $H_2SO_4$ gives carboxylic acid (B) and alcohol(C). Obtained alcohol on oxidation with $CrO_3$ gives carboxylic acid B.Which of the following structure is not possible for $C_{10}H_{18}O_2$.

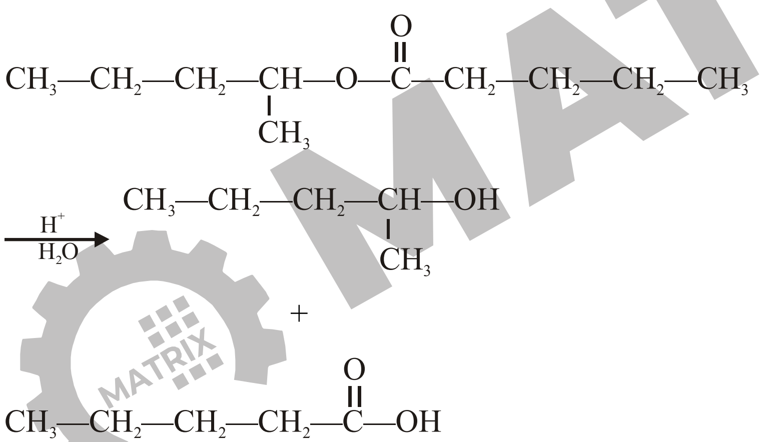
(1) 

(2) 

(3) 

(4) None of these

Ans. (3)

Sol. 

**10.** In which of the following N–O bond strength is minimum.

(1) $NO^{2+}$ (2) $NO^{+}$ (3) NO (4) $NO^{-}$

Ans. (4)

Sol.

| | $NO^{2+}$ | $NO^{+}$ | NO | $NO^{-}$ |
|---|---|---|---|---|
| 'N–O' Bond order = | 2.5 | 3.0 | 2.5 | 2.0 |

Bond order $\propto$ Bond strength

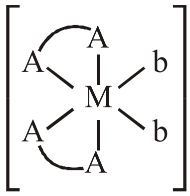
**11.** Which of the following complexes shows optical isomerism.

(1) cis$-\left[Cr(OX)_2Cl_2\right]^{3-}$  (2) trans$-\left[Cr(OX)_2Cl_2\right]^{3-}$

(3) cis$-\left[Co(NH_3)_4Cl_2\right]^{+}$  (4) trans$-\left[Co(NH_3)_4Cl_2\right]^{+}$

Ans. (1)

Sol. Cis $[M(AA)_2b_2]$




POS absent,
optically active

**12.** Which of the following mixture will form acidic buffer.

(1) 100 ml, 0.1M $CH_3COOH$ + 200 ml, 0.1 M NaOH

(2) 100 ml, 0.1M HCl + 200 ml, 0.1 M $CH_3COONa$

(3) 100 ml, 0.1 M HCl + 100 ml, 0.1 M NaOH

(4) 100 ml, 0.1M $CH_3COOH$ + 100 ml, 0.2 M NaOH

Ans. (2)

Sol. **<u>Mixture - I</u>**

| | | | | | | |
|---|---|---|---|---|---|---|
| | $CH_3COOH$ | + | NaOH $\longrightarrow$ | $CH_3COONa$ | + | $H_2O$ |
| initial | $0.1 \times 100$ | | $0.1 \times 200$ | — | | — |
| milli moles | = 10 | | 20 | | | |
| final | 10 – 10 | | 20 – 10 | 10 | | 10 |
| | = 0 | | = 10 | | | |

Resultant solution $\Rightarrow$ $\boxed{CH_3COONa + NaOH}$ not a buffer

**Mixture - II**

| | $CH_3COONa$ + | $HCl \longrightarrow$ | $CH_3COOH$ + | $H_2O$ |
|---|---|---|---|---|
| initial | $0.1 \times 200$ | $0.1 \times 100$ | — | — |
| milli moles | = 20 | = 10 | | |
| final | 20 – 10 | 10-10 | 10 | 10 |
| | = 10 | =0 | | |

Resultant solution $\Rightarrow$ $\boxed{CH_3COOH + CH\ COONa}$ buffer solution (W.A. + (W.A. + SB)Salt)

**Mixture - III**

$$\underbrace{HCl + NaOH} \longrightarrow NaCl + H_2O$$

buffer can't be formed using these.

