CLASS : 12th (Sr. Secondary) 4379/4329 Series : SS-M/2019 SET : A, B, C, & D Total No. of Printed Pages : 64 SET : A, B, C, & D

MARKING INSTRUCTIONS AND MODEL ANSWERS CHEMISTRY

ACADEMIC/OPEN

(Only for Fresh/Re-appear Candidates)

उप-परीक्षक मूल्यांकन निर्देशों का ध्यानपूर्वक अवलोकन करके उत्तर-पुस्तिकाओं का मूल्यांकन करें। यदि परीक्षार्थी ने प्रश्न पूर्ण व सही हल किया है तो उसके पूर्ण अंक दें।

General Instructions :

- (i) Examiners are advised to go through the general as well as specific instructions before taking up evaluation of the answer-books.
- (ii) Instructions given in the marking scheme are to be followed strictly so that there may be uniformity in evaluation.
- (iii) Mistakes in the answers are to be underlined or encircled.
- (iv) Examiners need not hesitate in awarding full marks to the examinee if the answer/s is/are absolutely correct.

4379/4329/(Set : A, B, C & D) P. T. O.

(2) 4379/4329

- (v) Examiners are requested to ensure that every answer is seriously and honestly gone through before it is awarded mark/s. It will ensure the authenticity as their evaluation and enhance the reputation of the Institution.
- (vi) A question having parts is to be evaluated and awarded partwise.
- (vii) If an examinee writes an acceptable answer which is not given in the marking scheme, he or she may be awarded marks only after consultation with the head-examiner.
- (viii) If an examinee attempts an extra question, that answer deserving higher award should be retained and the other scored out.
- (ix) Word limit wherever prescribed, if violated upto 10%. On both sides, may be ignored.
 If the violation exceeds 10%, 1 mark may be deducted.

(3) 4379/4329

- (x) Head-examiners will approve the standard of marking of the examiners under them only after ensuring the non-violation of the instructions given in the marking scheme.
- (xi) Head-examiners and examiners are once again requested and advised to ensure the authenticity of their evaluation by going through the answers seriously, sincerely and honestly. The advice, if not headed to, will bring a bad name to them and the Institution.

महत्त्वपूर्ण निर्देश :

- (i) अंक-योजना का उद्देश्य मूल्यांकन को अधिकाधिक वस्तुनिष्ठ बनाना है। अंक-योजना में दिए गए उत्तर-बिन्दु अंतिम नहीं हैं। ये सुझावात्मक एवं सांकेतिक हैं। यदि परीक्षार्थी ने इनसे भिन्न, किन्तु उपयुक्त उत्तर दिए हैं, तो उसे उपयुक्त अंक दिए जाएँ।
- (ii) शुद्ध, सार्थक एवं सटीक उत्तरों को यथायोग्य अधिमान दिए जाएँ।

4379/4329/(Set : A, B, C & D) P. T. O.

(4) 4379/4329

- (iii) परीक्षार्थी द्वारा अपेक्षा के अनुरूप सही उत्तर लिखने पर उसे पूर्णांक दिए जाएँ।
- (iv) वर्तनीगत अशुद्धियों एवं विषयांतर की स्थिति में अधिक अंक
 देकर प्रोत्साहित न करें।
- (v) भाषा-क्षमता एवं अभिव्यक्ति-कौशल पर ध्यान दिया जाए।
- (vi) मुख्य-परीक्षकों / उप-परीक्षकों को उत्तर-पुस्तिकाओं का मूल्यांकन करने के लिए केवल Marking Instructions/Guidelines दी जा रही हैं, यदि मूल्यांकन निर्देश में किसी प्रकार की त्रुटि हो, प्रश्न का उत्तर स्पष्ट न हो, मूल्यांकन निर्देश में दिए गए उत्तर से अलग कोई और भी उत्तर सही हो तो परीक्षक, मुख्य-परीक्षक से विचार-विमर्श करके उस प्रश्न का मूल्यांकन अपने विवेक अनुसार करें।

SET –	Α
-------	---

1.	(i)	(C)	1
	(ii)	(D)	1
	(iii)	(B)	1
	(iv)	(A)	1

1

1

(v) (A) 1

(5)

(vi) Frenkel defect



- (viii) It is linkage (or bond) by which α -amino acids are connected to each other in a protein. 1
- (ix) Azeotropes are binary mixtures having same composition in liq. and vapour phase and boil at constant temp.

