Kinematics

1. A car accelerates uniformly from rest at a rate of 2.5 m/s². How far does the car travel in 10 seconds?

2. A ball is thrown vertically upward with an initial velocity of 20 m/s. Calculate:

   o (a) The maximum height reached by the ball.

   o (b) The total time the ball is in the air.

3. A sprinter runs 100 m in 10 s. What is their average speed?

2. Dynamics

1. A 10 kg box is pulled with a force of 50 N on a surface with a coefficient of friction of 0.2. Calculate:

   o (a) The force of friction.

   o (b) The net force acting on the box.

   o (c) The acceleration of the box.

2. An object of mass 5 kg is suspended by a rope. Calculate the tension in the rope if:

   o (a) The object is at rest.

   o (b) The object is accelerating upwards at 2 m/s².

3. Energy and Work

1. A 2 kg object is lifted to a height of 5 m. Calculate:

   o (a) The gravitational potential energy of the object.

   o (b) The work done to lift the object.

2. A roller coaster cart with a mass of 500 kg starts from rest at a height of 20 m. Assuming no friction, calculate the speed of the cart at the bottom of the hill.

4. Waves and Sound

1. A wave has a frequency of 500 Hz and a wavelength of 0.7 m. Calculate the speed of the wave.

2. A sound wave travels through air at a speed of 340 m/s. If the frequency is 1700 Hz, what is its wavelength?

3. Explain the Doppler Effect and provide one real-life example of its application.

5. Electricity and Magnetism

1. A 6.0 Ω resistor is connected to a 12 V battery. Calculate:

- o   (a) The current flowing through the resistor.

- o   (b) The power dissipated by the resistor.

2. Three resistors of 4 Ω, 6 Ω, and 8 Ω are connected in series. Calculate the total resistance.

3. Calculate the equivalent resistance if the resistors in question 2 are connected in parallel.

6. Forces in Two Dimensions

1. A 15 N force acts at an angle of 30° above the horizontal. Calculate the horizontal and vertical components of the force.

2. A plane is flying with an airspeed of 200 km/h north, but there is a wind blowing east at 50 km/h. Calculate the resultant velocity of the plane.

7. Circular Motion and Gravitation

1. A satellite orbits Earth at a height where the gravitational field strength is 6.5 N/kg. If the satellite has a mass of 2000 kg, calculate the gravitational force acting on it.

2. A car travels around a curve with a radius of 50 m at a speed of 15 m/s. Calculate the centripetal force if the car's mass is 1200 kg.