

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

FIRST YEAR [BATCH 2016-19]

B.A./B.Sc. SECOND SEMESTER (January – June) 2017

Mid-Semester Examination, March 2017

Date : 17/03/2017

Time : 12 noon – 1 pm

PHYSICS (General)

Paper : II

Full Marks : 25

[Use a separate Answer Book for each group]

Group – A

(Answer any two questions)

[2×5]

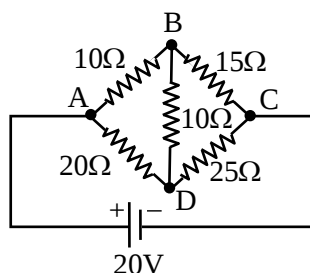
1. State the law of equipartition of energy and show how you can use the law to calculate the specific heats of gas. Hence find the value of ratio of two specific heats of gas (γ) for diatomic and triatomic gas. [1+2+2]
2. a) State the difference between gas and vapour. [2]
b) Find the temperature at which r.m.s velocity of Nitrogen molecules in the Earth's atmosphere equals the velocity of escape from the Earth's gravitational field. Given mass of Nitrogen atom $23 \cdot 24 \times 10^{-24}$ gm, mean radius of the Earth = 6370 km. Boltzmann constant = $1 \cdot 37 \times 10^{-16}$ erg K⁻¹. [3]
3. a) What do you understand by the state function of a system. Name two such functions. [2]
b) A quantity of air at NTP is adiabatically compressed to $\frac{1}{5}$ th of its volume. Calculate the rise of its temperature. γ for air = 1.41. [3]

Group – B

(Answer any three questions)

[3×5]

4. a) If $\phi(x, y, z)$ is a constant surface show $\vec{\nabla} \phi \cdot d\vec{r} = 0$. [3]
b) Prove $\vec{\nabla} \times (\vec{\nabla} \phi) = 0$. [2]
5. A vector field is given by $\vec{F} = 2xz^2\hat{i} + 2yz^2\hat{j} + (2x^2z + 2y^2z - 1)\hat{k}$. Show that the vector fields is conservative. [5]
6. Write Gauss's theorem. Find electric field of a uniformly charged plane sheet. [1+4]
7. Find the current flowing through the arm BD in the Wheatstone bridge network. [5]



8. a) An emf is applied across a series LR circuit at time $t = 0$. Find an expression for current at any time, t . [3]
b) A telephone operates at a current of 120 mA has an inductance of 10H and resistance 100Ω. If 24V battery having negligible internal resistance is suddenly applied, calculate the operating time. [2]