# SAMPLE QUESTION PAPER

**SERIES–A**

Time : 3 Hrs.                                                                                           M.M : 60

**Note:** Candidates are required to give their answers in their own words as far as practicable. Marks allotted to each question are indicated against it.

**Special Instructions :**

(1)   You must write question paper series in the circle at the top left side of the title page of your answer-book.

(2)   While answering your questions, you must indicate on your answer-book the same question no. as appears in your question paper.

(3)   Do not leave blank page/pages in your answer-book.

(4)   All questions are compulsory. Internal choices have been given in some questions.

(5)   Question nos. 1 to 6 are multiple choice type questions (MCQ) carrying 1 mark each. Choose one correct answer among four options.

(6)   Question nos. 7 to 10 are very short answer type carrying 1 mark each. Answer these in about one word or in one sentence.

(7)   Question nos. 11 to 17 are short answer type carrying 2 marks each. Answer these in about 30 words each. ·

(8)   Question nos. 18 to 25 are short answer type carrying 3 marks each. Answer these questions in about 40 words each.

(9)   Question nos. 26 to 28 are short answer type carrying 4 marks each.

(10)  Use of log table is allowed, whereas that of calculator is not permitted.

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1. The number of octahedral sites per sphere in *fcc* structure is
   a) 8                                         b) 4
   c) 2                                         d) 1                                                      [1]

2. Effect of temperature on reaction rate is given by
   a) Claisen-Clapeyron equation       b) Arrhenius equation
   c) Gibbs-Helmholtz equation          d) Kirchoff's equation                              [1]

3. An example of water soluble vitamin is
   a) vitamin A                             b) vitamin C
   c) vitamin D                             d) vitamin E                                         [1]

4. The transition metal present in vitamin $B_{12}$ is
   a) Fe                                       b) Co
   c) Ni                                       d) Na                                                 [1]

5. Pyrolusite is an ore of
   a) Mn                                      b) Ni
   c) Sb                                       d) Sn                                                  [1]

6. The size of colloidal particles is in between
   a) $10^{-7} - 10^{-9}$ cm             b) $10^{-9} - 10^{-11}$ cm
   c) $10^{-5} - 10^{-7}$ cm             d) $10^{-2} - 10^{-3}$ cm                          [1]

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7. What is the unit of molarity ? [1]

8. Define space lattice. [1]

9. Write the geometry of $[Ni(CN)_4]^{2-}$. [1]

10. What is tincture of iodine ? [1]

11. A solution containing 0.45 g of urea in 22.5 g of water gave a boiling point elevation of 0.17 K. Calculate the molal elevation constant of water. Molar mass of urea is 60 g mol$^{-1}$. [2]

12. What is the difference between multimolecular and macromolecular colloids ? Give one example of each. [2]

13. What is zone refining ? Explain with the help of an example. [2]

14. Derive the integrated rate law equation for 1$^{st}$ order reaction and write its one use. [2]

15. What is Nernst's equation ? Write the mathematical relation. [2]

16. a) Explain the working of dry cell with diagram.
    b) Define the following terms :
    i) Specific conductance
    ii) Molar conductance

17. a) What is the difference between tetrahedral void and octahedral void ? [2]
    b) What is $n$-type semiconductor ? [2]

18. a) The partial pressure of ethane over a solution containing $6.56 \times 10^{-3}$ g of ethane is 1 bar. If the solution contains $5.00 \times 10^{-2}$ g of ethane, then what shall be the partial pressure of gas ?
    b) What is the effect of temperature on solubility of a gas in a liquid ?

    **Or**

    a) Calculate the mass of a non-volatile solute (molar mass 40 g mol$^{-1}$) which should be dissolved in 114 g octane to reduce its vapour pressure to 80 %. [3]
    b) What is Van't Hoff factor ?

19. a) Show that half life of first order reaction is independent of initial concentration of the reactants. [3]
    b) Define molecularity of a reaction.

20. a) How would you account for the fact that $[Ni(CO)_4]$ has tetrahedral geometry ? [3]
    b) What is crystal field splitting ?

