K24U 4008

Reg. No. : .....

Name : .....

First Semester B.Sc. Degree (C.B.C.S.S. – OBE-Supplementary/ Improvement) Examination, November 2024
(2019 to 2023 Admission)
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** carries **1** mark. Answer **all 4** questions.

1. Calculate the wavelength (in nanometre) associated with a proton moving at 1.0×10^3 ms^{-1}. (Mass of proton = 1.67×10^{-27} kg and h = 6.63×10^{-34} Js).
2. The hybridisation of orbitals of N atom in NH_4^+ is _____
3. Arrange the following in increasing order of size.
   N^{3-}, Na^+, F^-, O^{2-}, Mg^{2+}.
4. Find the value of the decay constant of a radioactive substance having a half-life of 0.04 seconds. **(4×1=4)**

SECTION – B

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

5. What are the first three series of hydrogen emission spectrum ? Name the series which falls in the visible region of the hydrogen emission spectrum.
6. What is Heisenberg's uncertainty principle ?
7. What is Hund's rule of maximum multiplicity ? Give an example.
8. Write notes on De Broglie Hypothesis.
9. What kind of force is present in ionic bonds ?

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10. What is hybridization ? What shapes are associated with the molecules involving sp^3d^2 and sp^3d^3 hybridisation ?
11. What is Slater's rule ?
12. How does the size vary in the following series ?
    N^{3-}, Na^+, Mg^{2+}, Al^{3+}, O^{2-}, F^-.
13. a) What do you mean by Q value of a nuclear reaction ?
    b) Write down the expression for Q value in the class of α decay.
14. What are cyclotrons ? **(7×2=14)**

SECTION – C

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

15. Calculate wavelength of third line of the Balmer series for a H atom.
16. What is the physical significance of Schrodinger wave function ? What is the Hamilton operator used in the Schrodinger equation ?
17. Based on VSEPR theory, explain the structure of NH_3 molecule.
18. What is ionization potential ? Explain the factors which effect ionization potential.
19. What is radio activity ? What is unit of radio activity ?
20. Distinguish between nuclear fission and nuclear fusion. **(4×3=12)**

SECTION – D

Long essay type. **Each** carries **5** marks. Answer **2** questions out of 4.

21. Briefly explain the Planck's quantum concept. How is the theory used in explaining (i) Photoelectric effect and (ii) Wave-particle duality.
22. Discuss experimental determination of Lattice Energy.
23. 'The term electronegativity has been defined differently by different investigators'. Comment on this statement.
24. Write down the expression for the disintegration of a radioactive substance. What is meant by disintegration constant ? Half-life of radium (atomic mass 226) is 1580 years. Show that 1 gram of Radium gives 3.70×10^{10} disintegrations per second. **(2×5=10)**
