CHEMISTRY FOR IIT-JEE

Conducted by:

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MARKING SCHEME

CHEMISTRY SAMPLE PAPER - 1
CLASS - XII

Q.No.	Value Points		Marks
1.	Fe^{3+} (ferric ion) is a better coagulating ion.		1
2.	Unidentate ligands are equidistant from each other.		1
3.	Because of intermolecular hydrogen bonding between ether and water molecule.		1
4.	4 - Methylpent – 3 – en – 2 – one		1
5.	Glycine and amino caproic acid OR $H_2N - CH_2 - COOH$ and $H_2N - (CH_2)_5 COOH$		1
6.	Saccharin / Aspartame		1
7.	Besides ortho, para substituted products : (i) oxidised tarry products and (ii) meta substituted products are formed	½ ½	1
8.	Phosphodiester linkages		1
9.	(i) schottky defects (ii) decreases (iii) Na+ Cl^- (or any other correct example) (iv) not affected	½ ½ ½ ½	2
10.	Let, the number of M^{2+} ion = x then, the number of M^{3+} ion will be = (0.96 – x) $2x + 3(0.96 - x) = 0.88$ $\%\ \text{of}\ M^{2+}\ \text{ion} = \frac{0.88}{0.96} \times 100 = 91.67\%$ $\%\ \text{of}\ M^{3+}\ \text{ion} = \frac{0.08}{96} \times 100 = 8.33\%$	1 ½ ½	2

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OR

Number of N^- ion in each F.C.C. unit cell = 4 ½

Number of tetrahedral voids = 2 x 4 = 8

Fraction occupied tetrahedral voids = $\frac{1}{3} x 8 = \frac{8}{3}$ ½

Empirical formula of compound = $M_{8/3}\ N_4$

= $M_2\ N_3$ ½

Coordination number of M^+ ions = 4 ½ 2

11. (i) Reverse osmosis ½

(ii) Fresh water container ½

(iii) Cellulose acetate placed on a suitable support ½

(iv) Desalination of sea water. ½ 2

12. Oxidation : $Fe\ (s) \longrightarrow Fe^{2+}\ (aq) + 2e^-$

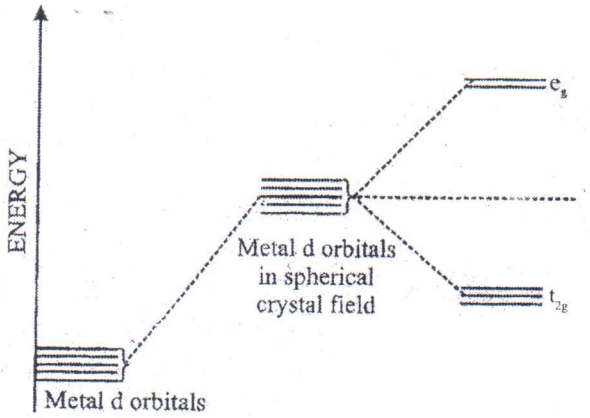
Reduction : $O_2(g) + 4H^+\ (aq) + 4e^- \longrightarrow 2H_2O$

Atmospheric oxidation :

$$2Fe^{2+}(aq) + 2H_2O(l) + \frac{1}{2}O_2(g) \rightarrow Fe_2O_3(s) + 4H^+(aq)$$ ½ x 3 = 1½

Prevention : Applying a coating of more reactive metal like Zn. ½ 2

13. (i)



