04/6/24

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 3216

Unique Paper Code : 32177908

Name of the Paper : DSE-8: Green Chemistry

Name of the Course : **B.Sc. (H) Chemistry**

Semester : VI

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **Six** questions. **All** parts of a question should be attempted together.
3. Each question carries **12.5** marks.

1. (a) What is interesterification of oils? Differentiate between chemical and enzymatic interesterification.

   (b) Write an account on environmentally advanced wood preservatives.

   (c) Percentage yield is different from atom economy. Explain. (4.5,4,4)

P.T.O.

2. (a) Give the green synthesis of the following **(Any three)** :

(i) Adipic acid

(ii) Hoffmann elimination reaction using microwave

(iii) Disodium diiminodiacetate

(iv) Catechol

(b) Write down the reaction involved in the carbaryl synthesis at UCIL factory. Also, suggest a greener alternative to the synthesis.

(c) Explain with suitable example, why ultrasound assisted reactions are green. Mention any two advantages of ultrasound assisted reactions.

(4.5,4,4)

3. (a) What is the green alternative of PERC in dry cleaning of clothes? List the demerits of PERC and the merits of the greener substitute.

(b) Discuss the following microwave assisted reactions **(Any two)** :

(i) Hydrolysis of benzyl chloride

(ii) Oxidation of toluene

(iii) Diels Alder reaction

(c) Why ionic liquids are also termed as designer solvents. List two advantages and two limitations of ionic liquids.

(4.5,4,4)

4. (a) What is pollution prevention hierarchy? Explain using suitable diagram.

(b) Explain, why CO_2 is a solvent of choice over other supercritical liquids?

(c) Explain, green chemistry and sustainable development are inter-related. Explain. Also highlight any two business benefits of green chemistry. (4.5,4.4)

5. (a) What is E-factor. How is it determined? And how is it related to green chemistry?

(b) What are photocatalysts? How photocatalytic reactions are different from photochemical reactions?

(c) How does the use of protection/de-protection group(s) reduce the atom economy of the reaction? Explain using appropriate example. (4.5,4,4)

6. (a) What is ozone layer? Discuss its role. Name the chemicals which causes depletion of ozone layer and explain various reactions involved.

(b) What do you mean by the term PEG? Discuss its applications in green chemistry.

(c) The catalytic reagents are superior to stoichiometric reagents? Discuss giving one example. (4.5,4,4)

7. (a) _____ is most versatile, biodegradable thermoplastic polyester. How is it synthesized in a greener way?

(b) Risk = f (Hazard × exposure). Justify using suitable example.

(c) Write short notes on **(Any two)** :

(i) Cradle to cradle carpeting

(ii) Co-crystal controlled solid state synthesis

(iii) Flixborough accident (4.5,4,4)

8. (a) Differentiate homogenous and heterogenous catalysis and state whether biocatalysis is homogenous or heterogenous.

(b) Classify and justify the following types of reactions using suitable examples as atom economical and atom uneconomical reactions.

(i) Addition reaction

(ii) Elimination reaction

(c) Enlist the major advantages of biodiesel over diesel. Also discuss the principle of green chemistry involved in its preparation. (4.5,4,4)

(34)

[This question paper contains 8 printed pages.] 04/6/24

Your Roll No.....

Sr. No. of Question Paper : 3027

Unique Paper Code : 32177904

Name of the Paper : DSE: Analytical Methods in Chemistry

Name of the Course : **B.Sc. (Hons) CHEMISTRY**

Semester : VI

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any Six questions in all including Q. No. 1, which is compulsory.
3. The questions should be numbered in accordance to the number in the question paper.

1. Attempt **any five** of the following:

(a) Explain the basic principle of pH metric titrations. Give name and explain any one indicator electrode.

P.T.O.

(b) "Multistep extraction is more efficient as compared to single step extraction". Justify it

(c) How Adsorption chromatography differs from Partition chromatography.

(d) Explain the origin of spectra. How molecular spectra differs from atomic spectra.

(e) How Furnace heating rate and Furnace atmosphere affect the thermo gravimetric results? Explain it.

(f) Explain how tests of significance are helpful in the statistical quantitative analysis.

(g) What are the variables that affect the column efficiency? How column efficiency can be increased?

(5x3)

2. Attempt **any three** from the following:

(a) Classify electro-analytical methods or thermal methods of analysis.

(b) What are the various methods of ***introduction of sample*** in atomic absorption spectroscopy (AAS)?

(c) What are different types of wavelength selectors used in UV-VIS spectrophotometer. Explain any one.

(d) Define Thermo Gravimetric Analysis (TGA)? Discuss decomposition analysis of $CuSO_4.5H_2O$ using TGA curve. (3x4)

3. **Attempt the following:**

(a) Explain the various processes involved in Flame Emission Spectroscopy (FES).

supercritical liquids?

(b) Explain redox potentiometric titration with electrode system with suitable example.

