Rewarding Learning

**General Certificate of Secondary Education
2010–2011**

Science: Double Award (Modular)

Forces and Energy
End of Module Test
Foundation Tier

C

[GDC01]

GDC01

FRIDAY 20 MAY 2011, AFTERNOON

TIME

45 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces
provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all twelve** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 50.
Figures in brackets printed down the right-hand side of pages
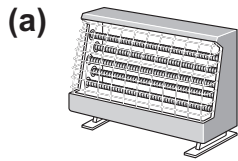indicate the marks awarded to each question or part question.

7157

1 The devices below change energy from one form to another. Complete the boxes to show the **main** energy change that each device is designed to bring about. The first one has been done for you.
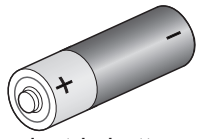
changes | *Chemical* energy | to | *Electrical* energy

electric battery

(a)

changes | _____ energy | to | _____ energy

[2]

electric fire

(b)

changes | _____ energy | to | _____ energy

[2]

microphone

(c)

changes | *Electrical* energy | to | _____ energy

[1]

i pod

2

2 In recent years engineers have been developing renewable energy resources, such as wave energy, to replace fossil fuels.

(a) (i) Explain the meaning of the term **renewable**.

_____ [1]

(ii) Name two **other** renewable energy resources.

1. _____

2. _____ [2]

Many power stations in the United Kingdom use fossil fuels such as oil.

(b) Name two **other** fossil fuels.

1. _____

2. _____ [2]

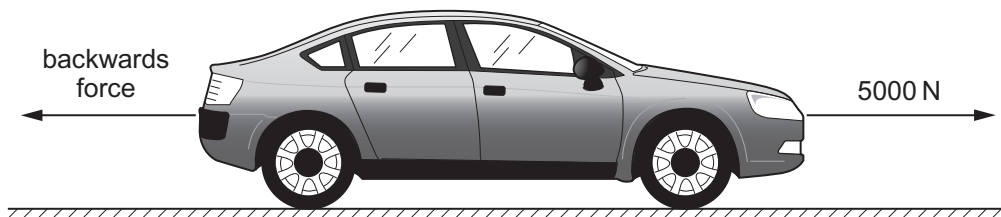**3**   A train which is 90 m in length takes 6 seconds to emerge completely
from a tunnel.
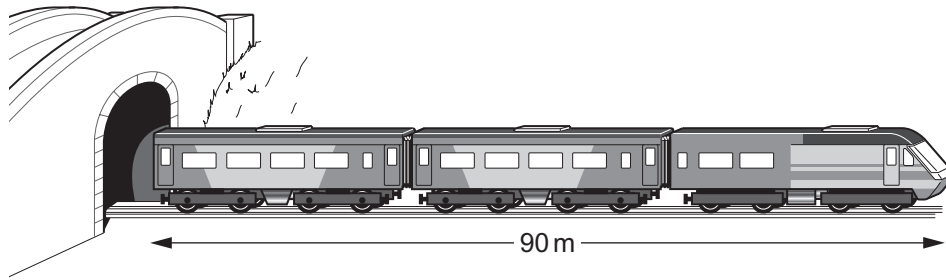
Calculate the average speed of the train.

You are advised to show your working out.

Average speed = _____ m/s [3]

4 A car moves forwards at a **constant speed**, in a straight line.

backwards
force

5000 N

(a) (i) State **one** possible cause of the backwards force.

_____ [1]

The forward force due to the engine is 5000 N.

(ii) Tick (✓) the correct statement.

The backwards force is less than 5000 N. ☐

The backwards force is equal to 5000 N. ☐
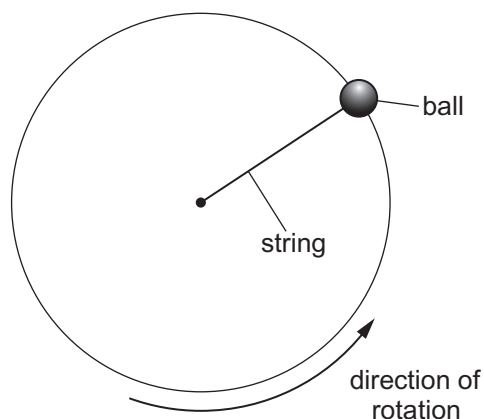
The backwards force is greater than 5000 N. ☐ [1]

(b) The forward force due to the engine increases to 7000 N.

If the backwards force does not change, what happens to the speed of the car?