(x)
$$E = E^{\circ} - \frac{0.059}{2} \log \frac{[Sn^{2+}]}{[H^{+}]^{2}}$$
 1

- (xi) Second order 1
- (xii) $2Cl_2 + 2H_2O \rightarrow 4HCl + O_2$ 1

or

$$Cl_2 + H_2O \rightarrow 2HCl + [O]$$

	(6)	4379/4329
(xiii) 4-Nitroanisole		1
(xiv) 🗁 = NOH		1

2. Mass of Na^+ ions = 92 g $\frac{1}{2}$

Moles of
$$Na^+$$
 ions = $\frac{92}{23} = 4$ $\frac{1}{2}$

Mass of water =
$$1$$
Kg $1/_2$

Molality =
$$\frac{4}{1}$$
 = 4 m ¹/₂

3. Coulombs of electrons = current × time

$$0.5 \text{ A} \times 2 \times 60 \times 60 \text{ s} = 3600 \text{ C}$$
 ¹/₂

Now,

96500 C is equivalent to =
$$6.022 \times 10^{23}$$
 electrons $\frac{1}{2}$

3600 C is equivalent to =
$$\frac{6.022 \times 10^{23}}{96500} \times 3600$$
 1/2

$$= 2.246 \times 10^{22}$$
 electrons ¹/₂

(7) **4379/4329**

4.	Cationic detergents : These are quaternary
	ammonium salt of amines with acetates,
	chlorides or bromides. ¹ / ₂
	e.g. cetyltrimethyl ammonium bromide. ½
	(Any other example may also be given)
	Anionic detergents : Anionic detergents are sod.
	salt of sulphonated long chain hydrocarbons or
	alcohols. ½
	e.g. Sod. lauryl sulphate or any other example. $^{1\!/_2}$
5.	Process in which two or more monomer combine
	to form a polymer. 1
	e.g.
	(i) 1, 3-Butadiene and styrene $\frac{1}{2}$
	(ii) 1, 3-Butadiene and acrylonitrile ¹ / ₂
6.	When a protein in its native form is subjected to
	physical or chemical change, the hydrogen
	bonds are disturbed. This is called Denaturation
	of a protein. 1
4379	/ 4329/(Set : A, B, C & D) P. T. O.

(8) 4379/4329

Denaturation changes physical and biological properties but chemical properties remains the same. 1

7. During intravenous injections, the conc. of the solution to be injected should be comparable to blood plasma. If the solution is more conc. then water will flow out of cell & they would shrink. If the solution is less conc. then water will flow into cell & they would burst.



2 T ()

1⁄2

4379/4329 (9)

- Single *N*-*N* bond is weaker than single *P*-*P* bond 9. because of high inter electronic repulsion of the non bonding electrons, owing to the small bond length. As a result the catenation tendency is weaker in Nitrogen. 2
- 10. This is because in strongly acidic medium (conc. $HNO_3 + H_2SO_4$), the aniline is pronated to form anilinium ion which is meta directing. Thus in addition to 0-& p-derivatives, significant amount of m-derivative is also formed. 2
- This is a method for preparation of 1° amines in 11. which an amide is treated with bromine in an aq. or alc. solution of NaOH. 1

$$O \\ \parallel \\ R - C - NH_2 + Br_2 + 4NaOH \rightarrow R - NH_2 + Na_2CO_3 \\ + 2NaBr + 2H_2O$$
 1

Diborane $(BH_3)_2$ reacts with alkene to give 12. (a) trialkyl boranes as addition product. This is oxidized to alcohol by H_2O_2 in the presence of aq. NaOH. 1

(10) 4379/4329

$$CH_{3} - CH = CH_{2} + (H - BH_{2})_{2} \rightarrow CH_{3} - CH_{2} - CH_{2} - CH_{2} - BH_{2}$$

 $2CH_{3}CH = CH_{2}$
 $(CH_{3} - CH_{2} - CH_{2})_{3}B$ ¹/₂

$$(CH_3 - CH_2 - CH_2)_3 B \frac{3H_2O_2 / OH^-}{H_2O} \downarrow$$

 $3CH_3CH_2CH_2OH + B(OH)_3$ ¹/₂



13. In the presence of strong ligand NH_3 , the 3d electrons pair up leaving two d orbitals to be involved in d^2sp^3 hybridization forming inner orbital complex.



4379/4329/(Set : A, B, C & D)

(11) **4379/4329**

In $[Ni(NH_3)_6]^{2+}$, Ni is in +2 0.s and has $3d^8$ configuration and hybridization involved is sp^3d^2 forming outer orbital complex.



- 14. (a) F-centres : In metal excess defect some anion vacancies are created by passing alkali metal vapour over alkali metal crystal. Electrons are entrapped in these vacancies and responsible for importing colour to crystal.
 - (b) Antiferromagnetism : If the alignment of magnetic moments of domain is in a compensatory way so as to give zero net mag. moment e.g. MnO. 1¹/₂
- 15. (a) Activity : It is the ability of catalyst to increase the rate of chemical reaction. e.g. H₂ and O₂ to form water in the presence of platinum.

(12) **4379/4329**

(b) Selectivity : It means the ability of the catalyst to direct reaction to give particular product e.g.

$$Co(g) + 3H_2(g) \xrightarrow{Ni} CH_4(g) + H_2O(g)$$
 ^{1/2}

16. (a)
$$\log \frac{k_2}{k_1} = \frac{Ea}{2.303R} \left[\frac{T_2 - T_1}{T_1 T_2} \right]$$
 ^{1/2}

$$\log \frac{0.07}{0.02} = \left(\frac{Ea}{2.303 \times 8.314}\right) \left[\frac{700 - 500}{700 \times 500}\right] \qquad \frac{1}{2}$$

$$0.544 = Ea \times 5.714 \times 10^4 / 19.15$$
^{1/2}

 $Ea = 0.544 \times 19.15 / 5.714 \times 10^{-4}$

- (b) A bimolecular Rx behaves kinetically 1st order Rx when one of the reactant is present in excess.
- 17. The graph of $\Delta_r G^6$ vs *T* in Ellingham diagram for the formation of oxides shows that the *Cu-CuO* line is almost at the top. Therefore it is very easy to reduce oxide ores of *Cu* directly to metal by heating with coke. This is because $\Delta_r G^6$ vs *T* line for *CO* has -ve slope at higher temp. of therefore can easily reduce Cu_2O to *Cu*. $1\frac{1}{2}$

(13) 4379/4329

However the Gibb's energies for formation of most sulphides are greater than that for CS_2 . In fact CS_2 is an endothermic compound. Moreover there is no CS analogous to CO. Therefore extraction of Cu from Cu_2S is difficult. $1\frac{1}{2}$

18. Chlorine withdraws electrons through inductive effect and releases electrons through resonance. Through inductive effect chlorine destabilizes the intermediate carbocation formed during E^{\oplus} substitution.



