



[This question paper contains 4 printed pages.]

Sr. No. of Question Paper : 2097 GC-3 Your Roll No.....

Unique Paper Code : 32173901

Name of the Paper : IT Skills for Chemists

Name of the Course : **B.Sc. Honours (Chemistry) / Life Science / Physical Sciences / Industrial Chemistry) (CBCS) Skill Enhancement Course**

Semester : III

Duration : 2 Hours

Maximum Marks : 37.5

**Instructions for Candidates**

1. Write your Roll No. on the top immediately on the receipt of this question paper.
2. Attempt four questions out of seven.
3. Question No. 1 is compulsory.
4. Attempt all parts of a question together.
5. Use of scientific calculator and logarithmic table is allowed.

1. Attempt any seven parts. Each part carry 1.5 mark. (1.5×7=10.5)

(a) Calculate  $\exp(-2x^3)$  to 8 significant figures for  $x = 0.1$

Where expansion series for  $e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots$

(b) Simplify the following :

$$\frac{(x^2 + 2x)^2 - x^2(x-2)^2 + 12x^4}{6x^3 + 12x^4}$$

(c) For  $y = f(x) = x^2 + 2$ ,

(i) find  $x$  as a function of  $y$

P.T.O.

- (ii) sketch graphs of  $y = f(x)$
- (d) Distinguish between (any one) :
- (i) Debug and Virus
  - (ii) Interpreter and Compiler
- (e) Identify error in each statement, if any :
- (i) FOR I = 1 TO 50 STEP -2
  - (ii) GO TO 100 IF P = Q
  - (iii) LET 7 = D
- (f) Calculate the following to the proper numbers of significant digits
- (i)  $36.458 \times 32.5$
  - (ii)  $(45.22 + 56.359)(9.6592 - 5.865)$
- (g) Kohlrausch's law for molar conductivity  $\Lambda_m$  of a strong electrolyte at low concentration  $c$  is  $\Lambda_m = \Lambda_m^0 - Kc^{1/2}$   
where  $\Lambda_m^0$  is the molar conductivity at infinite dilution and  $K$  is a constant.
- (i) Express  $c$  as an explicit function of  $\Lambda_m$ .
  - (ii) Explain how  $K$  and  $\Lambda_m^0$  can be obtained graphically from results of measurements of  $\Lambda_m$  over a range of concentration  $c$ .
- (h) Explain briefly the least square fit method.
2. (a) Define mean and standard deviation with formulae. (3)
- (b) Find the mean and the standard deviation of the set of numbers.  
 $32.41, 33.76, 32.91, 33.04, 32.75, 33.23$  (3)
- (c) Two lengths have been measured as  $24.8 \text{ m} \pm 0.4 \text{ m}$  and  $13.6 \text{ m} \pm 0.3 \text{ m}$ .  
Find the probable value of their sum and its probable error. (3)

3. (a) What is the difference between the systematic and random error ? How can these errors be minimized ? Explain Briefly. (3)

(b) Find the pH of a 0.01 M solution of acetic acid assuming that there is no other source of  $[H_3O^+]$  present. The dissociation constant is given by following equation :

$$K_a = \frac{[H_3O^+]^2}{[HA] - [H_3O^+]}$$

$$K_a = 1.85 \times 10^{-5}, \text{ tolerance} = 1 \times 10^{-6} \quad (6)$$

4. (a) What is Newton-Raphson method ? Using Newton-Raphson method determine the volume of exactly one mole of oxygen gas at a pressure of 100.0 atm and a temperature of 300 K. For oxygen  $a = 1.360 \text{ litre}^2 \text{ atm mol}^{-2}$  and  $b = 0.003183 \text{ litre mol}^{-1}$ . Take R to be  $0.08206 \text{ litre atm mol}^{-1} \text{ K}^{-1}$ . (Apply these parameters on van der-Waals equation) (6)

(b) The barometric formula  $p = p_0 e^{-Mgh/RT}$  gives the pressure of a gas of Molar mass M at altitude h, when  $p_0$  is the pressure at sea level. Express h in terms of the other variables P and T. (3)

5. (a) What is the full form of (i) BASIC (ii) ASCII (iii) RAM ? (3)

(b) Write a program to read and store the numbers 1,2,3-----9 in two dimensional array variable, print them as a  $3 \times 3$  matrix A and B. Add these two matrix and print as matrix C.

$$[A] = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix} \quad [B] = \begin{bmatrix} 9 & 8 & 7 \\ 6 & 5 & 4 \\ 3 & 2 & 1 \end{bmatrix} \quad (6)$$

6. (a) Write BASIC expressions corresponding to the following expressions (any three) :

(i)  $E = BhcJ(J+1)$

$$(ii) E = n^2 h^2 / 8mL^2$$

$$(iii) C_{RMS} = \sqrt{\frac{3RT}{M}} \quad (3)$$

$$(iv) \sqrt{a^2 + b^2}$$

(b) Which of the following are valid basic variables? Correct the invalid variables.

1. MAXWELLS

2. DATA2%

3. 2nd ORDERS

4. "RATE"

5. TOTALCOUNT

6. 1DAY

(3)

(c) Write the output of the following program

READ A\$, B\$, C\$, D\$

E\$ = LEFT \$(A\$,2) + LEFT \$(B\$,2)

F\$ = E\$ + " "

G\$ = F\$ + D\$

PRINT G\$

DATA "STAND", "OPPOSITE", "TO", "HIM".

(3)

7. (a) Define Trapezoidal Rule. Use the trapezoidal rule with  $n=8$  to estimate

$$\int_1^5 (1+x^2) dx \quad (6)$$

(b) The van der Waals equation of state is

$$\left( p + \frac{n^2 a}{v^2} \right) (V - nb) = nRT$$

where  $a$  and  $b$  are temperature – independent parameters.

Write this equation as a cubic equation in  $V$ . (3)

(400)