

## ASSIGNMENT

### Atomic Structure, Bonding, General Organic Chemistry and Aliphatic Hydrocarbons Core Course in Chemistry

Course Code: BCHCT-131

Assignment Code: BCHCT-131/TMA/2021-2022

Maximum Marks: 100

Note: Attempt all questions. The marks for each question are indicated against it.

#### PART-(A) (50)

1. What were the expected and observed results of Geiger and Marsden's  $\alpha$ -particle experiment? Explain with the help of suitable diagrams. (5)
2. What is photoelectric effect? How did Einstein explain it? (5)
3. (i) What are eigenfunctions and eigenvalues? (2)  
(ii) What is a well behaved function? Illustrate using a suitable diagram. (3)
4. Write the values of four quantum numbers for the electrons present in the following orbitals. (1+2+2)  
(i)  $2p$  (ii)  $3d$  (iii)  $4f$
5. (a) Write the electronic configuration of the elements platinum and gold. Also give reasons in support of your answer. (5)
6. Predict the coordination number of  $Mg^{2+}$  in  $MgO$  crystal and the crystal structure of  $MgO$ , if the ionic radius for  $Mg^{2+}$  is 65 pm and that for  $O^{2-}$  is 140 pm. (5)
7. (a) State Fajan's rules. Explain all the rules with suitable examples. (3)  
(b) Why are alkali metal chlorides more soluble than alkaline earth chlorides? Explain. (2)
8. Draw the Lewis structures of the following ions giving all the steps. (5)  
(i)  $S_2^{2-}$  (ii)  $OCl^-$  (iii)  $CN^-$
9. Draw the resonance structures of cyanate ion. Out of them which one is less important as a resonance structure and why? (5)
10. Write the molecular orbital configuration of  $NO$  molecule and draw its energy level diagram. Also calculate its bond order. (5)

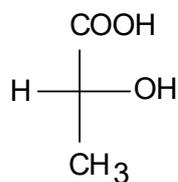
#### PART B

11. Draw the *cis*- and *trans*- forms of 1, 3-dimethylcyclobutane. Which one of these (i) will be polar in nature? (5)

(ii) has higher melting point?

Explain your answer giving reasons.

12. Write the enantiomer of the following compound: (5)



Assign *R/S* configuration to both the compounds.

13. Write the possible conformations of butane. Arrange these conformations in the increasing order of their stability giving reasons. (5)
14. Give reason for the following: (5)
- (i) Ethanoic acid is more acidic than ethanol.
  - (ii) Aniline is less basic than ammonia.
15. With the help of two examples, compare the terms basicity and nucleophilicity. (5)
16. Give one example of each of the following: (5)
- (i) Halogenation of alkane
  - (ii) Nitration of alkane
  - (iii) Isomerisation of alkane
  - (iv) Aromatization of alkane
  - (v) Pyrolysis of alkane
17. Explain the structures of a monoene and a diene. (5)
18. Explain Markovnikoff's rule giving suitable examples. (5)
19. Give mechanism of the following: (5)
- (i) Hydrohalogenation of an alkyne
  - (ii) Ozonolysis of an alkyne
20. Give the molecular structure of the following compounds: (5)
- (i) 2-Phenyl-1-octene
  - (ii) 2-Phenylbromoethane
  - (iii) 4-Bromotoluene
  - (iv) 1-Bromo-2-chlorobenzene
  - (v) Propylbenzene