½

(ii) $t_{2g}^4\ e_g^0$ or t_{2g}^4 ½

(iii) $d^2 sp^3$ ½

(iv) optical isomerism ½ 2

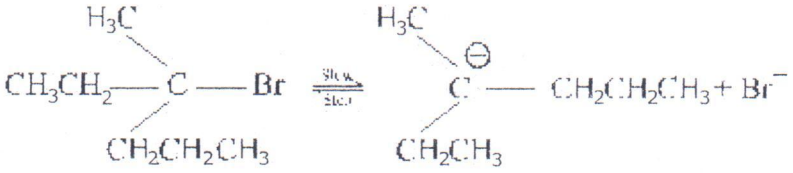
Q.No.	Value Points	Marks

14. Compound (A) is sodium chromate or Na_2CrO_4 ½
Compound (B) is sodium dichromate or $Na_2Cr_2O_7$ ½

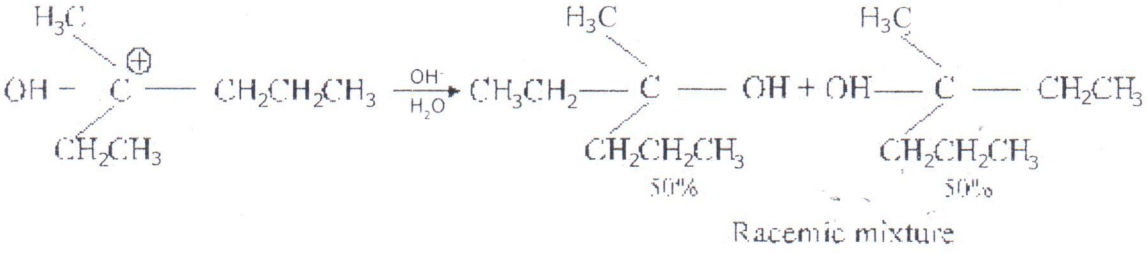
$$4\,FeOCr_2O_3 + 8\,Na_2CO_3 + 7\,O_2 \longrightarrow 8\,Na_2CrO_4 + 2Fe_2O_3 + 8\,CO_2$$ ½

$$2\,Na_2CrO_4 + 2H^+ \longrightarrow Na_2Cr_2O_7 + 2Na^+ + H_2O$$ ½ (2)

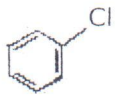
15. Undergoes S_N1 mechanism



(optically active)



Racemic mixture (2)

16. (i) $(CH_3)_2\,CH - CH - (CH_3)_2$ ½
(ii) CH_3F ½
(iii) CH_3CH_2I ½
(iv)  ½ (2)

17. (i) Novolac is a straight chain linear polymer but bakelite is cross linked. 1
(ii) Buna-S is an elastomer having weak vander waal's intermolecular forces whereas terylene is a fibre having strong intermolecular hydrogen bonding. 1 (2)

18. Calcium ions form insoluble calcium soaps which separate as scum in water, hence detergents preferred. 1
Soaps are biodegradable, detergents are not easily biodegradable 1 (2)

19. Moles of heptane $= \dfrac{\text{mass of heptane}}{\text{Molar mass of heptane}} = \dfrac{25\text{g}}{100\text{g mol}^{-1}} = 0.25\,\text{moles}$ (½)

moles of octane $= \dfrac{\text{mass of octane}}{\text{molar mass of octane}} = \dfrac{28.5\text{g}}{114\text{g mol}^{-1}} = 0.25\,\text{moles}$ (½)

Total moles = 0.25 + 0.25 = 0.50 moles

Mole fraction of heptane $= \frac{0.25}{0.50} = 0.5$ (½)

Mole fraction of octane $= \frac{0.25}{0.50} = 0.5$ (½)

partial pressure of heptane p $= P^0_{heptane} \times X_{heptane}$

$= 105.2$ K Pa x 0.5

$= 52.6$ K Pa (½)

partial pressure of octane p $= P^0_{octane} \times X_{octane}$

$= 46.8$ K Pa x 0.5

$= 23.4$ K Pa (3)

$P_{solution} = P_{heptane} + P_{octane}$

$= 52.6$ K Pa + 23.4 K Pa

$= 86.0$ K Pa (½)

mole fraction of octane in vapour phase $= \frac{P_{octane}}{P_{solution}} = \frac{23.4\,K\,Pa}{86.0\,K\,Pa}$

$= 0.272$ (½)

20.

(a) (i) 0.81 V

(ii) $E^{\theta}_{cell} = E_{right} - E^{\theta}_{left} = 0.81V - (-2.36\,V)$ (½)

$= 3.17$ V (½)

(b) Ecell $= E^{\theta}_{cell} - \frac{0.0591}{n} \log \frac{[Mg^{2+}]}{[Ag+]^2}$ (3)

$= 3.17V - \frac{0.0591}{2} \log \frac{(0.1)}{(0.0001)^2}$

$= 2.96$ V (1)

(c) (i) $Mg(s) | Mg^{2+}(0.10M) \| Ag^{+}(0.0001M | Ag(s)$ (½)

(ii) yes (½)

21.

(a) (i) (x / m) extent of adsorption decreases 1

(ii) (x / m) extent of adsorption increases 1

(b) catalyst : iron ½

promoter : molybdenum / Al_2O_3 / K_2O ½ (3)

22.

