

Instructions:

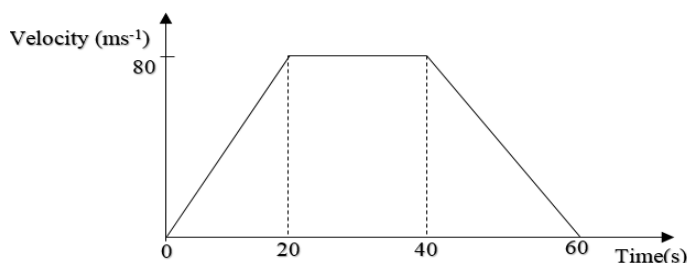
Attempt any five questions in this paper.

Use the following where necessary:

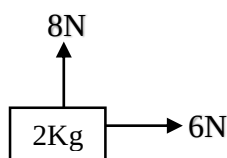
Acceleration due to gravity = 10ms^{-2}

Density of water = 1000kgm^{-3}

1. (a) State Newton's laws of motion.
(b) The figure below shows a velocity – time graph for a vehicle in motion.

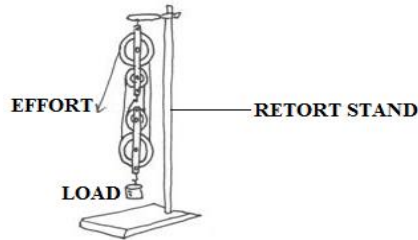


- (i) Find the total distance the vehicle moved.
(ii) Calculate the retardation of the vehicle.
2. (a) Define the terms a joule and impulse.
(b) (i) Distinguish between elastic and inelastic collision as applied to linear momentum
(ii) What is meant by linear momentum?
(iii) Give the factors on which the momentum of a body depends.
(iv) State the law of conservation of linear momentum.
(c) A bullet of mass 20g is fired into a block of wood of mass 400g lying on a smooth horizontal surface. If the bullet and the wood move together with speed of 20ms^{-1} . Calculate:
(i) The speed with which the bullet hits the wood.
(ii) The kinetic energy lost.
3. (a) (i) State the laws of reflection.
(ii) With the aid of a labeled diagram, distinguish between regular and diffuse reflections.
(b) Define the following terms as applied to curved mirrors: -
(i) Centre of curvature
(ii) Principal axis.
(c) An object of height 5cm is placed 15cm in front of a concave mirror of focal length 10cm, by drawing, find the;
(i) Image distance from the mirror.
(ii) Height of the image
(d) (i) draw ray diagrams to show how regular and diffuse reflections are produced.
(ii) State the characteristics of images formed in plane mirror.
4. (a) (i) Define acceleration.
(ii) The figure below shows a mass of 2kg acted upon by two forces of 8N and 6N as shown. Calculate the resultant force and acceleration of the body if the force at right angles.



- (b) (i) State the law of conservation of energy.
- (ii) A stone of mass 0.2 kg is thrown vertically upwards attaining maximum potential energy of 16 J. Calculate its initial velocity.
- (c). Distinguish between mass and weight and state the SI units of each of them.
- (d) (i) What is meant by the terms scalar and vector quantities? Give two examples of each.
- (ii) State the conditions under which a body is said to be in mechanical equilibrium.
- (iii) Two forces of 80N and 60N act on a body of mass 10kg. Find the resultant force; hence find the acceleration of the body.
- (e) Differentiate between potential energy and kinetic energy.

5. (a) (i) What is meant by the terms mechanical advantage and efficiency as applied to simple machines.
- (ii) Give two reasons why the efficiency of any practical machine is always less than 100%.
- (iii) Give two ways of improving the efficiency of a pulley system
- (b) The diagram below shows a load of 20N being raised by a pulley system by applying an effort of 10N.



- (i) What is the velocity ratio of the system?
 - (ii) Calculate the efficiency of the pulley system.
 - (iii) If the load is raised through 5m, calculate the distance moved by the effort.
 - (c) A drop of oil of volume $6.0 \times 10^{-3} \text{ cm}^3$ forms a patch of diameter 3.5 cm on a water surface.
 - (i) Calculate the diameter of a molecule of the oil.
 - (ii) State the **two** assumptions made.
6. State Archimedes' principle.
- (a) A metal block weighs 25N in air and 20N when fully submerged in water. Find the;
 - (i) Relative density of the metal block.
 - (ii) Density of the metal block.
 - (b) (i) State the law of floatation
 - (ii) Give two applications of the law of floatation
 - (c) (i) What is meant by the term friction?
 - (ii) Give two advantages and two disadvantages of friction
 - (iii) State two ways of reducing friction.
 - (iv) State the laws of friction.
 - (d) (i) Distinguish between static friction and dynamic friction.
7. (a) Distinguish between the following a brittle and a ductile material. Give one example of each.
- (b) (i) What is meant by the term reinforcement of a concrete?
 - (ii) Give two reasons for reinforcing a concrete
 - (c) (i) Define the term pressure and state its SI units.
 - (ii) State two factors affecting pressure in fluids.
 - (b) A rectangular block of mass 30kg measures 3cm by 4cm by 5cm rest on the floor. Calculate;
 - (i) Minimum pressure exerted on the floor.
 - (ii) Maximum pressure exerted on the ground.
 - (c) Describe the operation of a force pump.