

**2020-21**

**Time - 3 hours**

**Full Marks - 60**

*Answer all groups as per instructions.*

*Figures in the right hand margin indicate marks.*

**GROUP – A**

1. Answer all questions or fill in the blanks as required. [1 × 8]
- (a) Wave nature of electron was suggested by \_\_\_\_\_ .
- (b) How many number of radial nodes are found in 3d orbital ?
- (c) Which one of the following is smallest cation ?  
 $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{Al}^{3+}$
- (d) Which one of the following has highest electronegativity ?  
I, Br, Cl, F
- (e) Element with atomic number 33 belongs to which group in periodic table ?
- (f) Bond order of  $\text{N}_2$  is \_\_\_\_\_ .
- (g) What is the shape of  $\text{ClF}_3$  ?
- (h) Shape of  $\text{CO}_2$  molecule is \_\_\_\_\_ .

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**GROUP – B**

2. Answer any eight of the following questions within three sentences each. [1½ × 8

- (a) State Fajan's rule.
- (b) What is p-type semiconductor ?
- (c) Calculate the shielding constant value for valence shell electron of Zn.
- (d) Which one of the following is paramagnetic ?



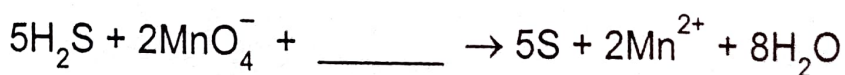
- (e) What are London forces ?
- (f) How many number of elements are present in 5th period of periodic table ?
- (g) Draw the radial probability function against 'r' for 1s orbital.
- (h) Which rule predicts the number of electrons in different orbits ?
- (i) Which series is formed when electron returns to second shell ?
- (j) What is the expression for radius of an orbit ?

[ 3 ]

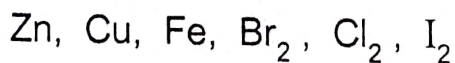
**GROUP – C**

3. Answer any eight of the following questions. [2 × 8]

- (a) What is the ratio of 2nd to 3rd shell of He<sup>+</sup> ion ?
- (b) What is the number of lines, when electron falls from 5th shell to ground state in H-atom ?
- (c) Why Mg has higher ionisation potential than Al atom ?
- (d) What is the shape and hybridisation of PCl<sub>5</sub> molecule ?
- (e) Write electronic configuration of Boron molecule.
- (f) Write Hanny and Smith equation.
- (g) Why CO is diamagnetic whereas NO is paramagnetic ?
- (h) Why bond energy of NO<sup>+</sup> is higher than NO ?
- (i) Fill in the blank.



- (j) Select the strongest oxidising agent and strongest reducing agent from the following :



**GROUP – D**

Answer *any four* questions.

4. Draw Born-Haber cycle for NaCl(s). [6]

P.T.O.

[ 4 ]

5. Draw the MO diagram of CO molecule. [6]
6. Write the rules of VSEPR theory. Draw the shape of SF<sub>4</sub>. [6]
7. Define Ionisation Enthalpy and explain how it changes along group and period. [6]
8. Write the postulates of Bohr's atomic model and calculate the radius. [6]
9. Write notes on Normalised and Orthogonal wave function. [6]
10. Write notes on : [3 × 2]
  - (a) Dipole-dipole interaction
  - (b) Intra molecular hydrogen bond