Sample Question Paper - III
CHEMISTRY
BLUE PRINT
CLASS - XII

Time Allowed : 3 Hrs **Maximum Marks : 70**

S.R.	UNIT	VSA(1)	SA I	SA II	LA	TOTAL
1	Solid State		4(2)			4(2)
2	Solutions	1(1)	4(2)			5(3)
3	Electrochemistry				5(1)	5(1)
4	Chemical Kinetics		2(1)	3(1)		5(2)
5	Surface Chemistry	1(1)		3(1)		4(2)
6	General Principles and Processes of Extraction of Elements	1(1)	2(1)			3(2)
7	p- Block Elements		2(1)	6(2)		8(3)
8	d- and f- Block Elements				5(1)	5(1)
9	Coordination Compounds	1(1)	2(1)			3(2)
10	Haloalkanes and Haloarenes		4(2)			4(2)
11	Alcohols,Phenols & 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			3(1)		3(1)
16	Chemistry in Everyday Life			3(1)		3(1)
	Total	**8(8))**	**20(10)**	**27(9)**	**15(3)**	**70(30)**

DESIGN

S No.	Type of Question	Marks for each Question	No. of Questions	Total Marks
1.	Long Answers (LA)	5	3	15
2.	Short Answers-II (SA II)	3	9	27
3.	Short Answers-I (SA-I)	2	10	20
4.	Very Short Answer (VSA)	1	08	08
	Total		**30**	**70**

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General Instructions:

1. All questions are compulsory.
2. Question No. 1 to 8 are very short questions carrying one mark each.
3. Question No. 9 to 18 are short answer questions carrying 2 marks each.
4. Question No. 19 to 27 are also short answer questions carrying 3 marks each.
5. Question No. 28 to 30 are long answer questions carrying 5 marks each.
6. Use of calculators is not allowed. Use the log tables wherever necessary.

Q.1 A and B liquids on mixing produce a warm solution. Which type of deviation from Raoult's law is there? 1

Q.2 Why is Ferric Chloride preferred over Potassium Chloride in case of a cut leading to bleeding? 1

Q.3 Among Octahedral and Tetrahedral crystal fields, in which case the magnitude of crystal field splitting is larger?

Q.4 Why is ortho-nitrophenol more acidic than ortho-methoxyphenol?

Q.5 Write two important uses of Formalin.

Q.6 Why do amines act as nucleophiles?

Q.7 Why can't aluminium be reduced by carbon?

Q.8 What are the ultimate products of digesion of proteins? 1

Q.9 Gold (atomic mass =197u, atomic radius = 0.144nm) crystallizes in a face centered unit cell. Determine the density of gold, [$N_A = 6.022 \times 10^{23}$ mol^{-1}] 2

Q.10 Classify each of the following as being either a p-type or an n-type semi-conductor. Give reason.

(a) Si doped with In

(b) Si doped with P.

Q.11 Determine the molarity of an antifreeze solution containing 250g water mixed with 222g ethylene glycol ($C_2H_6O_2$).The density of this solution is 1.07g/ml. 2

Q.12 An aqueous solution containing urea was found to have boiling point more than the normal

boiling point of water (373.13 K).When the same solution was cooled it was found that its freezing point is less than the normal freezing point of water (273.13K).Explain these observations. 2

Q.13 Consider the decomposition of hydrogen peroxide in alkaline medium which is catalysed by iodide ions.

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

This reaction takes place in two steps as given below

Step - I $H_2O_2 + I^- \rightarrow H_2O + IO^-$ (slow)

Step -II $H_2O_2 + IO^- \longrightarrow H_2O + I^- + O_2$ (fast)

(a) Write the rate law expression and determine the order of reaction w.r.t. H_2O_2.

(b) What is the molecularity of each individual step? 2

Q.14 (a) What is the role of depressant in froth floatation process?

