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(NEP—2020)

(1st Semester)

PHYSICS

(Multi-disciplinary Course)

(**Physics for All**)

Full Marks : 75

Time : 3 hours

The figures in the margin indicate full marks for the questions

(SECTION : A—OBJECTIVE)

(Marks : 10)

Tick (✓) the correct answer in the brackets provided :

1×10=10

1. Newton's first law of motion is also known as

- (a) law of inertia ()
- (b) law of momentum ()
- (c) law of conservation of energy ()
- (d) law of gravity ()

2. Which of the following quantities is a vector quantity?

- (a) Temperature ()
- (b) Mass ()
- (c) Density ()
- (d) Displacement ()

3. Identify the SI unit of work.

- (a) newton ()
- (b) kg ()
- (c) kg m/s^2 ()
- (d) joule ()

4. The path traced by a planet around the sun is
 (a) hyperbolic orbit () (b) circular orbit ()
 (c) elliptical orbit () (d) parabolic orbit ()
5. Which law states that 'for every action, there is an equal and opposite reaction'?
- (a) Newton's first law ()
 (b) Newton's second law ()
 (c) Newton's third law ()
 (d) Kepler's first law ()
6. What is the minimum velocity an object needs to reach in order to break free from a planet's gravitational influence?
- (a) Orbital velocity () (b) Terminal velocity ()
 (c) Escape velocity () (d) Circular velocity ()
7. Isotopes of an element have different numbers of
- (a) proton () (b) neutron ()
 (c) atom () (d) electron ()
8. What is the main purpose of control rods in a nuclear reactor?
- (a) To generate electricity ()
 (b) To initiate nuclear reactions ()
 (c) To absorb excess neutrons and control the reactor's power ()
 (d) To cool down the reactor core ()
9. What are the potential effects of radiation exposure on living organisms?
- (a) Only beneficial effects ()
 (b) Only harmful effects ()
 (c) Both beneficial and harmful effects ()
 (d) No effects at all ()
10. Which of the following is **not** a type of radiation emitted during radioactive decay?
- (a) Alpha particle () (b) Beta particle ()
 (c) Gamma ray () (d) Delta particle ()

(SECTION : B—SHORT ANSWERS)

(Marks : 25)

Answer *five* questions, taking at least *one* from each Unit :

5×5=25

UNIT—I

1. What are the three types of inertia?
2. Differentiate between kinetic energy and potential energy.
3. What are the different power sources?

UNIT—II

4. What is weightlessness, and how is it experienced by astronauts in space?
5. What is torque? Explain it with illustrative figure.
6. How does the buoyant force enable helium balloons to float in the atmosphere?

UNIT—III

7. What is radioactivity? Give an example of radioactive elements.
8. Explain in brief the applications of radioactivity.
9. What is chain reaction in nuclear physics? How is it important in nuclear reactors?

(SECTION : C—DESCRIPTIVE)

(Marks : 40)

Answer *four* questions, taking at least *one* from each Unit :

10×4=40

UNIT—I

1. (a) What are inertial and non-inertial frames of reference? Explain them with reference to Newton's first law of motion. 6
(b) What are uniform and non-uniform motions? Explain their differences. 4
2. (a) State Newton's second law of motion. Explain the action of force on an object as predicted by Newton's second law of motion. 6

- (b) Explain the concept of work done in physics. How does it relate to the concept of energy? 4
3. Give the methods used to measure electrical energy consumption in households. Discuss the importance of energy conservation in the context of growing energy demand. 10

UNIT—II

4. Explain each of Kepler's three laws and discuss their implications for our understanding of the solar system. 10
5. Discuss elliptical orbits, focusing on their characteristics and the factors that determine the shape and size of such orbits. Give an example of a celestial body with an elliptical orbit and explain its significance. 10
6. Describe the working principle of rockets. Detail the fundamental physics behind rocket propulsion, including Newton's third law, thrust generation, and how rocket engines expel propellant to achieve forward motion in the vacuum of space. 10

UNIT—III

7. What are ionizing and non-ionizing radiations? Explain the health effects of radiation and mention some safety measures. 10
8. Differentiate between nuclear fission and nuclear fusion processes. Describe the fundamental principles behind each process and provide examples of the reactions involved. 10
9. Discuss the challenges and concerns related to nuclear waste. Explain the types of nuclear waste generated, their potential hazards, and the methods used for their storage, disposal or reprocessing. 10

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