

# CBSE QUESTION PAPER

## CHEMISTRY (Theory)

## रसायन विज्ञान (सैद्धान्तिक)

### CLASS-XII

निर्धारित समय : 3घण्टे

अधिकतम अंक :70

*Time allowed : 3hours*

*Maximum Marks :70*

1. Write a feature which will distinguish a metallic solid from an ionic solid. 1
2. Define 'order of a reaction'. 1
3. What is an emulsion? 1
4. Why does  $\text{NO}_2$  dimerise ? 1
5. Give an example of linkage isomerism. 1
6. A solution of KOH hydrolyses  $\text{CH}_3\text{CHClCH}_2\text{CH}_3$  and  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Cl}$ . Which one of these is more easily hydrolysed? 1
7. Draw the structural formula of I-phenylpropan-1-one molecule. 1
8. Give the IUPAC name of  $\text{H}_2\text{N} - \text{CH}_2 - \text{CH}_2 - \text{CH} = \text{CH}_2$ . 1

9. Non-ideal solutions exhibit either positive or negative deviations from Raoult's law. What are these deviations and why are they caused? Explain with one example for each type. 2
10. A reaction is of first order in reactant A and of second order in reactant B. How is the rate of this reaction affected when (i) the concentration of B alone is increased to three times (ii) the concentrations of A as well as B are doubled? 2
11. The rate constant for a reaction of zero order in A is  $0.0030 \text{ mol L}^{-1} \text{ s}^{-1}$ . How long will it take for the initial concentration of A to fall from 0.10 M to 0.075 M? 2
12. Draw the structures of white phosphorus and red phosphorus. Which one of these two types of phosphorus is more reactive and why? 2
13. Explain the following observations:
- (i) Generally there is an increase in density of elements from titanium ( $Z = 22$ ) to copper ( $Z = 29$ ) in the first series of transition elements.
  - (ii) Transition elements and their compounds are generally found to be good catalysts in chemical reactions. 2
14. Name the following coordination compounds according to IUPAC system of nomenclature:
- (i)  $[\text{Co}(\text{NH}_3)_4(\text{H}_2\text{O})\text{Cl}]\text{Cl}_2$
  - (ii)  $[\text{CrCl}_2(\text{en})_2]\text{Cl}$ , (en = ethane – 1, 2 – diamine) 2
15. Illustrate the following reactions giving a chemical equation for each:
- (i) Kolbe's reaction,
  - (ii) Williamson synthesis. 2
16. How are the following conversions carried out?
- (i) Benzyl chloride to benzyl alcohol,
  - (ii) Methyl magnesium bromide to 2-methylpropan-2-ol. 2

17. Explain the following terms. :

- (i) Invert sugar
- (ii) Polypeptides

**OR**

Name the products of hydrolysis of sucrose. Why is sucrose not a reducing sugar? 2

18. What are essential and non-essential amino acids in human food? Give one example of each type. 2

19. The well known mineral fluorite is chemically calcium fluoride. It is known that in one unit cell of this mineral there are 4  $\text{Ca}^{2+}$  ions and 8  $\text{F}^-$  ions and that  $\text{Ca}^{2+}$  ions are arranged in a fcc lattice. The  $\text{F}^-$  ions fill all the tetrahedral holes in the face centred cubic lattice of  $\text{Ca}^{2+}$  ions. The edge of the unit cell is  $5.46 \times 10^{-8}$  cm in length. The density of the solid is  $3.18 \text{ g cm}^{-3}$ . Use this information to calculate Avogadro's number (Molar mass of  $\text{CaF}_2 = 78.08 \text{ g mol}^{-1}$ ) 3

20. A solution prepared by dissolving 1.25 g of oil of winter green (methyl salicylate) in 99.0 g of benzene has a boiling point of  $80.31^\circ\text{C}$ . Determine the molar mass of this compound. (B.P. of pure benzene =  $80.10^\circ\text{C}$  and  $K_b$  for benzene =  $2.53^\circ\text{C kg mol}^{-1}$ ) 3

21. What is the difference between multi molecular and macromolecular colloids? Give one example of each type. How are associated colloids different from these two types of colloids? 3

22. Describe how the following changes are brought about:

- (i) Pig iron into steel.
- (ii) Zinc oxide into metallic zinc.
- (iii) Impure titanium into pure titanium. 3

**OR**

Describe the role of

- (i)  $\text{NaCN}$  in the extraction of gold from gold ore.

- (ii)  $\text{SiO}_2$  in the extraction of copper from copper matte.
- (iii) Iodine in the refining of zirconium.

Write chemical equations for the involved reactions.

