Paper 7

Class XII (3^{rd} July 2015)

TIME: 3 hrs. **Max. Marks: 70**

GENERAL INSTRUCTIONS:

. All questions are compulsory.

2. Question numbers 1 to 5 are very short answer questions of one mark each. Answer these in one word or about one sentence each.

3. Question numbers 6 to 10 are short answer question of two marks each. Answer these in about 30 words each.

4. Question numbers 11 to 22 are short answer question of three marks each. Answer these in about 40 words each. Question no. 23 is of 4 marks .

5. Question numbers 24 to 26 are long answer question of five marks each. Answer these in about 70 words each.

6. Use log tables, if necessary.

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1. What are F-centres? 1

2. What happens when an electrolyte, NaCl is added to hydrated ferric oxide sol? 1

3. Write IUPAC name of the following organic compound:
   $(CH_3)_3CCOCH_3$ 1

4. What is peptide linkage? 1

5. Give one chemical test to distinguish acetic acid and formic acid 1

6. Predict the products of electrolysis in each of the following: 2
   (i) A dil. Solution of H_2SO_4 with platinum electrodes.
   (ii) An aqueous solution of $AgNO_3$ with Ag electrodes.

   OR

   Write the cell reactions taking place at electrodes in a fuel cell.

7. Give reasons: 2
   (i) H_3PO_3 is diprotic.
   (ii) N_2 is inert at room temperature.

8. Which compound in each of the following pairs will react faster in SN_2 reaction with OH^- and why? 2
   (i) CH_3Br or CH_3I.
   (ii) $(CH_3)_3CCl$ or CH_3Cl.

9. Give monomers of following polymers:
   (i) Teflon
   (ii) Novolac 2

10. Convert: 2
    (i) Bromoethane to propanoic acid.
    (ii) Toluene to benzyl alcohol.

11. Answer the following: 3
    (i) How willyou distinguish acetone from acetaldehyde?
    (ii) What type of aldehydes undergo Cannizaro's reaction?
    (iii) Aniline dissolves in HCl.

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12.(a) How will you prepare? 3

(i) Ethanamine from phthalimide.

(ii) Methanamine from acetamide.

(b)Why amines not give Friedel Craft reaction?

13. (a) Why cyclohexylamine is a stronger base than aniline? 3

(b) Primary amines have higher boiling points then tertiary amines.

OR

(a) Explain the following order of basic nature of methyl substituted amines in aqueous solutions: $(CH_3)_2NH > CH_3NH_2 > (CH_3)_3N > NH_3$.

(b) Tertiary amines do not react with Hinsberg's reagent.

14. (a)Complete the following reactions: 3

(i) $P_4 + 3NaOH + 3H_2O \xrightarrow{\Delta}$

(ii) $2KMnO_4 + 5SO_2 + 2H_2O \longrightarrow$

(b)Transition metal compounds are coloured. Why?

15. An element crystallizes in BCC structure. The edge length of its unit cell is 288 pm. If the density of crystal is 7.2 g/cm^3, what is the atomic mass of the element? 3

16. Calculate the equilibrium constant for the reaction: 3

$Cu(s) + 2Ag^+(aq) \longrightarrow Cu^{++}(aq) + 2Ag(s)$

Given: E^0_{cell}=0.46V; T=25°C; F=96500C/mol; R=8.314J/K/mol.

17. (a) Give differences between lyophilic and lyophobic sols. 3

(b) Why delta is formed at the meeting point of river in sea?

18. Outline the principles of refining of metals by the following methods: 3

(a) Froth Floatation process

(b) Zone refining

(c) Vapour phase refining

19. Arrange the following in order of property indicated against each set: 3

(i) F_2, Cl_2, Br_2, I_2-Increasing bond dissociation enthalpy.

(ii) HF, HCl, HBr, HI- Increasing acidic strength.

(iii) $NH_3, PH_3, AsH_3, SbH_3, BiH_3$- Increasing basic strength.

20. (a) Give IUPAC name of following complex 2+1=3

$[Co(NH_3)_5NO_2]Cl_2$, $K_2[Zn(OH)_4]$

(b) Draw the geometrical isomers of the complex ion $[CrCl_2(ox)_2]^{3+}$.