_____ [1]

5

5 Garden pavements can be cleaned using a high pressure water sprayer. The sprayer can produce a fine water jet with a force of 300 N on an area of 0.02 m^2.

Calculate the pressure the sprayer exerts on the pavement.
Remember to include the unit.

You are advised to show your working out.

Pressure = _____ [4]

6

6 The diagram shows a bird's eye view of a ball being whirled in a horizontal circle. In order for this to happen a centripetal force must act on the ball.

(diagram: a circle with a ball on the upper right, connected to the centre by a string, and an arrow showing direction of rotation)

(a) (i) Mark on the diagram an arrow to show the direction of the centripetal force which keeps the ball moving in a circle. [1]
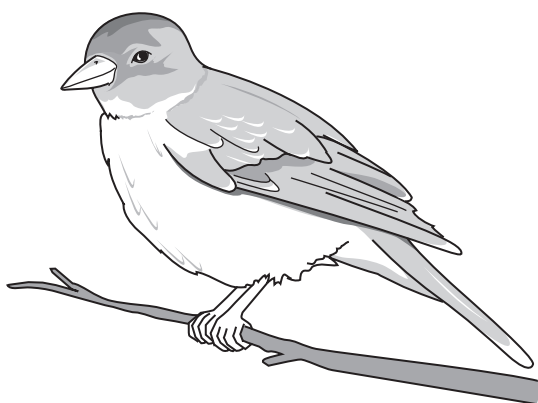
(ii) What provides this centripetal force?

_____ [1]

(b) The ball has a mass of 1.2 kg and a velocity of 8.0 m/s. Calculate the momentum of the ball.

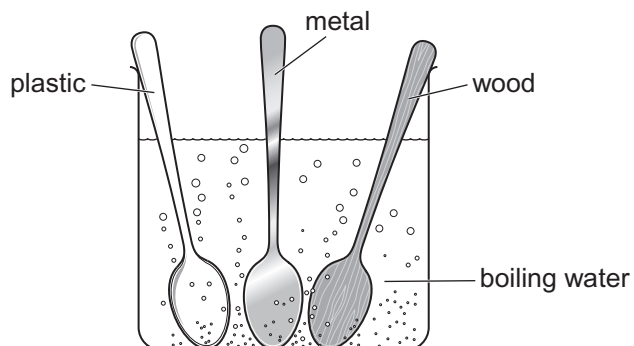**You are advised to show your working out.**

Momentum = _____ kg m/s [3]

7 In winter, birds ruffle their feathers to keep themselves warm as shown in the diagram below.

(a) Explain fully how the ruffling of feathers can help keep a bird warm.

_____

_____ [2]

Three spoons, one plastic, one wooden and the other metal, are placed in a beaker containing boiling water.

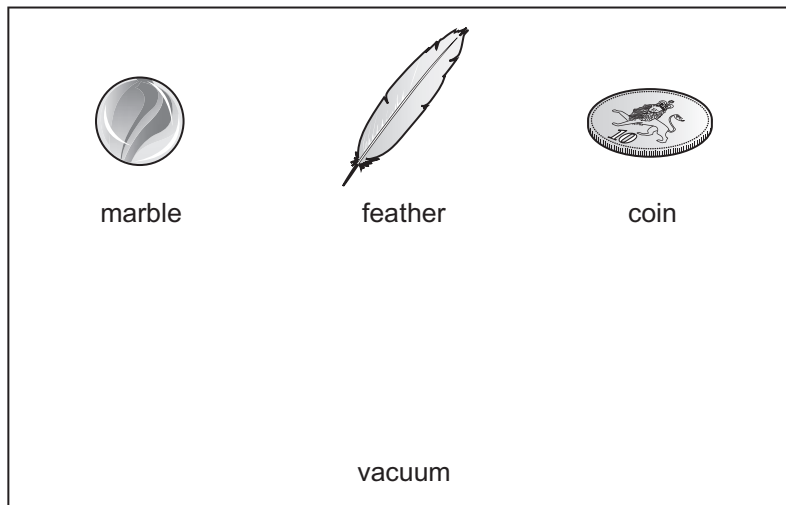**(b) (i)** Which spoon feels warmest to touch?

_____ [1]

(ii) Explain your answer.

_____

_____ [1]

8

8 Three objects are released in a chamber from which all the air has been removed. The objects are released at the same instant and from the same height.

marble   feather   coin

vacuum

(i) Which **one** of the following statements describes what will happen?

