2024/FYUG/ODD/SEM/
CHMDSC–102T/185

FYUG Odd Semester Exam., 2024

CHEMISTRY

(1st Semester)

Course No. : CHMDSC–102T

(Physical Chemistry—I)

Full Marks : 70
Pass Marks : 28

Time : 3 hours

The figures in the margin indicate full marks for the questions

UNIT—I

1. Answer any *two* from the following : 2×2=4

(a) Write the two faulty postulates of kinetic theory of gases.

(b) What will be the effect of temperature and pressure on collision frequency of gas molecule?

(c) Derive a relation between KE and absolute temperature.

Answer any *one* from the following : 10

2. *(a)* Define mean free path and obtain a relation between mean free path and coefficient of viscosity of gas molecules. 2+4=6

(b) What is degrees of freedom? Calculate the degrees of freedom of water molecule. 2+2=4

OR

3. *(a)* For hydrogen gas, calculate—

(i) the r.m.s. velocity, c;

(ii) the average velocity, v;

(iii) the most probable velocity, ∞ at 0°C. 2+2+2=6

(b) Explain the principle of equipartition of energy and calculate the energy of CO_2 at room temperature assuming all the degrees of freedom. 2+2=4

UNIT—II

4. Answer any *two* from the following : 2×2=4

(a) Define compressibility factor of a gas. What will be the effect of pressure on the compressibility factor? 1+1=2

(b) Under what condition the real gases behave ideally?

(c) Explain the significance of van der Waals' constant.

Answer any *one* from the following : 10

5. (a) Introducing volume and pressure correction term, derive the van der Walls' equation of state from ideal gas equation. 6

(b) Define critical temperature of gas and explain why a gas cannot be liquified above critical temperature. 2+2=4

OR

6. (a) Derive a relation of van der Walls' constants a and b in terms of critical constant. 5

(b) Explain the PV isotherm of CO_2. 3

(c) Define inversion temperature. 2

UNIT—III

7. Answer any *two* from the following : 2×2=4

(a) Define viscosity of liquid. Explain the effect of temperature on viscosity.

(b) What are the factors on which vapour pressure of liquid depends?

(c) "Surface tension of a liquid vanishes at its critical temperature." Explain the statement.

Answer any *one* from the following : 10

8. (a) What is surface active agent? Discuss the cleansing action of soap. 2+3=5

(b) Define vapour pressure of a liquid and explain one method of determination of vapour pressure. 2+3=5

OR

9. (a) Explain the method of determination of coefficient of viscosity by Ostwald's viscometer. 4

(b) Define interfacial tension of liquid pairs. 2

(c) What will be the effect of addition of non-volatile solute on the surface tension and viscosity of a liquid? 4

UNIT—IV

10. Answer any *two* from the following : 2×2=4

(a) Why are crystalline solids called anisotropic in nature?

(b) Define colour centre. Give one example.

(c) Explain why metallic solid is a good conductor of electricity but ionic solid is not at room temperature.

Answer any *one* from the following : 10

11. (a) What are the different types of crystalline solid? Give the characteristic feature of each of them. 2+4=6

(b) Explain the difference between semi-conductor and conductor in terms of band theory. Give example of each. 3+1=4

OR

12. (a) Explain the different kinds of defect arise in a crystal. Give example of each. 6

(b) What are liquid crystals? How are they classified? 2+2=4

UNIT—V

13. Answer any *two* from the following : 2×2=4

(a) Explain why ΔH_{mix} and ΔV_{mix} are equal to zero for ideal solution.

(b) Define CST. Give one example of UCST.

(c) What is steam distillation?

Answer any *one* from the following : 10

14. *(a)* State and explain Raoult's law for vapour pressure of binary solutions of volatile liquids. What are positive and negative deviations? Give example of each. 3+3=6

(b) Discuss the temperature-composition curves of ideal solution. 4

OR

15. *(a)* Define azeotropic mixture. Explain maximum and minimum boiling azeotropes with an example. 2+3=5

(b) State distribution law and explain how this law is useful in determination of composition of a complex. 2+3=5

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