



Sl.No.

2822

Total No. of Pages : 3

II Semester B.Sc. Examination, April/May - 2019

(Semester Scheme - CBCS)

PHYSICS (Paper - II)

Heat, Thermodynamics and Sound

Time : 3 Hours

Max. Marks : 80

Instruction : Answer any Two from Part - A, any Two from Part - B, any Three from Part - C and any Ten from Part - D.

PART - A

1. a) List the assumptions made by Maxwell while deriving the expression for molecular velocities. [3]
b) Obtain the expression for average velocity of a gas. [3]
c) Arrive at the van der waal's equation of state for the real gases. [6]
2. a) Describe an experiment to determine the thermal conductivity of a bad conductor by Lee's-Charlton method. [6]
b) Derive Stefan's law of black body radiation from Planck's law. [6]
3. a) With a neat diagram, explain porous plug experiment and discuss its results. [6]
b) Explain the thermodynamic scale of temperature. [6]

PART - B

4. a) State and discuss the Second Law of Thermodynamics, in terms of entropy. [4]
b) Explain entropy and non-available energy. [3]
c) Show that change in entropy is zero for a system taken around a reversible cycle. [5]

5. a) Derive the first and the second 'Tds equations'. [6]
 b) Derive an expression for frequency of Vibration of stretched string. [6]
6. a) Evaluate the Fourier coefficients. [7]
 b) What are damped vibrations. Deduce a suitable equation for them. [5]

PART - C

7. Calculate the kinetic energy of translation of oxygen at 350k for the following data. Avagadro's number = 6.02×10^{26} Kilomole⁻¹ and Boltzmann's constant = 1.38×10^{-23} JK⁻¹. [4]
8. Calculate the depression in the melting point of ice, when the pressure changes by 1.013×10^5 pa. Specific volume of ice at 0°C is 1.091×10^{-3} m³/kg and specific volume of water at 0°C is 1×10^{-3} m³/kg. Latent heat of ice = 3.36×10^5 J/kg. [4]
9. Calculate the change of entropy when 1kg of water at 27°C is heated to 100°C, assuming the specific heat capacity of water to be 4200 J kg⁻¹ k⁻¹. [4]
10. The density of oxygen is 16 times that of hydrogen. For both gases, $\gamma = 1.4$. If the speed of sound is 317 ms⁻¹ in oxygen at 0°C, what is the speed of hydrogen at the same pressure? [4]

PART - D

11. a) What is meant by 'mean free path' of a partide? [2]
 b) Explain Planck's quantum Theory of radiation. [2]

- c) Distinguish between Real and Ideal gas. [2]
- d) Define 'inversion temperature'. [2]
- e) Explain 'efficiency' of a heat engine. [2]
- f) State 'Carnot's Theorem'. [2]
- g) What is Adiabatic Demagnetization? [2]
- h) What is 'entropy'? [2]
- i) What are "Lissajou's figures"? [2]
- j) What is Enthalpy? Explain. [2]
- k) What is Resonance? Explain with an example. [2]
- l) Write differential equation of wave motion. [2]

II Semester I B.Sc. Examination, April/May - 2019
(Semester Scheme) (CBCS) (2018-19 Batch & onwards)
CHEMISTRY (Paper - II)

Time : 3 Hours

Max. Marks : 80

Instruction: Write equations and draw neat diagrams wherever necessary.

PART - A

Answer all the questions.

[8 × 1 = 8]

1. a) Define polarizing power.
- b) What is the bond angle in BeCl_2 molecule?
- c) Which type of alkyl halide undergoes SN^1 - reaction?
- d) Write the number of Π bonds present in phenanthrene.
- e) Give the relation between Rate constant & Energy of activation.
- f) Write the equation for half life period of a II order reaction.
- g) What are Soaps?
- h) What is the degree of polymerization?

PART - B

[Inorganic Chemistry]

Answer any two questions:

[2 × 9 = 18]

2. a) What is lattice energy? How is the lattice energy of NaCl determined using Born - Haber cycle? [4]
- b) What are the factors that favours the formation of a co-valent bond? [2]
- c) On the basis of VSEPR theory explain the shape of H_2O molecule. [3]

3. a) Write the molecular orbital energy level diagram of O_2 molecule. [4]
b) Explain the Fajan's rules of polarisation. [3]
c) What are the differences between bonding and antibonding molecular orbitals. [2]
4. a) Explain $sp^3 d^2$ hybridization by taking SF_6 as an example. [4]
b) Write the rules for LCAO method. [3]
c) Write the resonating structures of CO_3^{2-} ion. [2]

PART - C

[Organic Chemistry]

Answer any two questions:

[2 × 9 = 18]

5. a) Explain SN^2 reaction mechanism with energy profile diagram. [4]
b) Write a Note on Sachse - Mohr theory. [3]
c) Write the structures of Cis - Trans Stilbene. [2]
6. a) Write the general mechanism of Electrophilic substitution reaction. [3]
b) Explain Ullmann reaction with example. [2]
c) Explain Anti - Aromaticity of Annulenes. [2]
d) Explain dehydro halogenation reaction with suitable example. [2]
7. a) Explain conformational analysis of ethylene glycol with energy profile diagram. [4]
b) How do you convert toluene to benzoic acid? [2]
c) Classify the following groups into, ortho, para & meta directing. [3]
- CH_3 , - SO_3H , - $COOH$, - Cl , - NH_2 , - NO_2

PART - D**[Physical Chemistry]**

Answer any two questions: [2 × 9 = 18]

8. a) Derive an expression for the rate constant of a II order reaction. When $a = b$. [4]
- b) Write Debye - Huckel- On Sager equation & explain the terms involved in it. [2]
- c) Calculate the hydrolysis constant and degree of hydrolysis of 0.1 M solution of aniline hydrochloride. Given $K_b = 5.94 \times 10^{-10}$ & $K_w = 1.0 \times 10^{-14}$. [3]
9. a) Describe the spectrophotometric study of kinetics of oxidation of Indigocarmine by chloramine - T. [4]
- b) Discuss Debye - Huckel theory of strong electrolyte. [3]
- c) The rate constant for a II order reaction is $3.33 \times 10^{-2} \text{ dm}^3 \cdot \text{Mol}^{-1} \cdot \text{Sec}^{-1}$. If the initial concentration of the reactants is $0.05 \text{ mole} \cdot \text{dm}^{-3}$, calculate its half life. [2]
10. a) Derive an expression for the hydrolysis constant of a salt of weak acid & strong base. [4]
- b) Calculate the rate constant of a II order reaction, when $a = b$, which is 40% completed in 60 min. [2]
- c) How do you determine the order of a reaction by Ostwald's isolation method? [3]

PART - E**[General Chemistry]**

Answer any two questions: [2 × 9 = 18]

11. a) Explain the manufacture of soap by hot process. [4]
- b) Equal number of molecules with $M_1 = 10000$ & $M_2 = 30000$ are mixed with each other. Calculate \bar{M}_n & \bar{M}_m . [3]
- c) How do you prepare dimethyl sulphate, an organic reagent? [2]

12. a) How do you determine molar mass of a polymer by osmotic pressure method? [4]
- b) What are detergents? Explain the types with examples. [3]
- c) Mention any two advantages of organic precipitants over inorganic precipitants. [2]
13. a) Write the structure of Ni^{+2} – DMG & Mg^{2+} – oxine complexes. [4]
- b) What are waxes? Give an example for plant and animal waxes. [3]
- c) Give an application each of acetic anhydride & Raney nickel. [2]



