JEE MAIN SEP 2020 (MEMORY BASED) | 4th Sep. SHIFT-1

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

1. The correct order of ionic radii of O^{2-}, F^-, Na^+, Mg^{2+}

(1) $O^{2-} > F^- > Na^+ > Mg^{2+}$ (2) $O^{2-} > Mg^{2+} > F^- > Na^+$

(3) $Na^+ > O^{2-} > F^- > Mg^{2+}$ (4) $F^- > Na^+ > Mg^{2+} > O^{2-}$

Ans. (1)

Sol.

	O^{2-}	F^-	Na^+	Mg^{2+}
$\frac{Z}{e} =$	$\frac{8}{10}$	$\frac{9}{10}$	$\frac{11}{10}$	$\frac{12}{10}$

$$\text{Size of isoelectronic species} \propto \frac{1}{Z/e}$$

$$\frac{Z}{e} \uparrow \text{ size} \downarrow$$

2. Which of the following complexes have same spin only magnetic moment

(1) $[Cr(H_2O)_6]^{2+}$ & $[Fe(H_2O)_6]^{2+}$ (2) $[Cr(H_2O)_6]^{3+}$ & $[Fe(H_2O)_6]^{3+}$

(3) $[Cr(H_2O)_6]^{2+}$ & $[Co(Cl)_4]^{2-}$ (4) $[Co(H_2O)_6]^{2+}$ & $[Fe(H_2O)_6]^{2+}$

Ans. (1)

Sol. $[Cr(H_2O)_6]^{2+}, Cr^{2+}(3d^4), t_{2g}^{1.1.1} e_g^{1,0}, n = 4$

$[Fe(H_2O)_6]^{2+}, Fe^{2+}(3d^6), t_{2g}^{2,1,1} e_g^{1,1}, n = 4$

$[Cr(H_2O)_6]^{3+}, Cr^{3+}(3d^3), t_{2g}^{1,1,1} e_g^{0,0}, n = 3$

$[Fe(H_2O)_6]^{3+}, Fe^{3+}(3d^5), t_{2g}^{1,1,1} e_g^{1,1}, n = 5$

$[COCl_4]^{2-}, CO^{2+}(3d^7), e_g^{2,2}, t_{2g}^{1,1,1} n = 3$

$[CO(H_2O)_6]^{2+}, CO^{2+}(3d^7), t_{2g}^{2,2,1} e_g^{1,1} n = 3$

3. The combustion of Li, Na, K in excess of air gives major oxides :

(1) Li_2O, Na_2O_2, KO_2 (2) Li_2O_2, Na_2O, KO_2 (3) Li_2O, NaO_2, KO_2 (4) LiO_2, Na_2O_2, K_2O_2

Ans. (1)

Sol. $Li(s) + \frac{1}{2} O_2(g) \xrightarrow{\Delta} Li_2O$
(Normal oxide)

$2Na(s) + O_2(g) \xrightarrow{\Delta} Na_2O_2$
(per oxide)

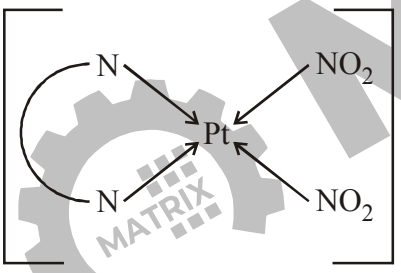
$K(s) + O_2(g) \xrightarrow{\Delta} KO_2$
(super oxide)

4. Total Number of possible isomers in $[Pt(en)(NO_2)_2]$

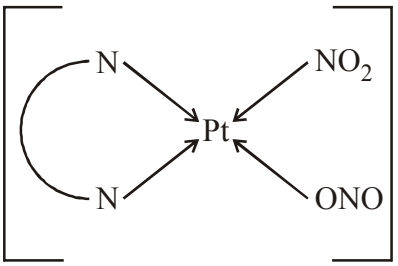
(1) 3 (2) 1 (3) 2 (4) 4

Ans. (1)

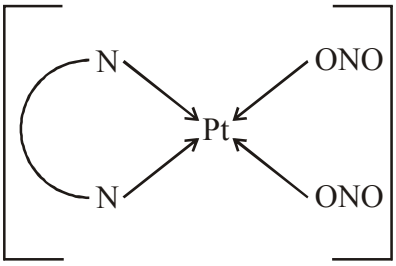
Sol. Donor atoms of NO_2 ligands



N, N



N, O



O, O

5. Lead nitrate on heating gives brown colour gas X, X on cooling gives Y, Y react with NO gives Z(blue solid/ liquid). Find oxidation number of N in compound Z.

