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JEE MAIN 2023

APRIL ATTEMPT

PAPER-1 (B.Tech / B.E.)

QUESTIONS & SOLUTIONS

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10 APRIL, 2023

9:00 AM to 12:00 Noon

Duration : 3 Hours | Maximum Marks : 300

SUBJECT - CHEMISTRY

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CHEMISTRY

1. The number of moles and molecules of O_2 in 28.375L of oxygen gas at STP.

Ans. 1.25, 7.525×10^{23}

Sol. Number of moles of $O_2 = \frac{28.375}{22.7} = 1.25$

$\Rightarrow$ Number of molecule = 1.25 $N_A = 7.525 \times 10^{23}$

2. The compound which does not exist.

(1) $BeCl_2$ (2) NaO_2 (3) $PbEt_4$ (4) $(NH_4)_2BeF_4$

Ans. (2)

Sol. NaO_2 (Super oxide of sodium is unstable)

3. Stabilizer use for concentrating sulphide ores :

(1) Fatty acid (2) Pine oil (3) Cresol (4) Xenthate

Ans. **(3)**

Sol. Cresol

4. Which of the following is correct regarding adsorption ?

(1) $\Delta H_{adsorption} \Rightarrow$ +ve, ΔH of micelle formation $\Rightarrow$ +ve

(2) $\Delta H_{adsorption} \Rightarrow$ –ve, ΔH of micelle formation $\Rightarrow$ +ve

(3) $\Delta H_{adsorption} \Rightarrow$ +ve, ΔH of micelle formation $\Rightarrow$ –ve

(4) $\Delta H_{adsorption} \Rightarrow$ –ve, ΔH of micelle formation $\Rightarrow$ –ve

Ans. **(4)**

Sol. $\Delta H_{adsorption}$

$$\text{gas + solid} \xrightarrow{\text{adsortion}} \text{gas/solid} ; \quad \Delta H = -ve$$

$$+ \text{Solvent } (H_2O) \xrightarrow{[\text{Conc.}] > \text{CMC}} \text{Micelle formation}$$

ΔH = –ve

5. Which of the following is low spin diamagnetic, octahedral complex ?

(1) $[CoCl_6]^{3-}$ (2) $[CoF_6]^{3-}$ (3) $[Co(NH_3)_6]^{3+}$ (4) $[Fe(H_2O)_6]^{3+}$

Ans. (3)

Sol. (3) $Co^{+3} \rightarrow [Ar]3d^6$

$NH_3 \rightarrow$ SFL

$t_{2g}^{2,2,2}, e_g^{0,0}$

(Complex is diamagnetic and low spin)

(1) $[CoCl_6]^{-3}$

$Co^{3+} \rightarrow [Ar]3d^6$

$Cl^- \rightarrow$ W.F.L.

$t_{2g}^{2,1,1}, e_g^{1,1}$

(Paramagnetic and high spin)

(2) $[CoF_6]^{-3}$

$Co^{+3} \rightarrow [Ar]3d^6$

$F^- \rightarrow$ WFL

$t_{2g}^{2,1,1}, e_g^{1,1}$

(Paramagnetic and high spin)

6. $C(s) + H_2O(g) \xrightarrow{T_1} CO(g) + H_2(g)$

$CO(g) + H_2O(g) \xrightarrow[\text{Catalyst}]{T_2} CO_2(g) + H_2(g)$

(1) $T_1 = T_2$

(2) $T_1 > T_2$

(3) $T_1 < T_2$

(4) $T_1 = 100$ K, $T_2 = 1270$ K

Ans. (2)

Sol. $C(s) + H_2O(g) \xrightarrow{1273K} CO(g) + H_2(g)$

$CO(g) + H_2O(g) \xrightarrow[\text{Catalyst}\ (FeO.Cr_2O_3)]{673K} CO_2(g) + H_2(g)$

7. Select the correct option

$2CO_{(g)} + O_{2(g)} \longrightarrow 2CO_{2(g)}$ $\Delta H = -x$ kJ/mole

$C(\text{graphite}) + O_{2(g)} \longrightarrow CO_{2(g)}$ $\Delta H = -y$ kJ/mole

Then ΔH for

$C_{(\text{graphite})} + \frac{1}{2}O_{2(g)} \longrightarrow CO_{(g)}$ is

(1) $x - \frac{y}{2}$ (2) $\frac{x-2y}{2}$ (3) $\frac{x+2y}{2}$ (4) $\frac{x-y}{2}$

Ans. (2)

Sol. Target equation

$C(\text{graphite}) + \frac{1}{2}O_{2(g)} \longrightarrow CO_{(g)}$ ……(i) ΔH

$C(\text{graphite}) + O_{2(g)} \longrightarrow CO_{2(g)}$ ……(ii) $\Delta H_1 = -y$ kJ/mole

$CO_{2(g)} \longrightarrow CO_{(g)} + \frac{1}{2}O_{2(g)}$ ……(iii) $\Delta H_2 = \frac{x}{2}$ kJ/mole

eq. (i) = eq.(ii) +eq (iii)

$\therefore \quad \Delta H = \frac{x}{2} - y = \frac{x-2y}{2}$

8. $Na_2O + H_2O \longrightarrow 2X$

$Cl_2O_7 + H_2O \longrightarrow 2Y$

Number of 'O' atom in one molecules of X and Y.