4379/4329/(Set : A, B, C & D) P.

P. T. O.

Through resonance halogen tends to stabilize the carbocation and the effect is more pronounced at 0-& p-position. The inductive effect is stronger than resonance effect & causes net deactivation. Reactivity is thus controlled by inductive effect and orientation is controlled by resonance effect. 2

19. (a) Pentan-2-one forms yellow ppt of Iodoform with alkaline solution of iodine. Pentan-3-one does not give this test

 $CH_3COCH_2CH_2CH_3 + 3I_2 + 4NaOH -$

 $CH_3CH_2CH_2COONa + CHI_3 + 3H_2O + 3NaI$ 1

Iodoform



OR By any Method

4379/4329

OR

(15)

(a) Aldol condensation : Aldehydes and ketones having at least one α -H undergo a reaction in the presence of dilute alkali as catalyst to form β -hydroxy aldehydes or β hydroxy ketones. The β -hydroxy aldehydes and ketones readily loose water to give α - β unsaturated carbonyl compounds. This Rx is called aldol condensation. 1

$$2CH_{3}CHO \xrightarrow{dil NaOH} CH_{3}CH-CH_{2}CHO \xrightarrow{\Delta} CH_{3}$$
$$| \\ OH \\ -CH = CH - CHO \quad 1\frac{1}{2}$$

Decarboxylation : Carboxylic acids lose (b) CO_2 to form hydrocarbons when their sod. salt are heated with soda lime (NaOH + CaO in the ratio of 3 : 1. The reaction is known as decarboxylation. 2

$$RCOONa \xrightarrow{NaOH+CaO} R - H + Na_2CO_3 \qquad \frac{1}{2}$$
Heat

20. (a) (i)
$$I_2 < F_2 < Br_2 < Cl_2$$
 1

- (ii) *HI* > *HBr* > *HCl* > *HF* 1
- (iii) $NH_3 > PH_3 > AsH_3 > SbH_3 > BiH_3$ 1

(16) **4379/4329**

- (b) (i) Low temperature : But the temp. should not be very low otherwise rate of Rx will become slow. The optimum temp. 720 K should be maintained. 1
 - (ii) High pressure of 2 bar ^{1/2}
 - (iii) Presence of Catalyst, V_2O_5 ^{1/2}



(b) On large scale, ammonia is manufactured by Haber's process.

$$N_2(g) + 3H_2(g) \implies 2NH_3(g) \quad \Delta_f 4 = -46.1$$

 KJ/Mot^{-1}

(17) **4379/4329**

The optimum conditions for the production of NH_3 are a pressure of 200×10^5 Pa, a temp. of ~700 K and the use of catalyst such as Ironoxide with small amount of K_2O and Al_2O_3 to increase the rate of attainment at equilibrium. 2

21. (a) Electronic configuration of Mn^{2+} is $[Ar]3d^5$ which is half filled and it is stable. It means third e° cannot be removed easily. 1 In case of Fe^{2+} , the electronic configuration is $[Ar]3d^6$. Therefore Fe^{2+} can easily loose one e° to acquire $3d^5$ stable electronic

configuration.

(b) Interstitial compounds are those which are formed when small atoms like *H*, *C* or *N* are trapped inside crystal lattice of metals. 1

1

4379/4329/(Set : A, B, C & D) P. T. O.

(18) **4379/4329**

The transition metals can easily accommodate these small atoms because of space between metal atoms in crystal lattice. 1

(c)
$$[Xe]4f^4$$
 1

OR

(a) (i)
$$5C_2O_4^{2-} + 2MnO_4^{-} + 16H^+ \rightarrow 2Mn^{2+} + 8H_2O + 10CO_2$$
 1
(ii) $5S^{2-} + 2MnO_4^{-} + 16H^+ \rightarrow 2Mn^{2+} + 8H_2O + 5S$
(iii) $5SO_3^{2-} + 2MnO_4^{-} + 6H^+ \rightarrow 2Mn^{2+} + 3H_2O$
 $+ 5SO_4^{2-}$ 1

(b) The actinoids are highly reactive metals, especially when finely divided. The action of boiling water on them e.g. gives a mixture of oxide and hybride and combination with most non metals takes place at moderate temp. *HCl* attacks all metals but most are slightly affected by *HNO*₃. Alkalies have no action. 2

		SET – B
1.	(i)	(B) 1
	(ii)	(A) 1
	(iii)	(C) 1
	(iv)	(A) 1
	(v)	(B) 1
	(vi)	Any two like <i>Cu</i> , <i>Ag</i> , <i>Ni</i> , <i>Zn</i> , <i>Al</i> etc. $\frac{1}{2} + \frac{1}{2}$
	(vii)	When a sequence of elementary reactions give us the product, the reactions are called complex reactions.
	(viii)	This is because aspartame is unstable at cooking temp. and decomposes.
	(ix)	The sugars which can reduce Tollen's reagent or Fehling solution are called reducing sugars.

(19) 4379/4329

4379/4329/(Set : A, B, C & D) P. T. O.