21. (a) Give an example of each: 2+1=3

(i) Kolbe's Reaction.

(ii) Williamson's ether synthesis.

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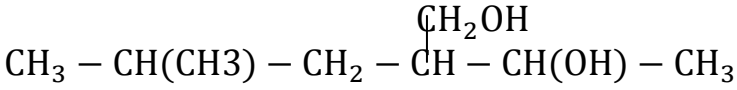
(b) Give the IUPAC name of the compound:



22. (a) Account for the following: - 2+1=3
    (i) Chloroacetic acid has lower pK_a value than acetic acid.
    (ii) Cyclohexanone forms cyanohydrin in good yield but 2,2,6-trimethyl cyclohexanone does not.

(b) Outline the mechanism of Nu^- addition reaction of carbonyl compounds.

OR

What happens when? 1+1+1=3
(i) 2-methyl but-2-ene is ozonised & the product is reduced.
(ii) Methyl magnesium bromide is added to propanone & the product is hydrolysed.
(iii) 2-methyl propan-2-ol is heated with copper at 573 K.

23. After watching at T V programme about the ill effects of fast food and soft drinks SIMRAN and PRANJAL students of class XII discussed the issue with the school principal. Principal immediately instructed the canteen instructor to replace the fast food with fibre and vitamin rich food. This decision was welcomed by the parents and the students.
1.What values are expressed by Simran and Pranjal and principal of the school?
2.Give two examples of water soluble vitamins?
3.Why vitamin c be supplied regularly in diet? 4

24. (a) If N_2 gas is bubbled through water at 293K, howmany millimolesof N_2 gas would dissolve in one litre of water. Assume that N_2 exerts a partial pressure of 0.987 bar. Given that Henry's law constant forN_2 at 293K is 76.48 k-bar.
(b) Illustrate elevation in boiling point with the help of vapour pressure temperature curve of a solution. Show the elevation in boiling point is a colligative property. 3+2=5

OR

(a) 1.0 g of a non-electrolyte solute dissolved in 50 g of benzene lowered the freezing point of benzene by 0.40 K. The freezing point depression constant of benzene is 5.12 K kg/mol. Find the molar mass of the solute.
(b) On mixing two solutions A and B the resulting mixture becomes warm.Why?
(c) Which colligative property is used to measure molecular mass of polymers? 3+1+1=5

25. (a) Calculate the overall order of a reaction which has the rate expression, Rate = $K[A]^{3/2}[B]^{-1}$.

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(b) The first order rate constant for the decomposition of ethyl iodide by the reaction: $C_2H_5I(g) \longrightarrow C_2H_4(g) + HI\ (g)$, at 600K is $1.60 \times 10^{-5} s^{-1}$. Its energy of activation is 209 kJ/mol. Calculate the rate constant of the reaction at 700K.

(c) What do you understand by elementary reaction? 1+3+1=5

OR

(a) A first order reaction is found to have a rate constant K=$1.60 \times 10^{-5} s^{-1}$. Find the half life of the reaction.

(b) Write units of zero order and first order reaction?

(c) Define energy of activation. 2+2+1=5

26. Give reasons:

(a) The enthalpies of atomization of the T.M. are high.

(b) T.M. show higher oxidation states in oxides and fluorides.

(c) Zn, Cd & Hg are highly volatile.

(d) Cu^+ is not stable in aqueous medium .

(e) Zr & Hf exhibit similar properties. 1+1+1+1+1=5

OR

(a) Out of $La(OH)_3$&$Lu(OH)_3$, which one is more basic and why?

(b) Actinide contraction is more than lanthanide contraction, why?

