

Year 11 Physics Test
Energy and Momentum

1. (a) Show that the work done on a sled dragged 154 m along flat ground by a constant force of 5.6×10^2 N is approximately 8.6×10^4 J.

(2)

- (b) Calculate the power required if the dragging takes 182 seconds.

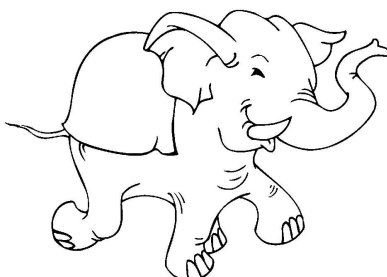
(2)

- (c) Hence calculate the efficiency if the sled is being dragged by a 1.0 kW engine.

(2)

2. Calculate the kinetic energy of a 4.6×10^3 kg elephant running at 11 ms^{-1} .

(2)



3.

(a) Calculate the potential energy of a 1 kg textbook at a height of 2 m.

(3)

(b) Hence state the work required to lift a 1 kg textbook a height of 2 m.

Give one reason for your answer.

(2)

(c) State what happens to the potential energy when the textbook is dropped.

(1)

4. A 62 kg skateboarder pushes off from a 3.7 kg trolley for 0.52 seconds, applying a constant force of 37 N. Both the skateboarder and trolley were stationary to begin with.

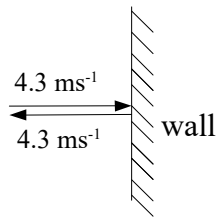
a) Calculate the magnitude of the final momentum of the skateboarder.

(3)

b) State the final momentum of the trolley. Give a reason for your answer.

(2)

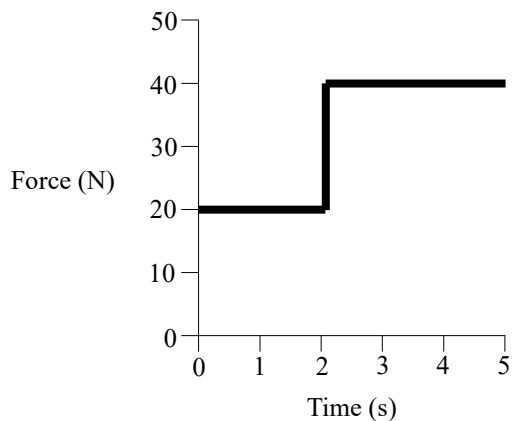
5. A ball with a mass of 0.12 kg bounces off a wall without a change in speed, as shown below:



Calculate the change in momentum of the ball.

(4)

6. The graph below shows variations in the force applied to an object:



Determine the change in momentum after 5.0 seconds.

(3)

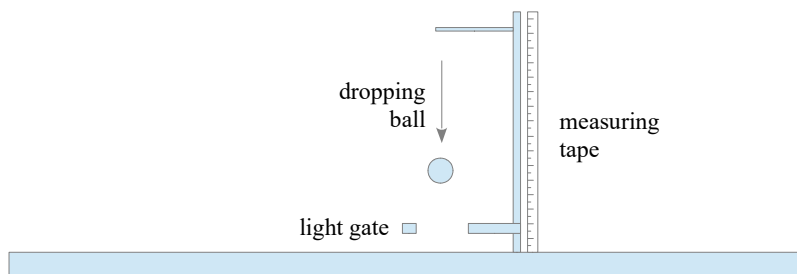
7. (a) A 13 g crossbow bolt is fired at 91 ms^{-1} into a 1.3 kg solid target. The target is initially stationary, and it is not attached to the ground, so it moves freely when the bolt sticks into it. Show that the speed of the target (with the bolt stuck in it) after the collision is 0.90 ms^{-1} .

(3)

- (b) Calculate whether the collision above is an elastic or inelastic collision.

(2)

8. An experiment is conducted in which a ball is dropped from different heights. The ball passes through a light gate, measuring its speed at the moment just before it hits the ground.

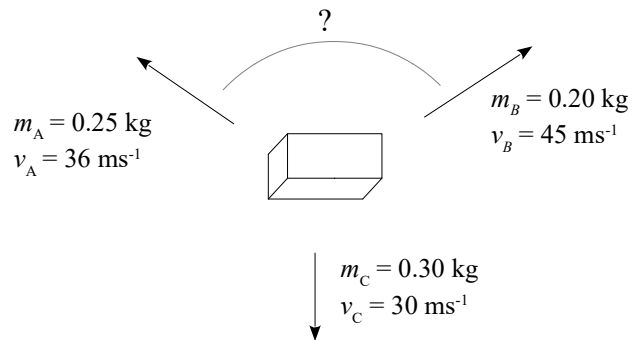


Write a hypothesis that could be investigated by this experiment. Show all working.

(3)

BONUS QUESTION

A block of 'C-4' explosive (initially stationary) explodes into three pieces, as shown below:



Determine the angle between the directions of pieces A and B.