

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 $0.0041/\text{years}$. (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?

P.T.O.

10. Write the Born-Landé 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 $^{40}_{18}\text{Ar}$. 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 ψ^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 ClF_3 using VSEPR theory.19. a) A typical neutron initiated fission of $^{235}_{92}\text{U}$ yields $^{97}_{42}\text{Mo}$, 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 $^{238}_{92}\text{U}$ 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)