

# AMRITA VIDYALAYAM

## AMRITA PRE BOARD EXAMINATION 2 - 2018 - '19

Class : XII

Marks : 70

Time : 3 hrs

### CHEMISTRY (043)

#### General Instructions:

1. All questions are compulsory.
2. Question No. 1 to 5 are very short answer questions of 1 mark each.
3. Question No. 6 to 12 are short answer questions of 2 marks each.
4. Question No. 13 to 24 are also short answer questions of 3 marks each.
5. Question No. 25 to 27 are long answer questions of 5 marks each.
6. Use log tables if necessary. Use of calculator is not allowed.

#### SECTION - A

1.  $(\text{CH}_3)_3\text{C-CHO}$  does not undergo aldol condensation. Comment.
2. A coordination compound with molecular formula  $\text{CrCl}_3 \cdot 4\text{H}_2\text{O}$  precipitates one mole of  $\text{AgCl}$  with  $\text{AgNO}_3$  solution. Its molar conductivity is found to be equivalent to two ions. What is the structural formula and name of the compound?
3. How is Brownian movement responsible for the stability of sols?
4. When could be order and molecularity of a reaction a) be the same b) be different?
5. Vitamin C can not be stored in the body. Why?

#### SECTION - B

6. a) Allylchloride can be distinguished from Vinyl chloride by  $\text{NaOH}$  and silver nitrate test. Comment.  
b) Alkyl halide reacts with Lithium aluminium hydride to give alkane. Name the attacking reagent which will bring out this change.
7. Which of the following solutions has higher freezing point?  
 $0.05 \text{ M Al}_2(\text{SO}_4)_3$ ,  $0.1 \text{ M K}_3[\text{Fe}(\text{CN})_6]$  Justify.
8. Calculate the emf of the following cell at 298 K :  $\text{Cr(s)} / \text{Cr}^{3+} (0.1\text{M}) // \text{Fe}^{2+} (0.01\text{M}) / \text{Fe(s)}$   
[Given :  $E^\circ_{\text{Cell}} = +0.30 \text{ V}$ ]

OR

The conductivity of  $10^{-3} \text{ mol/L}$  acetic acid at 25°C is  $4.1 \times 10^{-5} \text{ S cm}^{-1}$ . Calculate its degree of dissociation, if  $\lambda_m$  for acetic acid at 25°C is  $390.5 \text{ S cm}^2 \text{ mol}^{-1}$ .

9. What happens when  
a) Orthophosphorus acid is heated?  
b)  $\text{XeF}_6$  undergoes complete hydrolysis?
10. Identify the following.  
a) Oxoanion of chromium which is stable in acidic medium.  
b) The lanthanoid element that exhibits +4 oxidation state.

OR

Predict which of the following ions will be coloured in aqueous solutions.

$\text{Ti}^{3+}$ ,  $\text{V}^{3+}$ ,  $\text{Sc}^{3+}$ ,  $\text{Mn}^{2+}$ ,  $\text{Fe}^{3+}$

Give reason.

11. Name the major product of acid catalysed dehydration of  
a) 1-methylcyclohexanol  
b) butan-1-ol
12. Define the following.  
a) Primary structure  
b) Peptide linkage

## SECTION - C

13. Give the IUPAC name of the product formed when
- 2-Methyl-1-bromopropane is treated with sodium in the presence of dry ether.
  - 1-Methyl cyclohexene is treated with HI.
  - Chloroethane is treated with silver nitrite.
14. The freezing point of benzene decreases by 2.12 K when 2.5 g of benzoic acid ( $C_6H_5COOH$ ) is dissolved in 25 g of benzene. If benzoic acid forms a dimer in benzene, calculate the van't Hoff factor and the percentage association of benzoic acid. ( $K_f$  for benzene =  $5.12 \text{ K kg mol}^{-1}$ )
15. Explain the following behaviours.
- Alcohols are more soluble in water than the hydrocarbons of comparable molecular masses.
  - Ortho-nitrophenol is more acidic than ortho-methoxyphenol.
  - Cumene is a better starting material for the preparation of phenol.
16. The rate constant for a first order reaction is  $60 \text{ s}^{-1}$ . How much time will it take to reduce 1 g of the reactant to 0.0625 g?
17. a) Solutions of two electrolytes 'A' and 'B' are diluted. The limiting molar conductivity of 'B' increases 1.5 times while that of 'A' increases 25 times. Which of the two is a strong electrolyte? Justify your answer.
- b) The products of electrolysis of aqueous NaCl at the respective electrodes are  
Cathode :  $H_2$                       Anode :  $Cl_2$  and not  $O_2$ . Explain.
18. a) Write the expression for Freundlich's equation to describe the behaviour of adsorption from solution.
- b) What causes charge on sol particles?
- c) Name the promoter used in the Haber's process for the manufacture of ammonia.
19. An organic aromatic compound 'A' with the molecular formula  $C_6H_7N$  is sparingly soluble in water. 'A' on treatment with dil HCl gives a water soluble compound 'B'. 'A' also reacts with chloroform in presence of alcoholic KOH to form an obnoxious smelling compound 'C'. 'A' reacts with benzene sulphonyl chloride to form an alkali soluble compound 'D'. 'A' reacts with  $NaNO_2$  and HCl to form a compound 'E' which on reaction with phenol forms an orange red dye 'F'. Elucidate the structures of the organic compounds from 'A' to 'F'.
20. a) Which vitamin deficiency causes rickets?
- b) Name the base that is found in nucleotide of RNA only.
- c) Glucose on reaction with acetic acid gives glucose penta acetate. What does it suggest about the structure of glucose?
21. Name the type of reaction involved in the formation of the following polymers from their respective monomers.
- |        |           |         |
|--------|-----------|---------|
| a) PVC | b) Nylon6 | c) PHBV |
|--------|-----------|---------|
22. Describe the role of
- NaCN in the extraction of gold from its ore.
  - Cryolite in the extraction of aluminium from pure alumina.
  - CO in the purification of nickel.
23. A metal ion  $M^{n+}$  having  $d^4$  valence electronic configuration combines with three bidentate ligands to form a complex compound. Assuming  $\Delta_0 > P$ .
- Write the electronic configuration of  $d^4$  ion.
  - What type of hybridisation  $M^{n+}$  has?
  - Name the type of isomerism exhibited by this complex.
24. The magnetic moments of few transition metal ions are given below.
- | Metal ion | Magnetic moment (BM) |
|-----------|----------------------|
| $Sc^{3+}$ | 0.00                 |
| $Cr^{2+}$ | 4.90                 |
| $Ni^{2+}$ | 2.84                 |