(b) Out of C and CO which is a better reducing agent for FeO

(i) In the lower part of blast furnace (Higher temperature) 2

(ii) In the upper part of blast furnace (Lower temperature) 2

Q.15 Complete the following reactions:-

(a) $(NH_4)_2Cr_2O_7 \xrightarrow{heat}$

(b) $I^- + O_3 + H_2O \longrightarrow$

Q.16 Using valence bond theory , predict the geometry and magnetic character of $[NiCl_4]^{2-}$. Atomic no of Ni is 28.

Q.17 (a) Write the structure of following compound

1-Bromo-4 -sec-butyl- 2- methylbenzene

(b) How will you bring about the conversion:

Methyl bromide to methyl iodide 2

Q.18 Explain-

(a) Grignard reagents should be prepared under anhydrous conditions.

(b) $C_6H_5CHClCH_3$ is hydrolysed more easily with KOH than $C_6H_5CH_2Cl$ 2

OR

Arrange the following compounds in the decreasing order of reactivity towards SN^2 displacement reaction and give reasons in support of your answer.

a) C_2H_5Br, C_2H_5I, C_2H_5Cl

b) $(CH_3)_3CBr$, $CH_3CH_2CHBrCH_3$, $CH_3CH_2CH_2CH_2Br$ 2

Q.19 Draw the structures of the following:

(a) $H_2S_2O_8$

(b) XeO_3

(c) $HOClO_2$

Q.20 In a hydrolysis reaction, 5g ethyl acetate is hydrolyzed in presence of dilute HCl in 300 minutes. If the reaction is of first order and the initial concentration of ethyl acetate is 22g/L, calculate the rate constant of the reaction. 2

Q.21 (a) Give reasons for the following:

(i) Glucose does not give 2, 4- DNP test and Schiff's test.

(ii) Amino acids have high melting points and are soluble in water. 2

(c) What is meant by the secondary structure of proteins ? 1

Q.22 (a) Give an example of a synthetic rubber and mention its main advantage.

(b) Write the structures of the monomers of Dacron.

(c) Arrange the following polymers in the increasing order of tensile strength.

Nylon6, Buna-S, Polythene 3

Q.23 Give one example for each of the following:

(a) An artificial sweetner whose use is limited to cold drinks.

(b) A non ionic detergent.

(c) A pain reliever used for relief from severe pain like post-operative pain or pain due to terminal cancer. 3

Q.24 (a) Give chemical tests to distinguish between the following compounds (One test in each case).

(i) Aniline and ethylamine

(ii) Methylamine and dimethylamine 2

(b) How will you convert aniline to sulphanilic acid? 1

OR

An aromatic compound (A) on treatment with ammonia followed by heating forms compound (B), which on heating with Br_2 and KOH forms a compound (C) having molecular formula C_6H_7N. Give the structures of A, B and C and write the reactions involved. 3

Q.25 (a) Give the mechanism of the following reaction:

$$2CH_3CH_2OH \xrightarrow[413K]{dil\,H_2SO_4} CH_3CH_2OCH_2CH_3$$

Does this reaction follow S_N1 or S_N2 pathway? 2

(b) Describe hydroboration oxidation reaction with the help of an example. 1

Q.26 Give reasons:-

(a) Interhalogen compounds are more reactive than halogens.

(b) PCl_5 is known but NCl_5 is not known.

(c) Amongst all noble gases only xenon is known to form compounds with oxygen and fluorine. 3

Q.27 (a) Give one main difference between lyophillic and lyophobic colloids. 1

(b) Explain:-

(i) Sky appears blue in colour. 2

(ii) A freshly formed precipitate of ferric hydroxide can be converted to a colloidal sol by shaking it with a small quantity of ferric chloride. 3

Q.28 (a) Two electrolytic cells containing silver nitrate solution and dilute sulphuric acid solution were connected in series. A steady current of 2.5 amp was passed through them till 1.078g of silver was deposited. [Ag = 107.8g mol^{-1}, IF = 96, 500 C]

(i) How much electricity was consumed?