23. How would you account for the following?

- (i) The atomic radii of the metals of the third (5d) series of transition elements are virtually the same as those of the corresponding members of the second (4d) series.
- (ii) The  $E^\circ$  value for the  $\text{Mn}^{3+}/\text{Mn}^{2+}$  couple is much more positive than that for  $\text{Cr}^{3+}/\text{Cr}^{2+}$  couple or  $\text{Fe}^{3+}/\text{Fe}^{2+}$  couple.
- (iii) The highest oxidation state of a metal is exhibited in its oxide or fluoride. 3

24. (i) State one use each of DDT and iodoform.

- (ii) Which compound in the following couples will react faster in  $\text{S}_{\text{N}}2$  displacement and why?

(a) 1-Bromopentane or 2-bromopentane

(b) 1-Bromo-2-methylbutane or 2-bromo-2-methylbutane. 3

25. In the following cases rearrange the compounds as directed:

- (i) In an increasing order of basic strength:

$\text{C}_6\text{H}_5\text{NH}_2$ ,  $\text{C}_6\text{H}_5\text{N}(\text{CH}_3)_2$ ,  $(\text{C}_2\text{H}_5)_6\text{NH}$  and  $\text{CH}_3\text{NH}_2$

- (ii) In a decreasing order of basic strength:

Aniline, p-nitroaniline and p-toluidine

- (iii) In an increasing order of  $\text{pK}_\text{b}$  values:

$\text{C}_2\text{H}_5\text{NH}_2$ ,  $\text{C}_6\text{H}_5\text{NHCH}_3$ ,  $(\text{C}_2\text{H}_5)_2\text{NH}$  and  $\text{C}_6\text{H}_5\text{NH}_2$  3

26. Give one example each of
- addition polymers,
  - condensation polymers,
  - copolymers.

3

27. What are analgesic medicines? How are they classified and when are they commonly recommended for use?

3

28. (a) State Kohlrausch law of independent migration of ions. Write an expression for the molar conductivity of acetic acid at infinite dilution according to Kohlrausch law.

- (b) Calculate  $\Lambda_m^\circ$  for acetic acid.

Given that  $\Lambda_m^\circ(\text{HCl}) = 426 \text{ S cm}^2 \text{ mol}^{-1}$

$$\Lambda_m^\circ(\text{NaCl}) = 126 \text{ S cm}^2 \text{ mol}^{-1}$$

$$\Lambda_m^\circ(\text{CH}_3\text{COONa}) = 91 \text{ S cm}^2 \text{ mol}^{-1}$$

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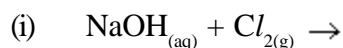
**OR**

- (a) Write the anode and cathode reactions and the overall reaction occurring in a lead storage battery.

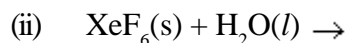
- (b) A copper-silver cell is set up. The copper ion concentration is 0.10 M. The concentration of silver ion is not known. The cell potential when measured was 0.422 V. Determine the concentration of silver ions in the cell. (Given  $E_{\text{Ag}^+/\text{Ag}}^\circ = +0.80 \text{ V}$ ,  $E_{\text{Cu}^{2+}/\text{Cu}}^\circ = +0.34 \text{ V}$ )

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29. (a) Complete the following chemical equations:



(Hot and cone.)

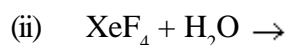
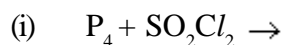


- (b) How would you account for the following?
- (i) The value of electron gain enthalpy with negative sign for sulphur is higher than that for oxygen.
  - (ii)  $\text{NF}_3$  is an exothermic compound but  $\text{NCl}_3$  is endothermic compound.
  - (iii)  $\text{CF}_3$  molecule has a T-shaped structure and not a trigonal planar one.

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**OR**

- (a) Complete the following chemical reaction equations:



- (b) Explain the following observations giving appropriate reasons:

- (i) The stability of +5 oxidation state decreases down the group in group 15 of the periodic table.
- (ii) Solid phosphorus pentachloride behaves as an ionic compound.
- (iii) Halogens are strong oxidizing agents.

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30. (a) Explain the mechanism of a nucleophilic attack on the carbonyl group of an aldehyde or a ketone.
- (b) An organic compound (A) (molecular formula  $\text{C}_8\text{H}_{16}\text{O}_2$ ) was hydrolysed with dilute sulphuric acid to give a carboxylic acid (B) and an alcohol (C). Oxidation of (C) with chromic acid also produced (B). On dehydration (C) gives but-1-ene. Write the equations for the reactions involved.

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**OR**

- (a) Give chemical tests to distinguish between the following pairs of compounds:

- (i) Ethanal and Propanal
- (ii) Phenol and Benzoic acid

(b) How will you bring about the following conversions?

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(i) Benzoic acid to benzaldehyde

(ii) Ethanal to but-2-enal

(iii) Propanone to propene

Give complete reaction in each case.