(xiii) Potassium hexacyanomanganate (II).

(xiv)
$$CH_3 - CH - CH_2 \xrightarrow{OH^-} CH_3CH = CH_2$$
 1
 $H X$ Alc.

2. Aliphatic and aromatic 1° amines on heating with CHCl₃ and ethanolic KOH form isocynide or carbylamine, is called carbyl amine Rx. 1
e.g. CH₃CH₂NH₂ + CHCl₃ + 3KOH <u>heat</u> →

$$CH_{3}CH_{2}NC + 3KCl + 3H_{2}O \quad 1$$
3. (a)

$$(H_{3}CO)_{2}O \xrightarrow{(CH_{3}CO)_{2}O}_{Pyridine} \xrightarrow{(i) Br_{2} \text{ in } CH_{3}COOH}_{(ii) H^{+}} \bigoplus_{Br}^{NH_{2}} \xrightarrow{(h_{2}CO)_{2}O}_{H^{+}} \xrightarrow{(h_{2}CO)_{2}O}_{Br}$$

$$(b) \qquad \underbrace{\bigvee_{l=1}^{NH_2} \underbrace{\bigvee_{l=1}^{N_2} Cl^-}_{HCl}}_{273 - 278 \text{ K}} \underbrace{\bigvee_{l=1}^{N_2} Cl^-}_{OH^-} OH \underbrace{\bigvee_{l=1}^{N_2} OH^-}_{OH^-} OH \underbrace{\bigvee_{l=1}^{N_2} Cl^-}_{OH^-} OH \underbrace{\bigvee_{l=1}^{N_2} Cl^-}_{V_2 + V_2} OH \underbrace{\bigvee_{l=1}^{N_2} Cl^-}_{V_2 +$$

(21) 4379/4329

4. N because of having small size & high e° -vity is able to form $P\pi$ - $P\pi$ multiple bond & thus exist as N_2 .

On the other hand size of P is large it cannot form $P\pi$ - $P\pi$ multiple bond and it satisfy its valency by forming single bond & thus exist as P_4 .

5.
$$\frac{P^{\circ} - P}{P^{\circ}} = x_2 = \frac{W_B}{M_B} \times \frac{M_A}{W_A}$$
 ^{1/2}

$$\frac{17.535 - P}{17.535} = \frac{25}{180} \times \frac{18}{450}$$
 1/2

$$\frac{17.535 - P}{17.535} = 5.56 \times 10^{-3}$$
^{1/2}

17.535 - P = 0.0975

6. The amount of a chemical compound deposited at any electrode during electrolysis is directly proportional to the quantity of electricity based.

$$W \propto Q = W = ZQ.$$

(22) **4379/4329**
7.
$$\bigwedge_{m}^{\circ} (HA_{C}) = \aleph_{H^{+}} + \aleph_{AC^{-}} = \aleph_{H^{+}} + \aleph_{CC^{-}} + \aleph_{AC^{-}} + \aleph_{Na^{+}} - \aleph_{Na^{+}} + \aleph_{CC^{-}} - \aleph_{Na^{+}} + \frac{1}{2}$$

 $= \bigwedge_{m}^{\circ} (HCl) + \bigwedge_{m}^{\circ} (NaAC) - \bigwedge_{m}^{\circ} (NaCl) + \frac{1}{2}$
 $= (425.9 + 91.0 - 126) \text{S cm}^{2} \text{ mol}^{-1} + \frac{1}{2}$
 $= 390.5 \text{ S cm}^{2} \text{ mol}^{-1} + \frac{1}{2}$

1270/1220

- 8. Scuba divers cope with high conc. of dissolved gases while breathing air at high pressure under water. Increased pressure increases solubility of gases in blood. When the divers come towards surface, the pressure gradually decreases. This releases dissolved gases & lead to formation of bubbles of N_2 in blood. This blocks capillaries and creates a medical condition known as bends. 2
- 9. Transquilizers are neurologically active drugs. 1

These are used for treatment of stress and mild or even severe mental diseases. 1

1	0.	Homopolymer : It is a polymer which is form	ed
		from one type of monomer.	1⁄2
		e.g. polythene.	1⁄2
		Copolymer : It is a polymer formed from two	or
		more different monomers.	1⁄2

e.g. Nylon-6,6.

1⁄2

11.		DNA	RNA
	(i)	Ithasdoublestrandedα-helixstructure	It has single stranded α -helix structure
	(ii)	Sugar molecule is 2-Deoxyribose	Sugar molecule is ribose
	(iii)	It has unique property of replication	RNA does not replicate
	(iv)	Nitrogeneous base uracil not present	Nitrogeneous base thymine is not present
			$\frac{1}{2} \times 4 = 2$
12.	(a)	Density, $\rho = \frac{Z \times M}{a^3 \times N_0}$	- 1/2
		for fcc lattice, $Z = 4$	
		Atomic mass, <i>M</i> of (<i>Cu</i> = 63.5
			$a = 3.61 \times 10^{-8}$ cm ¹ / ₂
		$\therefore \rho = \frac{4 \times 6}{(3.61 \times 10^{-8}) \times 10^{-8}}$	$\frac{3.5}{(6.022 \times 10^{23})}$ ¹ / ₂

$$= 8.96g / cm^3$$
 ¹/₂

(24) **4379/4329**

(b) In bcc arrangement number of lattice point are = 8 (at corner) +1 (at centre)

