TDP (General) 5th Semester Exam., 2016

CHEMISTRY (General)

FIFTH PAPER

Full Marks : 40

Time : 2 hours

*The figures in the margin indicate full marks
for the questions*

Answer **four** questions, taking **two** from each Unit

UNIT—I

(General Chemistry)

1. (a) What are Lewis acids and Lewis bases? Give one example of each.

   (b) According to solvent-system concept, between ammonium chloride and potassium amide which one is treated as an acid and a base in liquid ammonia?

   (c) Arrange the following in decreasing order of their acidity with proper explanation :

   (i) BF_3, BCl_3, BBr_3, BI_3

   (ii) H_3PO_2, H_3PO_3, H_3PO_4

   (d) What is symbiosis? What are its applications?   3+2+2+3=10

(*Turn Over*)

2. (a) Write the mechanism of an acidic buffer.

(b) What do you mean by Weiss and Miller indices?

(c) Define the term 'unit cell' with its classification. $3+3+4=10$

3. (a) What are the characteristics of a hard base and a soft acid? Identify the hard or soft acid and base among the following:

Li^+, Cu^+, Fe^{3+}, I^-, H_2O, I_2, $AlCl_3$, OH^-

(b) Why is pH an important factor in selection of an indicator for a complexometric titration?

(c) BF_3 readily combines with F^- to form stable complex BF_4^-. Explain. $(3+2)+3+2=10$

UNIT—II

(**Inorganic Chemistry**)

4. (a) Arrange the alkali metal oxides in increasing order of their solubility and basicity and explain the trend.

(b) What are silicones? How are they prepared? Mention some uses of silicones.

(c) Write the preparation and structure for H_2SO_3 and $H_2S_2O_7$. $3+4+3=10$

5. (a) Give the atomic numbers and electronic configurations for chromium and cobalt.

(b) Explain $[NiCl_4]^{2-}$ is paramagnetic but $[Ni(CN)_4]^{2-}$ is diamagnetic.

(c) Mention the principal oxidation states for vanadium.

(d) Give the origin of the purple colour of $[Ti(H_2O)_6]^{+3}$. $2+3+2+3=10$

6. (a) How is lithium aluminium hydride prepared in the laboratory? Discuss its structure and uses. Give reactions.

(b) What is Zeise's salt? How is it prepared? Discuss its structure.

(c) Give the formula for Nessler's reagent. Mention its use in qualitative inorganic analysis with reaction. $4+4+2=10$

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TDP (General) 5th Semester Exam., 2018

CHEMISTRY (General)

FIFTH PAPER

Full Marks : 40

Time : 2 hours

*The figures in the margin indicate full marks
for the questions*

Answer each unit in separate answer script

Answer **four** questions, taking **two** from each Unit

UNIT—I

(General Chemistry)

1. (a) Arrange the following acids, in order of their increasing acidity :

   (i) HF, HCl, HBr, HI

   (ii) H_3PO_4, H_3PO_3, H_3PO_2

   (b) "All Arrhenius acids are also Bronsted acids, but all Arrhenius bases are not Bronsted bases." Explain.

   (c) Explain SHAB principle with example. Write the characteristics of soft and hard acids and bases.　　　(2+2)+2+4=10

M9/150a　　　　　　　　　　　　　(Turn Over)

2. (a) What is an acid-base indicator? State with reasons what indicators would you use for the following titrations :

   (i) NaOH vs. H_2SO_4

   (ii) Na_2CO_3 vs. HCl

   (iii) NaOH vs. CH_3COOH

   (b) How to choose an indicator for an acid-base titration?

   (c) Write the mechanism of an acidic buffer.

   $(1+3)+2+4=10$

3. (a) Define Weiss and Miller indices.

   (b) What is space lattice?

   (c) A crystal plane has intercepts on the three axes of crystal in the ratio of $\frac{3}{2}$: 2 : 1. What are the miller indices of the plane?

   (d) Name different crystal systems with number of Bravais lattices. $(2+2)+2+2+2=10$

UNIT—II

(Inorganic Chemistry)

4. (a) What are silicates? Draw the structures of any two silicates with names.

   (b) Write down the preparation and structure for Caro's acid and Marshal acid.

   (c) List all the oxidation states of manganese.

   $(2+2)+4+2=10$

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5. (a) Explain the following :

   (i) Copper sulphate is blue in colour but anhydrous copper sulphate is white.

   (ii) $[Fe(CN)_6]^{4-}$ has a weaker magnetic moment than $[Fe(H_2O)_6]^{2+}$.

   (b) How is ferrocene prepared in the laboratory? Explain the structure and bonding of ferrocene. $(3×2)+(1+3)=10$

6. (a) Write the preparation and structure of all the oxyacids of sulphur.

   (b) How is lithium aluminium hydride prepared in the laboratory? Mention some important uses of the compound. Give reactions. $6+(2+2)=10$

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TDP (General) 5th Semester Exam., 2019

CHEMISTRY

(General)

FIFTH PAPER

Full Marks : 40

Time : 2 hours

The figures in the margin indicate full marks
for the questions

Answer **four** questions, taking **two** from each Unit

UNIT—I

(General Chemistry)

1. (a) Arrange the following acids in order of increasing acidity :

   (i) $HClO_4$, $HClO$, $HClO_3$, $HClO_2$

   (ii) BF_3, BBr_3, BCl_3, BI_3

   (b) KNH_2 is a base but NH_4Cl is an acid in presence of NH_3 medium. Explain.

