

2020

Time : 3 hours

Full Marks : 75

Candidates are required to give their answers in their own words as far as practicable.

The questions are of equal value.

Answer **two** questions each from Group – A and Group – B in addition to Q. No. 1 which is compulsory.

1. Select the correct answer from the options given below :

(a) Zeroth law of Thermodynamics gives the concept of :

- (i) ~~Heat~~ (ii) Internal Energy
(iii) ~~Temperature~~ (iv) Enthalpy

(b) In isothermal process the physical quantity remains constant :

- (i) Pressure (ii) Volume
(iii) Entropy (iv) Temperature

(c) The number of degree of freedom of a diatomic molecule (there is no vibrational motion) is :

- (i) 2 (ii) 3
(iii) ~~5~~ (iv) 7

(d) According to the van der Waals equation of state, the critical volume is :

- (i) 2b (ii) ~~b~~
(iii) 4b (iv) 3b

(e) The work done in twisting a wire of torsional rigidity C through angle θ is :

- (i) $C\theta$ (ii) $C\theta^2$
(iii) $\frac{1}{2} C\theta$ (iv) $\frac{1}{2} C\theta^2$

(f) The Gibbs potential of a system is :

- (i) ~~$U + PV$~~ (ii) $U - PV$
(iii) $U + \frac{1}{2} PV$ (iv) None of these

(g) The dark lines in the solar spectra are explained by :

- (i) Stefan's Law
(ii) Kirchhoff's Law
(iii) Planck's Law
(iv) ~~Rayleigh Jeans Law of radiation~~

(h) In a Planetary motion which of the following quantity remains constant ?

- (i) Potential Energy
- (ii) Linear Momentum
- (iii) Kinetic Energy
- ~~(iv) Angular Momentum~~

(i) With the increase of temperature, the viscosity of a gas ?

- ~~(i) Increases~~
- (ii) Decreases
- (iii) May increase or decrease
- (iv) Does not depend upon temperature

Group – A

2. Deduce the Maxwell's law of distribution of velocities for gas molecules. What are R. M. S. velocity, mean velocity and most probable velocity ?

3. What is mean free path ? Deduce an expression for mean free path of a gas. Discuss its experimental verification.

4. Derive Poiseuille's formula for the rate of flow of liquids through a horizontal capillary tube

of uniform cross-section. What are necessary corrections ?

5. What is surface tensions ? Describe theory and method to determine surface tension of water by ripple-method.

Group – B

6. Derive Maxwell's four Thermodynamical relations. <https://www.mungeruniversity.com>

7. How did Kelvin arrive at thermodynamic scale of temperature ? Show that this scale and perfect gas scale are identical.

8. Give an account of Debye's theory of specific heat of solids. Why this method is better than that of Einstein's theory ?

9. Discuss Joule-Thomson effect with necessary theory. Obtain the expression for the inversion temperature for a van der Waal's gas.

OR

Define entropy. Show that entropy remains constant during reversible process and increases during irreversible process.

