Seat Number

Nov - 2015

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कात - 009

PHYSICS PAPER - I : PHY - 121
Heat and Thermodynamics
(12125)

P. Pages : 3

Time : Two Hours

Max. Marks : 40

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Graph or diagram should be drawn with the black ink pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. All questions are compulsory and carry equal marks.
5. Figures to the right indicates full marks.
6. Draw neat diagram whenever necessary.
7. Use of logarithmic table or standard electronic calculator is allowed.
8. Symbols have their usual meanings.

1. Attempt **any eight** of the following. Select the correct option. **8**

i) When there is no temperature difference between the parts of system or between the system and its surrounding, it is said to be in a state of

a) Electrical equilibrium b) Thermal equilibrium
c) Chemical equilibrium d) Mechanical equilibrium

2) The highest temperature at which a gas can be liquified by the application of pressure is called.....

a) Boyle's temperature b) Room temperature
c) Boiling temperature d) Critical temperature

3) If two systems are separately in thermal equilibrium with the third system, then they themselves are in Thermal equilibrium with each other. This is....

a) First law of thermodynamics
b) Second law of Thermodynamics
c) Law of equilibrium
d) Zeroth law of thermodynamics.

4) Boyle's temperature of gas is the temperature at which gas obey's.....
   a) Boyle's law b) Charles law
   c) Dalton's law d) Law of Thermodynamics.

5) Entropy of the system increases, when it undergoes.....
   a) Reversible change b) irreversible change
   c) both a and b d) none of the above.

6) Sink is.....
   a) cold body b) hot body
   c) both a and b d) none of the above.

7) Otto cycle is perfectly.....
   a) Irreversible b) Reversible
   c) both a and b d) Isothermal.

8) Efficiency of Carnot's heat engine is always------
   a) Less than 1 b) greater than 1
   c) Equal to 1 d) zero.

9) Liquid generally used as refrigerant in domestic refrigerator is.....
   a) Freon b) liquid nitrogen
   c) Liquid ammonia d) None of the above.

10) The machine which causes heat to flow from------ is called refrigerator.
   a) cold body to hot body b) hot body to cold body
   c) both a and b d) none of the above.

2. Attempt **any four** of the following : 8

a) Give any two conclusions of Andrew's experiment.

b) State first law of thermodynamics.

c) Draw PV diagram of Carnot cycle.

d) Calculate the efficiency of Carnot's engine operating between temperatures 550°K and 250°K.

e) Give the basic components of simple vapour compression refrigeration system.

f) A quantity of air at 27°C and atmospheric pressure is suddenly compressed to one-third of its original volume. Find the final pressure and temperature. The ratio of specific heat of air is 1.4.

3. Attempt **any two** of the following : 8

a) Explain the terms adiabatic change and isothermal change.

b) Describe Joule-Thomson Porous plug experiment.

c) Calculate the efficiency of an otto engine in which the working substance is adiabatically compressed to one - sixth of its initial volume in each cycle. Assume the engine to operate on the otto cycle. (γ=1.4)

4. a) Attempt **any two** of the following : 6

i) State the important conclusions of Amagat's experiment.

ii) State the conditions for reversible process.

iii) Distinguish between otto engine and diesel engine.

b) State applications of refrigerator. 2

5. Attempt **any one** of the following : 8

a) Draw and explain an indicator diagram for Carnot cycle, calculate the net work done by a gas during the cycle and hence calculate the efficiency of Carnot engine.

b) i) For critical constants, prove the relation V_c=3b.

ii) The critical temperature and pressure of oxygen are -119°C and 50 atmosphere respectively. Determine Van-der Waals constants 'a' and 'b' for oxygen. R = 8310 J/K mole °K.

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