**Mixture - IV**

| | $CH_3COOH$ + | $NaOH \longrightarrow$ | $CH_3COONa$ + | $H_2O$ |
|---|---|---|---|---|
| initial | $0.1 \times 100$ | $0.2 \times 100$ | — | — |
| milli moles | = 10 | 20 | | |
| final | 10 – 10 | 20 – 10 | 10 | 10 |
| | = 0 | = 10 | | |

Resultant solution $\Rightarrow$ $\boxed{CH_3COONa + NaOH}$ not a buffer

**13.** A balloon contain He gas at 'T' gets burst then it is.

(1) Reversible isothermal (2) Irreversible isothermal

(3) Reversible Adiabatic (4) Irreversible Adiabatic

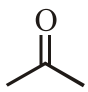
Ans. (4)

Sol. Q = 0 and bursting of balloon with He gas in it is irreversible.so process is irreversible Adiabatic

**14.** Which has most acidic hydrogen.

(1) $NC-CH_2-CN$

(2) $\left(CH_3-O-\overset{O}{\overset{\|}{C}}\right)_3 CH$

(3) 

(4) $CH_3-C\equiv CH$

Ans. (1)

Sol. Conjugate base of $NC-CH_2-CN$ is stable due to delocalisation with two CN groups

15. The Tyndall effect is observed only when following conditions are satisfied :

(a) The diameter of the dispersed particles is much smaller than the wavelength of the light used.

(b) The diameter of the dispersed particles is not much smaller than the wave length of the light used

(c) The refractive indices of the dispersed phase and dispersion medium are almost similar in magnitude.

(d) The refractive indices of the dispersed phase and dispersion medium differ greatly in magnitude.

(1) (b) and (d) (2) (a) and (c) (3) (b) and (c) (4) (a) and (d)

Ans. (1)

Sol. *The diameter of the dispersed particles is not much smaller than the wavelength of the light used

*The intensity of scattered light depends on the difference between the refractive indice of the D.P and D.M., In lyophobic colloids, this difference is appreciable and therefore the tyndal effect is quite well defined but in lyophilic sols the difference is very small and the tyndal effect is very weak. So, to show Tyndall effect the refractive indices of the dispersed phase and dispersion medium differ greatly in magnitude.

**16.** Novestrol will give which of the following reactions :

(1) $Br_2/H_2O, HCl + ZnCl_2$, neutral $FeCl_3$

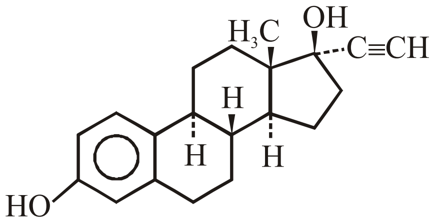
(2) $Br_2/H_2O$, $HCl + ZnCl_2$, $I_2/OH^-$

(3) alc. HCN, $I_2/OH^-$, $HCl + ZnCl_2$

(4) alc. HCN, $I_2/OH^-$, NaOCl

Ans. (1)

Sol.



Ethynylestradiol (novestrol)

It has phenolic, alcoholic and Terminal alkyne functional group.

**17.** $R-X \rightarrow [R^{+}][X^{-}] \xrightarrow{Nu^{-}} R-Nu$

Which statement is/are correct for this reaction ?

(I) Polarity of solvent decreases then rate of reaction increases.

(II) Strong nucleophile is more suitable for this reaction.

(III) If R is bulky then carbocation becomes more stabe.

(IV) Racemisation will take place in this reaction.

(1) Only I and II (2) Only II and IV (3) I, II and IV (4) Only III and IV

Ans. (4)

Sol. Above reaction is $S_N1$ reaction as it proceed via formation of carbocation. Polar protic solvent is more suitable for $S_N1$ and racemisation takes place.

**18.** Select true statement among following :

(1) 2nd order reaction is always multi step reaction.

(2) 1st order reaction is always single step reaction.

(3) zero order reaction is always single step reaction.

(4) zero order reaction is always multi step reaction.

Ans. (4)

Sol. Zero order reaction is always complex reaction, so it will be multistep.

**19.** Four gases a, b, c & d have $K_h$ values 50 kbar, 20 kbar, $2 \times 10^{-3}$ kbar and 2 kbar respectively. Then ?

(1) a is more soluble in water (2) Pressure of c in 55.5 molal solution is 1 bar

(3) Pressure of d in 55.5 molal solution is 250 bar (4) Prassure of b in 55.5 molal solution is 50 bar

Ans. (2)

Sol. (i) From Henery's law

$P = K_h(X)$

Higher the value of $K_h$ ,smaller will be solubility so d is more soluble.

(ii) For c $\Rightarrow$ $(P)_c = (K_h)_c.(X)_c = 2\times\left[\dfrac{55.5}{55.5+\dfrac{1000}{18}}\right] = 1$ bar

(iii) For d $\Rightarrow$ $P_d = (K_h)_d.(X)_d = 2\times10^3\times\dfrac{1}{2} = 1000$ bar.

(iv) For b $\Rightarrow$ $(P)_b = (K_h)_b.(X)_b = 20\times\dfrac{1}{2} = 10$ bar.

20. Conductance of NaCl and $BaSO_4$ is $C_1$ and $C_2$ at temperature $T_1$, then which of the following statement is correct.

