U.G. 3rd Semester Examination - 2019
CHEMISTRY
[HONOURS]
Skill Enhandement Course (SEC)
Course Code : CHEM(H)/SEC-1A&B-T

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.

Answer all the questions from any one Group.

GROUP–A

IT Skills for Chemists

CHEM(H)SEC-1A-T

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

    a) What are logical operator?

    b) Define bits and bytes in computer programming.

    c) Sketch the curve $y = \ln x$.

    d) What is iterative method?

    e) What is debugging process?

[Turn over]

f) What is molar extinction coefficient? What is its significance?

g) Define the term 'standard deviation'.

h) What is meant by 'f' test?

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

$5 \times 4 = 20$

a) i) Explain standard uncertainties with an example in an experiment.

   ii) Describe a pseudocode to calculate the roots of quadratic equation. $2\frac{1}{2} + 2\frac{1}{2}$

b) i) Calculate the pH of 0.1(M) CH_3COOH considering pKa.

   ii) The curve 'C' has equation, $y = x^3 - 2x^2 - x + 9$, $x > 0$. The point 'P' has coordinates (2, 7). Show that 'P' lies on 'C'. $2\frac{1}{2} + 2\frac{1}{2}$

c) A function $f : R \rightarrow R$ is defined by $f(x) = x^3$. Determine the range of f. 5

d) Calculate the pH of an acetate buffer that is a mixture with 0.10M acetic acid and 0.10M sodium acetate. 5

e) Define 't'-test with example. 5

f) Most experiments use theoretical formulae, and usually those formulae are approximations.

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Is the error of approximation one of precision or of accuracy? Justify your answer with example. 5

3. Answer any **one** of the following: $10 \times 1 = 10$

a) What is the value of the first and second derivatives of the pressure with respect to the volume at constant temperature and at a critical point? 10

b) $n(E) dE = \dfrac{2\pi N}{V(\pi KT)^{\frac{3}{2}}} \cdot E^{\frac{1}{2}} e^{-\frac{E}{KT}} \cdot dE$. 10

GROUP–B

(Bar Analytical Chemistry)

CHEM(H)SEC-1B-T

1. Answer any **five** questions: $2 \times 5 = 10$

     a)   Give an example of a chelating agent used for the estimation of hardness of water. Draw its structure.

     b)   Give two examples of metal-ion indicators and draw their structures.

     c)   What are the main compositions of soil?

     d)   Name a chemical compound which can be used in trap cases. Give its structure.

     e)   What is meant by stationary phase? Give one example.

     f)   Give the name of two Class I food preservatives.

     g)   What is meant by adulteration of food?

     h)   What is meant by significant figures?

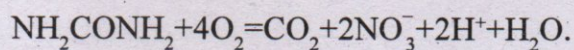2. Answer any **two** questions: $5 \times 2 = 10$

     a)   Write the sum of 1.586+2.31 with the correct number of significant figures. Give differences between accuracy and precision. $2+3=5$

b) What do you mean by exchange capacity of an ion-exchange resin? R_f values of three amino acids A_1, A_2 and A_3 are 0.14, 0.36, 0.65 respectively. Which one of these amino acids in their TLC separation will occur on the top and which one at the bottom?   2+3=5

c) Discuss the criteria required for a good metal-ion indicator. What are masking and demasking reactions?   2+3=5

d) What is meant by BOD of water? Find out the BOD of water sample which contains 1.5 gm of urea for every 100 litres of water. The reaction is as follows:

$$NH_2CONH_2 + 4O_2 = CO_2 + 2NO_3^- + 2H^+ + H_2O.$$
   2+3=5

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

a) What do you mean by acidity and alkalinity of water sample? How total alkalinity is determined for a water sample?   4+6=10

b) Describe the principle of TLC. What are the largest and smallest R_f values possible? Why pH is important for a successful complexometric titration?   4+2+4=10

c) EDTA is a very suitable reagent in a complexometric titration— explain. Briefly discuss the principle of determination of iron vitamin tablets.   5+5=10

d) Write the name of the common adulterants used to adulterate the chilli powder. Briefly describe the method of identification lead chromate and coal tar dye used as adulterants in turmeric powder.   2+4+4=10

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