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AO—81—2018

FACULTY OF SCIENCE

B.Sc. (First Year) (Second Semester) EXAMINATION

MARCH/APRIL, 2018

(CBCS Pattern)

PHYSICS

(Heat and Thermodynamics)

Paper III

(MCQ & Theory)

(Saturday, 31-03-2018)   Time : 10.00 a.m. to 12.00 noon

Time—2 Hours   *Maximum Marks—40*

N.B. :—   (*i*)   Attempt *All* questions.

       (*ii*)   Use separate answer-book/sheet for MCQs and descriptive type questions.

       (*iii*)   Negative marking system is applicable to MCQ examination.

       (*iv*)   Calculator or logarithmic table is allowed for numerical problems.

MCQ

1.   Attempt *all* multiple choice questions :   10

   (*i*)   The diameter of nitrogen molecule is 3.2×10^{-10} m. The number of molecules at 0°C and 1 atm pressure is 2.69×10^{25} per cm^3. The mean free path for nitrogen molecule is :

     (*a*) 0.008175×10^{-5} m   (*b*) 0.008175×10^{-3}

     (*c*) 0.008175×10^{-2} m   (*d*) $0.08175 \times 10^{+6}$

   (*ii*)   The conductivity of a gas is due to transport of :

     (*a*)   energy   (*b*)   momentum

     (*c*)   mass   (*d*)   volume

   (*iii*)   At critical temperature of a gas can be liquefied by increase in :

     (*a*)   Temperature   (*b*)   Volume

     (*c*)   Pressure   (*d*)   None of these

P.T.O.

(*iv*) The expression for critical volume is :

(*a*) $\dfrac{a}{27\,b^2}$ (*b*) $\dfrac{a}{27}$

(*c*) $3\,b^2$ (*d*) $3\,b$

(*v*) In Carnot heat engine .... is the hot body.

(*a*) Source   (*b*) Sink

(*c*) Working substance   (*d*) Insulating stand

(*vi*) The work done in thermodynamical system is :

(*a*) $dW = T\,dP$ (*b*) $dW = P\,dV$

(*c*) $dW = V\,dP$ (*d*) dW = change in volume

(*vii*) According to first $T\,dS$ equation, $T\,dS = ... + T\left(\dfrac{dP}{dT}\right)_V \; dV$:

(*a*) $C_P\,dT$ (*b*) $C_P \cdot C_V \; dT$

(*c*) $C_V \; dT$ (*d*) $\dfrac{C_P}{C_V} \; dT$

(*viii*) The Gibbs thermodynamical function is given by :

(*a*) $G = U - TS + PV$ (*b*) $G = U + TS + PV$

(*c*) $G = TS + PV$ (*d*) $G = TS - PV$

(*ix*) The average energy of Plancks' oscillator is :

(*a*) $E = h\nu$ (*b*) $E = nh\nu$

(*c*) $E = mc^2$ (*d*) $E = \dfrac{h\nu}{e^{\frac{h\nu}{kT}} - 1}$

(*x*) Rayleigh-Jeans' law of radiation applies to :

(*a*) Smaller wavelengths   (*b*) Longer wavelengths

(*c*) All wavelengths   (*d*) None of these

Theory

2.   Attempt any *five* of the following :   10

     (*a*)   Define critical pressure

     (*b*)   Write van der Waals' equation of state

     (*c*)   Define temperature of inversion

     (*d*)   State third law of Thermodynamics

     (*e*)   Define enthalpy of the system

     (*f*)   State Rayleigh-Jeans' law

     (*g*)   State Stefan-Boltzmann' law.

3.   Attempt any *two* of the following questions :   10

     (*a*)   Obtain an expression for Boyle's temperature

     (*b*)   Explain Carnot's ideal heat engine

     (*c*)   Derive Clausius-Clapeyron heat equation

     (*d*)   Explain spectral distribution in black body radiations

4.   Attempt any *one* of the following :   10

     (*a*)   Derive an expression for coefficient of viscosity of a gas.

     (*b*)   Explain in detail Andrews' experiment.