(1) +2 (2) +3 (3) +4 (4) +5

Ans. (2)

Sol. $Pb(NO_3)_2 \xrightarrow{\Delta} PbO(s) + 2NO_2\uparrow + \frac{1}{2}O_2\uparrow$

Browngas

(X)

$2NO_2 \xrightarrow{\text{Cooling}} N_2O_4$

(Y)

$2NO + N_2O_4 \longrightarrow 2\overset{+3}{N_2}O_3$

(Z)

6. Select the correct statement(s)

(a) Mond process used for Ni

(b) Van arkel process used for Ti and Zr

(c) In extraction of silver, Ag present in anionic complex.

(d) In metallurgy of Iron, lime stone is converted to CaO.

(1) (a), (b) and (c) only (2) (a) and (c) only

(3) (b), (c) and (d) only (4) (a), (b), (c) and (d)

Ans. (4)

Sol. (a) $Ni_{\text{impure}} + 4CO \xrightarrow[50°C]{\Delta} [Ni(CO)_4] \xrightarrow{250°} Ni + 4CO$ (Pure)

(b) $M + 2I_2 \longrightarrow MI_4 \xrightarrow{\Delta} M + 2I_2$ ($M = Ti/Zr$; M: Pure)

(c) $Ag + 2NaCN \longrightarrow Na[Ag(CN)_2]$ Soluble complex.

7. Select the correct statement regarding element A (atomic no. = 101) and element B (atomic no. = 104).

(1) Element A is actinoid and B is 4th group element

(2) Element A is actinoid and B is 6th group element

(3) Element B is actinoid and A is 4th group element

(4) Element B is actinoid and A is 6th group element

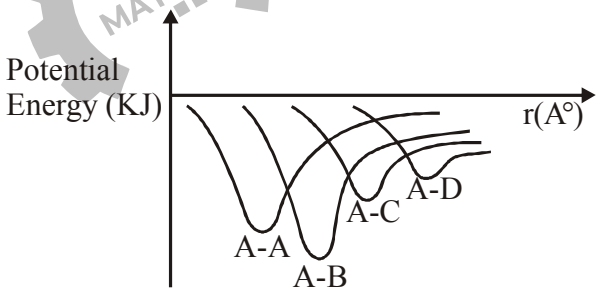
Ans. (1)

Sol. A (Z = 101) $\Rightarrow$ Actinoid

$\Rightarrow$ Actinoid having atomic no. 89 to 103

B (Z = 104) $\Rightarrow$ group 4th.

8. Using following potential energy graph identify correct option.



(1) D has highest electronegativity.

(2) Bond length of A-B bond is greater than A-C bond.

(3) A-D has minimum bond length.

(4) A-B has most stiff(strong) bond.

Ans. (4)

Sol. Bond enthalpy of AB bond is highest so A-B bond is more strong and B is highest electronegative atom.

Order of bond length $\Rightarrow A–A < A–B < A–C < A–D$

9. How many grams of NH_3 are produced when 2.8 kg of N_2 reacts with 1 kg of H_2 ?

Ans. 3400 g

Sol.

	N_2	+ $3H_2$	→ $2NH_3$
Number of mole initially	$\frac{2800}{28}=100$	$\frac{1000}{2}=500$	0
Number of mole finally	0	200	200

mass of NH_3 Produced = $200 \times 17 = 3400$ gram

10. A Ist order reaction gets completed 75% in 90 mins, then time for 60% completion will be :

Ans. 60 mins

Sol. $90 = \frac{2.303}{k}\log\frac{100}{25}$ -------- (1) $\quad t = \frac{2.303}{k}\log\frac{100}{40}$ ----------(2)

Divide equation 1 by 2

$$\frac{90}{t} = \frac{\log 4}{\log 2.5}$$

$t = 60$ mins.

11. An ideal solution containing 3 mole n-heptane and 1 mole n-hexane has total vapour pressure 550 mm of Hg. When 1 mole n-heptane is added to this solution, total vapour pressure increases by 10 mm of Hg. Find vapour pressure of pure n-heptane.

Ans. 600 mm of Hg

Sol. $550 = P^0_{hep} \times \frac{3}{4} + P^0_{hex} \times \frac{1}{4}$ ----------(1)

$560 = P^0_{hep} \times \frac{4}{4} + P^0_{hex} \times \frac{1}{5}$ ---------(2)

solving equation 1 and 2

$P^0_{hep} = 600$ mm of Hg.

