PART : CHEMISTRY

1. A weak acid HA of concentration 0.001 mole/litre have conductance 2×10^{-5} Scm^{-1} and molar conductivity at infinite dilution is 190 Scm^2 $mole^{-1}$ then value of Ka of weak acid is [**x**] $\times 10^{-6}$, then value of **x** in nearest integer is :

Ans. 11.00

Sol. $\lambda_M^C = \frac{K \times 1000}{M} = \frac{2 \times 10^{-5} \times 10^3}{10^{-3}} = 20\ Scm^3\,mole^{-1}$

For weak acid (α) = $\frac{\lambda_M^C}{\lambda_M^\infty} = \frac{20}{190} = \frac{2}{19}$

Ka = $\frac{C\alpha^2}{1-\alpha} \cong C\alpha^2 = 10^{-3} \times \left(\frac{2}{19}\right)^2 = 0.011 \times 10^{-3} = 11 \times 10^{-6}$

So, x = 11

2.

	List –I		**List –II**
(a)	NaOH	(i)	Acid
(b)	$Be(OH)_2$	(ii)	Base
(c)	$Ca(OH)_2$	(iii)	Amphoteric
(d)	$Al(OH)_3$		
(e)	$B(OH)_3$		

Correct Matching of List–I and List –II is :

(1) (a) – (ii), (b) – (iii), (c) – (ii), (d) – (iii), (e) – (i)

(2) (a) – (ii), (b) – (ii), (c) – (iii), (d) – (iii), (e) – (iii)

(3) (a) – (ii), (b) – (i), (c) – (iii), (d) – (ii), (e) – (i)

(4) (a) – (ii), (b) – (iii), (c) – (ii), (d) – (ii), (e) – (ii)

Ans. (1)

Sol.

	Species	Nature
(i)	NaOH	Base
(ii)	$Ca(OH)_2$	Base
(iii)	$Be(OH)_2$	Amphoteric
(iv)	$Al(OH)_3$	Amphoteric
(v)	$B(OH)_3$	Acidic

3. Lattice Parameter for a crystal Lattice is a $\neq$ b $\neq$ c and $\alpha = 90^o$, $\gamma = 90$ and $\beta = 120^o$ this represent which type of Bravais Lattice.

(1) Monoclinic (2) Triclinic (3) Hexagonal (4) Orthorhombic

Ans. (1)

Sol.

	Unit Cell	**Lattice Parameter**
(i)	Monoclinic	$a \neq b \neq c$ & $\alpha = 90, \gamma = 90$ & $\beta = 120^o$

Seven Crystal System

S.No.	Crystal System	Edge length	Angles
1	**Cu**bic	a = b = c	$\alpha = \beta = \gamma = 90^o$
2	**Te**tragonal	a = b $\neq$ c	$\alpha = \beta = \gamma = 90^o$
3	**Or**thorhombic	a $\neq$ b $\neq$ c	$\alpha = \beta = \gamma = 90^o$
4	**Mo**noclinic	a $\neq$ b $\neq$ c	$\alpha = \gamma = 90^o$ $\beta \neq 120^o$, $\neq 90^o, \neq 60^o$
5	**He**xagonal	a = b $\neq$ c	$\alpha = \beta = 90^o$ $\gamma \neq 120^o$
6	**R**hombohedral or **T**rigonal	a = b = c	$\alpha = \beta = \gamma \neq 90^o$
7	**T**riclinic	a $\neq$ b $\neq$ c	$\alpha \neq \beta \neq \gamma \neq 90^o$

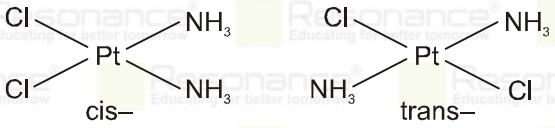
4. Number of Geometrical isomers of complex's $[Ni(CO)_4]$, $[PtCl_2(NH_3)_2]$, $[RuCl_3(NH_3)_3]$, are respectively :

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

Ans. (1)

