B.Sc. Part-1 Examination, 2013

(PHYSICS)

Paper-Sub/Gen

Full marks: 75

Time: 3 hours

Answer from **all** the groups

The figure in the right-hand margin indicate marks

Candidates are required to give their answers in their

own words as far as practicable

GROUP-A

(Objective type question)

1. Indicate the correct answer in each of the following:
   a. $\vec{\nabla}(\frac{1}{r})$ is:
      i. 0
      ii. $\vec{r}$
      iii. $\overrightarrow{-r}/r^2$
      iv. $\overrightarrow{-r}/r^3$
   b. The Young's modulus for a perfectly rigid body (Elastic) is :
      i. Zero
      ii. 1
      iii. Infinity
      iv. None of the above
   c. At which of the following temperature, the value of surface tension of water is minimum:

i. 4°C
ii. 0°C
iii. 50°C
iv. 70°C

d. The degree of freedom of each molecule of triatomic gas possesses:
   i. 3
   ii. 5
   iii. 6
   iv. 7.

e. Sun's heat reaches us by:
   i. Conduction
   ii. Convection
   iii. Radiation scattering.

f. Unpolarised light on emerging out of Nicol Prism is:
   i. Remains unpolarised
   ii. Becomes partially polarized
   iii. Becomes elliptically polarized
   iv. Becomes circularly polarized

g. Which of the following properties of light conclusively support wave theory of light?
   i. Light obeys laws of reflection
   ii. Light shows interference
   iii. Light shows photoelectric effect
   iv. None of the above

h. If more air is pushed in a soap-bubble, the pressure in it :
   i. Decreases
   ii. Increases
   iii. Remains same
   iv. Remains zero

i. The expression involving $\overrightarrow{D}$, $\vec{P}$ and $\vec{E}$ in a dielectric is :
   i. $\vec{P}=\vec{E}+\vec{D}$

ii. $\vec{D}=\varepsilon_0\vec{P}+\vec{E}$

iii. $\vec{D}=\varepsilon_0\,\vec{E}+\vec{P}$

iv. $\vec{E}=\varepsilon_0\vec{P}+\vec{D}$

j. According to van der Walls' equation of state, the critical temperature is:

i. $\frac{a}{Rb}$

ii. $\frac{2a}{Rb}$

iii. $\frac{8a}{Rb}$

iv. $\frac{8a}{27Rb}$

GROUP-B

(Short answer type questions)

2. Answer any two questions of the following:
   a. Explain why Poisson's ratio is said to lie between -1 and $+\frac{1}{2}$
   b. Distinguish between reversible and irreversible process with examples.
   c. What is quarter-wave plate? Deduce its thickness for a given wavelength in term of its indices.
   d. What do you mean by bel and phon?

GROUP-C

(Long answer type questions)

3. State and prove Stokes' theorem.
4. Deduce Poiseuille's a formula for flow of liquids through a capillary tube. Mention the necessary corrections.
5. What is Joule-Thomson effect? Deduce an expression for Joule-Thomson cooling produced in van der Walls' gas.
6. Differentiate phase and group velocity. Describe with neat diagram the Kerr cell method of finding the velocity of light.

7. What is forced vibration? Give analytical treatment of forced vibration. What is sharpness of resonance?
8. Describe the constructions and working of Michelson Interferometer. Under what conditions would you observe the fringes in Michelson Interferometer with white light?
9. What is dielectric substance? Describe Hopkinson's null method for determination of dielectric constant of solid.
10. State the Stafan's law. Deduce it thermodynamically.

GROUP-D

(Numerical problems)

Answer any three questions of the following:

11. Calculate the percentage increase in length of a wire of diameter 2.5 mm. Stretched by a force of 100 kg. weight. (Young's modulus of elasticity of wire is 12.5×10^{11} dyne/sq.cm.)
12. Calculate the change in entropy when 10 gm. of ice at 0 °C is converted into water at the same temperature. Given that the latent heat of fusion is 80 cal. per gm.
13. Prove div curl A=0.
14. Calculate the change in intensity level when the intensity of sound increases by 10^6 times its original intensity.
15. In a Newton's ring experiment, the diameter of the 15^{th} ring was found to be 0.590 cm and that of the 5^{th} ring was 0.336 cm. If the radius of the Plano convex lens is 100 cm, calculate the wavelength of light speed.