

2017

(CBCS)

(3rd Semester)

CHEMISTRY

THIRD PAPER

(Physical Chemistry—I)

Full Marks : 75

Time : 3 hours

(PART : B—DESCRIPTIVE)

(Marks : 50)

*The figures in the margin indicate full marks
for the questions*

1. What are the postulates of kinetic theory of gas? Derive the kinetic gas equation. 3+7=10

OR

2. (a) What do you mean by compressibility factor? Explain its variation with pressure for different gases. 1+4=5
- (b) Evaluate the critical constant from van der Waals' equation. 5

3. (a) Describe the vacancy theory of liquids. 5
- (b) What are the effects of temperature on surface tension? 5

OR

4. (a) Define liquid crystal. Explain the types of liquid crystal. 1+4=5
- (b) What are the effects of temperature on viscosity? 5
5. (a) Explain the preparation of colloids by Bredig's arc method. 5
- (b) Explain the origin of charge in colloid particles. 5

OR

6. (a) Define gold number. Give example. 1½
- (b) Derive Langmuir adsorption isotherm. Mention its advantage and limitation. 5+2=7
- (c) What do you mean by protective colloids? 1½
7. (a) Derive the Henderson-Hasselbalch equations for acidic and basic buffers. 5
- (b) Derive the hydrolysis relation between dissociation constant of weak acids (K_a), ionic product of water (K_w) and hydrolysis constant (K_h). 5

(3)

OR

8. (a) Calculate the degree of hydrolysis of 0.10 M solution of sodium acetate at 25 °C.
 $K_a = 1.75 \times 10^{-5}$ and $K_w = 1.008 \times 10^{-14}$ 5
- (b) Derive the hydrolysis constant for salts of weak acids and weak bases. 5
9. (a) Explain how the entropy changes with the irreversible process. 4
- (b) How does entropy change in an ideal gas with temperature and pressure? 6

OR

10. (a) Explain the working of Carnot's cycle and its efficiency. 5+1=6
- (b) Heat supplied to a Carnot engine is 1897.8 J. How much useful work can be done by the engine which works between 0 °C and 100 °C? 4

Subject Code : **CHEM/III/EC/05**

Booklet No. **A**

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Date Stamp

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To be filled in by the Candidate

CBCS
DEGREE 3rd Semester
(Arts / Science / Commerce /
.....) Exam., **2017**
Subject
Paper

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CBCS
DEGREE 3rd Semester
(Arts / Science / Commerce /
.....) Exam., **2017**
Roll No.
Regn. No.
Subject
Paper
Descriptive Type
Booklet No. B

INSTRUCTIONS TO CANDIDATES

1. **The Booklet No. of this script should be quoted in the answer script meant for descriptive type questions and vice versa.**
2. **This paper should be ANSWERED FIRST and submitted within 1 (one) Hour of the commencement of the Examination.**
3. **While answering the questions of this booklet, any cutting, erasing, overwriting or furnishing more than one answer is prohibited. Any rough work, if required, should be done only on the main Answer Book. Instructions given in each question should be followed for answering that question only.**

Signature of
Scrutiniser(s)

Signature of
Examiner(s)

Signature of
Invigilator(s)

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(CBCS)

(3rd Semester)

CHEMISTRY

THIRD PAPER

(Physical Chemistry—I)

(PART : A—OBJECTIVE)

(Marks : 25)

The figures in the margin indicate full marks for the questions

SECTION—I

(Marks : 10)

Put a Tick (✓) mark against the correct answer in the
brackets provided : 1×10=10

1. The real gases show nearly ideal behaviour at
- (a) low pressures and low temperatures ()
 - (b) high pressures and high temperatures ()
 - (c) high pressures and low temperatures ()
 - (d) low pressures and high temperatures ()

/50

(2)

2. For 1 mole of a gas, the kinetic energy is given by

(a) $E = \frac{1}{2}RT$ ()

(b) $E = \frac{3}{2}RT$ ()

(c) $E = \frac{5}{2}RT$ ()

(d) $E = \frac{7}{2}RT$ ()

3. For every increase in one degree of temperature of the liquid, there is a decrease in viscosity for

(a) 2% ()

(b) 3% ()

(c) 4% ()

(d) 10% ()

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(3)

4. With the rise in temperature, the surface tension of a liquid

(a) increases ()

(b) decreases ()

(c) remains the same ()

(d) None of the above ()

5. $2\text{H}_2\text{S} + \text{SO}_2 \rightarrow 2\text{H}_2\text{O} + 3\text{S}$

In the above reaction, a sol of sulphur is produced by passing hydrogen sulphide into the solution of sulphur dioxide by

(a) reduction ()

(b) oxidation ()

(c) hydrolysis ()

(d) double decomposition ()

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(4)

6. Physical adsorption generally decreases with temperature.

(a) decreasing ()

(b) increasing ()

(c) reversible ()

(d) exothermic ()

7. The buffer solution will have the maximum buffer capacity when

(a) the concentrations of the salt and acid are equal in solution ()

(b) the concentration of the salt is higher than acid in solution ()

(c) the concentration of the salt is lower than acid in solution ()

(d) None of the above ()

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(5)

8. The salt of strong acid and strong base

(a) undergoes complete hydrolysis ()

(b) does not hydrolyse ()

(c) undergoes partial hydrolysis ()

(d) None of the above ()

9. Entropy is a measure of of the molecule of the system.

(a) concentration ()

(b) velocity ()

(c) reversibility ()

(d) randomness ()

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(6)

10. Which of the following is true for cyclic process?

(a) $\Delta E = 0$ ()

(b) $\Delta E = q - w$ ()

(c) $q = w$ ()

(d) All of the above ()

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(7)

SECTION—II

(Marks : 15)

Answer the following questions :

3×5=15

1. What causes the deviation of gases from the ideal gas behaviour?

Or

Explain the law of corresponding states.

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(8)

2. What do you mean by free volume in liquid?

Or

Define (a) molar refraction and (b) specific refraction.

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(9)

3. Differentiate between physisorption and chemisorption.

Or

Explain the optical properties of colloids.

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(10)

4. Write notes on buffer solutions and buffer activity.

Or

What are the differences between dissociation equilibria of weak electrolytes and dissociation constant of weak acids?

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(11)

5. Define 2nd law of thermodynamics. Explain why the 2nd law is needed.

Or

Derive the relationship between entropy and probability.

8G—650/50

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