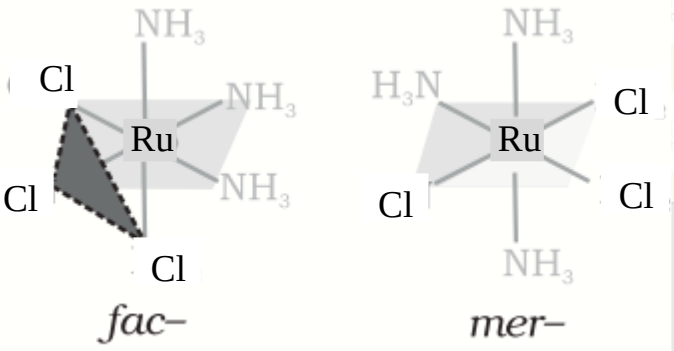
Sol.

	Complex	**Number of G.I.**
(1)	$[Ni(CO)_4]$	0
(2)	$[PtCl_2(NH_3)_2]$	2



Geometrical isomers (cis and trans) of $Pt(NH_3)_2Cl_2$

(3) $[RuCl_3(NH_3)_3]$ 2



The facial (fac) and meridional (mer) isomers of $[Ru(NH_3)_3(Cl)_3]$

5. Identify the correct hybridisation and Magnetic nature of complex $[MnCl_6]^{3-}$

(1) sp^3d^2, Diamagnetic (2) sp^3d^2, Paramagnetic

(3) d^2sp^3, Paramagnetic (4) d^2sp^3, Diamagnetic

Ans. (2)

Sol. $[MnCl_6]^{3-}$

$\Rightarrow Mn^{3+} \Rightarrow 3d^4 \Rightarrow t_{2g}^{1,1,1}, e_g^{1,0} \Rightarrow sp^3d^2$ Hybridisation $\Rightarrow$ Paramagnetic

6. Difference between bond order of CO and NO^+ is $\left(\frac{x}{2}\right)$, then value of 'x' to the nearest integer

Ans. 0

Sol.

Species	Bond order
(i) CO	3
(ii) NO^+	3

So difference in bond order = 0

So value of x = 0

7. The value of $(\Delta H - \Delta U)$ for vaporisation of water at 100°C is 'x' × 10^2 J/mole, assume water vapour to be an ideal gas [Take R = 8.31 J/mole.K]

[report your answer to nearest integer]

Ans. 31.00

Sol. $H_2O(\ell) \longrightarrow H_2O(g)$

$\Delta H^o = \Delta U^o + \Delta n_g RT$

$\Delta H^o - \Delta U^o = \Delta n_g RT$

$= 1 \times 8.3 \times 373$

$= 3099.63$ J/Mole

$= 30.9963 \times 10^2$ J/Mole

$= 31 \times 10^2$ J/Mole

8. Density of aqueous solution of NaOH is 1.2 g/cm^3, then find its molality

[Given density of water = 1 g/cm^3]

Ans. 05.00

Sol. Let volume of solution is x one

So mass of solution = 1.2 x

& mass of water (solvent) = x gram

So mass of solute = 0.2 x gram

$$\text{Molality} = \frac{W_{solute} \times 1000}{GMM_{solute} \times W_{solvent}}$$

$$= \frac{0.2x \times 1000}{40 \times x} = \frac{200}{40} = 5m$$

Ans = 5m

9. Identify the wrong statement from following about Ellingham diagram

(1) It gives rate of reaction

(2) It tells about the stability of oxide

(3) It gives idea about reduction of metal oxide

(4) It gives idea about free energy of reduction.

Ans. (1)

Sol. Ellingham diagram do not gives any idea about rate of reaction, rest all statement are correct

10. The main product of electrolysis of conc. H_2SO_4 is

(1) SO_3

(2) $HO_3SO - OSO_3H$

(3) $HO_2SO - OSO_2H$

(4) O_2

Ans. (2)

Sol. Main product of electrolysis of conc. H_2SO_4 is $H_2S_2O_8$ that is $HO_3SO–OSO_3H$

11. Oxidation number of P in $H_4P_2O_7$, $H_4P_2O_5$ and $H_4P_2O_6$ are respectively:

(1) 5, 3, 4 (2) 3, 4, 5 (3) 5, 4, 3 (4) 5, 4, 5

Ans. (1)

Sol.