(ii) What was the weight of oxygen gas liberated? 3

(b) Give reason:-

(i) Rusting of iron pipe can be prevented by joining it with a piece of magnesium.

(ii) Conductivity of an electrolyte solution decreases with the decrease in concentration. 2

OR

(a) What is a fuel cell? What is its main advantage? 1

(b) What are the reactions occurring at the cathode and anode of a Lachlanche cell? 1

(c) In the button cell widely used for watches and other devices, the following reaction takes place:

$$Zn(s) + Ag_2O(s) + H_2O(l) \longrightarrow Zn^{2+}(aq) + 2Ag(s) + 2OH^-(aq)$$

Give the cell representation and determine the value of Kc for the above reaction using the following data:

$$Ag_2O(s) + H_2O(l) + 2e^- \longrightarrow 2Ag(s) + 2\,OH^-(aq) \qquad (E^0 = 0.344V)$$

$$Zn^{2+}(aq) + 2e^- \longrightarrow Zn(s) \qquad (E^0 = -0.76V)$$ 3

Q.29 Explain the following:

(a) Actinoids show large number of oxidation states.

(b) The transition metals form a large number of complex compounds.

(c) Chromium is a typical hard metal while mercury is a liquid.

(d) MnO is basic while Mn_2O_7 is acidic in nature.

(e) Silver is a transition metal but zinc is not.

OR

(a) Give two consequences of lanthanoid contraction. 1

(b) Complete the following reactions:

(i) $MnO_4^- + S_2O_3^{2-} + H_2O \longrightarrow$

(ii) $Cr_2O_7^{2-} + Sn^{2+} + H^+ \longrightarrow$ 2

(c) Which of the following has maximum number of unpaired electrons?

$Ti^{3}+$, $V^{3}+$, $Fe^{2}+$, Mg^{2+} 1

(d) Based on the data, arrange Fe^{2+} , Mn^{2+} and Cr^{2+} in the increasing order of stability of +2 oxidation state

$E^0_{Cr^{3+}/Cr^{2+}} = -0.4\ V$ $E^0_{Mn^{3+}/Mn^{2+}} = 1.5V$ $E^0_{Fe^{3+}/Fe^{2+}} = 0.8V$

Q.30 (a) Identify A, B and C in the following reaction

$$CH \equiv CH \xrightarrow[HgSO_4]{dil.\ H_2SO_4} A \xrightarrow{dil.NaOH} B \xrightarrow{heat} C \longrightarrow$$ 3

(b) Give reasons:

(i) p-Nitro benzoic acid has higher K_a value than benzoic acid.

(ii) Acetone is highly soluble in water but benzophenone is not. 2

OR

(a) An organic compound(A) has molecular formula ($C_5H_{10}O$). It does not reduce Tollen's reagent but forms an orange precipitate with 2,4 - DNP reagent. It forms a carboxylic acid(B)with molecular formula ($C_3H_6O_2$) when treated with alkaline $KMnO_4$, yellow precipate on treatment with NaOH and I_2. Under vigorous conditions. On oxidation it gives ethanoic acid and propanoic acid. Sodium salt of (B) gave a hydrocarbon (C) in Kolbe,s Electrolytic Reduction. Identify (A) , (B) and (C) and write the reactions involved. 3

(b) Predict the products formed in the following cases :

(i) (A) reacts with PhMgBr and is then hydrolysed.