A   The feather will hit the bottom first.
B   They will not move.
C   They will all hit the bottom at the same instant.
D   The marble will hit the bottom first.
E   The coin will hit the bottom first.
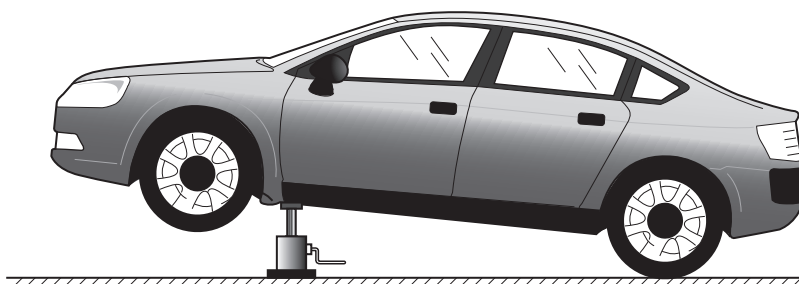
Letter _____ [1]

(ii) Give a reason for your choice.

_____

_____ [1]

(iii) Which object would hit the bottom last if air had been introduced into the chamber?

_____ [1]

9 A car jack is used to raise a car so that the wheel can be changed. The useful work done in lifting the car is 1200 J.

(a) When using the car jack, the mechanic uses 3000 J of energy to lift the car.
Calculate the efficiency of the car jack.
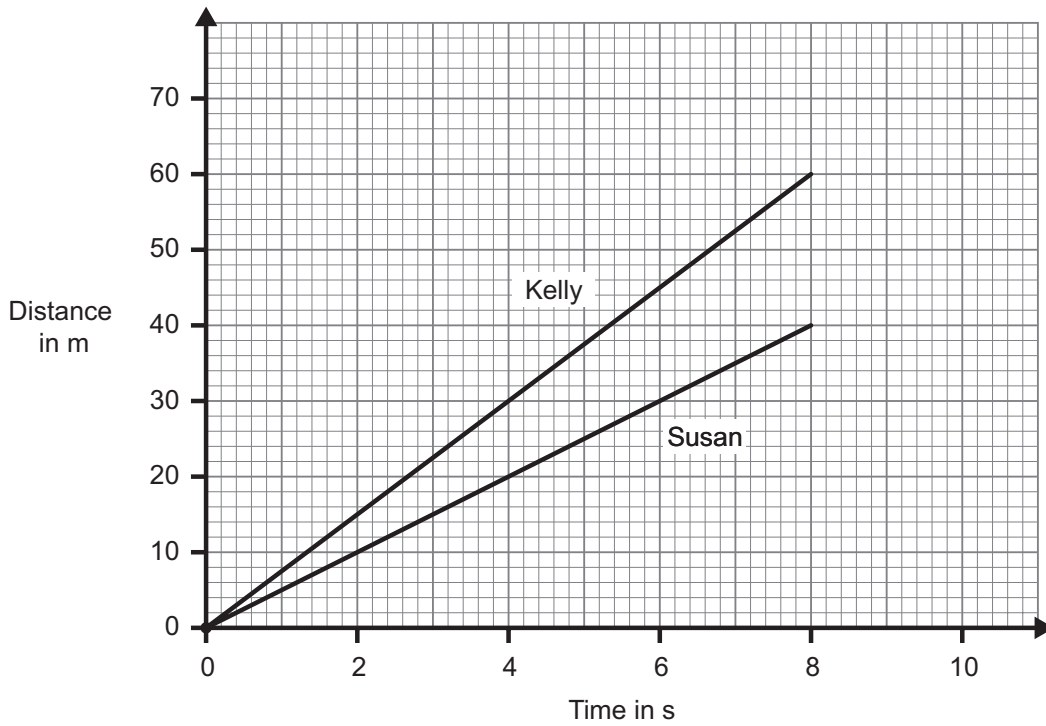
You are advised to show clearly your working out.

Efficiency = _____ [3]

(b) What fraction of input energy is wasted?

_____ [1]

10 Below is the distance–time graph for two runners, Kelly and Susan.

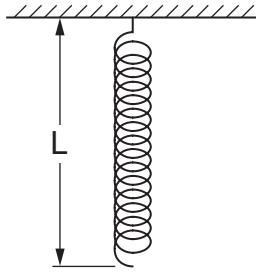**(a)** How far apart are Kelly and Susan after 8 seconds?

_____ [1]

(b) Use the graph to calculate Kelly's speed.