21. a) What is the significance of leaching in the extraction of aluminium ? [3]
    b) Why are ethers insoluble in water ?

22. a) Write structure of the product of the following reaction :
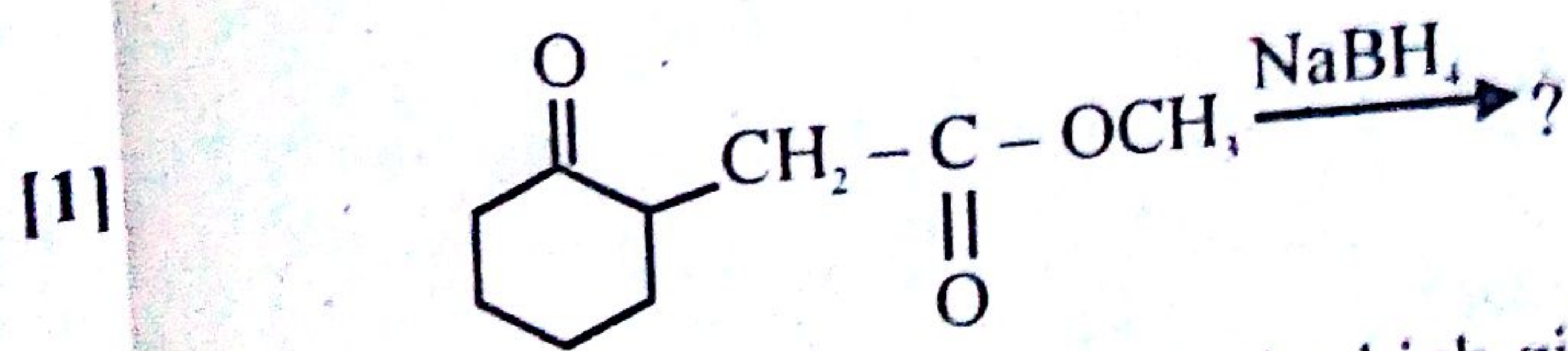


    b) Name the only primary alcohol which gives iodoform test. [3]

23. a) Though nitrogen exhibits +5 oxidation state, it does not form pentahalides. Give reason. [3]
    b) Deduce the molecular shape of $BrF_3$ on the basis of VSEPR theory.

24. a) Write short notes on the followings :
    i) Cross aldol-condensation
    ii) Kolbe's electrolytic method. [2,1]
    b) Give the equations of reactions of preparation of phenol from cumene.

25. a) Complete the following reaction :

$CH_3CH_2Cl \xrightarrow{NaCN} A \xrightarrow{OH^-} B \xrightarrow{KOH+Br_2} C.$
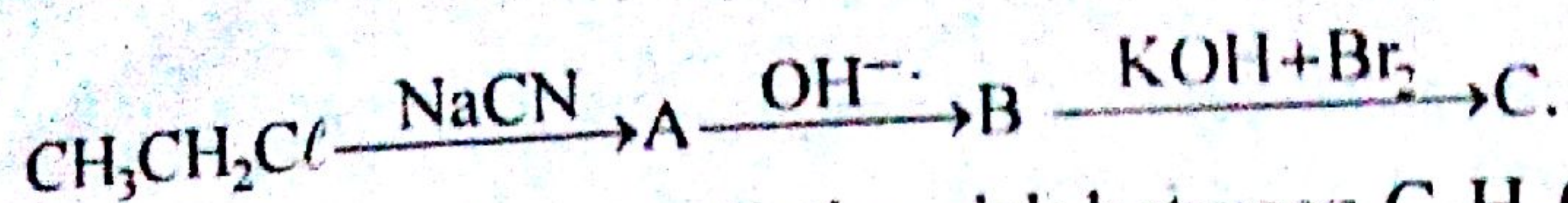
b) Give chemical test to distinguish between $C_6H_5CH_2NH_2$ and $C_6H_5NH_2$.

c) How is aniline obtained from benzoic acid ?                              [1,1,1]

*Or*

a) What is a biodegradable polymer ? Give an example of a biodegradable aliphatic polyester.

b) What is aspartame ? What is its use ?                                   [2,1]

26. Attemp any four of the following :

a) Why does $NH_3$ act as a Lewis base ?

b) $H_2S$ is less acidic than $H_2Te$. Why ?

c) The bond energy of $F_2$ is less than that of $Cl_2$. Why ?

d) Helium and neon do not form compounds with fluorine. Why ?

e) Neon is generally used for warning signals. Why ?