(c) How will you prepare potassium dichromate from chromite ore? 1+1+3=5

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Marking scheme

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1. Electron trapped in anion vacancies. 1
2. Coagulation takes place. 1
3. 3,3-Dimethylbutan-2-one 1

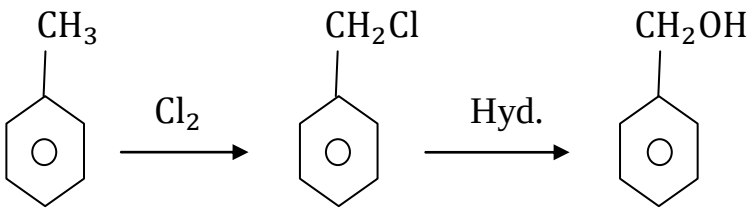
4. CO-NH linkace between two amino acids 1
5. By Tollen'sreagent test.Formic acid give this test. 1

6. (i) Cathode : H_2 2
   Anode : O_2
   (ii) Ag at Cathode, Ag^+ at anode.

   OR

   Correct reaction at cathode and anode.
7. (i) Since H is non-ionisable (P-H). 2
   (ii) Because of high bond dissociation enthalpy.
8. (i) CH_3I as I^- is a better leaving group. 2
   (ii) CH_3Cl as it is 1^0 Alkyl halide.
9. (i) Tetrafluoroethylene
   (ii) Phenol and formaldehyde 2

10. (i) $CH_3CH_2Br \xrightarrow{KCN} CH_3CH_2CN \xrightarrow{Hyd.} CH_3CH_2COOH$ 2
    (ii)



11. (i) Tollen's or Fehling's test. 3
    (ii) Aldehydes lacking alpha-H.
    (iii) Due to lone pair basic, and accepts H^+ions to form salt.
12. (a) (i) Chemical reaction of Gabriel phthalimide synthesis. 3
    (ii) Reaction of acetamide with Br/alkali.

(b) Because of acidic nature of AlCl3 , basic character of amines is lost.

13. (a) Electron pair of nitrogen is involved in resonance, thus not available for donation. 3

(b) Because of maximum H-bonding

OR

(a) Steric factors, solvation, +I effect (explanation).

(b) Because they lack replaceable H.

14. (a) (i) $PH_3 + 3NaHPO_2$ 3

(ii) $K_2SO_4 + 2MnSO_4 + 2H_2SO_4$

(b) d-d transition.

15. a= 288×10^{-10} cm ; Z= 2 3

$$M = \frac{d \times a^3 \times N_A}{Z} = \frac{7.2 \times (288 \times 10^{-10}) \times 6.023 \times 10^{23}}{2} = 51.77 \text{ g/mol}$$

16. $\log K = \frac{nFE^0_{cell}}{2.303 \times RT}$ 3

$$= \frac{2 \times 96500 \times 0.46}{2.303 \times 8.314 \times 298} = 15.5 \Longrightarrow K = 3.69 \times 10^{15}$$

17. (a) Any (2-4) differences. 3

(b) Because of coagulation of river water by sea water (saline).

18. Principle involved and explanation. 3

19. (i) $I_2 < F_2 < Br_2 < Cl_2$

(ii) HF<HCl<HBr<HI

(iii) $BiH_3 < SbH_3 < AsH_3 < PH_3 < NH_3$

20. (a) Penta amminenitrito-N-Cobalt (III) chloride

Potassiumtetrahydroxozincate(II) 2+1=3

(b) Cis and trans isomers

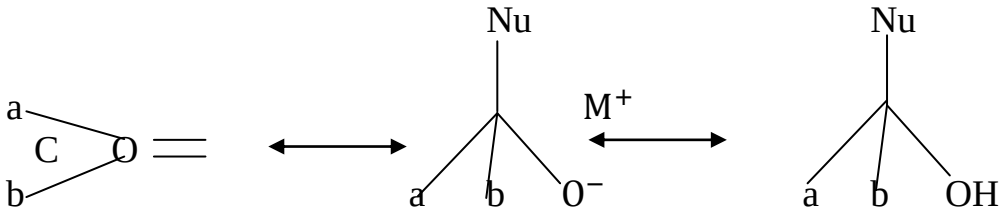
Cis-OA

21. (a) Example of each. 2+1=3

(b) 2,5-dimethyl hexane-1,3 diol

22. (a) Electron withdrawing effect in Cl^- group increases the acidic character.