(ii) (A) reacts with hydrazine and is then heated with KOH and ethylene glycol. 2

MARKING SCHEME OF
CHEMISTRY
SAMPLE PAPER-III

A.1 Negative deviation. 1

A.2 Fe3+ is a better coagulating ion due to greater positive charge on it 1

A.3 Octahedral crystal field. 1

A.4 Due to electron withdrawing effect of nitro group. 1

A.5 In preserving biological specimens and in making polymer like bakelite. ½ + ½

A.6 Due to the presence of lone pair of electrons on nitrogen of amines. 1

A.7 Because aluminium is a stronger reducing agent than carbon. 1

A.8 Amino acids. 1

A.9 $d = \frac{Z \times M}{N_a \times a_3}$ $\gamma = \frac{2}{2\sqrt{2}}$ ½

$a = 2 \times 0.144 \times 1.414 nm$

$= .407 nm.$ ½

$$d = \frac{4 \times 197 g\ mol^{-1}}{6.002 \times 10^{23}\ mol^{-1} \times (0.407 \times 10^{-7})\ cm^3}$$

$d = 19.6 g / cm^3$ 1

A.10 (a) p-type, because In has 3 Valence electrons. Holes are produced which can move through the crystal like a positive charge.

(b) n-type, because P-has 5 valence electrons. The fifth electron becomes delocalised and is free to contribute to electrical conduction 1+1

A.11 No. of moles of ethylene glycol = n_B

Molar mass of $C_2 H_6 O_2 = (24+6+32) g\ mol^{-1}$

$$M_B = \frac{222g}{62\ mol^{-1}} = 3.58\ mol$$ ½

mass of Solution = (250 + 222)g = 472g.

$$\text{Volume of Solution} = \frac{\text{mass of solution}}{\text{density of solution}}$$ ½

$$V = \frac{472g}{1.07g/ml} = 441.12ml$$ 1

$$M = \frac{n_B}{V} \times 1000$$

$$= \frac{3.58mol}{441.12L} \times 1000 = 8.12mol\,L^{-1}$$

A.12 The vapour pressure of the aqueous solution containing urea is less than the vapour pressure of pure water because urea is a nonvolatile solute. To boil this solution we have to heat it to the temperature higher than the normal boiling point of water. 1

To freeze the solution the temperature is lowered, the vapour pressure of solution also lowers. The vapour pressure of solution equalizes the vapour pressure of solid solvent at temperature lower than the normal freezing point of water. 1

A.13 (a) $Rate = k[H_2O_2]^1[I^-]^1$ ½

order w.r.t. $H_2O_2 = 1$ ½

(b) Molecularity -step I = 2 ½

step II = 2 ½

A.14 (a) Depressant is used in the froth floatation process for preventing the specific sulphide ore from forming froth in a mixture of sulphides. 1

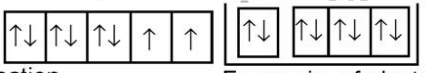
(b) C is better reducing agent at higher temperature ½

CO is better reducing agent at lower temperature. ½

A.15 (a) $(NH_4)_2Cr_2O_7(s) \xrightarrow{Heat} N_2(g) + 4H_2O(l) + Cr_2O_3(s)$ 1

(b) $2I^-(aq) + O_3(g) + H_2O(l) \longrightarrow 2OH^-(aq) + I_2(s) + O_2(g)$ 1

A.16 $[NiCl_4]^{2-}$ =



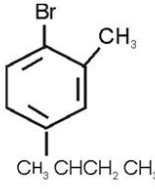
Sp3 hybridisation

Four pairs of electrons from 4Cℓ⁻ ions

Geometry - Tetrahedral due to sp^3 hybrdisation

Magnetic character-Paramagnetic, due to the presence of 2 unpaired electrons in 3d orbitals. 1+1

A.17 (a)



3

Four pairs of electrons from 4Cℓ⁻ ions

(b) $CH_3Br + NaI \xrightarrow{\text{dry acetone}} CH_3I + NaBr$ 1+1

Methylbromide Methyl Iodide

A.18 (a) As Grignard reagents react with water to give corresponding alkanes, therefore they are prepared under anhydrous conditions.