*Or*

a) What happens when $Cl_2$ is passed through a hot concentrated solution of a base like $Ba(OH)_2$ ?

b) $ClF_3$ exists but $FCl_3$ does not. Explain.

c) Iodine is more soluble in KI than in water. Why ?

d) $H_3PO_3$ is diprotic. Why ?

e) Why does $NO_2$ dimerise ?                                              [1,1,1,1]

27. Attempt any four of the following :

a) What is most common oxidation state of lanthanoids ?

b) Why $Zn^{2+}$ salts are white ?

c) What are coinage metals ?

d) Why have the transition elements high enthalpy of hydration ?

e) Chromium is a typical hard metal while mercury is a liquid. Explain why ?          [1,1,1,1]

28. a) How is dacron obtained from ethylene glycol ? What are its uses ?

b) What are the artificial sweetening agents ? Give two examples.

c) Why are detergents preferred over soaps ?                              [1½,1½,1]

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# SAMPLE QUESTION PAPER

**Time : 3 Hrs.**                      **SERIES–B**                      **M.M : 60**

1. Due to Frenkel defect, density of ionic solids
   a) decreases            b) increases
   c) does not change      d) changes                                    [1]

2. The depression in freezing point is directly proportional to
   a) mole fraction of the solution   b) molarity of the solution
   c) molality of the solution        d) molarity of the solvent         [1]

3. Rate of first order reaction depends upon
   a) time                 b) concentration of reaction
   c) temperature          d) all the three .                            [1]

4. Adsorption is
   a) colligative property   b) oxidation process
   c) reduction process      d) surface phenomenon                       [1]

An ore of aluminium is
a) $Na_3AlF_6$
b) $Al_2O_3.2H_2O$
c) $Al_2O_3$
d) $Al_2O_3.H_2O$  [1]

5. The bond angle in ammonia molecule is
a) $109°$
b) $90°$
c) $120°$
d) $107°$  [1]

6. Write one ore of silver.  [1]

7. Using IUPAC norms, write the formulae of Tetrahydroxozincate (II).  [1]

8. What is the name given to medicines used for getting relief from pain ?  [1]

10. What type of ligands form chelates ?  [1]

11. What are ambident nucleophiles ? Explain with an example.  [2]

12. The half life for radioactive decay of $^{14}C$ is 5730 years. An archaelogical artifact contained wood that had only 80 % of the $^{14}C$ found in living tree. Estimate the age of the sample.  [2]

13. What is the difference between enzyme and catalyst ? Explain with an example.

*Or*

What are emulsions ? What are their different types ?  [2]

14. What is pseudo first order reaction ? Give an example.  [2]

15. What is fuel cell ? State two advantages of $H_2$–$O_2$ fuel cell over ordinary cell.  [2]

16. a) Give the mechanism of rusting of iron.

b) Can we store copper sulphate solution in a zinc vessel ?  [2]

17. a) What are important differences between hexagonal close packing and cubic close packing ?

b) What is a ferrimagnetism ?  [2]

18. a) Calculate the mole fraction of benzene in solution containing 30% by mass in carbon tetrachloride.

b) Define osmotic pressure.

*Or*

a) Calculate the mass of ascorbic acid ($C_6H_8O_6$) to be dissolved in 75 g of acetic acid to lower its melting point by $1.5°C$. $K_f = 3.9$ K kg $mol^{-1}$.  [3]

b) Define colligative properties.

19. a) What is half- life of a reaction ? For a first order reaction, how is it related to its rate constant ?  [3]

b) Define activation energy of a reaction.