Lattice points are =
$$8 \times \frac{1}{8} + 1 = 2$$
 1

13. A balanced chemical equation never gives us true picture of how a reaction takes place since rarely a reaction gets completed in one step. The reactions taking place in one step are called elementary Rx. When a sequence of elementary Rx give us the product, the Rx are called complex Rx. These may be consecutive Rx, reverse Rx & side Rx.

e.g. Decomposition of H_2O_2 in the presence of I^- in an alkaline medium

 $2H_2O_2 \xrightarrow{I^-} 2H_2O + O_2$

Actually it occurs in two steps

$$H_2O_2 + I^- \rightarrow H_2O + IO^-$$
$$H_2O_2 + IO^- \rightarrow H_2O + I^- + O_2 \qquad 1$$

(25) **4379/4329**

14. The variation in amount of gas absorbed by the adsorbent with pressure at constant temp. is expressed by cure termed as adsorption isotherm.

Freundlich adsorption isotherm : Variation of extent of adsorption (x/m) with pressure at constant temp. is given by

$$\frac{x}{m} = KP^{1}/_{n}$$
 (i)

Where x = mass of gas adsorbed

m = mass of adsorbent at pressure P

K of n are constants which depend upon nature of gas and adsorbent. The relationship is generally expressed in the form of curve where mass of gas adsorbed/gram of adsorbent is plotted against pressure.

Taking log of equⁿ (i)

$$\log \frac{x}{m} = \log K + \frac{1}{n} \log P$$
 $\log \frac{x}{m}$ $\log \frac{1}{n}$

 $\log P$

ī

from slope value of *n* can be calculated.

2

4379/4329/(Set : A, B, C & D) P. T. O.

(26) **4379/4329**

(ii)
$$CH_3 - CH - CH - CH_3 \xrightarrow{-H_2O} CH_3 - CH_3 \xrightarrow{H_1} CH_3 \xrightarrow{+I_2O} CH_3 \xrightarrow{H_1} CH_3$$

$$\begin{array}{c} - CH_3 \leftrightarrow CH_3 \stackrel{+}{-C} - CH_2 - CH_3 \\ \downarrow \\ CH_3 \end{array}$$

(iii)
$$CH_3 \xrightarrow{-C - CH_2 - CH_3} \xrightarrow{Br^{\ominus}} CH_3 \xrightarrow{-C - CH_2 - CH_3} \xrightarrow{Br} \xrightarrow{I} CH_3 \xrightarrow{I} CH_3$$

 $1 \times 3 = 3$

16. (a)Alkyl halides are held together by dipole-
dipole forces. On the other hand H_2O
molecules are held together by H-bonds.
When alkyl halides are added to H_2O , the
new force of attraction is weaker than the
already existing between R_X - R_X of $H_2O - H_2O$
molecules. Hence alkyl halide are
immiscible in water.24379/4329/(Set : A, B, C & D)2

(27) **4379/4329**

(b) Grignard reagents are very reactive & reacts with moisture present in apparatus

 $RMgX + H_2O \rightarrow R-H + Mg(\text{on}) X.$

- ∴ RMgX must be prepared under anhydrous conditions.
 1
- 17. (a) In both the complexes iron is in +2 oxidation state having $3d^6$ electronic configuration having 4 unpaired e°s. But in $[Fe(CN)_6]^{4-}$ these e°s are paired up by strong CN^- ligand. On the other hand they remain unpaired in $[Fe(H_2O)_6]^{2+}$ as H_2O is weak ligand. So due to difference in unpaired e°s, the complexes give different colours. 2



4379/4329/(Set : A, B, C & D)

P. T. O.

(28) 4379/4329

18. (a) Gold is leached with dilute solution of NaCN or KCN in the presence of O_2 from which metal is obtained later by replacement. $\frac{1}{2}$

$$4M(s) + 8CN^{-}(aq) + 2H_2O(aq) + O_2(g) \rightarrow$$

 $4[M(CN)_2]^{-}(aq) + 4OH^{-}(aq)$ M = A₄ $\frac{1}{2}$

$$2[M(CN)_2]^-(aq) + Zn(s) \rightarrow [Zn(CN)_4]^{2-}(aq) + 2M(s)$$

1⁄2

(b) The copper matte containing Cu₂S and FeS is put in silica lined converter. Some SiO₂ is also added & hot air blast is blown to convert remaining FeS to FeO which is removed us slag with silica. Cu₂S or CuO converted to Cu.

$$\begin{split} & 2FeS + O_2 \rightarrow 2FeO + 2SO_2 \\ & FeO + SiO_2 \rightarrow FeSiO_3 \\ & 2Cu_2S + 3O_2 \rightarrow 2Cu_2O + 2SO_2 \\ & 2Cu_2O + Cu_2S \rightarrow 6Cu + SO_2 \end{split}$$

(29) 4379/4329

19. (a) Ozone acts as powerful oxidizing agent because it is thermodynamically unstable and decomposes as

$$O_3 \rightarrow O_2 + O$$
 2

The nascent oxygen oxidizes a no. of compounds.

(b) The electron gain enthalpy of fluorine is less negative as compared to chlorine. It is due to small size of F atom. As a result there are strong inter electronic repulsions in relatively small 2p orbitals of F & thus incoming e[⊕] does not feel much attraction. 2

(c)
$$XeF_2 + 2H_2O \rightarrow 2Xe(g) + 4HF(aq) + O_2(g)$$
 1

OR

(a) Helium is used as diluent for oxygen in diving apparatus because of its very low solubility in blood.

