

Question Paper 2017 (May)**1. Answer the following questions:**

i) A particle is moving along a straight path with constant acceleration of 4.0m/s^2 . If the initial velocity of the particle be 20 m/s , the distance travelled by it in the 5^{th} second is –

- (a) 150 m (b) 40 m ✓ (c) 38 m (d) none of these.

ii) Impulse of a force acting on a body is equal to –

- ✓ (a) Change in momentum of the body
(b) rate of change of momentum of the body
(c) change in kinetic energy of the body
(d) none of these

iii) A body of mass 4.0 kg is hanged at the lower end of a spring balance whose upper end is fixed at the ceiling of a lift. If the lift moves up with an acceleration of 6.0 m/s^2 , the reading of the spring balance is (Take $g = 9.8\text{ m/s}^2$) –

- (a) 15.2 N (b) 24.0 N (c) 39.2 N ✓ (d) 63.2 N

iv) Which of the following remains constant for a particle executing uniform circular motion? –

- ✓ (a) Linear speed (b) Linear velocity
(c) Linear acceleration (d) None of these

v) A vehicle of mass 1000 kg is moving on a rough horizontal road with a constant velocity of 40 m/s . If the frictional force be 200 N , the power delivered by the engine of the vehicle is –

- (a) $2.0 \times 10^5\text{W}$ (b) $4.0 \times 10^4\text{W}$ ✓ (c) $8.0 \times 10^3\text{W}$ (d) $5.0 \times 10^3\text{W}$

vi) The ratio of resistances of two bulbs of powers 40W and 60W , designed to operate at 110V and 220V respectively, is –

- ✓ (a) 3:8 (b) 3:4 (c) 3:2 (d) 3:1

vii) A straight conductor of length 50 cm is placed in a uniform magnetic field of 1.5 T with its length parallel to the direction of the field. If the current through the conductor be 1.0A , the force on the conductor is –

- ✓ (a) 0.75N (b) 7.5N (c) 75.0N (d) zero

viii) The SI unit of magnetic flux density is –

✓ (a) tesla

(b) oersted

(c) gauss

(d) none of these

ix) If a very small amount of boron is added to a pure germanium crystal at room temperature, it becomes, –

✓ (a) an n-type semiconductor

(b) a p-type semiconductor

(c) an insulator

(d) a good conductor

x) Which of the following statement is true? –

(a) Frequency of X-rays is slightly less than that of visible light

(b) Frequency of X-rays is much less than that of visible light

✓ (c) Frequency of X-rays is greater than that of visible light

(d) Frequency of X-rays is equal to that of visible light

Group-A

2. a) A particle is moving along a straight path with uniform acceleration a . Its initial velocity is u and final velocity after time t is v . Write down the relation between u , v , a and t and draw the v - t curve.

b) Define unit of force from Newton's second law.

c) A constant force of 6.0 N acts on a body for 4.0 seconds. Draw the force vs time graph and calculate the change in momentum of the body from the graph.

a) & c) See Chapter: Particle Dynamics, Question No. 17 of Long Answer Type Questions.

b) See Chapter: Particle Dynamics, Question No. 6 of Long Answer Type Questions.

3. a) Define centripetal force. Write down its formula.

b) Define the terms angular momentum and moment of a force (torque). Write down the relation between them. State the principle of conservation of angular momentum.

a) See Chapter: Particle Dynamics, Question No. 5 of Long Answer Type Questions.

b) See Chapter: Particle Dynamics, Question No. 18 of Long Answer Type Questions.

4. a) Derive the expression for kinetic energy of an object of mass m moving along a straight path with speed V .

b) An electric pump can lift 600 litre of water from a depth of 10 m to a height of 30 m above the ground in 5 minutes. If the power of the pump be 1.2 hp, calculate its efficiency. (Given $g = 10 \text{ m/s}^2$).

a) See Chapter: Work, Power and Energy, Question No. 3(a) of Long Answer Type Questions.

b) See Chapter: Work, Power and Energy, Question No. 7 of Long Answer Type Questions.

5. a) What is non-ohmic conductor? Give an example of it.

b) The resistance of a 20 mV voltmeter is 1000 ohm. How can you convert this voltmeter into an ammeter which can measure up to 2.0 A. Draw the necessary circuit diagram.

See Chapter: Current Electricity, Question No. 15 of Long Answer Type Questions.

6. a) Write down the expression of the thermo-emf (E) developed in a thermocouple in terms of the temperature difference (θ) between its junctions. Draw E vs θ curve and show the positions of neutral temperature and inversion temperature. <https://www.wbscteonline.com>

b) Write down two important differences between Joule effect and Peltier effect.

a) See Chapter: Current Electricity, Question No. 1 of Long Answer Type Questions.

b) See Chapter: Current Electricity, Question No. 3(a) of Long Answer Type Questions.

Group-B

7. a) State Biot-Savart's law for the magnetic field due to a small current element.

b) Write down the expression for the magnetic field developed inside a long solenoid carrying a current.

c) Which rule gives the direction of the force on a current carrying conductor when placed in a magnetic field? State it.

See Chapter: Electromagnetism, Question No. 8 of Long Answer type Questions.

8. a) State the laws of electromagnetic induction.

b) Define coefficient of mutual inductance of a pair of coils. Write down its SI unit.

See Chapter: Electromagnetism, Question No. 9 of Long Answer Type Questions.

9. a) Draw the necessary circuit diagram for studying the forward bias characteristic curve of a p-n junction diode. Also draw the characteristic curve.

- b) Write down two important differences between n-type and p-type semiconductor.
- a) See Chapter: Modern Physics, Question No. 20 of Short Answer Type Questions.
- b) See Chapter: Modern Physics, Question No. 2 of Long Answer Type Questions.

10. a) Write down two important applications of X-rays.

b) Write short notes on – (i) spontaneous emission, and (ii) stimulated emission.

See Chapter: Modern Physics, Question No. 11 of Long Answer Type Questions.

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