(a) In liquid state entropy is higher than the solid form, this makes $\Delta_r G$ more negative (1)

(b) By increasing temperature, fraction of activated molecules increase which help in crossing over the energy barriers. (1)

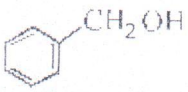
(c) Pine oil enhances non-wetting property of ore particles and acts as a froth collector. (1) (3)

Q.No.	Value Points	Marks

23. (a) Due to their abilities to show multiple oxidation states and form complexes. (1)
(b) Have maximum number of unpaired electrons in d orbitals because of which maximum d - d interactions. (1)
(c) d- d transitions. (1) (3)

24. (a) (i) Add bromine water to both the containers containing phenol and cyclohexanol. The container in which white precipitate is formed contains phenol while the container in which no precipitate is formed contains Cyclohexanol.  (1)

(ii) Add iodine and sodium hydroxide to both the containers containing $CH_3\text{-}\underset{\underset{OH}{|}}{CH}\text{-}CH_3$ (isoprophyl alcohol) and  (benzyl alcohol).

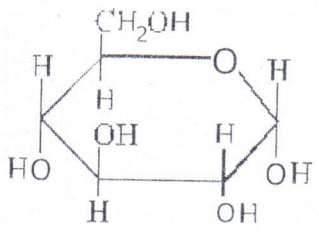
The container in which yellow precipitate is formed contains $CH_3-\underset{\underset{OH}{|}}{CH}-CH_3$, while the container in which no yellow precipitate is formed contains  (1) (3)

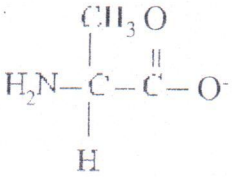
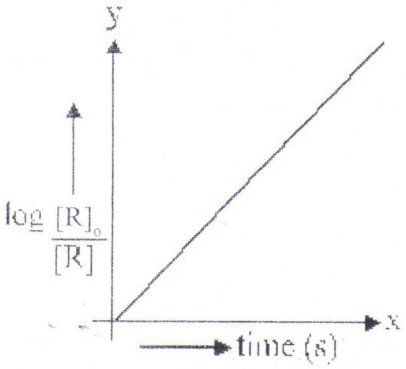
(b) (i) Phenol has electron withdrawing phenyl group, but ethanol has electron releasing ethyl group, hence extent of forward reaction is higher in phenol in aqueous medium. (½)
(ii) Phenoxide ion is resonance stabalised, ethoxide ion is not resonance stabalised, hence extent of back direction is more in ethanol than phenol. (½)

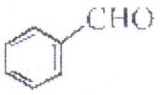
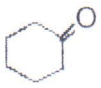
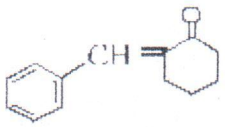
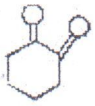
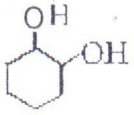
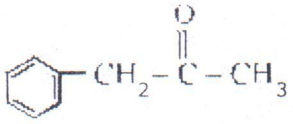
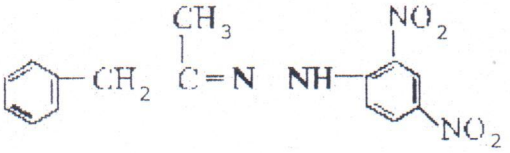
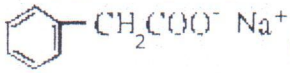
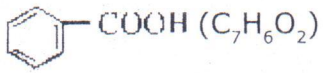
25. (i) Low bond dissociation enthalpy and high hydration (solvation) enthalpy. or highest S.R.P. value among the halogens. (1)
(ii) Due to its high electronegativity. (1)
(iii) Higher the oxidation state of chlorine in oxo acid, stronger the acid. (1) (3)

26. (a) (i) To remove HX formed so that the reaction shifts in the forward direction. (1)
(ii)Aryl halides do not undergo nucleophillic substitution with the anion formed by phythalamide. (1) (3)
(b) (iii) N – ethyl – N – methylethanamide. (1)

27. (i) anomers (1)
(ii) No, they are not enantiomers because stereo isomers related to each other as non super-imposable mirror images are enantiomers.Anomers differ only at C_1 configuration. (or carbonyl carbon) (1) (3)

(iii)  (1)

