

Government General Degree College, Dantan-II

3rd Semester B. Sc (H) Internal Examination-2021

Subject: Chemistry

Paper: CC-5T

F.M: 20

Time: 1h

Answer the following questions (*any ten*)

10×2

1. Show that $\left[\frac{d^2}{dx^2}, x\right] = 2\frac{d}{dx}$.
2. verify the function $A \exp\left(-\frac{1}{2}\beta x^2\right)$ is an eigen function of a linear S.H.O where $\beta = (mk)^{\frac{1}{2}}/\hbar$
3. Show that: If two operators commute with each other, they must have a common eigen function.
4. What are requirements for valid wave function?
5. Find out the expectation value of the kinetic energy of a particle in 1-D box if normalized wave function of the particle is $\psi_n = \sqrt{\frac{2}{a}} \sin \frac{n\pi x}{a}$ $0 \leq x \leq a$.
6. What is meant by precise value in quantum mechanics?
7. $n = 0$ State is not allowed for particle in 1-D box problem. – Explain.
8. Calculate the degree of degeneracy of the level having an energy of $14\left(\frac{h^2}{8ma^2}\right)$ for a particle of mass ‘m’ confined in a cubic box of dimension ‘a’.
9. What is partial molar quantity?
10. Show that $\left(\frac{\partial G}{\partial n_i}\right)_{T,P,n_j(i \neq j)} = \left(\frac{\partial A}{\partial n_i}\right)_{V,T,n_j(i \neq j)}$.
11. Vapour pressure of water at 25°C is 24 mm of Hg. In a solution of 0.2 m glucose the vapour pressure is found to be 23.90 mm of Hg. Calculate the activity coefficient of water in the solution.
12. “Specific conductance decreases with decrease in concentration.” – Explain.
13. What is abnormal transport number?
14. What is ionic mobility? Mention its unit.
15. State and explain Kohlrausch law of independent migration of ions.
16. Explain the abnormal high ionic mobility and ionic conductance of hydrogen ions in aqueous medium.
17. What is chemical potential? It is extensive or intensive?
18. The specific conductance of 0.1 (M) KCl solution is measured in two conductivity cells with cell constant 1.0 and 2.0 cm⁻¹ and equivalent conductance values are calculated. Will the measured and calculated values of specific conductance and equivalent conductance differ? Justify your answer.
19. What is Debye-Falkenhagen effect?
20. What is transport number? How it is changes with temperature.