20. a) Explain on the basis of valence bond theory that $[Ni(CN)_4]^{2-}$ ion with square planar geometry is diamagnetic and the $[Ni(Cl)_4]^{2-}$ ion with tetrahedral geometry is paramagnetic.  [3]

b) What is spectrochemical series ?

21. a) Why hydrated copper sulphate is blue while anhydrous copper sulphate is white ?

b) Explain Kharash effect with an example.  [3]

22. a) Give equation of the following reaction :
Oxidation of propan -1-ol with alkaline $KMnO_4$ solution.

b) How will you synthesise salicylic acid from phenol ?

23. a) Oxygen is diatomic and gaseous in nature, explain.

b) Discuss the structure of $IBr_2^-$.

24.a) Write short note on the followings :
   i) Hunsdiecker reaction
   ii) Esterification reaction
b) Complete the following reaction :

$$CH_3CH_2OH \xrightarrow{K_2Cr_2O_7, H^+} X \xrightarrow{HCN} Y.$$                    [2,1]

25.a) Aniline does not undergo Friedel-Crafts reaction. Why ?
   b) Amines are more basic than comparable alcohols. Explain.
   c) Why are primary amines have higher boiling point than tertiary amines ?          [1,1,1]

*Or*

   a) What are nucleic acids ? Mention their important functions.
   b) What is nucleoside and nucleotide ?                                              [1½,1½]

26. Attempt any four of the following :
   a) $PH_3$ has lower boiling point than $NH_3$. Why ?
   b) Why does $NO_2$ dimerise ?
   c) $OF_2$ should be called oxygen difluoride and not fluorine oxide. Why ?
   d) What are pseudohalides ?
   e) Neon is generally used for warning signals. Why ?

*Or*

   a) Noble gases are mostly inert. Why ?
   b) Helium and neon donot form compounds with fluorine. Why ?
   c) Why HF acid is stored in wax coated glass bottles ?
   d) Why $H_2S$ is acidic while $H_2O$ is neutral ?
   e) Sulphur exhibits greater tendency for catenation than selenium. Why ?           [1,1,1,1

27. Attempt any four of the following :
   a) Why Zn, Cd and Hg are soft and have low melting point ?
   b) Out of $La(OH)_3$ and $Lu(OH)_3$, which is more basic and why ?
   c) Why $Zn^{2+}$ salts are white while $Cu^{2+}$ salts are blue ?
   d) Write the general electronic configuration of lanthanoids.
   e) Explain, why lanthanoids are paramagnetic in nature ?                           [1,1,1,1

28.a) What are essential and non-essential amino acids ? Give one example of each .
   b) How are polymers classified on the basis of structure of polymers ?
   c) Name the medicine which can act both as an analgesic as well as antipyretic.    [1½,1½,1

# SAMPLE QUESTION PAPER

**Time : 3 Hrs.** | **SERIES–C** | **M.M. : 60**

1. $NH_3$ can be prepared by
   a) Dow's process
   b) Haber's process
   c) Ostwald's process
   d) Castner's process    [1]

2. Paramagnetism is a property of
   a) completely filled electronic subshells
   b) unpaired electrons
   c) non-transition elements
   d) melting and boiling points of the elements. [1]

3. One Faraday is equal to
   a) 69500 C    b) 99500 C    c) 96500 C    d) 66900 C    [1]

4. Alkyl halides react with Mg in dry ether to form
   a) magnesium halide    b) Grignards reagent    c) alkene    d) alkyne    [1]

5. Rectified spirit is a mixture of
   a) 95% ethyl alcohol + 5% water
   b) 94% ethyl alcohol + 4.53% water
   c) 94.4% ethyl alcohol + 4.43% water
   d) 95.87% ethyl alcohol + 4.13% water    [1]

6. Which of the following is not correct for ideal solution ?
   a) $\Delta S$ mixing = 0    b) $\Delta V$ mixing = 0    c) $\Delta H$ mixing = 0    d) It obeys Raoult's law. [1]

