AIEEE Chemistry Model Test with Solutions

1. With a certain radiation (exciting) of a particular frequency, to which hydrogen atoms are exposed, the maximum number of spectral lines is obtainable in the emission is 15. The uppermost energy level to which the is excited is n =

1) 4 2) 5 3) 6 4) 7

Ans: 3

Sol. Number of spectral lines

$$\frac{n(n-1)}{2} = 15 \Rightarrow n = 6$$

2. The number of moles of $KMnO_4$ that will be required to react with one mole of ferrous oxalate is

1) $\frac{3}{5}$ 2) $\frac{2}{5}$ 3) $\frac{4}{5}$ 4) 1

Ans: 1

Sol. $Mn^{2+} + 5e^- \rightarrow Mn^{2+}]\times 3$ $\left.\begin{array}{l} Fe^{2-} \rightarrow Fe^{3+} + e^- \\ C_2O_4^{2-} \rightarrow 2CO_2 + 2e^- \end{array}\right]\times 5$

3 moles of $KMnO_4$= 5 moles of FeC_2O_4

$\therefore$ 1mol of ferrous oxalate = $\frac{3}{5}$ mol of $KMnO_4$

3. The sealed containers of the same capac-ity and at the same temperature are filled with 44g of H_2 in one and 44g of CO_2 in the other. If the pressure of carbondioxide in the second container is 1atm. That of hydrogen in the first container would be

1) 1 atm 2) 10 atm

3) 22 atm 4) 44 atm

Ans: 3

Sol. $$\frac{P_1V_1}{P_2V_2} = \frac{n_1RT_1}{n_2RT_2} = \frac{n_1T_1}{n_2T_2}$$

As $V_2 = V_2$ and $T_1 = T_2$

$$\frac{P_1}{P_2} = \frac{n_1}{n_2}$$

$$\frac{P_{H_2}}{P_{CO_2}} = \frac{n_{H_2}}{n_{CO_2}}$$

$$\frac{P_{H_2}}{1} = \frac{44/2}{44/44} = 22\,\text{atm}$$

Hence 3 is the correct answer

4. Half life of a reaction becomes half when initial concentration of reactants are made doubled. The order of the reaction will be

1) 1 2) 2 3) 0 4) 3

Ans: 2

Sol. $t_{1/2} \propto \frac{1}{a^{n-1}}$

$$t_{1/2} \propto \frac{1}{a}$$

Where n = order of reaction for second order reaction

Hence 2 is correct answer

5. The reaction $A \xrightarrow{k}$ Product, is zero order while the reaction $B \xrightarrow{k}$ Product, is first order reaction. For what initial concentration of A are the half lives of the two reactions equal (Rate constant value are same for both two reaction)

1) $(\log_e 4)$ 2) 2M

3) log 2M 4) ln 2M

Ans: 1

Sol. For zero order reaction, x = kt

$\therefore \frac{a}{2} \times k \times t_{1/2}$, i.e $t_{1/2} = \frac{a}{2k}$ .... (i)

For first order reaction, $t_{1/2} = \frac{\log_e 2}{k}$ ... (ii)

From (i) and (ii), $\frac{a}{2k} = \frac{\log_e 2}{k}$

$a = \log_e 4M$

Hence 1 is the correct answer

6. The dissociation of phosgene, which occurs according to the reaction

$COCl_2(g) \quad CO(g) + Cl_2(g)$

is an endothermic process. Which of the following will increase the degree of dissociation of $COCl_2$?

1) Adding Cl_2 to the system

2) Adding helium to the system at constant pressure

3) Decreasing the temperature of the system

4) Increasing the total pressure

Ans: 2

7. Which of the following compounds/ions can act as Bronsted acid as well as a Bronsted base ?

1) HCO_3^- 2) K_2CO_3

3) H_2SO_4 4) $H_2PO_2^-$

Ans: 1

8. Calculate the standard Gibbs free energy change in kJ for the reaction

$Cu^-(aq) + I^-(aq) \longrightarrow CuI$ (or)

Given:

$CuI(or) + e \rightarrow Cu(or) + I^-(aq)\ E^o = -0.17v$

$Cu^+(aq) + e \longrightarrow Cu(or)\ E° = 0.53V$

1) - 67.55 2) 135.1

3) 1.78V 4) - 1.75V

Ans: 1

Sol. $CuI(or) + e \longrightarrow Cu(or) + I^-(aq)$

$\Delta G_1^o = -1 \times F \times (-0.17V)$

$Cu^+(aq) + e \longrightarrow Cu(or)\ E° = 0.53V$

$\Delta G_2^o = -1 \times F \times (0.53V) = -0.53V$

The $\Delta G^o = \Delta G_2^o - \Delta G_1^o$

= - 0.53F - 90.17F) =- 0.70F

= -0.70X96500J - -67550J

= - 67.55kJ

Hence 1 is correct answer

9. In a solid AB^+ having NaCl structure atoms B^- occupy the corners of the unit cell. If all the face centred atoms along one of the axis are removed, then the resultant stoichiometry of the solid is

