REV-01
BSC/10/15

2023/12

SET A

B.SC. CHEMISTRY
THIRD SEMESTER
ORGANIC, INORGANIC & PHYSICAL CHEMISTRY I
BSC – 731 [REPEAT]

[USE OMR FOR OBJECTIVE PART]

Duration : 3 hrs. **Full Marks : 70**

(Objective)

Time : 30 min. **Marks : 20**

Choose the correct answer from the following: ***1×20=20***

1. When an electron jumps from one of its orbit to another orbit, energy is -
   a. Emitted only
   b. absorbed only
   c. No effect
   d. Emitted or absorbed

2. The orbits in which electron moves according to Bohr are-
   a. Eliptical
   b. Cylindrical
   c. spherical
   d. Circular

3. The position and velocity of a small particle cannot be determined simultaneously with great degree of accuracy. The statement is known as-
   a. Pauli's exclusion principle
   b. Hund's rule
   c. Heisenberg Uncertainty principle
   d. De-Broglie hypothesis

4. The correct orbital having quantum n=3, l=1, m_l=+1, m_s=+1/2 is-
   a. 3s
   b. 3p
   c. 3d
   d. None of these

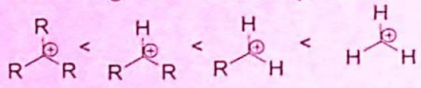
5. The quantum numbers which represent the shape of an orbital is-
   a. Principle quantum numbers
   b. Magnetic quantum number
   c. Azimuthal quantum numbers
   d. Spin quantum numbers

6. The spectral lines for atomic hydrogen which falls in the visible region of electromagnetic spectrum is-
   a. Lymen series
   b. Balmer series
   c. Pachen series
   d. Bracket series

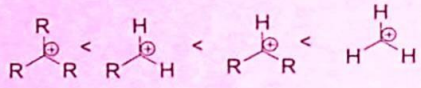
7. The hybridization found in PCl_5 is
   a. Sp^3
   b. Sp^3d
   c. Sp^3d^2
   d. Sp^3d^3

8. Choose the **incorrect** statement
   a. A high bond order indicates more attraction between electrons
   b. Higher bond order means atoms are held together more tightly
   c. Molecules exist with bond order zero.
   d. As bond order increases, bond length decreases.

9. The increasing order of stability of the following carbocations are

a. 

b.

c. 

d.

10. The decreasing order of halogenations of alkanes will be

a. $F_2 > Cl_2 > Br_2 > I_2$
b. $Cl_2 > F_2 > Br_2 > I_2$
c. $Cl_2 > Br_2 > F_2 > I_2$
d. $I_2 > Br_2 > Cl_2 > F_2$

11. The halogenations of alkane is

a. Addition reaction
b. Elimination reaction
c. Free radical substitution reaction
d. Combustion reaction

12. Reduction of alkyne with sodium in liquid ammonia gives

a. cis-Alkene
b. trans-Alkene
c. Both cis- and trans-alkene
d. Alkane

13. Dehydrohalogenation of 2-bromobutane with alc. KOH gives mainly

a. 1-Butene
b. 2-Butene
c. 2-Methylpropene
d. 2-Butanol

14. Which of the following is correct match

a. Boyle's law $\rightarrow PV$ = constant
b. Charles' law $\rightarrow V \propto T$
c. Ideal gas law $\rightarrow PV = nRT$
d. All of the above

15. Which of the following statement is true for different virial coefficient?

a. 1st virial coefficient neglects all molecular collisions
b. 2nd coefficient accounts only for bimolecular collisions
c. Both A & B
d. None of the above

16. Which of the following is true?

a. High pressure can liquefy gas above critical temperature
b. Pressure for liquefying gas at critical temperature is critical pressure
c. Volume at critical temperature is critical volume
d. All of the above

17. What is the number of internal degree of freedom for a nonlinear molecule with n atoms?

a. 3n-6
b. 3n
c. 3n-5
d. None of the above

18. According to Trouton's rule ratio of molar heat of vaporisation to boiling point (in J $mol^{-1} K^{-1}$) is equal to
    a. 86 b. 87
    c. 88 d. 89

19. Which is true for crystalline solids?
    a. They have sharp melting point b. They have long range order
    c. They have anisotropic properties d. All of the above

20. Number of Bravais latices are
    a. 7 b. 14
    c. 32 d. 230

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Descriptive

Time : 2 hrs. 30 min. **Marks : 50**

[Answer question no.1 & any four (4) from the rest]

1. a. Write the expression of radius and energy of hydrogen atom for the first stationary state or Bohr orbit. **2+2+3+3=10**
   b. Write the electronic configuration of Cu and Cr.
   c. Define electrophiles and nucleophiles with suitable example.
   d. What are the three laws of crystallography? Briefly explain.

2. a. Write the postulates of Bohrs theory of hydrogen atom. Also mention one limitation of Bohrs theory of hydrogen atom. **5+2+3=10**
   b. Explain why Bohrs concept of atomic radius goes against Heisenberg Uncertainty principle?
   c. An electron is confined to a region of width 5×10^{-11} m which is its uncertainty in position (Δx). Estimate the minimum Uncertainty in momentum.

3. a. What is de Broglie dual nature of matter? Also write the mathematical expression of de Broglie equation. 3+2+5 =10

b. Why does the negative electronic energy (E_n) for hydrogen atom mean?

c. Write short notes on-(a) Pauli's exclusion principle (b) Hund's rule of maximum multiplicity.

4. a. Explain briefly about (n+l) rule with suitable example which is used while writing the electronic configuration of elements. 3+2+2+ 3=10

b. Define the term 'dipole moment' with examples.

c. What is Bronsted-Lowry theory of acids and bases? Explain with examples.

d. Differentiate between crystalline and amorphous solids.

5. a. What do you mean by hybridization? Explain about the structure of BF_3 on the basis of hybridization. 4+3+3 =10

b. What is inductive effect and what are the different types? Explain with examples.

c. Define bond order. Determine the bond order of NO_3^-.

6. a. What is Wurtz reaction? Explain with suitable reaction involved. What is the limitation of the reaction? 3+4+3 =10

b. Write any two methods of preparation of alkenes.

c. How will you convert an alkyne to a cis- and trans-alkene? Explain with suitable chemical reaction.

7. a. Define vapour pressure of a liquid. Briefly describe how it is experimentally determined? 5+3+2 =10

b. What is the difference between surface tension and surface energy?

c. Define viscosity and give its S.I. unit.

8. a. Write down the postulates of kinetic theory of gases. 5+3+2 =10

b. What are the three types of velocities? Briefly explain them.

c. Define critical temperature and critical pressure.

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