12. Which of the following statement is correct for the structure of maltose ?

(1) It contains one hemiacetal and one ketal group

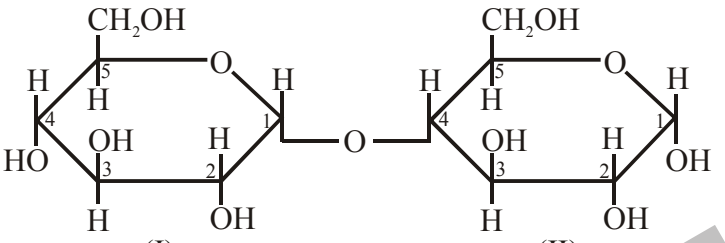
(2) It contains two acetal group

(3) It contains one acetal and one hemiacetal group

(4) It contains one ketal and one hemiacetal group

Ans. (3)

Sol.



(I) α–D–Glucose (II) α–D–Glucose

Maltose

It contains one acetal and one hemiacetal group

13. When neopentyl alcohol is heated with conc. H_2SO_4 two compounds A (85%) and B(15%) are formed compounds A and B respectively, are ?

(1) $H_3C–CH=CH–\underset{CH_3}{CH_2}$, $H_3C–\underset{CH_3}{CH}–CH=CH_2$

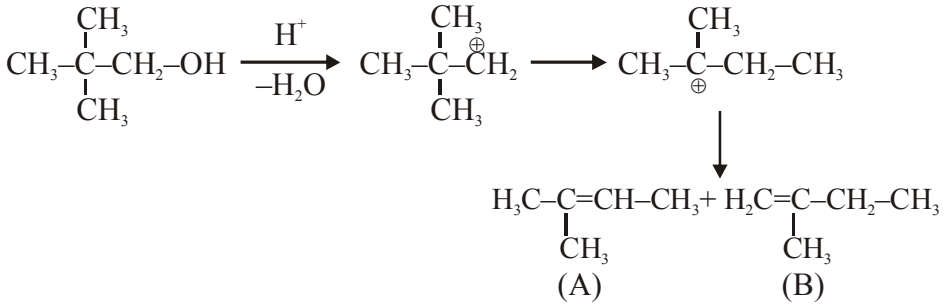
(2) $H_2C=\underset{CH_3}{C}–CH_2–CH_3$. $H_3C–CH=CH–\underset{CH_3}{CH_2}$

(3) $H_3C–\underset{CH_3}{C}=CH–CH_3$ + $H_2C=\underset{CH_3}{C}–CH_2–CH_3$

(4) $H_3C–\underset{CH_3}{CH}–CH=CH_2$. $H_3C–\underset{CH_3}{C}=CH–CH_3$

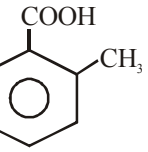
Ans. (3)

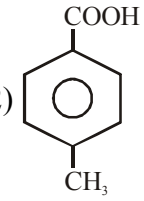
Sol.

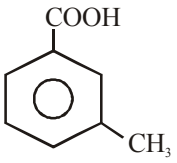


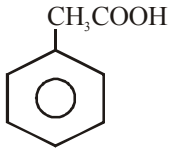
(A) (B)

14. A compound 'A'($C_8H_8O_2$) react with $Br_2|FeBr_3$ and gives only one kind of product. When A reacts with sodalime it gives toulene find A ?

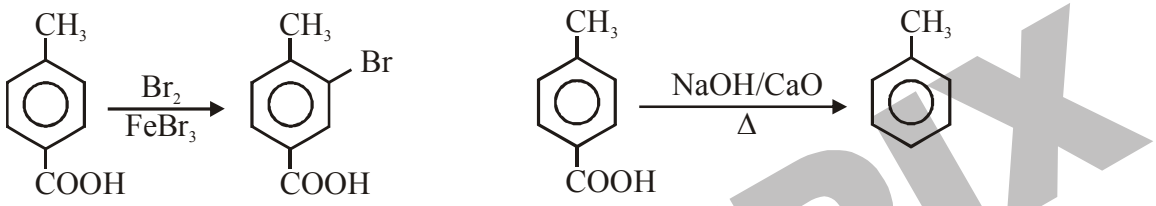
(1) 

(2) 

(3) 

(4) 

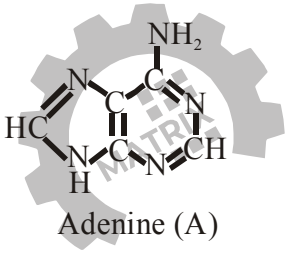
Ans. (2)

Sol. 

