

U.G. 6th Semester Examination - 2025**CHEMISTRY****[PROGRAMME]****Skill Enhancement Course (SEC)****Course Code : CHEM-G-SEC-T-2****(IT Skills for Chemists)****Full Marks : 40****Time : 2 Hours***The figures in the right-hand margin indicate marks.**Candidates are required to give their answers in their own words as far as practicable.***1. Answer any five from the following questions:****2×5=10**

- a) Find the value of X in the following logarithm:
 $\log_2(X + 1) - \log_2(2 - X) = 3.$
- b) Find the area of the rectangle having length and width as $4x - 3$ and $x - 1$, respectively.
- c) Given the function $f(x) = 4x$ evaluate the following: $f(5/2).$
- d) What is BASIC in computers?

[Turn Over]

- e) Write the equation of a straight line that has a slope of $\frac{3}{4}$ and passes through the (2, 1) point?
- f) Convert 21 into a binary number.
- g) What is the primary purpose of a word processor?

2. Answer any **four** from the following questions:

$$5 \times 4 = 20$$

- a) A shopkeeper notes the number of items sold on six consecutive days: 12, 15, 11, 15, y, and 18. If the mean, median, and mode of the number of items sold are all the same, determine the value of y? 5
- b) Why is the cubic form of the van der Waals equation significant? What information can be obtained from its roots? 5
- c) What is the full form of (i) CPU (ii) URL (iii) USB (iv) LAN (v) Wi-Fi 5
- d) Find the derivative of the function $f(x) = 3x^2 - 5x + 2$ using the power rule. 5
- e) Explain the geometric intuition behind the Newton-Raphson method for finding roots. How does it use the derivative of the function? 5

- f) Consider a reaction $A \rightleftharpoons 2B$ with an equilibrium constant K. If the initial concentration of A is C_0 and we let x be the change in concentration of A at equilibrium, write down the expression for K in terms of C_0 and x. Find the quadratic equation involved in this expression. 4+1

- g) What is a Gaussian distribution (also known as a normal distribution)? Sketch its typical shape and label its key characteristics. $2\frac{1}{2} + 2\frac{1}{2}$

3. Answer any **one** from the following questions:

$$10 \times 1 = 10$$

- a) i) Write the simplified equilibrium expression for its dissociation (K_a) for a weak acid (HA). 3
- ii) Explain the significance of the coefficient of determination (R^2) in evaluating the goodness of fit. What does an R^2 value close to 1 indicate? What does a value close to 0 indicate? 3+1
- iii) Name at least three different popular word processing software applications available today. 2

- iv) How do you typically identify a specific cell in a spreadsheet? 1
 - b) i) A student measures the mass of a solid sample three times and obtains the following results: 12.53 g, 12.58 g, and 12.55 g. (i) Calculate the mean mass of the sample. (ii) Calculate the standard deviation of the measurements. 4
 - ii) Briefly describe the core principle of the Trapezoidal rule for numerical integration. 4
 - iii) Explain the purpose of the SUM() function in Excel. 1
 - iv) What does the peak of a Planck's distribution curve indicate? 1
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