(c) Explain the preparation of TLC plates and give its analytical applications. (3x4)

4. Attempt **any three** of the following:

(a) Prove that A=2-log % T. Why absorptivity remains same while absorbance changes within the Beer's law. What is the absorbance range of Beer's law?

(b) Define determinate errors? What are the sources of determinate errors?

(c) Define background absorption. Explain any one background correction method..

(d) State and explain Nernst Distribution law and give two limitations of the law. (3x4)

5. **Attempt the following:**

(a) Define Accuracy and Precision. What are the various ways of expressing accuracy and precision?

(b) Define ion exchange chromatography? Explain the action of cation exchange resin.

(c) Write the difference between line source and continuous source with examples of each. (3x4)

Attempt any three of the following:

(a) How Refractory compound formation affects the results in AAS/AES. How can we avoid such situation in analysis.

(b) What is meant by the term sampling. Define Grab sample and Gross sample.

P.T.O.

(c) Draw and explain the Conductometric Titration Curve of the following:

(i) Strong Acid vs Strong Base

(ii) Weak Acid vs Strong Base

(iii) Mixture of Acids vs Strong Base

(d) Explain classical methods of analysis. Describe the terms:

(i) Proximate analysis,

(ii) Partial analysis,

(iii) Complete analysis (3x4)

7. Distinguish between the followings **(any three):**

(a) Batch extraction and continuous extraction

(b) Single beam spectrophotometer and double beam spectrophotometer

(c) Plate number and plate height

(d) Standard deviation of mean and relative standard deviation

(e) Prism and Gratings (3x4)

8. **Attempt the following:**

(a) The mean $\bar{x}$ of four deviations of the copper content of a sample of an alloy was 8.27% with standard deviation s= 0.17%. Calculate the 95% confidence limit for the true value. (t for 95% confidence for 3 degrees of freedom is 3.18).

(b) Discuss the various burner designs used in AAS and FES? Why turbulent flow burners never strike back?

P.T.O.

(c) Discuss the frontal, elution and displacement methods of the development of chromatograms.

(3x4)

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[This question paper contains 12 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 3138

Unique Paper Code : 32177903

Name of the Paper : DSE: Applications of Computers in Chemistry

Name of the Course : **B.Sc. (H) Chemistry**

Semester : VI

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any **Six** questions.
3. **All** questions carry equal marks **(12.5)**.
4. Attempt all parts of a question together.

P.T.O.

1. (i) Fill in the blanks :

(a) BASIC is _____ level language.

(b) Point of intersection of a row and a column in a graphic screen is known as _____.

(c) _____ command allows the numeric data to be printed in decimal format.

(d) 2 Kilo Byte = _____ Byte

(e) A loop within another loop, in BASIC, is termed as _____.

(f) _____ command is used to see a selected portion of the screen in graphics.

(g) _____ is a non-executable statement.

(h) _____ statement allows the same data to be reused for various variables.

(ii) Write a user friendly program in BASIC to read (READ....DATA) text and count and print how many times letters 'A' and 'a' occur in this text. (8,4.5)

2. (i) Write the full form of the following :

(a) ASCII

(b) VIRUS

(c) ALU

(d) HTML

(ii) Give the syntax and functions of the following commands :

(a) LEFTS

(b) LOCATE

P.T.O.

(35) June 2024

[This question paper contains 12 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 3138 **H**

Unique Paper Code : 32177903

Name of the Paper : DSE: Applications of Computers in Chemistry

Name of the Course : **B.Sc. (H) Chemistry**

Semester : VI

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any **Six** questions.
3. **All** questions carry equal marks **(12.5)**.
4. Attempt all parts of a question together.

P.T.O.

1. (i) Fill in the blanks :

(a) BASIC is _____ level language.

(b) Point of intersection of a row and a column in a graphic screen is known as _____ .

(c) _____ command allows the numeric data to be printed in decimal format.

(d) 2 Kilo Byte = _____ Byte

(e) A loop within another loop, in BASIC, is termed as _____ .

(f) _____ command is used to see a selected portion of the screen in graphics.

(g) _____ is a non-executable statement.

(h) _____ statement allows the same data to be reused for various variables.

(ii) Write a user friendly program in BASIC to read (READ....DATA) text and count and print how many times letters 'A' and 'a' occur in this text. (8,4.5)

2. (i) Write the full form of the following :

(a) ASCII

(b) VIRUS

(c) ALU

(d) HTML

(ii) Give the syntax and functions of the following commands :

(a) LEFTS

(b) LOCATE

(iii) Write a program to READ two matrices A(MxN) and B(NxP) using (READ-----DATA) and find their product. The matrices 'A' and 'B' and their product 'C' should be printed in matrix form. (4,4,4.5)

3. (i) Explain the following terms giving examples :

(a) Subscripted Variable

(b) Operating System

(ii) Convert the following as asked, show working too.