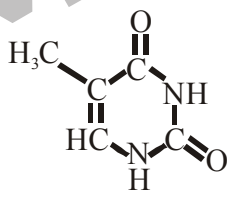
15 . Which of the following reacts with $CHCl_3 + KOH$?

(1) Adenine and uracil (2) Adenine and lysine (3) Adenine and thymine (4) Thymine and uracil

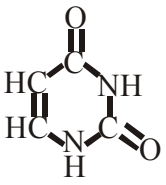
Ans. (2)



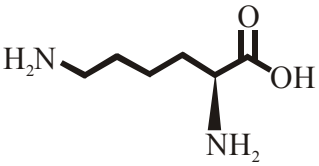
Adenine (A)



Thymine (T)

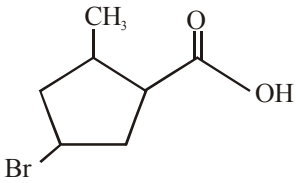
Sol. 

Uracil (U)



Lysine

Adenine and lysine contain NH_2 group therefore they will give reaction with $CHCl_3 + KOH$

16. 

Write the IUPAC name of the compound :

(1) 3-Bromo-5-methyl cyclopentane carboxylic acid

(2) 4-Bromo-2-methyl cyclopentane carboxylic acid

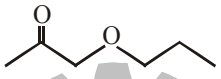
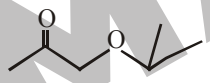
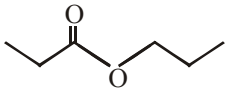
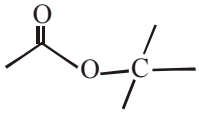
(3) 1-Bromo-3-methyl -4-cyclopentane carboxylic acid

(4) 3-Bromo-4-methyl cyclopentane carboxylic acid

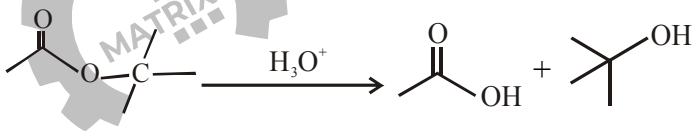
Ans. (2)

Sol. According to IUPAC Nomenclature rules carboxylic acid will get priority.

17. A compound $C_6H_{12}O_2$ (X) which undergoes acidic hydrolysis in presence of H_2SO_4 gives carboxylic acid (Y) and alcohol (Z). Z reacts with $ZnCl_2$ and gives turbidity immediately. Then X is.

(1)  (2)  (3)  (4) 

Ans. (4)

Sol. 

18. Which of the following is not a method of purification of colloid ?

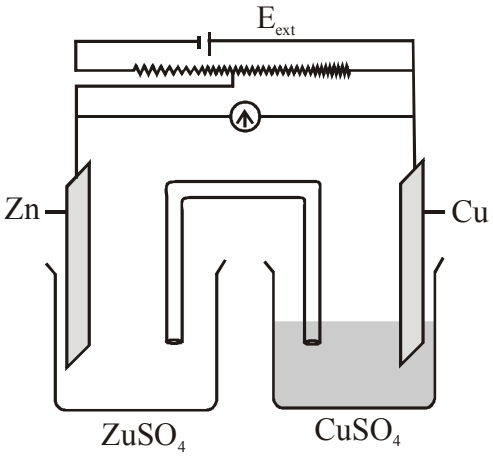
(1) dialysis (2) Peptization (3) Electrodialysis (4) Ultrafiltration

Ans. (2)

Sol. Peptization is a method to prepare colloid.

19. Which of the following statement is incorrect for the given electrochemical cell.

Given $E^{\circ}_{Zn^{+}|Zn} = -0.76eV$, $E^{\circ}_{Cu^{+2}|Cu} = -0.34eV$



(1) If EMF of external battery > 1.1 volt then electron flow direction is from Cu to Zn

(2) If EMF of external battery is < 1.1 volt then electron flow direction is from Zn to Cu

(3) If EMF of external battery is = 1.1 volt then no electron flows

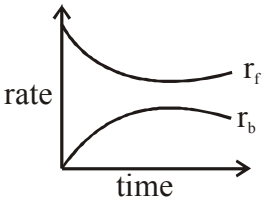
(4) If EMF of external battery is more than 1.1 volt then electron flow direction is from Zn to Cu

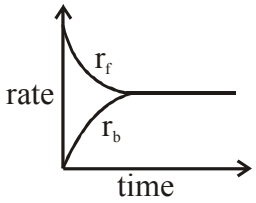
Ans. (4)

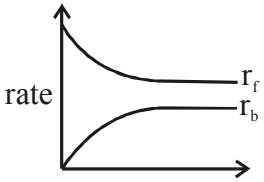
Sol. If EMF of external battery is more than 1.1 volt then current flows from Zn to Cu and electron flow direction is from Cu to Zn

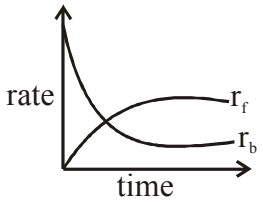
20. At equilibrium for a reaction $A \rightleftharpoons B$.