1) AB_2 2) A_2B 3) A_4B_3 4) AB_4

Ans: 3

Sol. In one NaCl type unit cell of solid, B^- are present at corners and face centres and A^+ are present at edge centres and body centre. Thus, a unit cell will contain $4A^+$ and $4B^-$ ions. In this unit two face centred ions B^- lies along the one axis and are removed

Contribution of two face centred B^- ions

$$= 2 \times \frac{1}{2} = 1$$

In the resultant unit cell;

$\therefore$Number of A^+ ions present per unit cell =4

$\therefore$Number of B^- ions present per unit cell = 4-1=3

$\therefore$Stoichiometry = A_4B_3.

Hence, (C) is the correct answer

10. The van't Hoff factor for 0.1M $Ba(NO_3)_2$ solution is 2.74. The percentage of dissociation is:

1) 91.3% 2) 87%
3) 100% 4) 74%

Ans: 2

Sol. $Ba(NO_3)_2 \qquad Ba^{2} + 2NO_3^-$

$1 \qquad 0 \qquad 0$

$(1-\alpha) \qquad \alpha \qquad 2\alpha$

$i = 1-\alpha+\alpha+2\alpha = (1+2\alpha)$

i= (1+2α)

$\therefore \alpha = \frac{(i-i)}{2} = \frac{2.74-1}{2} = 0.87$

=87%

Hence, (B) is the correct answer

11.The correct match is

	A	B	C	D		A	B	C	D
1)	s	r	q	p	2)	s	p	q	r
3)	p	r	s	q	4)	q	r	s	p

Ans: 1

Sol. $(A)\rightarrow(s)$: Hess's law states that enthalpy change in a reaction remains the same whether the reaction takes place in one step or in several steps

$(B)\rightarrow(r)$: Combustion reactions are exothermic

$$(D)\rightarrow(p): 2.303\log\frac{p_2}{p_1} = \frac{\Delta H_{vap}}{R}\left(\frac{T_2-T_1}{T_1T_2}\right)$$

It is an example of Clasius Clapeyron equation

12. The pair of species having identical shape is

1) CF_4, SF_4 2) PCl_3, BF_3
3) XeF_2, CO_2 4) PF_5, IF_5

Ans: 3

Sol. XeF_2 and CO_2 are linear molecules

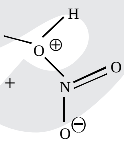
Hence 3 is the correct answer

13. Nitrobenzene can be prepared from benz-ene by using a mixture of conc. HNO_3 and conc. H_2SO_4. In the nitrating mixture HNO_3 acts as a

1) base 2) acid
3) reducing agent 4) catalyst

Ans: 1

Sol. HNO_3 accepts a proton from H_2SO_4

$H_2SO_4 + HNO_3 \qquad HSO_4^- +$ 

Hence 1 is the correct answer

14. Which of the following will give yellow precipitate with I_2/NaOH?

1) CH_3-CO-O-CO-CH_3

2) $I-CH_2-\overset{\overset{O}{||}}{C}-CH_2-CH_3$ 3) CH_3-CO-NH_2

4) $CH_3-\overset{\overset{O}{||}}{C}-Cl$

Ans: 2

Sol. ICH_2-CO-CH_2-CH_3 on further treatme-nt with I_2/NaOH first give $I_2CHCOCH_2CH_3$ and then I_3C-CO- CH_2-CH_3 which sub-sequently undergo-es hydrolysis with NaOH to yield CHI_3 and CH_3-CH_2-COONa

Hence, 2 is the correct answer

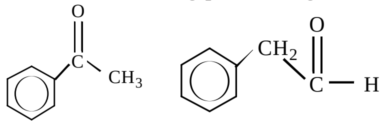
15. In Cannizzaro reaction given below

$Ph-CHO \xrightarrow{OH^-} Ph-CH_2-OH + PhCOO^-$

The slowest step is

1) the attack of OH^- at the carbonyl group
2) the transfer of hydride to the carbonyl group
3) the abstraction of proton from carboxylic acid
4) the deprotonation of Ph - COOH.

16. Consider the following pairs of organic compounds

I: 

II: $CH_3OH \qquad CH_3CH_2OH$

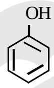
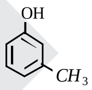
III: $CH_3\overset{\overset{O}{||}}{C}CH_3 \qquad HCHO$

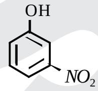
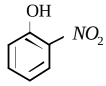
A test that can make distinction between each pair is

1) Lucas test 2) Silver-mirror test
3) Victor - Meyer's test 4) Iodoform test

Ans: 4

17. In the following compounds, the order of acidity is

I)  II) 

III)  IV) 

1) III > IV > I > II 2) I > IV >III >1
3) II > I > III > IV 4) IV > III> I > II

Ans: 4

Sol. +1 effect decreases acidity, -I and -R ef-fect increases acidity. NO_2 group cannot exert -R effect from the metal position.