Ans. 5

Sol. $Na_2O + H_2O \longrightarrow 2NaOH$

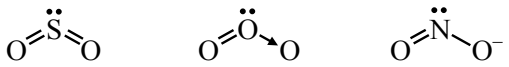
$Cl_2O_7 + H_2O \longrightarrow 2HClO_4$

So, 1 + 4 = 5

9. How many of the following are bent in shape

SO_2, O_3, I_3^-, N_3^-, NO_2^-

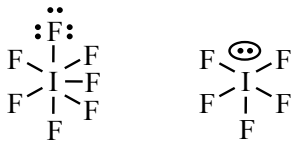
Ans. **3**

Sol. 

10. Calculate total number lone pairs in IF_7 & IF_5.

Ans. **37**

Sol.



Total lone pairs = 21 + 16 = 37

11. Number of electrons in t_{2g} set of orbitals in potassium ferrocyanide is ...

Ans. **6**

Sol. $[Fe(CN)_6]^{4-}$ $\quad Fe^{2+} : 3d^6 \Rightarrow t_{2g}^6\ e_g^o$

12. Prolonged heating of ferrous ammonium sulphate is avoided to prevent :

(1) Oxidation (2) Reduction (3) Hydrolysis (4) Breaking

Ans. **(1)**

Sol. Prolong heating will cause oxidation of $Fe^{2+} \rightarrow Fe^{3+}$

13. An ideal gas is taken at 930.2 mm of Hg pressure in a certain volume. What will be the final pressure if volume is reduced by 40% at constant temperature ?

Sol. $P_1V_1 = P_2V_2$

$930.2 \times 100 = P_2 \times 60$

$P_2 = 1550$ mm of Hg

14. Read the following two statements :

Statement-1 **:** Potassium dichromate is used in volumetric analysis.

Statement-2 : $K_2Cr_2O_7$ is more soluble in water than $Na_2Cr_2O_7$.

(1) Both statements-1 and 2 are correct.

(2) Both statement-1 and 2 are incorrect

(3) Statement-1 is correct and statement-2 is incorrect.

(4) Statement-1 is incorrect and statement-2 is correct.

Ans. **(3)**

15. The degree of dissociation of monobasic acid is 0.3. By what percent is the observed depression in freezing point greater than the calculated depression in freezing point ?

Ans. **30%**

Sol. $i = 1 + \alpha$ (for HA)

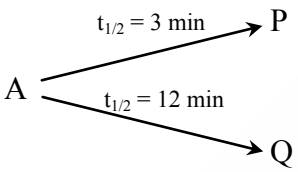
$= 1.3$

$$\% \text{ increase} = \frac{(\Delta T_f)_{obs} - (\Delta T_f)_{cal}}{(\Delta T_f)_{cal}} \times 100$$

$$= \frac{K_f \times i \times m - K_f \times m}{K_f \times m} \times 100$$

$$= \frac{i-1}{1} \times 100 = 30\%$$

16.



Both are Ist order reaction, calculate overall half life of A.

Ans. **2**

Sol. $$\frac{1}{t_{1/2}} = \frac{1}{3} + \frac{1}{12} = \frac{4+1}{12} = \frac{5}{12}$$

$$t_{1/2} = \frac{12}{5} \text{ min}$$

17. $$\text{'A'} + H_2O \longrightarrow \underset{\text{partially soluble}}{B} \xrightarrow{CO_{2(g)}} \underset{\text{insoluble}}{C} \xrightarrow{\text{excess } CO_2} \underset{\text{soluble}}{D}$$

'A' is

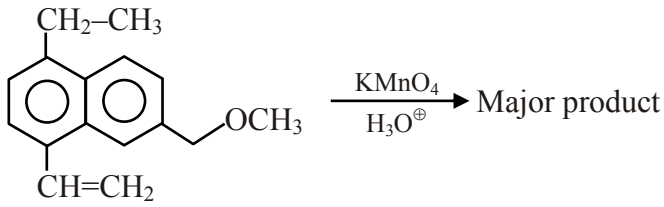
(1) Quick lime (2) Slaked lime

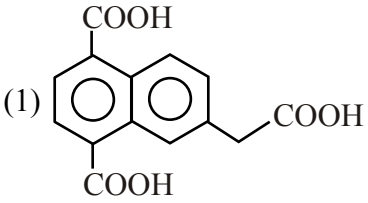
(3) White lime (4) Lime water

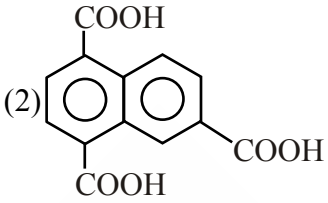
Ans. **(1)**

Sol. $$\underset{(A)}{CaO(s)} + H_2O \longrightarrow \underset{(B)}{Ca(OH)_2} \xrightarrow{CO_2} CaCO_3\downarrow \xrightarrow{\text{excess } CO_2} \underset{\text{soluble}}{Ca(HCO_3)_{2(aq.)}}$$

18.