$RMgX + H_2O \longrightarrow R\text{-}H + Mg(OH)X$ 1

(b) $C_6H_5CHClCH_3$ is a 2° benzylic halide which can form a carbocation more easily in SN1 displacement reaction than $C_6H_5CH_2Cl$ which is a 1° benzylic halide. Therefore $C_6H_5CHClCH_3$ is more easily hydrolysed with KOH. 1

OR

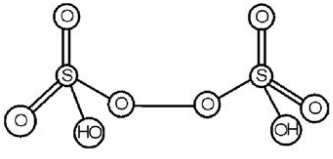
(a) $C_2H_6I > C_2H_5Br > C_2H_5Cl$

C-I bond is weaker than the C-Br bond which in turn is weaker than C-Cl bond; the SN^2 displacement reaction becomes slower as the bond strength increases.

b) $CH_3CH_2CH_2CH_2Br > CH_3CH_2CHBrCH_2 > (CH_3)_3CBr$

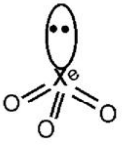
As the steric hinderance on C which is attacked by nucleophile increases, the rate of SN^2 displacement reaction decreases.

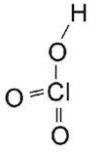
A.19 (i)



Peroxodisulphuric acid (or Marshall's acid) $H_2S_2O_8$

(ii)





(iii) Chloric acid, $HOC1O_2$ 1x3=3

A.20 (a) a = 22g/L Initial Concertration a = 22 g/L ½

a – x = (22 – 5) = 17g/L Final Concertration

t = 300 min 1

$$K = \frac{2.303}{t} \log \frac{a}{a\text{-}x}$$ 1

$$= \frac{2.303}{300\ \text{min}} \log \frac{22\text{gL}^{-1}}{17\text{gL}^{-1}}$$

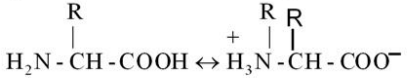
$= 7.6 \times 10^{-3} \log 1.29\ \text{min}^{-1}$

$= 7.6 \times 10^{-3} \times 0.11\ \text{min}^{-1}$ 1

$= 8.36 \times 10^{-4}\ \text{min}^{-1}$

A.21 (a) (i) In the cyclic structure of glucose - CHO group is not free as it forms a hemiacetal linkage with -OH group at C-5. 1

(ii) The amino acids have high melting points and solubility in water due to zwitter ion (polan) structure and strong intermolecular forces between them.



(b) Secondary structure of proteins refers to the shape in which a long polypeptide chain can exist. 1

A.22 (a) Buna-N

It is resistant to the action of petrol, lubricating oil and organic solvents. 1

(b) Monomers of Dacron are $HOCH_2CH_2OH$ and

1

(c) Buna-S < Polythene < Nylon 1

A.23 (a) Aspartame 1

(b) Ester of stearic acid and poly ethylene glycol

$CH_3(CH_2)_{16}COO(CH_2CH_2O)nCH_2CH_2OH$ 1

(c) Morphine 1

A.24 (a) (i) Aniline and Ethylamine:-

Add benzenediazonium chloride to both the compounds in separate test tubes at low temperature. Aniline forms an orange dye. 1

(ii) Methylamine and Dimethylamine

Add chloroform and aqueous sodium hydroxide solution to both the compounds in separate test tubes. Methylamine gives foul smell of isocyanide. 1

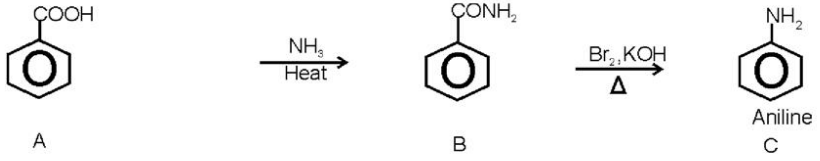
(b)

1

Anilinium hydrogensulphate

Sulphanilic acid

OR



(1,1,1)

A.25 (a) The formation of ether is a nucleophilic bimolecular reaction (SN^2) involving the attack of alcohol molecule on a protonated alcohol, as indicated below:

(i) $CH_3 - CH_2 - \ddot{O} - H + H^+ \longrightarrow CH_3 - CH_2 \overset{+}{\underset{H}{\ddot{O}}} - H$