Compound	Oxidation number of P
(i) $H_4P_2O_7$	5
(ii) $H_4P_2O_5$	3
(iii) $H_4P_2O_6$	4

12. Statement–I : Ruther ford's model of Atom cannot explain hydrogen Spectrum

Statement–II : Bohr's model is not in accordance with heisenberg's uncertainty principle

(1) Both statements are true

(2) Both statement are false

(3) Statement–I is true and Statement–II is false

(4) Statement–I is false and Statement–II is true

Ans. (1)

Sol. Theory Based

13. Statement–I **:** Generally halides of Li are covalent

Statement–II : Lithium has high polarising power

(1) Both Statement–I & Statement–II are correct

(2) Statement–I is correct and Statement–II is incorrect

(3) Statement–I is incorrect and Statement–II is correct

(4) Both Statement–I and Statement–II are incorrect

Ans. (1)

Sol. Due to small size of Li have high polarising power so most of the compound of Li are covalent

14. Unit of rate constant of n^{th} order reaction is :

(1) $mole^{1-n}$ $Lit.^{n-1}$ Sec^{-1} (2) $mole^{x}$ $Lit.^{-n}$ Sec^{-1}

(3) $mole^{-n}$ $Lit.^{n}$ Sec^{-1} (4) $mole^{n-1}$ $Lit.^{1-n}$ Sec^{-1}

Ans. (1)

Sol. Rate = $k[A]^n$

$$\frac{mole}{Lit \times Sec} = k\left[\frac{mole}{Lit}\right]^n$$

$\Rightarrow$ Unit of k = $(mole)^{1-n}$ $Lit.^{n-1}$ Sec^{-1}

15. Equilibrium constant K_C for dissociation of PCl_5 according to $PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$ is 1.844. Initially 3 mole of PCl_5 is present in a flask of 1 Lit., then number of moles of PCl_5 after equilibrium is set Up. Is :

Ans. 1.60

Sol.

	$PCl_5(g)$	$\rightleftharpoons PCl_3(g)$	+ $Cl_2(g)$ $K_C = 1.844$
Initially	3	0	0
At equilibrium	(3 – x)	x	x

$$K_C = \frac{x^2}{3-x} = 1.844$$

$x^2 = 1.844\ (3 - x)$

$x^2 = 5.532 - 1.844x$

$x^2 + 1.844x - 5.532 = 0$

$$x = \frac{-1.844 \pm \sqrt{(1.844)^2 - 4(1)(-5.532)}}{2}$$

On solving

$x = 1.60$

So at equilibrium number moles of $PCl_5 = 1.60$

16. According to Freundlich adsorption isotherm $\left(\frac{x}{m}\right) = k(P)^{\frac{1}{n}}$ when pressure increased 2 times, then extent of adsorption becomes 64 times. Find the value of $\left(\frac{1}{n}\right)$.

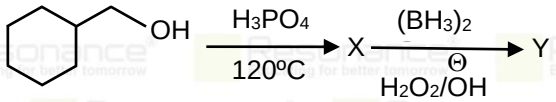
Ans. 6

Sol. $\left(\frac{x}{m}\right) = k(P)^{\frac{1}{n}}$ …… (i)

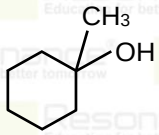
$64\left(\frac{x}{m}\right) = k(2P)^{\frac{1}{n}}$ ….. (ii)

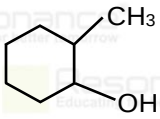
From equation (i) to (ii)

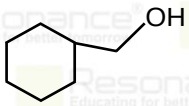
So $\frac{1}{n} = 6$

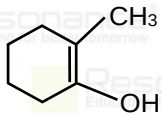
17. 