(a) $(229.25)_{10} = (\_\_\_\_\_)_2$

(b) $(1110110.1)_2 = (\_\_\_\_\_)_{16}$

(iii) Using following data, which were collected as part of a quality control study for the analysis of sodium in serum; results obtained were concentrations of Na^+ in mmol/L, write a

program to estimate the mean, variance and standard deviation of the following data set of 10 samples.

$[Na^+]$mmol/L	140	143	141	137	132	157	143	149	118	145

$$\text{Mean} = \frac{1}{n}\sum_{i=1}^{n} x_i$$

$$\text{Variance} = \frac{1}{n}\sum_{i=1}^{n}(x_i - \bar{x})^2$$

Standard deviation = $\sqrt{\text{variance}}$ (4,4,4.5)

4. (i) Differentiate between the following, explaining functions :

(a) Library functions and User defined functions

(b) RAM and ROM

(ii) Which of the following are valid BASIC variables? Correct the invalid ones.

P.T.O.

(a) XSYS

(b) "VOLUME"

(c) NEWTON-RAPHSON

(d) LOG

(iii) The following data for Concentration and Absorbance of a coloured solution is given. If the solution follows Lambert Beer's law, $A = \varepsilon cl$, find the molar extinction coefficient using least square curve fitting method. Assume $l = 1$.

.Concentration	0	1.0	2.0	3.0	4.0	5.0
Absorbance (at 515 nm)	0.234	0.365	0.479	0.521	0.664	0.802

Given slope = $\dfrac{n\sum xiyi - \sum xi \sum yi}{n\sum xi^2 - \left(\sum xi\right)^2}$. (4,4,4.5)

5. (i) Write the output of the following program :

```
10 FOR 1 = 1 TO 3

20 SUM = 0

30 FOR J = 1 TO 2

40 SUM = SUM + I + J

50 NEXT J

60 PRINT SUM

70 NEXT I

80 END
```

(ii) Write a program in BASIC to print first 'N' members of FIBONACCI series, N is to be input by the user.

(iii) Write a Program to plot Van der Waals isotherms in BASIC GRAPHICS for CO_2 gas molecule having a = 3.610 dm^6 atm mol^{-2} and

b = 0.0429 dm^3 mol^{-1} in the volume range from 0.06 to 0.55 dm^3 at the difference of 0.005 using the Van der Waals equation for temperatures between 290 K and 350 K, at intervals of 20 K. (R = 0.082 dm^3 atm K^{-1} mol^{-1}). (4,4,4.5)

6. (i) Identify the errors in the following BASIC constants and correct them.

(a) 6.6E^23

(b) COMPUTER "APPLICATIONS"

(c) 4.0 × 10^(-34)

(d) 9.4E2.5

(ii) Find errors in the following BASIC statements and correct them.

(a) FOR A$ = B$ TO C$

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(b) 90 GOTO 90

(c) ON C$ GOTO 100,200,300

(d) DATA, 10, 12, 30, 14, 25

(iii) Write a program in BASIC, Using Simpson's method, to determine the change in molar enthalpy of Oxygen gas when heated between 298 K and 373 K

Given : $C_{p,m} = a + bT + c/T^2$

$$\Delta S = \int_{T1}^{T2} \frac{Cp(T)}{T} dT$$

$a = 29.96$; $b = 4.18 \times 10^{-3}$; $c = -1.67 \times 10^5$

(4,4,4.5)

7. (i) What are the values given by the following functions when X = -5.78

(a) FIX(X)

(b) INT(X)

(c) CINT(X)

(d) SGN(X)

(ii) Give the output of the following program :

```
10 LET X = 1

20 LET Y = 2

30 IF (2*X+Y^2) > Y+3 THEN PRINT "TRUE"
ELSE PRINT "FALSE"

40 IF X > Y OR X = 0 AND Y = 0 THEN PRINT
"T" ELSE PRINT "F"

50 IF NOT(NOT(X = 0) AND Y = 0)) THEN PRINT
"T" ELSE PRINT "F"

60 END
```

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(iii) Write a program in BASIC to calculate the pH of a 10^{-6} M acetic acid solution by Bisection method. Use the following equation for hydrogen ion concentration $[H^+]$ for a weak acid :

$$[H^+]^3 + K_a [H^+]^2 - (C K_a + K_w) [H^+] - K_a K_w$$

Given $K_a = .8 \times 10^{-5}$ and $K_w = 10^{-14}$

(4,4,4.5)

8. (i) Write the following mathematical expressions in BASIC :

(a) $y = e^{(x \operatorname{Sin} \beta t + x \operatorname{Cos} \beta t)}$

(b) $\psi = \sqrt{\frac{2}{a}} \operatorname{Sin}\left(\frac{n\pi x}{l}\right)$

(ii) Write a program in BASIC to generate a rectangle with diagonal coordinates (10, 20) and (180, 150).

P.T.O.

(iii) Write a program to calculate Sin(x) given by the series

$$\mathrm{Sin}(x) = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} \cdots$$ (4,4,4.5)