11221

B.Sc. Second Semester Degree Examination, May/June 2017
PHYSICS
Paper – 2.1 : Heat, Thermodynamics, Waves and Oscillations

Time : 3 Hours Max. Marks : 80

Instructions : *1) Section – **I** is **compulsory**.*
*2) Answer **any four** questions **each** from Section – **II** and from Section – **III**.*

SECTION – I

1. Answer **any twelve** of the following : **(12×1=12)**

A) Choose the correct answer :

i) The speeds of 5 molecules of a gas are 2, 3, 4, 5 and 6. The root mean square for these molecules is

a) 2.91 b) 3.52
c) 4.00 d) 4.24

ii) Which of the following is a sudden process ?

a) isothermal b) adiabatic
c) isobaric d) isochoric

iii) The first operation involved in a Carnot cycle is

a) Isothermal expansion b) Adiabatic expansion
c) Isothermal compression d) Adiabatic compression

iv) The temperature of _____ salt decreases due to adiabatic demagnetization.

a) ferromagnetic b) paramagnetic
c) diamagnetic d) ferrimagnetic

B) Fill in the blanks :

i) dS = 0 represents a _____ process.

ii) There is change in _____ of the gas in the Joule-Kelvin expansion process.

iii) Unit of Stefan's constant is _____

iv) In case of damped oscillatory motion the amplitude is not constant but _____

P.T.O.

C) State **true** or **false** :

i) The P. V. diagram is also known as indicator diagram.

ii) In S.H.M. total energy of the particle is constant.

iii) Loudspeaker converts electrical energy into sound energy.

iv) Work done on a system is represent by negative sign.

D) Answer the following in **one** or **two** sentences :

i) State Carnot's theorem.

ii) What is the effect of pressure on the boiling point of a liquid ?

iii) State Wien's displacement law.

iv) Define damped oscillations.

SECTION – II

(4×4=16)

2. Write the postulates of kinetic theory of gases.

3. Obtain an expression for the mean free path of a gas.

4. Explain with a diagram the Joule Thomson porous plug experiment.

5. Derive the relation between amplitude and intensity.

6. Obtain an expression for undamped vibrations.

7. Give the construction and working of microphone.

SECTION – III

8. a) Describe the construction and working of Carnot's engine. Drive an expression for its efficiency. **9**

b) Calculate the change in entropy when 4 kg of ice at 0°C is converted into water at 80°C. Given : Latent heat of ice is 3.32×10^5 J/kg and specific heat of water is 4.2×10^3 J/kg. **4**

9. a) Deduce Claussius and Clapeyron equation. Explain the effect of pressure on boiling point and melting point. **9**

b) Derive the expression for work done during an adiabatic process. **4**

10. a) What is regenerative cooling ? Describe a method of liquefying air based on it. 9

b) Explain the principle of cooling by adiabatic demagnetization. 4

11. a) Describe the distribution of energy in black body radiation. 9

b) A body at 1500 K emits maximum energy of wavelength 2000 nm. If the sun emits maximum energy of wavelength 550 nm, what would be the temperature of the sun ? 4

12. a) Derive Newton-Laplace formula for velocity of sound in a medium. Discuss the effect of pressure and density on the velocity of sound. 9

b) The density of aluminum is 2.8×10^{3} kg m^{-3} and its Young's modulus is 7×10^{10} pascal. If the frequency of the aluminum rod is 500 Hz, calculate the velocity of sound and wavelength through the rod. 4

13. a) Obtain an expression for the velocity of transverse waves in a stretched string. 9

b) A tuning fork has frequency of 256 Hz and amplitude 0.5 cm. If the velocity of sound is 340 ms^{-1}, calculate the energy current. Density of air is 0.001293 gram per cubic centimeter. 4