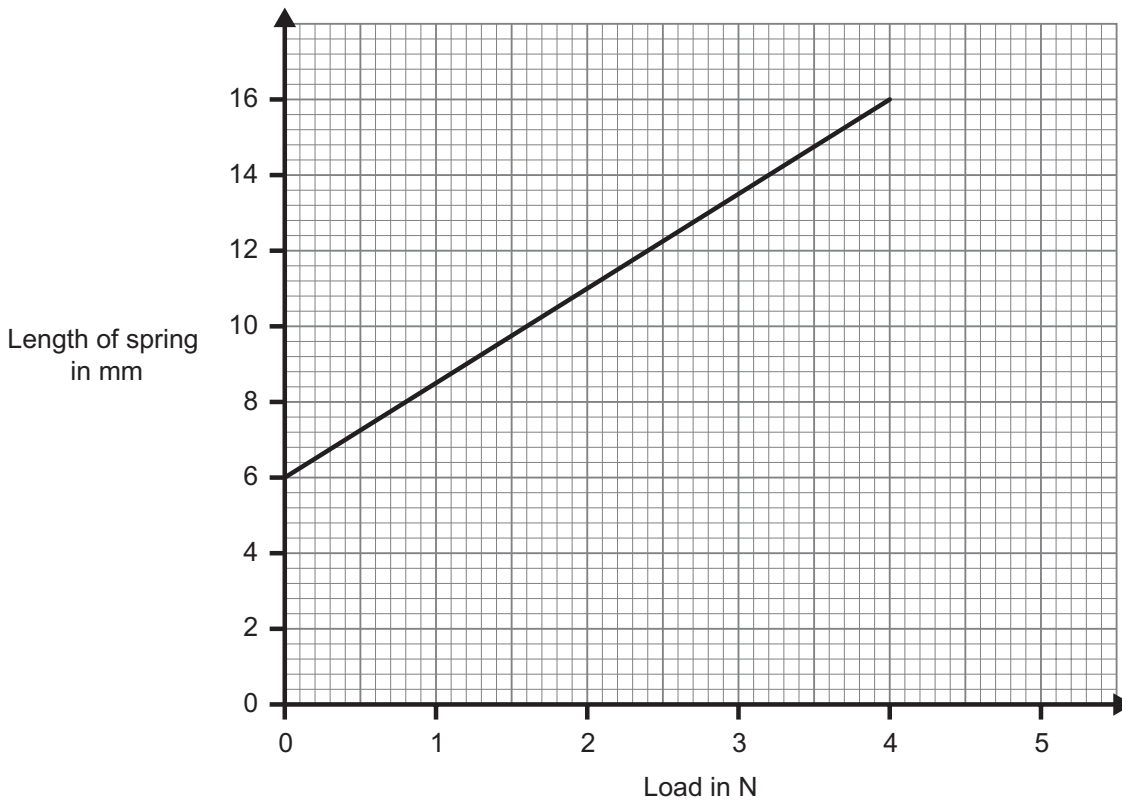**You are advised to show your working out.**

Speed = _____ m/s [3]

11 Robert carries out a Hooke's Law experiment using a spring of length L.

He plots his results on a graph as shown below.

Length of spring in mm (vertical axis)

Load in N (horizontal axis)

Use the graph to answer the following questions.

(a) (i) What is the unstretched length, L, of the spring?

L = _____ mm [1]

(ii) Robert could have tested Hooke's Law by plotting a more suitable graph. What should he have plotted on the vertical axis?

_____ [1]

(b) An unknown load is hung on the spring and the extension produced is 10 mm. Use the graph to find the unknown load.
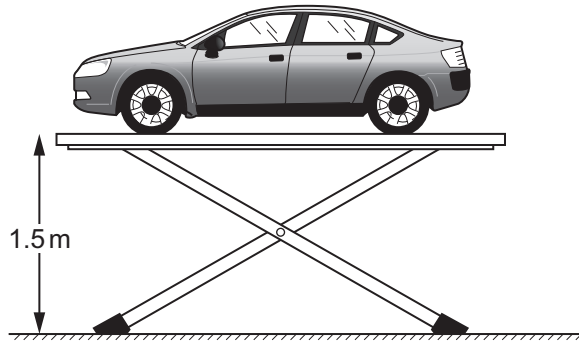
You are advised to show your working out.

Load = _____ N [2]

13

[Turn over

12 A garage lift is used to raise a car of mass 2500 kg a distance of 1.5 m.

1.5 m

(a) Calculate the work done by the garage lift.

You are advised to show your working out.

Work done = _____ J [3]

(b) The garage lift uses 42 000 J of energy to raise another car in 30 seconds. Calculate the power developed by the garage lift.

You are advised to show your working out.

Power = _____ W [3]

THIS IS THE END OF THE QUESTION PAPER

111920