7. What is the role of enzyme in chemical reaction ?    [1]

8. Give the oxidation state of central metal ion in $[Mn(H_2O)_6]SO_4$.    [1]

9. What is isoelectric point ?    [1]

10. Define denticity of ligands.    [1]

11. What is a semiconductor ? Describe the two main types of semiconductors.    [2]

12. Copper crystallizes into a *fcc* lattice with edge lenght $3.61 \times 10^{-8}$ cm. Show that the calculated density is in agreement with its measured value of 8.92 g cm$^{-3}$.    [2]

13. What is difference between lyophilic and lyophobic colloids ?
    *Or*
    What is the difference between multimolecular and macromolecular colloids ?    [2]

14. Copper can be extracted by hydrometallurgy but not zinc. Explain.    [2]

15. Derive the mathematical form of Freundlich adsorption isotherm.    [2]

16. Write short note on lead storage battery.    [2]

17. a) Rusting of iron is an electrochemical phenomenon. Explain.
    b) Explain the terms. specific conductance and molar conductance.    [2]

18. a) What are the stoichiometric and non-stoichiometric defects ?
    b) What are ferromagnetic substances ?    [3]

19. a) Calculate the mass of a non- volatile solute (molar mass 80 g mol$^{-1}$) which should be dissolved in 74 g pentane to reduce its vapour pressure to 80 %.
    b) Define azeotropic mixture.
    *Or*
    a) A 5% solution of cane sugar in water has freezing point of 271K. Calculate the freezing point of 5% glucose in water if freezing point of pure water is 273.15 K.
    b) Define Henry's law.    [3]

20. a) Explain, why the dipole moment of chlorobenzene is lower than that of cyclohexyl chloride ?

b) Out of chlorobenzene and chloromethane, which is more reactive towards nucleophilic substitution reaction ?　[3]

21. a) Explain with a suitable example, the geometrical isomerism exhibited by co-ordination compounds.

b) Why only transition metals are known to form complexes ?　[3]

22. a) Why are $Mn^{2+}$ compounds more stable than $Fe^{2+}$ compounds.

b) Explain, why aldehydes undergo nucleophilic addition reactions more readily than ketones ?　[3]

23. a) Nitric oxide is paramagnetic in the gaseous state but diamagnetic in the liquid and solid state. Why?

b) By using VSEPR theory, draw the structure of $XeO_2F_2$.　[3]

24. a) By using chemical equations, give a brief account of followings :

i) Friedel-Crafts reaction

ii) Rosenmund's reduction

b) How will you obtain trichloroacetic acid from acetic acid ?　[2,1]

25. a) What is diazotisation ?

b) What is Sandmeyer reaction ?

c) What are natural and synthetic polymers ? Give two examples of each.

d) How are detergents better than soaps .　[1,1,1,1]

26. Attempt any four of the followings:

a) $NCl_3$ gets readily hyrolysed while $NF_3$ does not. Why ?

b) Ammonia is a good complexing agent. Explain.

c) Nitric oxide becomes brown when released in air. Explain.

d) Sulphur in the vapour state exhibits paramagnetism. Discuss.

e) Why $H_2S$ is acidic while $H_2O$ is neutral ?

Or

a) $SCl_6$ is not known but $SF_6$ is known. Why ?

b) Sulphur exhibits greater tendency for catenation than selenium. Give reason.

c) Fluorine shows only -1 oxidation state whereas other halogens exhibit positive oxidation states. Why ?

d) $ClF_3$ exists but $FCl_3$ does not. Explain.

e) Why do noble gases form compounds with fluorine and oxygen ?　[1,1,1,1]

27. Attemp any four of the followings :

a) What is paramagnetic character due to ?

b) Give the general electronic configuration of actinoids.

c) What is maximum oxidation state shown by transition elements ?

d) What are coinage metals ?

e) How many elements are present in the $d$- block of periodic table ?　[1,1,1,1]

28. a) What are proteins ? Give the secondary structure of protein.

b) What are biomolecules ? Discuss their importance in living systems.

c) What are oligosaccharides ?　[1½,1½,1]