   (c) BF_3 is an acid but NH_3 is a base. Explain with the help of Lewis principle.

(*Turn Over*)

(d) What do you mean by conjugate acid-base pair? Give example. 2+3+3+2=10

2. (a) Explain Bragg's law.

(b) What are Miller and Weiss indices? A crystal plane has intercepts on the three axes of crystal in the ratio of 1 : 1 : 1. What are the Miller indices of the plane?

(c) What do you mean by axes of symmetry and plane of symmetry?

(d) Find the product of the following reaction :

$$Li^+ + Ag^+ + F^- + OH^- \rightarrow ?$$

2+(2+2)+2+2=10
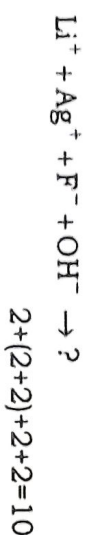
3. (a) Explain the theory of indicator.

(b) State with the reasons what indicator would be used for the titration of NaOH vs. HCl. Give an example of redox indicator.

(c) Write the demerits of Arrhenius principle.

(d) What do you mean by lattice enthalpy?

3+(2+1)+2+2=10

UNIT—II

(Inorganic Chemistry)

4. (a) "The chemistry of the alkali metals may be regarded as the chemistry of their ions." Explain.

(b) Discuss the structure of diborane.

(c) Discuss the colour imparted to the flame by s-block elements. 3+3+4=10

5. (a) "Cu, Ag and Au are typical transition elements while Zn, Cd and Hg are not." Explain.

(b) Discuss the oxidation states of chromium. Which of the oxidation states are most stable and why?

(c) "Transition metal compounds are generally coloured." Explain.

(d) Why do transition elements form a large number of coordination compounds?

2+3+3+2=10

6. (a) Discuss the catalytic properties of transition elements.

(b) Write short notes on the following :

    (i) Sodium nitroprusside

    (ii) Sodium cobaltinitrite

(c) What is Nessler's reagent? Mention one use of it. $3+(2\frac{1}{2}\times 2)+(1+1)=10$

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TDP (General) 5th Semester Exam., 2020
(Held in 2021)

CHEMISTRY

(General)

FIFTH PAPER

Full Marks : 40

Time : 2 hours

The figures in the margin indicate full marks
for the questions

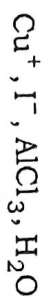Answer **four** questions, taking **two** from each Unit

UNIT—I

(General Chemistry)

1. *(a)* Account for the following facts :

   (i) BF_3 readily combines with F^- to form stable complex BF_4^-.

   (ii) H_3PO_3 is a dibasic acid.

   (b) Explain SHAB principle with suitable example.

(Turn Over)

(c) Identify the hard or soft acid and base among the following :

$$Cu^+, I^-, AlCl_3, H_2O$$

(d) Calculate the pH of 10^{-8} M HCl solution.

(2+2)+2+2+2=10

2. (a) What is an acid-base indicator? State with reasons what indicator you would use for the titration of Na_2CO_3 vs. HCl.

(b) Write the mechanism of an acidic buffer.

(c) Why is pH an important factor in selection of an indicator for a complexometric titration?

(d) Calculate the pH of a buffer solution which is obtained by mixing 0·01 M CH_3COOH and 0·1 M CH_3COONa. ($pK_a = 4·5$)

(1+1)+3+3+2=10

3. (a) What do you mean by Weiss and Miller indices?

(b) What is a unit cell? Calculate the number of atoms present in f.c.c. unit cell.

(c) A crystal plane has intercepts on the three axes of crystal in the ratio $\frac{3}{2} : 2 : 1$. What are the Miller indices of the plane?

(d) Explain common ion effect with an example.

(e) Name different crystal systems with number of Bravais lattices. 2+2+2+2+2=10

UNIT—II

(Inorganic Chemistry)

4. (a) Explain the anomalous behaviour of beryllium.

(b) Write the preparation and structures for $H_2S_2O_7$ and H_2SO_5.

(c) LiCl is soluble in organic solvent but NaCl does not. Explain.

(d) What are silicates? Give one example of a silicate and draw its structure.

2+3+2+3=10

5. (a) How is ferrocene prepared in the laboratory? Explain the structure and bonding of ferrocene.

(b) Explain the following :

(i) $[NiCl_4]^{2-}$ is paramagnetic but $[Ni(CN)_4]^{2-}$ is diamagnetic.

(ii) $[Ti(H_2O)_6]^{3+}$ is coloured but $[Sc(H_2O)_6]^{3+}$ is colourless.

(c) Calculate the magnetic moments for $[Co(NH_3)_6]Cl_3$ and $[Fe(CN)_6]^{3-}$.

$(1+3)+(2+1)+3=10$

6. (a) What is Zeise's salt? How is it prepared? Discuss its structure.

(b) How is lithium aluminum hydride prepared in the laboratory? Draw its structure and mention its important uses.

(c) Write the preparation and one analytical use of sodium nitroprusside. $4+4+2=10$

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