**K22U 3408**

**Reg. No. : ..................................**

**Name : .......................................**

**I Semester B.Sc. Degree (C.B.C.S.S. – O.B.E. – Regular/Supplementary/
Improvement) Examination, November 2022
(2019 Admission Onwards)
CORE COURSE IN CHEMISTRY
1B01CHE : Theoretical and Inorganic Chemistry**

Time : 3 Hours                                                                          Max. Marks : 40

**Instruction :**   *Answer the questions in* **English only**.

SECTION – A

Very Short Answer Type. **Each** carry **1** mark. Answer **all 4** questions.

1. The radius of the second Bohr orbit for the hydrogen atom is

2. The structure of $IF_7$ is

3. What is the cause of periodicity in properties ?

4. Calculate the half-life of a radioactive substance whose disintegration constant happens to be 0.0041/years.                                                              **(4×1=4)**

SECTION – B

Short Answer type. **Each** carry **2** marks. Answer **7** questions out of 10.

5. What is Hydrogen spectrum ?

6. What is photoelectric effect ?

7. What is the electron configuration of the element Potassium ?

8. What is De Broglie Hypothesis ?

9. What is the quantum number of p orbital ?

10. Write the Born-Lande equation and explain the terms.

11. Define electrovalent bond.

12. Why is the first ionization energy of Beryllium greater than that of Li ?

13. Calculate packing fraction in the formation of $_{18}Ar^{40}$. Isotopic mass of

    Ar = 39.96238 a.m.u.

14. What is half-life period of a radioactive substance ? A radioactive isotope has half-life of 20 days. What amount of isotope is left over after 40 days if the initial amount is 5 grams ? **(7×2=14)**

SECTION – C

Short essay/problem type. **Each** carry **3** marks. Answer **4** questions out of 6.

15. What is the physical significance of $\psi^2$ ? What are the limitations of the wave function ?

16. Define Lattice energy. How is Lattice energy influenced by (i) Charge on the ions (ii) Size of the ions ?

17. What is the main assumption of the VSEPR theory ? Explain in detail.

18. Explain the structure of $CIF_3$ using VSEPR theory.

19. a) A typical neutron initiated fission of $_{92}U^{235}$ yields $_{42}Mo^{97}$, two neutrons and an isotope of which element ?

    b) Find the value of the decay constant of a radioactive substance having a half-life of 0.04 seconds.

20. Why is $_{92}U^{238}$ not suitable for chain reaction ? **(4×3=12)**

SECTION – D

Long Essay type. **Each** carry **5** marks. Answer **2** questions out of 4.

21. a) Write the postulates of quantum mechanics.

    b) An electron and a photon each have a wavelength of 1.00 nm. Find :

       a) their momentum,

       b) the energy of the photon, and

       c) the kinetic energy of the electron.

22. a) Define the terms : atomic radii, electron affinity and electronegativity. How do these vary in periodic table as the atomic number increases ?

    b) What is the shielding constant experienced by a 3d electron in the Bromine atom ?

23. a) Discuss Fajan's rule.

    b) Which compound should theoretically the most ionic and the most covalent amongst the metal halides ?

    c) Arrange the following according to the increasing order of covalency : NaF, NaCl, NaBr, NaI.

24. What is artificial radio activity ? Describe the working of cyclotron.      **(2×5=10)**

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