(30) 4379/4329

1

(b) H_3PO_4 contains three P-O-H bond. It has three ionisable hydrogen. Hence it is tribasic acid. 1



- (c) Halogens have high electron affinities & hence have strong tendency to accept electron. That is why halogens are strong oxidizing agent.
- **20.** (a) (i) Oxoanion of transition metals have highest oxidation state e.g. O.S. of Mnin MnO_4^- is +7. This is because of high electro negativity of oxygen and its high oxidizing property. 2
 - (ii) The $E_M^{\circ}^{2+}/M$ value for Cu is +ve. This show Cu is least reactive element of 1st T.S. This is because Cu has high enthalpy of atomization of enthalpy of ionization. It means I.E. required is not balanced by hydration enthalpy. 2

(31) 4379/4329

(b) The principal O.S. of lanthanoids is = +3. In addition they exhibit oxidation states +2 & +4.

OR

(a) (i)
$$2MnO_4^- + 10I^- + 16H^+ \rightarrow 2Mn^{2+} + 8H_2O$$

+ $5I_2$ 1
(ii) $Cr_2O_7^{2-} + 3Sn^{2+} + 14H^+ \rightarrow 2Cr^{3+} + 3Sn^{4+}$
+ $7H_2O$ 1

(b) Cu exhibit +1 O.S most frequently because it has stable electronic configuration of $3d^{10}$ in +1 oxidation state. $\frac{1}{2} + \frac{1}{2}$

(c)
$$La(OH)_3$$
 is more basic than $Lu(OH)_3$ ^{1/2}

Due to lanthanoid contraction the size of lanthanoid ion decreases with increase in atomic no. As a result covalent character between lanthanoid ion of OH^- increases.

:. Basic character decreases from $La(OH)_3$ to $Lu(OH)_3$. $1\frac{1}{2}$

(32) 4379/4329

21. (a) Benzaldehyde forms silver mirror with Tollen's reagent. Acetophenone does not react.

$$\begin{array}{c} CHO \\ \hline \bigcirc \\ + 2[Ag(NH_3)_2]OH^- \longrightarrow \bigcirc \\ \hline \bigcirc \\ \end{array}$$

$$+2Ag\downarrow +3NH_3 + H_2O$$
 1

Silver mirror

(b)
$$(HO) \xrightarrow{[Ag(NH_3)_2]^+OH^-O} (HO)$$
 1

(c) Benzoic acid is stronger acid than phenyl acetic acid.1

This is because in benzoic acid -COOH gp is attached to SP^2C of benzene ring whereas in phenylacetic acid -COOH gp is attached to SP^3C .

OR

(a) (i) Since the given compound on hydrolysis with dil. H_2SO_4 give carboxylic acid (B) and alcohol (C). It must be an ester. $\frac{1}{2}$

(33) 4379/4329

- (ii) Since the oxidation of alcohol(C) gives acid (B). Both alcohol and acid must contain same no. of carbon atoms. ¹/₂
- (iii) Since ester contain 8 carbon atoms,
 ∴ acid and alcohol must contain 4 carbon each.
- (iv) Alcohol (C) on dehydration gives but-1ene,

(v) (B) is obtained by oxidation of C, ½
∴ B must be butanoic acid.

$$\begin{array}{c} O\\ CH_{3}-CH_{2}-CH_{2}-\overrightarrow{C}-O-CH_{2}-CH_{2}\\ (A) \qquad CH_{2}-CH_{3} \xrightarrow{dil.H_{2}SO_{4}} \end{array}$$

$$CH_{3}CH_{2}CH_{2}-COOH+CH_{3}CH_{2}CH_{2}CH_{2}OH \qquad \frac{1}{2}\\ (B) \qquad \qquad (C)\\ CH_{3}CH_{2}CH_{2}COOH \xleftarrow{CrO_{3}}{CH_{3}COOH}CH_{3}CH_{2}CH_{2}CH_{2}OH\\ (B) \qquad \qquad (C)\\ \underline{dehydration} CH_{3}CH_{2}CH = CH_{2} \qquad \frac{1}{2}\\ \textbf{4379/4329/(Set: A, B, C \& D)} \qquad P. T. O. \end{array}$$

(34) 4379/4329

 (b) Wolf Kishner reduction : Aldehydes or Ketones are heated with hydrazine and NaOH or KOH in ethylene glycol to give hydrocarbons.

$$> C = O \xrightarrow{NH_2.NH_2} > C = NNH_2 \xrightarrow{KOH} glycol Heat$$

 $> CH_2 + N_2 \xrightarrow{1/2} NH_2 \rightarrow CH_2 + N_2 = NCH_2 + N_2 = NCH_2 + N_2 = NCH_2 + N_2 = NCH_2 + NCH_$



			_
1.	(i)	(A)	1
	(ii)	(C)	1
	(iii)	(D)	1
	(iv)	(A)	1
	(v)	(B)	1
	(vi)	$\bigcirc -C = NCH_2 - CH_3$ CH_3	1
	(vii)	The reactions which takes place in one step	þ
		are called elementary reactions.	1
	(viii)	P-type	1
4070			

4379/4329

(ix)
$$\frac{P^{\circ} - P}{P^{\circ}} = x_2$$

(35)

(x) A method by which iron is protected from rusting by covering it with a layer of a metal more active than iron.

(xi) Critical Micelle concentration. 1

(xii) The main constituents of dettol are chloroxylenol and terpineol in suitable solvent.