Product (Y) is :

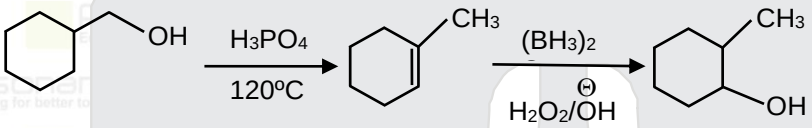
(1) 

(2) 

(3) 

(4) 

Ans. (2)

Sol. 

18. $CH_4 + I_2 \xrightarrow{hv} CH_3I + HI$

What shall be added so the reaction proceeds in one direction-

(1) Con.HIO_3 (2) HOCl (3) NH_3 (4) HNO_2

Ans. (1)

Sol. $CH_4 + I_2 \rightleftharpoons CH_3I + HI$

Reaction is reversible due to reducing nature of HI. Oxidising agent like HNO_3, HIO_3 should be added to make it irreversible (one direction).

19. Monosaccharide and disaccharides are differentiate by

(1) Iodine test (2) Seliwanoff test (3) Barfoed test (4) Tollen's test

Ans. (3)

Sol. Carbohydrates are polyhydroxy aldehydes and ketones. Carbohydrates may have an aldehyde group (aldoses) or ketose group. Barfoed's test distinguishes monosaccharides from disaccharides. In this test, copper acetate in dilute acid is reduced in 30 seconds by monosaccharides whereas disaccharides take several minutes.

20. In DNA complementary base Thymine is-

(1) Uracil (2) Adenine (3) Cytosine (4) Guanine

Ans. (2)

Sol. In DNA thymine bind with adenine by to hydrogen bonding.

21. **Statement-1:** Aniline is less basic then Acetamide

Statement-2: In Aniline, the lone pair delocalised so electron density reduce.

(1) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.

(2) Statement-1 is False, 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 False.

Ans. (2)

22. Which of the following given statements on Eutrophication are not correct?

(1) Eutrophication decrease oxygen level in water.

(2) <6ppm oxygen fishes can't survive.

(3) Eutrophication involve anaerobic respiration.

(4) Eutrophication increase oxygen level in water.

Ans. (4)

23. **Match the column:**

	Column-I		**Column-II**
(i)	Furacine	(a)	Antiseptic
(ii)	Dimetane	(b)	Synthetic antihistamine
(iii)	Arsphenamine	(c)	Tranquilizer
(iv)	Valium	(d)	Antibiotic

(1) (i) - b, (ii) - a, (iii) - c, (iv) – d

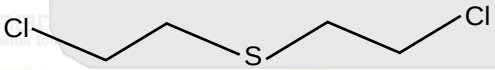
(2) (i) - a, (ii) - b, (iii) - d, (iv) - c

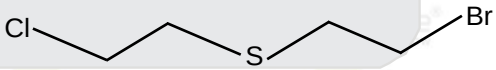
(3) (i) - a, (ii) - d, (iii) - c, (iv) – b

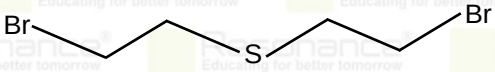
(4) (i) - c, (ii) - d, (iii) - a, (iv) - b

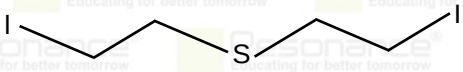
Ans. (2)

24. What is formula of mustard gas-

(1) 

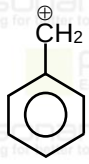
(2) 

(3) 

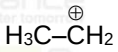
(4) 

Ans. (1)

25. Stability of given molecules is:

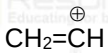


(i)



(ii)

(iii)



(iv)

(1) i > ii > iv > iii (2) i > ii > iii > iv (3) i > ii > iii > iv (4) iv > iii > i > ii

Ans. (1)

26. Staggered and eclipsed form of ethane are

(1) Enantiomer (2) Anomer (3) Epimer (4) Rotamer

Ans. (4)