CSIR NET Chemical Science Memory Based Question Paper & Answer Key 2023

1. The experimental magnetic moment (3.4 BM) of a hydrated salt of Eu3+ at 27°C is significantly different from the calculated value. The difference is due to (Given: atomic number of Eu is 63)

    1. population of electrons at higher level(s) via thermal excitation.
    2. strong ligand field splitting of/-orbitals
    3. strong spin-orbit coupling
    4. pairing of electrons in t-orbitals

    Ans: 1. population of electrons at higher / level(s) via thermal excitation.

2. Which of the following plots [k vs 1/T] represent(s) the Arrhenious rate equation, $k = Ae^{A/T}$ with $A = 3x10 \ s^{-1} = 3x10 \ J/mol$.

    Ans: Graph I (curve) and II (y = mx + c format)

3. Which band is called a filled band?

    Ans: Valence band

4. What is the value of the commutator at $[H, P_x]$?

    Ans: ih ($\delta V/\delta x$)

5. How many tetrahedral and octahedral voids are there in FCC structure?

    Ans: Tetrahedral voids - 2 for each atom, octahedral voids - 1 for each atom

6. What is the magnetic moment of Yb^{3+}?

    Ans: 4.5 µB

7. Find the uncertainty in the kinetic energy of a particle if its mass has 2% uncertainty and velocity has 3% uncertainty.

    Ans: 11%

8. For a rectangular box, $l_x = 2 \ l_y$ and $E = 10h^2/8ml_y{}^2$, then find m.

    Ans: m = 145

9. If $y^2 = 4x$ and if there is 1% error in x, then find the percent error in y.

    Ans: Error in y = 5%

10. At what temperature does micelle formation take place?

    Ans: Above Kraft temperature.

11. How many nodes are there in 1,3 Butadiene Homo?

Ans: one node and two electrons in the π^2 molecular orbital

12. How many unpaired electrons are there in B_2?
    Ans: two unpaired electrons

13. Which among the following is the Slater determinant for He?

    Ans: $[15\alpha(1) \ 15 \ \beta(1)]$
        $[15\alpha(2) \ 15 \ \beta(2)]$