Oct-2013

Seat No. | | | | | | |

केंद्रक - 013

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

P. Pages : 3

Time : Two Hours **Max. Marks : 40**

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answersheet should be written with blue ink only. Graph or diagram should be drawn with the same 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 a neat diagrams, wherever necessary.
7. Use of logarithmic table or standard electronic calculator is allowed.
8. Symbols have their meaning.

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

i) In Andrew's experiment on Co_2, the critical isothermal for Co_2 obtained at temperature -----

a) 100°C b) 62.5°C
c) 31.1°C d) 42.5°C

ii) Theoretically, the critical coefficient for all real gases should have a constant value.

a) 90.2 b) 6.67
c) 3.142 d) 2.67

iii) The relation between the pressure & volume of gas, when it undergoes adiabatic change is --------

a) PV^{γ} = constant b) RV^{γ} = constant
c) PT^{γ} = constant d) None of above.

iv) All natural processes are -------

a) irreversible b) reversible
c) a and b both d) None of above.

v) Efficiency of otto engine is given by x = -------

a) $1-\left(\frac{1}{\rho}\right)^{\gamma-1}$ b) $\left(\frac{1}{\rho}\right)^{\gamma-1}$
c) $\rho^{\gamma}-1$ d) None of above.

vi) Unit of refrigeration is --------
a) grams of refrigeration b) Kilograms of refrigeration
c) Ton of refrigeration d) None of above.

vii) In Vapour Compression refrigeration system liquid refrigerant is stored in -------
a) Condensar b) Compressor
c) Reserviour d) Evaporator.

viii) During the reversible isothermal process at mean absolute temperature 'T', the entropy of the system increases by infinitesimal amount 'ds' is given by -------
a) $ds = \frac{dQ}{T}$ b) $ds = \frac{PdQ}{T}$
c) $ds = \frac{RT}{V}$ d) None of above.

ix) A change in the state of the system at constant volume is called ----
a) isochoric change b) isobaric change
c) Natural change d) None of the above.

x) Entropy of the system increases, when it undergoes ------
a) reversible change b) irreversible change
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) Calculate the critical pressure for nitrogen, if it's Van der Waal's constants are $a = 2.72 \times 10^{-3}$ and $b = 1.73 \times 10^{-3}$, where the pressure is expressed in atmosphere.

c) Give the different parts of Car not heat engine.

d) Draw the neat indicator diagram of otto cycle.

e) Give any four uses of refrigerator.

f) Draw a block-diagram of Vapour Compression refrigeration system.

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

a) Derive an equation for work done in an isothermal change of gas.

b) Describe the working of otto engine.

c) Derive the first latent heat equation.

4. A) Attempt **any two** of the following. 6

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

b) Discuss briefly the refrigeration by throttling of the gas.

c) Show that the Boyle temperature of a gas is $T_B = \frac{a}{Rb}$.

B) Draw a neat diagram of Andrew's apparatus. 2

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

i) Draw and explain indicator diagram for the diesel cycle and hence obtain expression for efficiency of diesel engine.

ii) For an ideal gas undergoing adiabatic change, obtain the relation between (a) Pressure and Volume (b) temperature and Volume (c) temperature and pressure.

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