(1) $C_1 >> C_2$

(2) $C_1 (T_1) > C_1 (T_2)$ [where $T_2 > T_1$]

(3) $C_2 >> C_1$

(4) $C_1 > C_2$

Ans. (1)

Sol. (i) NaCl is completely soluble salt while $BaSO_4$ is sparingly soluble salt so conductance of NaCl $(C_1)$>> conductance of $BaSO_4$ $(C_2)$.

(ii) On increase in temperature conductance increases.

**21.** Find the volume strength of 8.9 M $H_2O_2$ solution.

Ans. 99.68

Sol. Volume strength of $H_2O_2$

$= 11.2 \times$ Molarity

$= 11.2 \times 8.9$

$= 99.68$

**22.** Find % w/w of $H_2O$ in a solution containing glucose with $X_{Glucose} = 0.1$

Ans. 47.36

Sol. $X_{glucose} = 0.1$

$X_{water} = 0.9$

Let's assume total moles = 1

$n_{glucose} = 0.1$

$n_{water} = 0.9$

$$\%\left(\frac{w}{w}\right)_{H_2O} = \frac{w_{water}}{w_{solution}} \times 100$$

$$= \frac{(0.9 \times 18)}{(0.9 \times 18) + (0.1 \times 180)} \times 100$$

$$= 47.36\%$$

23. For $[Ti(H_2O)_6]^{3+}$, the absorption maximum due to d–d transition is found to be $20{,}300\ cm^{-1}$, therefore the crystal filed stabilization energy in kJ/mole is

[Given : 1kJ/mole = 83.7 $cm^{-1}$]

Ans. –97

Sol. $[Ti(H_2O)_6]^{3+} \Rightarrow Ti^{3+} = 3d^1\ 4s^0$

$\Rightarrow t_{2g}^{\ 1,0,0},\ e_g^{\ 0,0}$

$CFSE = [-0.4\ nt_{2g} + 0.6\ ne_g]\ \Delta_0 + n(p)$

$= [-0.4\ ]\ 20300$

$= -8120\ cm^{-1}$

$= \frac{-8120}{83.7}\ kJ / mole$

$= -97$ kJ/mole

**24.** In a solid substance edge length of unit cell is 405 pm, density of solid is 10.9 gram/cm$^3$ and molar mass of substance is 109 gram, Find radius of atom (in pm) which forms above unit cell.

Ans. 143.16

Sol. Formula of density $d = \frac{Z \times M}{Na \times Volume}$ [M = 109 gm, Volume = a$^3$, a = 4.05 × 10$^{-8}$ cm]

$$10.9 = \frac{Z \times 109}{6.02 \times 10^{23} \times [4.05 \times 10^{-8}]^3}$$

Z = 4 So it will be fcc unit cell

then $4r = \sqrt{2}a$

$$r = \frac{a}{2\sqrt{2}}$$

$$r = \frac{1.414 \times 405}{4}$$

= 143.1675 pm

= 143.17 pm

**25.** A beam of light is made to incident on sodium metal (work function = 2.5 eV) and to stop photoelectric current, potential difference equal to $E_{cell}$ of following cell is used.

$$Pt(s) \left| \underset{1\,bar}{H_2(g)} \right| \underset{1M}{H^+(aq)} \left\| \underset{1M}{Cl^-(aq)} \right| AgCl(s) \left| Ag(s) \right.$$

If same light is made to incident on potassium metal (work function = 2.3 eV) and to stop photoelectric current potential difference equal to $E_{cell}$ of same cell is used, then pH of HCl solution (if other condition remains same) is –

[Given : $E^0_{Cl^-|AgCl|Ag} = 0.22V$ & $\frac{2.303RT}{F} = 0.06$]

Ans. 3.33

Sol. <u>For Sodium metal –</u> (w = work function)

$E = w + (KE)_{max}$ ; $E^0_{cell} = 0.22ev$ (because cell in standard conditions)

To stop photoelectric current

$(KE)_{max} = e \times V$ (V = Stopping potential)

$V = E^\circ_{cell} = 0.22V$

So $K.E._{max} = 0.22$ eV

$E = 2.5 + 0.22 = 2.72$ eV

For Potassium metal :

$E = w + (KE)_{max}$

$2.72 = 2.3 + (KE)_{max}$

$(KE)_{max} = 0.42 \text{ eV} = e \times E_{cell}$

$E_{cell} = 0.42$ V

Cell reaction

Cathode : $AgCl(s) + e^- \rightarrow Ag(s) + Cl^-(aq)$

Anode : $\frac{1}{2} H_2(g) \rightarrow H^+(aq) + e^-$

Overall : $AgCl(s) + \frac{1}{2} H_2(g) \rightarrow Ag(s) + H^+(aq) + Cl^-(aq)$

$$E_{cell} = E^0_{cell} - \frac{0.06}{1}\log[H^+][Cl^-]$$

$0.42 = 0.22 - 0.06 \log [H^+]$
$0.2 = 0.06 \times pH$
$pH = 3.33$