2022

M.Sc.

2nd Semester Examination

PHYSICS

PAPER—PHS-204

CONCEPTS OF PHYSICS: INVENTIONS AND APPLICATION (CBCS)

Full Marks : 40

Time : 2 Hours

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

Group – A

Answer any *four* questions.   4×2

1. Write down some applications of Archimedes' principle.

2. Derive the Newton's law of gravitation from Kepler's law of planetary motion.

3. Write the conditions for production of sustainable interference of light.

4. What is the difference between a superconductor and a perfect conductor ?

5. How can you distinguish between Single Crystal and Poly Crystal ?

6. What do you mean by non-linearly of a medium ?

Group – B

Answer any *four* questions.   4×4

7. (a) Write some drawbacks of Dalton's atomic theory.

     (b) What do you mean by the coherent sources of light ?   2+2

8. (a) Titan, the largest moon of Saturn, has a mean orbital radius of 1.22×10^9 m. The orbital period of Titan is 15.95 days. Hyperion, another moon of Saturn, orbits at a mean radius of 1.48×10^9 m. Use Kepler's third law of planetary motion to predict the orbital period of Hyperion in days.

     (b) Why did Thomson conclude that electrons could be found in atoms of all elements ?   3+1

9. Prove the laws of conservation of linear momentum and energy for a system of interacting particles. 4

10. What do you mean by modulation ? Name the different kinds of analog modulation. 2+2

11. Draw the waveform of amplitude modulated signal along with the waveforms of corresponding carrier signal and modulating signal. 2+2

12. (a) What is the importance of MTSO in mobile communication ?

(b) What are the salient features of 2G mobile communication ? 2+2

Group – C

Answer any *two* questions. 2×8

13. (a) A ball of mass 2 kg that has a diameter of 50 cm falls in the pool. Compute its buoyant force and volume of water displaced.

(b) How did Galileo use inclined planes to discover the idea of inertia ?

(c) Describe the formation of mirage. 2+3+3

14. (a) How does the formula $C_{12}H_{22}O_{11}$ (glucose) violates Dalton's atomic theory?

(b) A pair of screens are placed 13.7 m apart. A third order fringe is seen on the screen 2.50 cm from the central fringe. If the slits were cut 0.0960 cm apart, determine the wavelength of this light.

(c) Compare the properties of α, β and γ radiations.

2+3+3

15. (a) What is the advantage of using a single unit cm^{-1} (or $length^{-1}$) for length, frequency, energy etc. instead of different units for the same in spectroscopy?

(b) Convert the following spectroscopic quantities as indicated :
2000 cm^{-1} to μm, 0.15 nm to Hz, 500 nm to cm^{-1} and 9 GHz to cm^{-1}.

2+6

16. Describe how Si single crystal can be grown by Czochralski method. What is meant by nano materials? Mention two approaches for the manufacturing of nano materials.

5+1+2

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TB—100