

2017

( 2nd Semester )

CHEMISTRY

SECOND PAPER

( Inorganic Chemistry—I )

Full Marks : 55

Time : 2½ hours

( PART : B—DESCRIPTIVE )

( Marks : 35 )

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

1. (a) State and explain Heisenberg uncertainty principle. 3
- (b) Write down the Schrödinger equation for the wave mechanical model of an atom and define all terms involved in it. 1+1=2
- (c) Calculate the de Broglie wavelength of a rifle bullet ( $m = 2 \times 10^{-3}$  kg) moving with a speed of  $300 \text{ ms}^{-1}$ . 2

OR

2. (a) State and explain Pauli's exclusion principle. 2
- (b) Discuss the radial distribution curves for 1s and 2s orbitals. 2
- (c) What is effective nuclear charge? Calculate the effective nuclear charge for 3s electron of iron (atomic number = 26). 1+2=3
3. (a) What is meant by electron affinity? Discuss its general trends across the period and down the group of periodic table. 1+2=3
- (b) Define oxidation and reduction in terms of electronic concept. 2
- (c) Calculate the equivalent weight of  $\text{KMnO}_4$  for its reduction reaction in acidic solution. 2

OR

4. (a) Hydrogen sulphide reacts with sulphur dioxide (aqueous solution) to form sulphur and water. Write down the chemical reaction and balance the reaction by oxidation number method. 2

( 3 )

- (b) Explain why the size of cation is smaller and that of anion is bigger than its corresponding neutral atom. 2
- (c) What do you mean by formal potential? Discuss how change in pH affects formal potential. 3
5. (a) How is the percentage ionic character of a bond in a molecule determined from electronegativity of the bonded atom? 3
- (b) What types of bonding do you expect in the following cases? Give reason. 1+1=2
- (i) Between atoms having a very large difference in electronegativities
- (ii) Between different atoms of comparable electronegativities
- (c) Discuss the variation in dipole moments of  $\text{BF}_3$ ,  $\text{NF}_3$  and  $\text{NH}_3$ . 2
- OR**
6. (a) What are the factors on which the polarizing power of a cation depends? 2
- (b) Give reasons why  $\text{H}_2\text{O}$  is liquid and  $\text{H}_2\text{S}$  is gas though they have almost same molecular structure. 2
- (c) Using VSEPR theory, deduce the geometry of  $\text{SF}_4$  molecule and indicate the state of hybridization. 3

( 4 )

7. (a) Define the following terms : 1½+1½=3
- (i) Coordination number
- (ii) Chelate
- (b) Define ionization isomerism giving suitable example. 2
- (c) Write IUPAC nomenclatures of the following compounds : 1+1=2
- (i)  $[\text{Pt}(\text{NH}_3)_4(\text{NO}_2)\text{Cl}]\text{SO}_4$
- (ii)  $[\text{Co}(\text{en})_2\text{Cl}_2]^{+2}$
- OR**
8. (a) Explain why tetrahedral complexes are unable to exhibit the geometrical isomerism. 1
- (b) Write all possible geometrical isomers of  $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$ . 2
- (c) What are the basic postulates of Werner's theory of coordination? 4
9. (a) What do you mean by radioactive equilibrium? 2
- (b) Mention one standard unit of radioactivity and define it. 1+1=2
- (c) Explain the following terms : 1½+1½=3
- (i) Packing fraction
- (ii) Mass defect

( 5 )

OR

10. (a) Explain artificial radioactivity and give one example. 2
- (b) Differentiate between nuclear fission and fusion reactions. 3
- (c) Complete the following : 2
- (i)  ${}_{13}^{27}\text{Al} + \text{_____} \rightarrow {}_{15}^{30}\text{P} + {}_0^1n$
- (ii)  ${}_{92}^{238}\text{U} \rightarrow \text{_____} + {}_2^4\text{He}$

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Subject Code : CHEM/II/02

Booklet No. **A**

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Date Stamp .....

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**To be filled in by the Candidate**

DEGREE 2nd Semester  
(Arts / Science / Commerce /  
..... ) Exam., **2017**

Subject .....

Paper .....

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**To be filled in by the Candidate**

DEGREE 2nd Semester  
(Arts / Science / Commerce /  
..... ) Exam., **2017**

Roll No. ....

Regn. No. ....

Subject .....

Paper .....

Descriptive Type

Booklet No. B .....

**INSTRUCTIONS TO CANDIDATES**

1. The Booklet No. of this script should be quoted in the answer script meant for descriptive type questions and vice versa.
2. This paper should be ANSWERED FIRST and submitted within 45 minutes of the commencement of the Examination.
3. While answering the questions of this booklet, any cutting, erasing, overwriting or furnishing more than one answer is prohibited. Any rough work, if required, should be done only on the main Answer Book. Instructions given in each question should be followed for answering that question only.

Signature of  
Scrutiniser(s)

Signature of  
Examiner(s)

Signature of  
Invigilator(s)

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**CHEM/II/02**

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( 2nd Semester )

**CHEMISTRY**

SECOND PAPER

**( Inorganic Chemistry—I )**

( PART : A—OBJECTIVE )

( Marks : 20 )

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

SECTION—A

( Marks : 5 )

Put a Tick (✓) mark against the correct answer in the brackets provided : 1×5=5

**1.** The correct orbital notation for the set of quantum numbers  $n = 2, l = 0$  and  $m = 0$  is

(a)  $1s$  ( )

(b)  $2s$  ( )

(c)  $2p_x$  ( )

(d)  $2p_y$  ( )

**/300**

( 2 )

2. The halogen which has the highest electron affinity is

(a) F ( )

(b) Cl ( )

(c) Br ( )

(d) I ( )

3. The effective atomic number of iron in  $K_4[Fe(CN)_6]$  is

(a) 26 ( )

(b) 32 ( )

(c) 36 ( )

(d) 38 ( )

4. The SI unit of radioactivity is

(a) curie, Ci ( )

(b) rutherford, Ru ( )

(c) becquerel, Bq ( )

(d) neutrino, Nu ( )

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( 3 )

5. Which of the following has T-shaped structure?

(a)  $\text{ClF}_3$  ( )

(b)  $\text{SO}_3$  ( )

(c)  $\text{BF}_3$  ( )

(d)  $\text{TiO}_2$  ( )

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( 4 )

SECTION—B

( Marks : 15 )

Answer the following questions :

3×5=15

1. Explain why an electron orbital can accommodate maximum two electrons only.

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( 5 )

2. Define ionization energy. Give reasons why the second ionization energy of an element is higher than the first.

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( 6 )

3. Predict the types of hybridization of the central atom in the following molecules :

(a)  $\text{TeCl}_4$

(b)  $\text{ClF}_3$

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( 7 )

4. Is iodometry a redox reaction? Explain it.

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( 8 )

5. State the group displacement law for radioactive elements.

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G7—350/300

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