Correct representation is {r_f = Rate of forward reaction, r_b = Rate of backward reaction}

(1) 

(2) 

(3) 

(4) 

Ans. (2)

Sol. At equilibrium, rate of forward reaction = Rate of backward reaction.

21. In which region lines of Balmer series are present.

(1) Visible (2) Infrared (3) Ultra violet (4) Radio wave

Ans. (1)

Sol. In hydrogen spectrum maximum lines of Balmer series lies in visible region.

22. For 1 mole of ideal gas which of the following statements must be true.

(a) U and H depends only on temperature (b) Compressibility factor(Z) can not be 1.

(c) $C_P - C_V = R$ (d) $\Delta U = C_V dT$ for all processes

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

Ans. (1)

Sol. (a) For ideal gas U and H are function of Temprature $U = \frac{f}{2}nRT$ and $H = U + PV$

(c) $C_P - C_V = R$

(d) $\Delta U = nC_V dT$ for all processes $n = 1$

23. 20 mL of 0.2 gram H_2O_2 (impure) reacts completely with 0.316 gram $KMnO_4$. Find percentage purity of H_2O_2.[Given Molecular mass $H_2O_2 = 34$ & $KMnO_4 = 158$]

Ans. 85.00

Sol. Let mass of pure H_2O_2 is x gram

	+7	–1			0
	MnO_4^- +	H_2O_2	$\rightarrow$	Mn^{2+} +	O_2
n-factor	5	2			

Eq. of H_2O_2 = Eq. of MnO_4^-

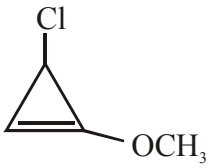
$$\left[\frac{x}{34}\right]2 = \left[\frac{0.316}{158}\right]5$$

$x = 0.17$

So, % purity of H_2O_2 solution $= \frac{0.17}{0.2} \times 100 = 85\%$

24. Aqueous $AgNO_3$ is reacted with the following compounds. Find the order of reactivity of S_N1.

(a) 

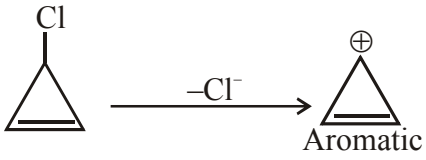
(b) 

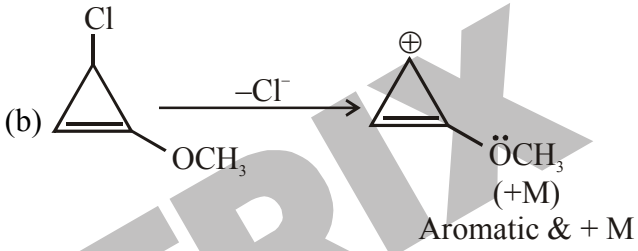
(c) $CH_3–\underset{\underset{Cl}{|}}{CH}–CH_3$ (d) $CH_3–\underset{\underset{Cl}{|}}{CH}–CH_2–NO_2$

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

Ans. (2)

sol. Reaction of Alkyl halide with $AgNO_3$ follow S_N1 reaction and rate of S_N1 reaction depend on stability of carbocation .

(a) 

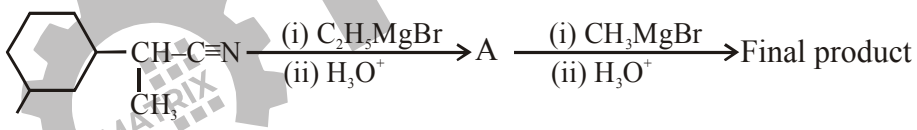
(b) 

(c) $CH_3–\underset{\underset{Cl}{|}}{CH}–CH_3 \xrightarrow{-Cl^-} CH_3–\overset{\oplus}{C}H–CH_3$ (2^0)

(d) $CH_3–\underset{\underset{Cl}{|}}{CH}–CH_2–NO_2 \xrightarrow{-Cl^-} CH_3–\overset{\oplus}{C}H–CH_2–NO_2$ (–I)

Reactivity order : b> a > c > d

25. Find the number of chiral centres in the final product :



Ans. (4)

Sol.