Name:	Class:	Teacher:

Physics preparation for mock – homework 1

1. A car accelerates at a constant rate of 1.83 m/s² along a flat straight road.
The force acting on the car is 1.870 kN.

(a) Calculate the mass of the car. Give your answer to three significant figures.

(3)

mass = ... kg

(b) The car accelerates from rest for 16 s. Calculate the speed of the car after 16 s.

(3)

speed = ... m/s

(c) The car starts on another journey. Figure 6 shows the graph of the car's movement.

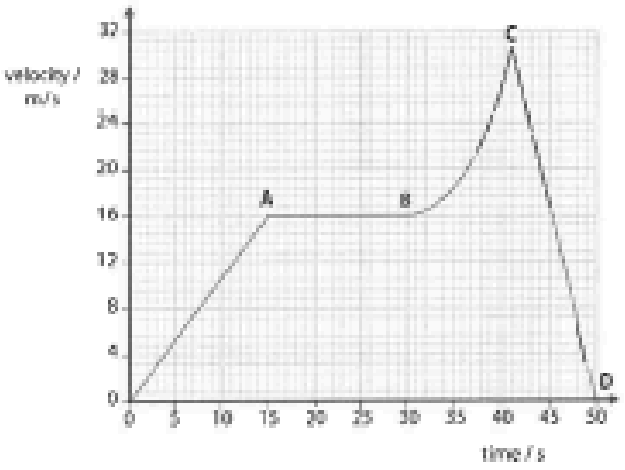

Figure 6

Show that the distance travelled when the car is moving at a constant speed is greater than the distance travelled when the car is slowing down.

(4)

2. Figure 11 is an energy diagram for an electric kettle, used to heat water.

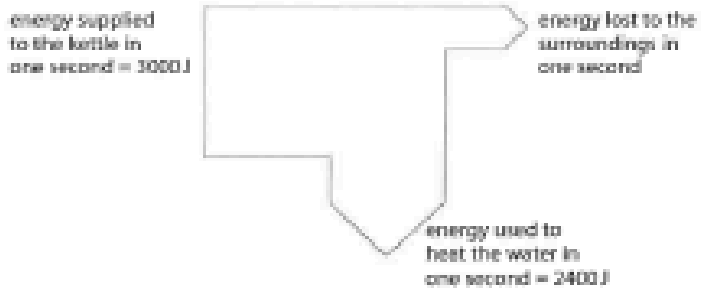

Figure 11

(i) Calculate the amount of energy lost to the surroundings in one second. (1)

energy lost to the surroundings in one second = ... J

(ii) Calculate the efficiency of the kettle. Use the equation (2)

$$\text{efficiency} = \frac{\text{useful energy transferred by the kettle in one second}}{\text{total energy supplied to the kettle in one second}}$$

efficiency = ...

3. Figure 10 shows a football kicked against a wall.

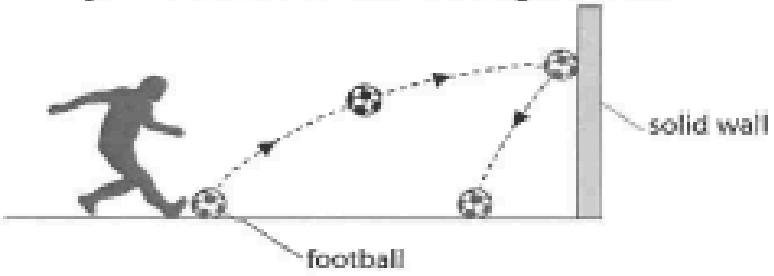

Figure 10

The football has a mass of 0.42 kg.

(i) The football gains 11 J of gravitational potential energy as it moves from the ground to the wall. Calculate the height at which the ball hits the wall. (3)

Gravitational field strength = 10 N / kg

Use the equation: $\Delta GPE = m \times g \times \Delta h$

height = ... m

The force acting on the car is 1.870 kN.

Calculate the mass of the car.

Give your answer to three significant figures.

(3)

mass = ... kg

5. Newton's second law can be stated as

force = mass × acceleration

A student is provided with a trolley and a runway on a bench, as shown in Figure 12, and access to other equipment.

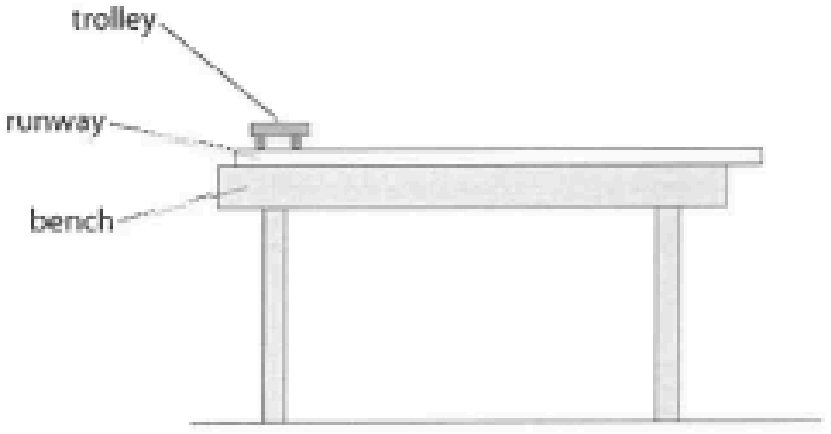

Figure 12

Describe a procedure the student could use to investigate how the acceleration of the trolley depends on the force applied to the trolley.

You may add to the diagram in Figure 12 to help your answer.

(6)

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(ii) Calculate the kinetic energy of the football when it is moving at a velocity of 12 m / s. (2)
Use the equation

$$KE = \frac{1}{2} \times m \times v^2$$

kinetic energy = ... J

(iii) Describe the energy transfers that happen when the ball hits the wall. (2)

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4. A car with a mass of 1800 kg is accelerating at 1.2 m/s^2.
Calculate the force used to accelerate the car.

Use the equation

force = mass × acceleration

(2)

force = ... N

A different car has a mass of 1200 kg.

Calculate the force needed to give this car an acceleration of 2.4 m / s^2.

(2)

Use the equation

$$F = m \times a$$

force = ... N

A third car accelerates at a constant rate of 1.83 m/s^2 along a flat straight road.