(1)


(2)


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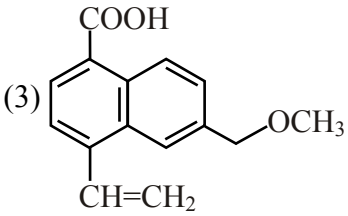
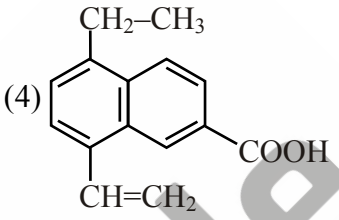


(4)


Ans. (2)

19. Which reactants are used to prepare phenyl methyl ether?

(1) PhONa , CH_3Br (2) PhBr, CH_3ONa

(3) PhONa, CH_3OH (4) PhOH, CH_3Br

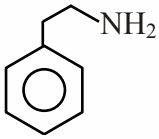
Ans. (1)

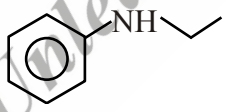
20. Following observations are found for the isomeric compounds of $C_8H_{11}N$.

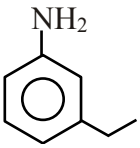
Isomer-I : Can prepare by Gabriel phthalimide synthesis

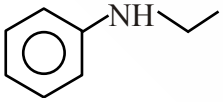
Isomer-II : Reacts with Hinsberg reagent but does not soluble in NaOH

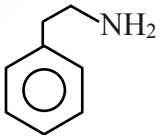
Isomer-III : Reacts with HNO_2 and form azodye

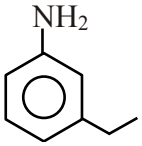
(1) Isomer-I : 

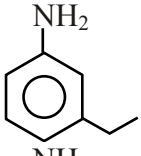
Isomer-II : 

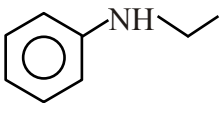
Isomer-III : 

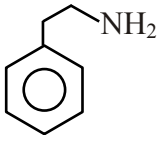
(2) Isomer-I : 

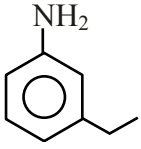
Isomer-II : 

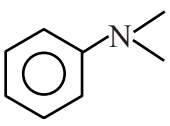
Isomer-III : 

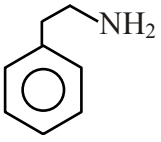
(3) Isomer-I : 

Isomer-II : 

Isomer-III : 

(4) Isomer-I : 

Isomer-II : 

Isomer-III : 

Ans. (1)

21. Which does not stabilise secondary and tertiary structure of protein?

(1) Hydrogen bonding (2) S–S linkage

(3) van der waals force (4) H–H linkage

Ans. (4)

Sol. Secondary and tertiary structure of protein are stabilise by H-bonding, disulphide linkage, ionic bonding as well as van der waals forces.

22.

Column-I	**Column-II**
(a) Nylon-26	(p) Addition polymer
(b) Dacron	(q) Thermosetting polymer
(c) Urea formaldehyde resin	(r) Polyester linkages
(d) Buna-N	(s) Biodegradable

Ans. a $\rightarrow$ s, b $\rightarrow$ r, c $\rightarrow$ q, d $\rightarrow$ p.

23.

Column-I	**Column-II (Waste product)**
(a) Steel industry	(p) Fly ash
(b) Thermal power plant	(q) Slag
(c) Fertilizer industry	(r) Biodegradable
(d) Paper mill	(s) Gypsum

Ans. a $\rightarrow$ q, b $\rightarrow$ p, c $\rightarrow$ s, d $\rightarrow$ r

24. Which of the following pair of compounds have not zero dipole moment ?

(1) CH_2Cl_2 , $CHCl_3$

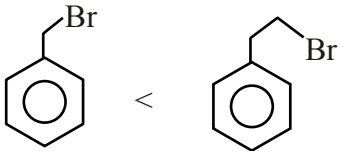
(2) Cis-butene, trans-butene

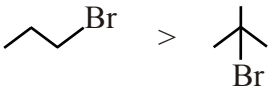
(3) 1,2–dichloro benzene, 1,4–dichloro benzene

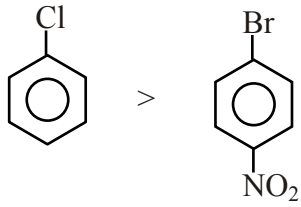
(4) Benzene and chlorobenzene

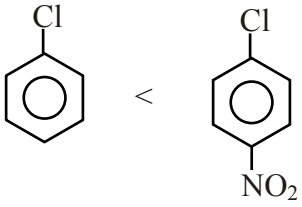
Ans. (1)

25. Observe the following compound for their rate of reaction.

(I)  (Rate of S_N1 reaction)

(II)  (Rate of S_N2 reaction)

(III)  (Rate of electrophilic substitution reaction)

(IV)  (Rate of nucleophilic substitution reaction)

The correct option is

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

Ans. (1)

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