(ii) $CH_3CH_2 - \ddot{O}(H) + CH_3 - CH_2 - \overset{+}{O}(H)H \rightarrow CH_3CH_2 - \overset{+}{O}(H) - CH_2CH_3 + H_2O$

(ii) $CH_3CH_2 - \overset{+}{O}(H) - CH_2CH_3 \longrightarrow CH_3CH_2 - O - CH_2CH_3 + H^+$

2

(b) Hydroboration oxidation reaction: 1

$$R - CH = CH_2 + H - BH_2 \rightarrow \underset{\text{Alkyl borane}}{R - CH_2 - CH_2 - BH_2} \xrightarrow{R-CH=CH_2}$$

$$\underset{\text{Dialkyl borane}}{(R\,CH_2\,CH_2)_2\,BH} \xrightarrow{RCH_2=CH_2} \underset{\text{Trialkyl borane}}{(RCH_2CH_2)_3\,B}$$

A.26 (a) Interhalogen compounds are more reactive than halogens because the X-X' bond present in interhalogens is weaker than the X-X bond present in halogens as the overlapping between orbitals of dissimilar atoms is less effective. 1

(b) PCl_5 exists because phosphorus can extend its covalency to five using empty 3d orbitals. Since d orbitals are not present in the valency shell of N, it can not form NCl_5. 1

(c) Xenon has bigger size and lower ionization enthalpy than the other noble gases As a result it is the only noble gas which is able to form compounds with oxygen and fluorine . 1

A.27 (a) Lyophillic colloids - (i) They have strong forces of attraction between the dispersed phase and dispersion medium. (ii) They are reversible in nature.

Lyobhobic colloids- (i) They have weak forces of attraction between the dispersed phase and dispersion medium.

(ii) They are irreversible in nature. (Any one difference) 1

(b) (i) Dust particles along with water suspended in air scatter blue light which reach our eyes and sky appears blue to us. 1

(ii) When we add a solution of $FeCl_3$ to freshly formed precipitate of $Fe(OH)_3$, peptisation occurs in which Fe^{3+} ions are adsorbed on the surface of precipitate which ultimately

breaks down into smaller particles of the size of colloid. 1

A.28 (a) In the first cell silver is deposited at cathode according to the equation:-

(i) $Ag^{+}_{(aq)} + e^{-} \rightarrow Ag(s)$

$107.8gAg = 1\text{F electricity}$

$1.078gAg = 0.01F$

$= 965\text{C electricity}$ 1

(ii) The oxygen gas is liberated at anode of first cell as well as second cell according to equation

$2H_2O(l) \rightarrow 4H^{+}_{(aq)} + 4e^{-} + O_2(g)$

$4\text{F electricity} = 1mol\ O_2 \text{ in each cell}$

$4\text{F} = 32\text{g } O_2 \text{ in each cell}$

$0.01\text{F} = \frac{32\text{g}}{4\text{g}} \text{ x } 0.01\text{g} = 0.08\text{g } O_2 \text{ in each cell}$

$\text{Total amount of oxygen liberated at anode of both cells}$

$= 2 \times 0.08\text{g} = 0.16\text{g}$ 2

(b) (i) Rusting of iron is prevented in the given case due to cathodic protection in which magnesium metal is oxidised in preference to iron and acts as anode. 1

(ii) When the concentration decreases the number of ions present in unit volume of solution decreases, as a result electrical conductivity decreases. 1

OR

(a) Galvanic cells, that are designed to convert the energy of combustion of fuels like $_{2}$, CH_4, CH_3OH etc. directly into electrical energy are called fuel cells. They produce electricity with an efficiency of about 70% and are pollution free. 1

(b) Reactions taking place in Leclanche cell

$Zn(s) \rightarrow Zn^{2+}(aq) + 2e^{-}$

Cathode : $2\ MnO_2(s) + 2NH_4^{+}(aq) + 2e^{-} \rightarrow 2MnO(OH) + 2\ NH_3$ 1