Ti<sup>3+</sup> 1.73  
(at no. Sc = 21, Ti = 22, Cr = 24, Ni = 28)

Which of the given metal ions.

- has the maximum number of unpaired electrons?
- forms colourless aqueous solution?
- exhibits the most stable +3 oxidation state?

OR

Consider the standard electrode potential values (M<sup>2+</sup> / M) of the elements of the first transition series.

Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn
-1.63	-1.18	-0.90	-1.18	-0.44	-0.28	-0.25	+0.34	-0.76

Explain.

- E<sup>0</sup> value for copper is positive.
- E<sup>0</sup> value of Mn is more negative as expected from the trend.
- Cr<sup>2+</sup> is a stronger reducing agent than Fe<sup>2+</sup>.

### SECTION - D

25. a) Arrange the following in the order of property indicated against each set.
- F<sub>2</sub>, Cl<sub>2</sub>, Br<sub>2</sub>, I<sub>2</sub> (increasing bond dissociation enthalpy)
  - H<sub>2</sub>O, H<sub>2</sub>S, H<sub>2</sub>Se, H<sub>2</sub>Te (increasing acidic character)
- b) A colourless gas 'A' with a pungent odour is highly soluble in water and its aqueous solution is weakly basic. As a weak base it precipitates the hydroxides of many metals from their salt solution.

Gas 'A' finds application in detection of metal ions. It gives a deep blue colouration with copper ions.

Identify the gas 'A' and write the chemical equations involved in the following.

- Gas 'A' with copper ions.
- Solution of gas 'A' with ZnSO<sub>4</sub> solution.

OR

Answer the following questions.

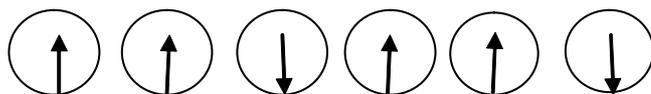
- Write the formula of the neutral molecule which is isoelectronic with ClO<sup>-</sup>.
  - Draw the shape of H<sub>2</sub>S<sub>2</sub>O<sub>7</sub>.
  - Nitric acid forms an oxide of nitrogen on reaction with P<sub>4</sub>. Write the formula of the stable molecule formed when this oxide undergoes dimerisation.
  - Bleaching action of chlorine is permanent. Justify.
  - Write the disproportionation reaction of that oxoacid of nitrogen in which nitrogen is in +3 oxidation state.
26. a) Write the products of the following reactions.
- C<sub>6</sub>H<sub>5</sub>CHO + conc. NaOH →
  - CH<sub>3</sub>COOH  $\xrightarrow{\text{Cl}_2 / \text{P}}$
- b) Give simple chemical tests to distinguish between the following pairs of compounds.
- Benzaldehyde and Benzoic acid.
  - Propanal and Propanone.

OR

- Account for the following.
  - CH<sub>3</sub>CHO is more reactive than CH<sub>3</sub>COCH<sub>3</sub> towards reaction with HCN.
  - 2-Fluorobutanoic acid is a stronger acid than 3-Fluorobutanoic acid.
- Write the chemical equations to illustrate the following name reactions.
  - Etard reaction.
  - Rosenmund's reaction.

c) Give the mechanism of cyanohydrin formation when carbonyl compounds react with HCN in the presence of alkali.

27. Following is the schematic alignment of magnetic moments.



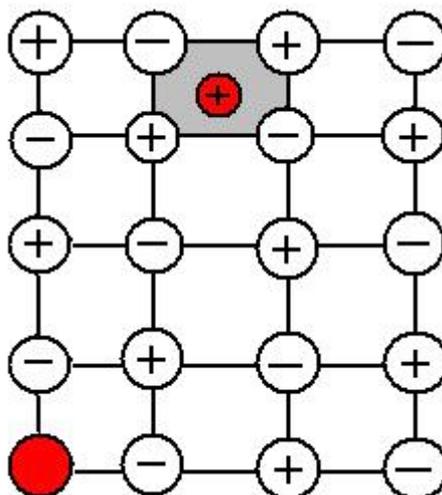
Identify the type of magnetism. What happens when these substances are heated?

a) If the radius of the octahedral void is 'r' and radius of the atoms in close packing is 'R'. What is the relation between 'r' and 'R'?

b) Tungsten crystallizes in body centred cubic unit cell. If the edge of the unit cell is 316.5 pm. What is the radius of tungsten atom?

OR

a) Identify the type of defect shown in the following figure.



What type of substances show this defect?

b) A metal crystallizes in a body centred cubic structure. If 'a' is the edge length of its unit cell, 'r' is the radius of the sphere. What is the relationship between 'r' and 'a'?

c) An element with molar mass 63 g / mol forms a cubic unit cell with edge length of 360.8 pm. If its density is 8.92 g / cm<sup>3</sup>, what is the nature of the cubic unit cell?