(xiii) Ethylene glycol and phthalic acid.

(xiv) $C_1 - C_4$ and $C_1 - C_6$ glycosidic linkage. 1

 Benzene diazonium chloride reacts with aromatic compound having active hydrogen to form azo compounds (dyes) is called coupling reaction.

e.g.
$$\bigcirc$$
 $N^+ \equiv NCl^- + H - \bigcirc OH \rightarrow \bigcirc$
 $N \equiv N - \bigcirc OH + Cl^- + H_2O$ 1

4379/4329/(Set : A, B, C & D)

P. T. O.

(36) **4379/4329**

- Aromatic primary amines cannot be prepared by Gabriel Phthalimide reaction because aryl halides do not undergo nucleophilic substitution with the anion formed by phthalimide.
- Conditions to form H-bond are small size and high electronegativity. Though chlorine has same electronegativity to that of oxygen but its size is large. That is why *Cl* does not form Hbonding.
- 5. Rusting of iron is an electrochemical phenomenon because at a particular spot of an object made of iron, oxidation takes place and spot behave as anode & we can write reaction : 1

Anode $2Fe(s) \rightarrow 2Fe^{2+} + 4e^- E^{\circ}_{Fe^{2+}/Fe} = -0.44 V$

Electrons released at anodic spot move through metal and go to another spot on the metal and reduce oxygen in the presence of H^+ . This spot behave as cathode.

Cathode –
$$O_2(g) + 4H^+(aq) + 4e^- \rightarrow 2H_2O(l)$$

$$E^{\circ}H^{+}/O_{2}/H_{2}O = 1.23V$$

4379/4329 (37)

6.
$$E_{cell}^{\circ} = 0.236 V$$

 $\Delta G^{\circ} = -nFE_{cell}^{\circ}$

$$\Delta G^{\circ} = -2 \times 96500 \, C \times 0.236 \, V = -45.55 \, \text{KJ} \qquad \frac{1}{2}$$

$$\Delta G^{\circ} = -2.303 \text{ RT log K}_{\text{C}}$$

$$\log K_{\rm C} = \frac{-\Delta G^{\circ}}{2.303 \,\text{RT}} = \frac{-45.55}{2.303 \times 8.314 \times 10^{-3} \times 298}$$

$$= 7.953$$

$$K_{\rm C} = \text{antilog } (7.953) = 9.62 \times 10^{7}$$
 $\frac{1}{2}$

7. Mass of ethylene glycol = 222.6 g

Molar mass of ethylene glycol = 62

Moles =
$$\frac{222.6}{62}$$
 = 3.59
Molality = $\frac{3.59}{200} \times 1000 = 17.95$ m
Moles of ethylene glycol = 3.59

Moles of ethylene glycol = 3.59

Mass of solution = $200 + 222.6 = 422.6 \text{ g} \frac{1}{2}$ Vol. of solution $=\frac{\text{Mass}}{\text{Density}}=\frac{422.6}{1.072}=394.22 \text{ ml}$ Molarity = $\frac{3.59}{394.22} \times 1000 = 9.11$ M 1⁄2

(38) 4379/4329

8. People taking a lot of salt or salty food experience water retention in tissue cells and intracellular space because of osmosis. The resulting puffiness or swelling is called edema.

2

9. Detergents having straight hydrocarbon chains are easily decomposed by microorganisms are called biodegradable detergents e.g. sod. lauryl sulphate. $\frac{1}{2} + \frac{1}{2}$

Detergents having branched hydrocarbon chain are not decomposed by microorganism and are called non biodegradable detergents e.g. sod. 4-(1,3,5,7-tetra-methyloctyl) benzene sulphonate. $\frac{1}{2} + \frac{1}{2}$

10. The amino acids which can not be synthesized in our body and must be present in our diet are called essential amino acids e.g. valine.

1/2 + 1/2

On the other hand the amino acids which can be synthesized in our body are called non essential amino acids e.g. alamine. $\frac{1}{2} + \frac{1}{2}$

11. Natural rubber is linear cis-1, 4 polyisoprene. The cis configuration does not allow chains to come closer due to weak intermolecular attraction. Therefore natural rubber is coiled, elastic & non crystalline.

On the other hand trans configuration occurs in Gulta-Purcha. The zig-zag chain pack more closely, hence it is crystalline, non elastic, hard of brittle. 1

12. (i) The conc. zinc blende is roasted in the presence of excess of air at 1200 K

$$2ZnS + 3O_2 \xrightarrow{\Delta} 2ZnO + 2SO_2$$

(ii) ZnO is reduced to Zn with crushed coke at 1673 K

 $ZnO + C \rightarrow Zn + CO$

(iii) Impure Zn is refined by electro refining method. The reactions taking place at cathode and anode are :

At anode $Zn \rightarrow Zn^{2+} + 2e^{-}$

At cathode $Zn^{2+} + 2e^- \rightarrow Zn$

4379/4329/(Set : A, B, C & D) P. T. O.

 $1 \times 3 = 3$

(40) **4379/4329**

13. In an octahedral coordination entity the six ligands surrounding the metal atom/ion, these will be repulsion between metal d orbitals and ligands. The $dx^2 - y^2$ and dz^2 orbitals are repelled more as they are directed forwards the ligands and are raised in energy. dxy, dyz and dxz orbitals which are directed between the axes are lowered in energy. As a result degeneracy of d orbitals is removed.