(c) $Zn(s)/\ Zn^{2+}(aq)//\ Ag_2O(s)/\ Ag(s)/\ OH^{-}(aq)$

$E^0 == E^0 Ag_2O_{/Ag} - E^0_{Zn^{2+}/Zn}$

Ag_2O== 0.344v – (– 0.76)v == 1.104 V 1

$Zn(s) + Ag_2O(s) + H_2O(l) \rightarrow Zn^{2+}(aq) + 2Ag(s) + 2OH^-(aq)$

$n = 2$

$\log Kc = nFEo / 2.303RT = \frac{\text{n E}^\circ \text{ cell}}{0.059}$ at 25°c

$\log k_c = \frac{2 \times 1.104}{0.059}$

$= 37.42$

$K_c = anti \log(37.42)$

$= 2.34 \times 10^{37}$

A..29 (a) Due to comparable energies of 5f, 6d and 7s subshells, all the electrons present in these subshells may participate in bonding, resulting in large number of oxidation states for actinoids. 1

(b) Transition metals form a large number of complexes because of small size and high charge of ions. They also have empty d orbitals to accept electron pairs from ligands. 1

(c) M-M interactions are strong in chromium due to the presence of six unpaired electrons in the 3d and 4s subshell , while in mercury all the electrons in the 5d and 6s subshell are paired and M-M interactions are weak. 1

(d) As the oxidation state of Mn in MnO is +2 while in Mn_2O_7 it is +7, MnO is basic while Mn_2O_7 is acidic. As the oxidation number of a metal increases, its acidic character increases due to decrease in size of the metal ion and increase in charge density. 1

(e) There are unpaired electrons in the ions formed by silver as silver can exhibit +2 oxidation state where it will have incompletaly filled - orbitats hence a transition element but zinc does not form any ion with incomplete d orbitals.

$_{47}Ag = 36$ [Kr] $4d^{10}\ 5S^1$

30 Zn = 18 [Ar] $3d^{10} 4S^2$

OR

(a) (i) 4d and 5d transition series have almost same atomic radii.

(ii) It is difficult to separate lanthanoids from their mixture 1

(b) (i) $8MnO_4^- + 3S_2O_3^{2-} + H_2O \text{ — } 8MnO_2 + 6SO_4^{2-} + 2OH^-$ 1

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

(c)

Ion E.C. of ion	No. of unpaired electrons
Mg^2 = [Ne]$3s^o$	0
Ti^{3+} = [Ar]$3d^1 4s^o$	1

V^{3+} = $[Ar]3d^2 4s^o$ 2

Fe^{2+} = $[Ar]3d^6 4s^o$ 4

Fe^{2+} has maximum number of unpaired electrons 1

(d) As the value of reduction potential increases, the stability of +2 oxidation state increases, therefore Cr^{2+} is less stable than Fe2+ which in turn is less stable than Mn^{2+}. 1

A.30 (a) A = CH_3CHO

B = $CH_3CHOHCH_2CHO$

C = $CH_3CH{=}CHCHO$ 1x3=3

(b) (i) $-NO_2$ group at p- position increases the positive charge at C-1 due to -I and -R effect, making the fission of O-H bond easier. 1

(ii) Acetone can make hydrogen bonds with water but benzophenone can not make hydrogen bonds due to steric hinderance of two phenyl groups. 1

OR

(a) (A) == $CH_3CH_2COCH_2CH_3$ 1

$CH_3CH_2COCH_2CH_3 \xrightarrow{\text{oxidation}} CH_3CH_2COOH$ 1
A B

$CH_3CH_2COONa \xrightarrow{\text{Kolbe Electrolysis}} CH_3CH_2CH_2CH_3$ 1
C

(b) (i) $CH_3CH_2C(Ph)(OH)CH_2CH_3$ 1

(ii) $CH_3CH_2CH_2CH_2CH_3$ 1