Q.No.	Value Points	Marks
	OR	
	(i)  Zwitter ion	(1)
	(ii) acidic	(1)
	(iii) anode	(1)
		(3)
28.	(i) First order	(1)
	(ii) time^{-1} (s^{-1})	(1)
	(iii) $k = \frac{0.693}{t_{1/2}}$	(1)
	(iv) rate constant k of reaction	(1)
	(v) 	(1)
		(5)
	OR	
	(i) Rate = k $[A]^x$ $[B]^y$	
	0.096 = k $(0.30)^x$ $(0.30)^y$ ----------(i)	
	0.384 = k $(0.60)^x (0.30)^y$ ----------(ii)	
	dividing eqn. (ii) by (i), we get	
	$\frac{x}{0.192} = \frac{2}{k (0.30)^x (0.60)^y}$ ----------(iii)	(1)
	dividing eqn. (iii) by (i) we get	
	$y = 1$	(1)
	(ii) Rate = k $[A]^2$ $[B]^1$	(1)
	(iii) 0.096 = k $(0.30)^2$ $(0.30)^1$	
	$k = 3.56$	(1)
		(5)
	(iv) Rate of reaction $= -\left\{\frac{\Delta[A]}{\Delta t}\right\}$	½
	$= \frac{1}{2}\left\{\frac{(\Delta C)}{\Delta t}\right\}$	½

Q.No.	Value Points	Marks
29.	(A) : white phosphorus (1) (B) : red phosphorus (1) (C) : phosphine or (PH_3) (1) (D) : phosphorus pentachloride or (PCl_5) (1) (E) : phosphoric acid or (H_3PO_4) (1)	(5)
	OR	
	(a) (i) $C_{12}H_{22}O_{11} \longrightarrow 12\ C + 11\ H_2O$ (white) (black substance) (1) (b) (ii) $2\ NaBr + 2\ H_2SO_4 \rightarrow Br_2 + Na_2So_4 + SO_2 + 2H_2O$ (Brown gas) (1) (c) (v) $2\ KCl + H_2SO_4 \longrightarrow 2\ HCl \uparrow + K_2SO_4$ (colourless gas) (1) (d) (iii) $Cu + 2\ H_2SO_4 \longrightarrow CuSO_4 + SO_2 + 2\ H_2O$ (1) (e) (iv) $3\ S + 2\ H_2SO_4 \longrightarrow 3\ SO_2\uparrow + 2\ H_2O$ (colourless gas) (1)	(5)
30.	(A) :  (1) (B) :  (1) (C) :  (1) (D) :  (1) (E) :  (1)	(5)
	OR	
	(A) :  (1) (B) :  (1) (C) : CHI_3 (yellow precipitate) (1) (D) :  (colourless compound) (1) (E) :  (1)	(5)

BLUE-PRINT I
Class XII
CHEMISTRY SAMPLE PAPER

S.NO.	UNIT	VSA (1 Mark)	SA I (2 Marks)	SAII (3 Marks)	LA (5 Marks)	TOTAL
1.	Soild State	-	4 (2)	-	-	4 (2)
2.	Solutions	-	2(1)	3(1)	-	5(2)
3.	Electrochemistry	-	2(1)	3 (1)	-	5(2)
4.	Chemical Kinetics				5 (1)	5(1)
5.	Surface Chemistry	1(1)		3 (1)	-	4(2)
6.	General principles and processes of Isolation of Elements	-	-	3(1)		3(1)
7.	p -Block Elements	-	-	3 (1)	5 (1)	8 (2)
8.	d- and f-Block Elements	-	2(1)	3(1)	-	5(2)
9.	Coordination Compounds	1(1)	2 (1)	-	-	3(2)
10.	Haloalkanes and Haloarenes	-	4(2)	-	-	4(2)
11.	Alcohols, Phenols and Ethers	1 (1)	-	3 (1)	-	4 (2)
12.	Aldehydes, Ketones and Carboxylic Acids	1 (1)	-	-	5 (1)	6 (2)
13.	Organic Compounds Containing Nitrogen	1 (1)	-	3 (1)	-	4 (2)
14.	Biomolecules	1 (1)	-	3 (1)	-	4 (2)
15.	Polymers	1 (1)	2 (1)	-	-	3 (2)
16.	Chemistry in Everyday Life	1 (1)	2 (1)	-	-	3 (2)
	Total	**8(8)**	**20(10)**	**27(9)**	**15(3)**	**70(30)**