Hence 4 is the correct answer

18. The equilibrium constant for the reaction

$2SO_{2(g)} + O_{2(g)} \qquad 2SO_{3(g)}$

is 5. If the equilibrium mixture contains equal moles of SO_3 and SO_2, the equilibr-ium partial pressure of O_2 gas is

1) 0.2 atm 2) 2 atm
3) 0.02 atm 4) 0.04atm

Ans: 1

Sol. $K_p = \frac{P_{SO_3}{}^2}{P_{SO_2}{}^2 . P_{O_2}}$;

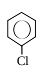
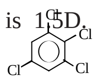
As $n_{SO_3} = n_{SO_2}$, $P_{SO_3} = P_{SO_2}$ and $K_p = 5$ hence $5 = \frac{1}{P_{O_2}}$

$P_{O_2} = 0.2\,atm$

19. In P_4O_{10}, the number of oxygen atoms attached to each phospho-rous atom is

1) 3 2) 2 3) 4 4) 2.5

Ans: 3

20. The dipole moment of  is 1.5D. The dipole moment of  is

1) 0D 2) 1.5D
3) 2.86D 4) 2.25D

Ans: 2

21. Argentite a compound of silver, was treated with potassium

cyanide solution. The product obtained has the formula

1) $K[Ag(CN)_2]$ 2) $K_2[Ag(CN)_2]$
3) $K_2[Ag(CN)_2]$ 4) $K[Ag(CN)_4]$

Ans: 1

22. Statement-1: In acidic medium, Zn^{+2} is not precipitated by S^{2-} ions

Statement-2 : Common ion effect reduces the concentration of S^{2-} ions to the minimum level

1) Statement-1 is true, statement-2 is true, statement-2 is a correct explanation for statement-1
2) Statement-1 is true, statement-2 is true, statement-2 is not a correct explanation for statement -1
3) Statement-1 is true,statement-2 is false
4) Statement-1 is false,statement-2 is true

Ans: 1

23. Select the correct order of acidity

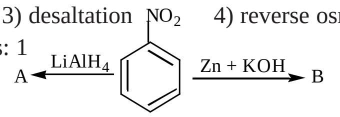
1) HI > HBr > HCl > HF
2) $HClO_4 < HBrO_4 < HIO_4$
3) HClO < HBrO < HIO
4) $HClO_4 > HClO_3 > HClO_2 > HClO$

Ans: 1

24. The process of getting fresh water from sea water is known as

1) osmosis 2) filtration
3) desaltation 4) reverse osmosis

Ans: 1

25. 

The ratio of number of moles of hydrogen atoms required to get 1 mole of A and 1 mole of B is

1) 4:5 2) 5:4 3) 1:1 4) 2:3

Ans: 1

Sol. A=Azobenzene, B=Hydrazobenzene

26. Which of the following polymers are obtained by step growth polymerization ?

A) Nylon 6, 6 B) neoprene
C) PVC D) Terylene

1) A, B 2) B, C 3) A, C 4) A, D

Ans: 4

27. Incorrect match in the following

1) Molecular oxygen: Diamagnetic
2) Order of stability:
$O_2^+ > O_2 > O_2^- > O_2^{-2}$
3) Order of bond orders:
$N_2 > N_2^+ = N_2^- > N_2^{-2}$
4) S.I. unit of dipole moment:
Coloumb - metre

Ans: 1

28. Ethanal reacts with HCN and the addition product so obtained is hydrolysed to form a new compound. This compound shows

1) Optical isomerism
2) Geometrical isomerism
3) Tautomerism
4) Metamerism

Ans: 1

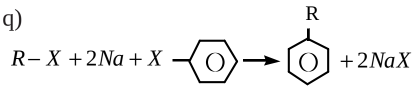
Sol. The new compound formed is Latic acid

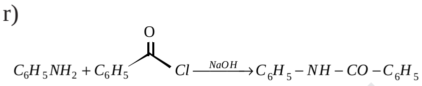
29. **List - I (Name of the reaction)**

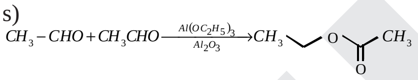
A) Wurtz - Fittig reaction
B) Hoffman bromamide reaction
C) Tischenko reaction
D) Schotten - Baumann reaction

List - II (Reaction)

p) $RCONH_2 + Br_2 + 4KOH \rightarrow R-NH_2 + 2KBr + K_2CO$

q) 

r) 

s) 

	A B C D		A B C D
1)	q p s r	2)	q s p r
3)	r s p q	4)	q s r p

Ans: 1

30. $Si \xrightarrow{O_2} (P) \xrightarrow[\text{Electric arc}]{\text{Excess of coke}} (Q)$

The product 'Q' in the above sequence of reactions is

1) Nitrolim 2) Carborundum
3) Silica 4) Lithopone

Ans: 2