14. Smoke is a colloidal solution of solid particles such as *C*, *As* compounds, dust etc. The smoke before it comes out from chimney is led through a chamber containing plates having charge opposite to smoke particles. The particles on coming in contact with these plates loose their 4379/4329/(Set : A, B, C & D)

(41) **4379/4329**



charge and gets precipitated. The particle thus

Cottrell smoke precipitator

15. (a) Let the initial conc., $[A]_0 = a$

Final conc.
$$[A] = \frac{1}{16}a$$
 ¹/₂

Rate constant = $60 S^{-1}$

$$t = \frac{2.303}{k} \cdot \log \frac{[A]_0}{[A]}$$
¹/₂

$$=\frac{2.303}{60}\log\frac{a}{a/16}=\frac{2.303}{60}\log 16$$
 ¹/₂

$$=\frac{2.303}{60} \times 1.204$$

= 0.046 sec. ¹/₂

(42) 4379/4329

- (b) The energy required to form activated complex is known as activation energy. 1
- 16. In a conductor, the energy gap between valence band and conductance band is very small or there is overlapping between valence band and conductance band. Therefore under an applied electric field the electron can jump from V. B to C. B and substance show conductivity. But in a semiconductor there is always a small energy gap between V. B and C. B.



(43) **4379/4329**

(c)
$$CH_3 \xrightarrow[CH_3]{} CH_3 \xrightarrow[CH_3]{} CH_3 \xrightarrow[CH_3]{} CH_3 \xrightarrow[CH_3]{} CH_2 \xrightarrow[HBr]{} Peroxide$$

$$CH_3 \xrightarrow[CH_3]{} CH_3 \xrightarrow[CH_3]{} CH_2 = 12$$

18. (a) Williamson Ether Synthesis : It is an important lab. method for the prep. of symmetrical and unsymmetrical ethers. In this method an alkyl halide is allowed to react with sod. alkoxide.

$$R - X + R - O^{-} - Na^{+} \rightarrow R - O - R + NaX \quad \frac{1}{2}$$

(b) **Kolbe's Reaction :** Sod. phenoxide react with CO_2 to form O-hydroxybenzoic acid as main Rx product. $\frac{1}{2}$

19. (i) According to definition, transition elements are those which have partially filled dorbitals in their elementary state or in their

(44) 4379/4329

one of oxidation state. Silver can exhibit +2 O-S. in which it has partially filled d-orbital (4d^a). Hence silver is regarded as transition element. 2

(b) Lanthanoids exhibits oxidation states of +2,
+3 & +4. The reason behind this limited no.
of O-S is large energy gap between 5d & 4f
subshells. On the other hand actinoids show
a no. of oxidation states of +3, +4, +5, +6 &
+7. This is because of small energy difference
between 5f, 6d & 7s orbitals.

OR

(a) In third transition series 4f orbitals are filled before 5d orbital. Due to poor shielding of 4f orbitals there is regular decrease in atomic radii called lanthanoid contraction. That is why 2nd & 3rd d series members have similar atomic radii.

(45) **4379/4329**

- (b) (i) Transition metals and their compounds are known for their catalytic activity. This is ascribed to their ability to adopt multiple O. States & to form complexes.
 - (ii) This is because of their high charge and small size of their ions.
- 20. (a) Acetophenone gives yellow ppt. with alkaline solution of Iodine. Benzophenone does not respond to this test.

 $C_6H_5COCH_3 \xrightarrow{I_2,NaOH} CHI_3 \downarrow +C_6H_5COONa$ Acetophenone Yellow ppt. 1

(b) (i)
$$3CH_3COOH + PCl_3 \rightarrow 3CH_3COCl + H_3PO_3$$
 1

(ii)
$$CH_3COOH \xrightarrow{(i) LiAlH_4} CH_3CH_2OH$$
 1

(iii)
$$CH_3COOH + C_2H_5OH \xleftarrow{H^+} CH_3COOC_2H_5 + H_2O$$
 1

(46) **4379/4329** OR

(a) In 2, 2, 6 trimethyl cyclohexanone, there are three methyl gps at α -position to keto gp. Thus Nu^{\ominus} attack of CN^{\ominus} is not possible due to steric hindrance. But in case of cyclohexanone these is no such case. $1\frac{1}{2}$



4379/4329/(Set : A, B, C & D)

(47) 4379/4329

21. (a) SO_2 dissolves in rain water and produces acid rain. The acid rain contains H_2SO_4 . 1

$$SO_2 + \frac{1}{2}O_2 + H_2O \rightarrow H_2SO_4 \qquad 1$$

(b) Aquaresia is three parts conc. HCl and one part conc. HNO_3 1

$$Au + 4H^+ + NO_3^- + 4Cl^- \rightarrow AuCl_4^- + NO + 2H_2O$$
 1



OR

4379/4329/(Set : A, B, C & D)

P. T. O.

(a) P can show max. O.S of +5 in its compounds. In PCl_5 its O.S is +5 so it can not increase its O.S beyond +5, it can not act as reducing agent. But it can act as oxidizing agent by decreasing its O. State from +5 to +3 e.g. 2

$$2Ag + PCl_5 \rightarrow 2AgCl + PCl_3$$

 (b) Size of chlorine (99pm) is larger than fluorine (64pm) so it can accommodate three fluorine around it. But F being smaller in size cannot accommodate three large sized chlorine.

1

4379/4329/(Set : A, B, C & D)

(c)