

FIRST SEMESTER B.A./B.Sc. DEGREE EXAMINATION, NOVEMBER 2019

(CBCSS—UG)

Physics/Applied Physics

PHY 1B 01/APH 1B 01—METHODOLOGY OF SCIENCE AND BASIC MECHANICS

(2019 Admissions)

Time : Two Hours

Maximum : 60 Marks

*The symbols used in this question paper have their usual meanings.***Section A (Short Answer Type)***Answer all questions in two or three sentences.**Each correct answer carries a maximum of 2 marks.*

1. What is science ?
2. What is meant by contact forces ? Give two examples.
3. Work done during uniform circular motion is zero. Justify.
4. Space rockets are usually launched from west to east ? Why ?
5. Draw the energy diagram of an attractive two atom system and mark the bounded region.
6. State work-energy theorem.
7. Define angular momentum of a particle. Give its S I Unit.
8. Define central force. Show that angular momentum is conserved in central force motion.
9. Two lenses-one convex and the other concave-of same mass and same radius are given. Which one will have greater moment of inertia,when rotating about an axis perpendicular to the plane and passing through the centre ? Justify your answer.
10. Give the relationship between linear velocity and angular velocity. Identify a pair of perpendicular vectors in the relation.
11. State Hooke's law of elasticity.
12. Write down the relationship between various elastic constants.

(Ceiling -20)

Turn over

Section B (Paragraph/Problem Type)

(Answer all questions in a paragraph of about half a page to one page.

Each correct answer carries a maximum of 5 marks.

13. Distinguish between science and pseudoscience with examples.
14. Discuss the criteria for ascertaining the relevance of a hypothesis for a research project.
15. A spring gun with a piston of mass m attached to a spring of constant k uses a marble of mass M as the shot. The marble and the piston are pulled back a distance L from the equilibrium position and suddenly released. Calculate the speed of the marble as it loses contact with the piston. Neglect friction.
16. A man weighing 100 kg stands on a scale (measuring newtons) in a moving elevator. Find the reading on the scale when the lift : (i) remains stationary ; (ii) accelerates upwards at the rate of 4 m/s^2 ; (iii) accelerates downwards at the rate of 2 m/s^2 ; (iv) falls freely under gravity ; and (v) moves with uniform velocity.
17. A uniform drum of radius R and mass M rolls without slipping down a plane inclined at an angle θ . Find its acceleration along the plane. Moment of inertia of the drum about its axis is $I_0 = MR^2/2$.
18. Derive an expression for the time period of a physical pendulum and hence show that a simple pendulum corresponds to a special case of it.
19. Derive an expression for the period of oscillation of a torsion pendulum.

(Ceiling - 30)

Section C (Essay Type)

Answer in about two pages, any one question.

Answer carries 10 marks

20. State Newton's laws of motion. Apply these laws to find (a) the force on each car of mass M in a string of three freight cars pulled with force F by a locomotive ; and (b) the tension on a string of length R used to whirl a mass m in a vertical plane in the gravitational field of the earth.
21. Distinguish between conservative and non conservative forces with examples. Derive the relation between potential energy and force for a conservative system and discuss how this relation is used in stability analysis.

(1 × 10 = 10 marks)