CHE-04

ASSIGNMENT BOOKLET

Bachelor's Degree Programme (B.Sc.)

PHYSICAL CHEMISTRY

It is Compulsory to submit the Assignment before filling in the Term-End Examination Form.

(Valid from 1st January, 2021 to 31st December, 2021)

Please Note

- You can take electives (56 to 64 credits) from a minimum of TWO and a maximum of FOUR science disciplines, viz. Physics, Chemistry, Life Sciences and Mathematics.
- You can opt for elective courses worth a MINIMUM OF 8 CREDITS and a MAXIMUM OF 48 CREDITS from any of these four disciplines.
- At least 25% of the total credits that you register for in the elective courses from Life Sciences, Chemistry and Physics disciplines must be from the laboratory courses. For example, if you opt for a total of 64 credits of electives in these 3 disciplines, at least 16 credits should be from lab courses.
- You cannot appear in the Term-End Examination of any course without registering for the course. Otherwise, your result will not be declared and the onus will be on you.

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School of Sciences
Indira Gandhi National Open University
New Delhi
(2021)

Dear Student,

We hope, you are familiar with the system of evaluation to be followed for the Bachelor's Degree Programme. At this stage you may probably like to re-read the section on assignments in the Programme Guide that we sent you after your enrolment. A weightage of 30 percent, as you are aware, has been earmarked for continuous evaluation, which would consist of one tutor-marked assignment. The assignment is based on Blocks 1, 2, 3 and 4.

Instructions for Formatting Your Assignments

Before attempting the assignments, please read the following instructions carefully.

1. On top of the first page of your answer sheet, please write the details exactly in the following format:

ENROLMENT NO.:…..……..……

NAME:……..……

ADDRESS:…..……

……

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COURSE CODE : ….....……

COURSE TITLE : ….....……

ASSIGNMENT NO.: ….....……

STUDY CENTRE : ….....…… DATE:..…….
(NAME AND CODE)

PLEASE FOLLOW THE ABOVE FORMAT STRICTLY TO FACILITATE EVALUATION AND TO AVOID DELAY.

2. Use only foolscap size writing paper (but not of very thin variety) for writing your answers.

3. Leave 4 cm margin on the left, top and bottom of your answer sheet.

4. Your answers should be precise.

5. While writing answers, clearly indicate the Question No. and part of the question being solved.

6. Please note that:

   i) The Assignment is valid from 1st January, 2020 to 31st December, 2020.

   ii) The response to this assignment is to be submitted to the Study Centre Coordinator within eight weeks of the receipt of this booklet in order to get the feedback and comments on the evaluated assignment.

   iii) In any case, you have to submit the assignment response before filling the exam for the term end examination.

7. We strongly suggest that you should retain a copy of your assignment responses.

   Wishing you all good luck.

Tutor Marked Assignment
CHE-04: PHYSICAL CHEMISTRY

Course Code: CHE-04
Assignment Code: CHE-04/TMA/2021
Maximum Marks: 100

Note: Answer all the questions given below. The marks are indicated in the brackets.

1. (a) Write the name and symbol of SI units of the following physical quantities: (2)
   (i) Length
   (ii) Mass
   (iii) Amount of substance
   (iv) Temperature

   (b) Differentiate between physiosorption and chemisorption. (3)

2. State Boyle's law and Charle's law. Also draw their corresponding isotherms and isobars. (5)

3. Derive van der Waals equation. (5)

4. Explain the surface tension of liquids and the factors affecting it. (5)

5. Draw the following Bravais lattices: (5)
   (i) Body centred cubic
   (ii) Face centred cubic
   (iii) Simple monoclinic
   (iv) End entered orthorhombic
   (v) Hexagonal

6. Define work. Give different ways in which work can be done. Which two other quantities have same units as that of work? (5)

7. Calculate $\Delta_r H^0$ at 298.15 K for the following reaction: (5)

$$C_3H_{6(g)} + \frac{9}{2}O_{2(g)} \rightarrow 3CO_{2(g)} + 3H_2O_{(l)}$$

   You can use the required data as given in the study material.

8. Discuss the entropy change for the isothermal reversible expansion and reversible Compression. (5)

9. Derive the following relation: (5)

$$\left(\frac{\partial S}{\partial V}\right)_T = \left(\frac{\partial p}{\partial T}\right)_V$$

10. Discuss the solubility of gases in liquids. Briefly explain the factors affecting the solubility. (5)

11. Explain the effect of impurities on CST of solutions giving suitable examples. (5)

12. Derive the following expression: (5)

$$\Delta T_b = K_b m$$

13. Draw and explain the phase diagram of Bi-Cd eutectic system. (5)

14. For the following reaction: (5)

$$CO_{(g)} + 2\ H_{2(g)} \rightleftharpoons CH_3OH_{(g)}$$

if 2 mol of $H_{2(g)}$ are mixed with 1 mol of CO, then derive the expression for the equilibrium

constant, K_p in terms of the extent of reaction, ξ and the total pressure, p_t.

15. Calculate the concentration of H^+ ions in a solution of 1.0 M acetic acid at 298 K, if $K_a=1.8\times10^{-5}$ Also show that (5)

$$\left[H^+\right]=\sqrt{K_a c_0}$$

16. How can you determine transport number using Hittorf method? (5)

17. Draw and explain the working of Daniell cell with salt bridge using suitable diagram. (5)

18. Briefly explain various experimental methods available for studying the reaction rates. (5)

19. In photochemical decomposition of acetone using 313 nm light, 7.57 x 10^{-6} mol of carbon monoxide is formed in 20 minutes. If the light absorbed corresponds to 2.41 x 10^{-3} J s^{-1}, calculate the quantum efficiency for the formation of carbon monoxide. (5)

20. Explain the terms-the number average molar mass and the mass average molar mass of a polymer giving suitable expressions for them. (5)