(b) More steric hindrance in trimethyl cyclohexanone & thus attack of CN^- is difficult. 2+1=3



OR

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(i) $CH_3 - HC - C(CH_3)_2 \xrightarrow{O_3/\text{Red.}} CH_3CHO + CH_3COCH_3$

(ii) 2-methyl propan-2-ol is formed.

(iii) 2-methyl propene. 1+1+1=3

23. (i) Students: Concern for friends, awareness and knowledge
Principal: Concern for students.
(ii) Vitamins B and C (any example)
(iii) It's excreted through urine as its water soluble.

24. (a) $X(N_2) - p/K_H = 1.29 \times 10^{-5}$ 3+2=5

$X(N_2) \Longrightarrow [\frac{n}{N+55.5}]\text{mol} = 1.29 \times 10^{-5}$

$N = 7.16 \times 10^{-4}$ mol = 0.716 m mol

(b) TVs V.P. diagram

$\Delta T_b = K_b \times m$

i.e. depends upon molality and not on nature of solute.

OR

(a) Correct formula 3+1+1=5

$M_2 = \frac{5.12\ \text{K kg/mol} \times 1.0\ \text{g} \times 1000\ \text{g}}{0.40 \times 50} = 256\ \text{g/ mol}$

(b) Because of negative deviation from ideal behavior.

(c) Osmotic pressure. Because it can be measured at room temperature.

25. (a) Half order. 1+3+1=5

(b) $\log K_2 = \log K_1 + \frac{E_a}{2.303\ R}[\frac{1}{11} - \frac{1}{12}]$

$= \log(1.60 \times 10^{-5}) + \frac{209000\ \text{J mol/L}}{2.303 \times 8.314\ \text{J mol/L/K}}[\frac{1}{600\ \text{K}} - \frac{1}{700\ \text{K}}]$

$= -2.197 \Longrightarrow K = 6.36 \times 10^{-3} s^{-1}$.

(c) Single step reactions are elementary reactions .

OR

(a) $t_{1/2} = \frac{0.693}{5.5 \times 10^{-14}\ s^{-1}} = 1.26 \times 10^{14}$ 2+2+1=5

(b) Molelitre^{-1}sec^{-1}, Sec^{-1}

(c) Correct definition.

26. (a) Because of strong bonding. 1+1+1+1+1=5

(b) Because of high electronegativity of oxygen and flourine.

(c) Paired up electrons hence weak bonding.

(d) Cu^{1+} disproportionate in aqueous medium to form Cu^{2+} and Cu .

(e) Due to lanthanoid contraction.

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OR

(a) $La(OH)_3$ because of lanthanoid contraction. 1+1+3=5

(b) Poor shielding of 4f.

(c) $FeCr_2O_4 + Na_2CO_3 \longrightarrow Na_2CrO_4$

$Na_2CrO_4 \xrightarrow{H^+} K_2Cr_2O_7$ (+KCl, $Na_2Cr_2O_7$ ~~crossed out~~)

S NO	UNIT	VS	SA I	SA II	VBQ	LA	TOTAL
1	THE SOLID STATE	1		1			23
2	SOLUTIONS					1	
3	ELECTROCHEMISTRY		1	1			
4	CHEMICAL KINETICS					1	
5	SURFACE CHEMISTRY	1		1			
6	GENERAL PRINCIPLES A PROCESSES OF ISOLATION ELEMENTS		1	1			19
7	P BLOCK ELEMENTS			1+1			
8	D AND F BLOCK ELEMENTS					1	
9	CO-ORDINATION COMPOUNDS			1			
10	HALOALKANES AND HALOARENES		1				28
11	ALCOHOLS,PHENOLS AND ETHERS	1		1			
12	ALDEHYDES ,KETONES A CARBOXYLIC ACID	1	1	1+1			
13	ORGANIC COMPOUND CONTAINI NITROGEN			1+1			
14	BIOMOLECULES	1			1		
15	POLYMERS		1				

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16	CHEMISTRY IN EVERYDAY LIFE						
	TOTAL	5(5	10(5)	36(12)	4(1)	15(3)	70(26)