B.Sc. 3rd Semester (Honours) Examination, 2019 (CBCS)

Subject : Chemistry

Paper : SEC-1

Time: 2 Hours   **Full Marks: 40**

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Section-A

(Basic Analytical Chemistry)

1. Answer *any five* questions from the following: 2×5=10

   (a) Define chromatography.

   (b) Find out which one of 1·01g and 1·010 g is more accurate.

   (c) What are the main components of loamy soil and clay soil?

   (d) Name two major chemical components found in hair gel.

   (e) How do you differentiate between municipal waste and industrial waste water?

   (f) What are five main nutrients in food?

   (g) Write two important applications of thin layer chromatography.

   (h) Indicate the significant figures in each of the following:

   0·216, 0·0670, $6·023×10^{23}$, 800·0

2. Answer *any two* questions from the following: 5×2=10

   (a) What do you mean by degradation of soil and how does it occur. What is soil texture? What is Humus in soil?   1+2+1+1=5

   (b) (i) Differentiate 'determinate' and 'indeterminate' errors with suitable examples.

   (ii) Which of the following parameter is not responsible in the choice of paper in chromatography:

   net strength of the paper; thickness of the paper; the shape of the paper.   4+1=5

   (c) Compare and contrast TLC with column chromatography. Distinguish between eluent and effluent.   3+2=5

18171   **Please Turn Over**

(d) (i) What are the advantages of food preservation?

(ii) Which is the most common adulterant in red chilli powder?   4+1=5

3. Answer *any two* questions from the following: 10×2=20

(a) (i) What are the advantages of EDTA in complexometric titration? Why is buffer solution essential for this titration?

(ii) Point out the requisite characteristics of a suitable metal-ion indicator for EDTA titration. Name one indicator with structural formula.   (4+2)+(2+1+1)=10

(b) (i) Write down the basic principles of adsorption and partition chromatography.

(ii) Define stationary phase and mobile phase in column chromatography with suitable examples.

(iii) Write down the characteristics and one example each of cation and anion exchangers.

3+3+(2+2)=10

(c) (i) What adulterants are used in turmeric powder and cite the harmful effects of them. How could you prove that the turmeric powder is adulterated?

(ii) Write down the relevant factors for any sampling programme.   (2+2+2)+4=10

(d) (i) Name the different steps of water treatment.

(ii) What are the main ingredients present in eyeliner?

(iii) Name the toxic chemicals present in nail polish.   4+3+3=10

Section-B

(IT Skill in Chemistry)

1. Answer *any five* questions from the following: 2×5=10

(a) Find the sum of the approximate numbers: 245·72, 258·7, 19·5, ·0013, 21·9

(b) What do you mean by numerical differentiation?

(c) State the rule of rounding off a number to n significant digits.

(d) Interpret geometrically the trapezoidal rule used for the numerical integration $\int_a^b f(x)dx$.

(e) Perform the following multiplication: $(10\cdot01)_2 \times (1\cdot010)_2$

(f) What do you mean by binary number system?

(g) Define relative error with example.

(h) Why are complicated mathematical functions replaced by polynomial expression?

2. Answer *any two* questions from the following:　　　　$5\times2=10$

(a) Find the real root of the equation $x^2 + x - 5 = 0$ in [1, 2] by iteration method, taking initial approximation $x_0 = 0$, correct up to 3 significant figure.　　5

(b) Compute $\int_{-3}^{3}(1 + x + x^3)\,dx$ by simpsons $1/3$ rule with space length 1.　　5

(c) For one mole van der Wall's gas the equation is $\left(P + \frac{a}{V^2}\right)(V - b) = RT$. Draw the P–V graph at constant temperature taking a feasible set of values of a, b and T.　　5

(d) Write a Basic program to solve a quadratic equation of the form $ax^2 + bx + c = 0$　　5

3. Answer *any two* questions from the following:　　　　$10\times2=20$

(a) (i) Explain the method of fitting a parabola $y = ax^2 + bx + c$ to a set of n points $(x_1, y_1), (x_2, y_2), \dots\dots, (x_n, y_n)$ by the least square principle.

(ii) Determine the least square approximation of the type $ax^2 + bx + c$, to the function 2^x at the points 0, 1, 2, 3 and 4.　　$5+5=10$

(b) (i) Describe Newton–Raphson method for computing a real root of $f(x) = 0$.

(ii) Use Newton–Raphson method to deduce the iterative procedure $x_{n+1} = \frac{1}{2}\left(x_n + \frac{a}{x_n}\right)$ for evaluating $\sqrt{a}$ as the solution of the equation $x^2 - a = 0$.　　$5+5=10$

(c) (i) What are bits and bytes?

(ii) Write a BASIC program for integration $\int_a^b f(x)\,dx$ by Trapezoidal rule.

(iii) What are the inbuilt function in BASIC?　　$3+5+2=10$

(d) (i) Where do errors and uncertainties come from?

(ii) Find the mean and standard deviation from mean of the following distribution:

Class Interval :	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90
Frequency :	4	6	8	10	12	14	7	5

$5+5=10$