



General Certificate of Secondary Education  
2010–2011

Centre Number

71

Candidate Number

## Science: Double Award (Modular)

Forces and Energy  
End of Module Test  
Foundation Tier

# C

[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.

For Examiner's  
use only

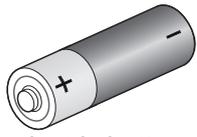
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	

Total  
Marks

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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.



electric battery

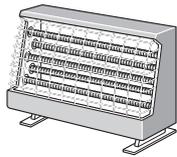
changes

*Chemical* energy

to

*Electrical* energy

(a)



electric fire

changes

\_\_\_\_\_ energy

to

\_\_\_\_\_ energy

[2]

(b)



microphone

changes

\_\_\_\_\_ energy

to

\_\_\_\_\_ energy

[2]

(c)



i pod

changes

*Electrical* energy

to

\_\_\_\_\_ energy

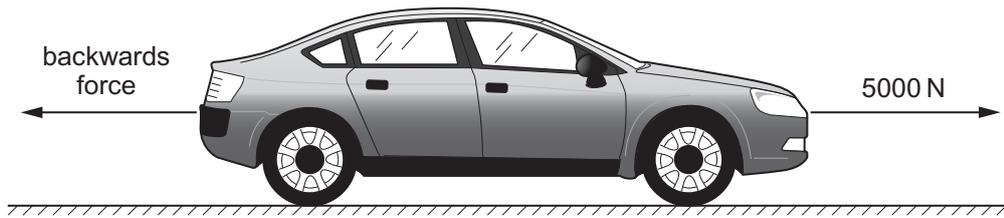
[1]

Examiner Only	
Marks	Remark
○	○





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



- (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.

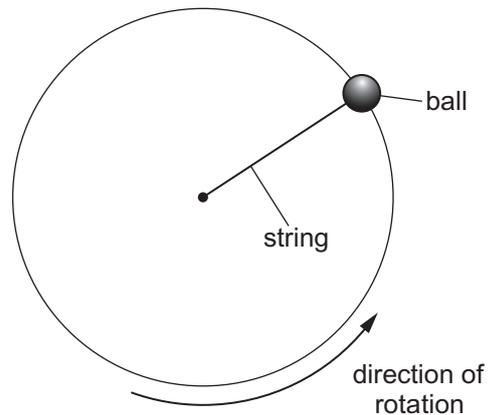
If the backwards force does not change, what happens to the speed of the car?

\_\_\_\_\_ [1]

Examiner Only	
Marks	Remark
○	○



- 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.



- (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]

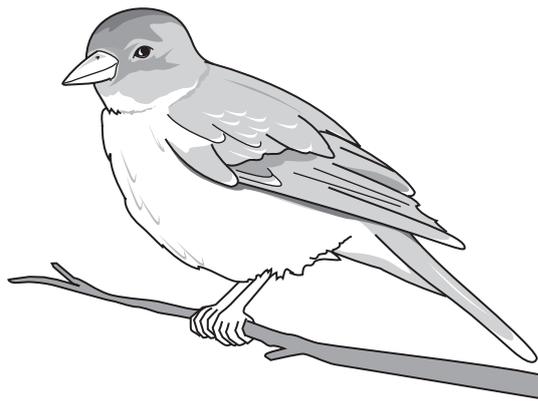
- (b) The ball has a mass of 1.2 kg and a velocity of 8.0 m/s. Calculate the momentum of the ball.

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

Momentum = \_\_\_\_\_ kg m/s [3]

Examiner Only	
Marks	Remark
○	○

- 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.

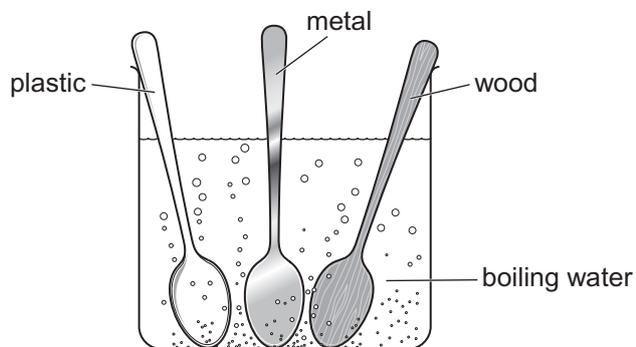
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 [2]

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?

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 [1]

- (ii) Explain your answer.

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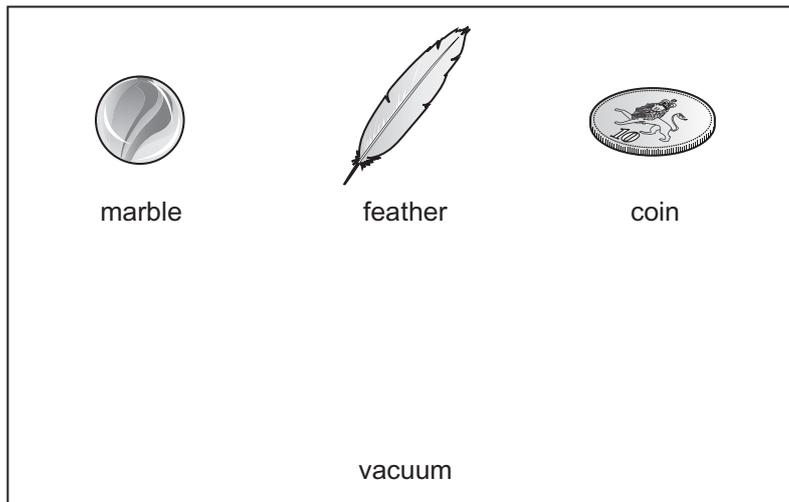


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 [1]

Examiner Only	
Marks	Remark
○	○

- 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.



- (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.

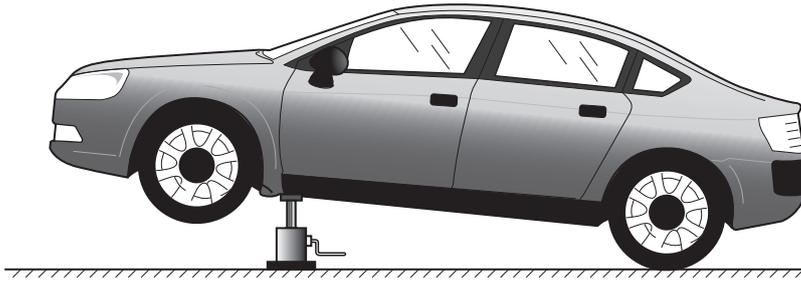
\_\_\_\_\_ [1]

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

\_\_\_\_\_ [1]

Examiner Only	
Marks	Remark
○	○

- 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.**

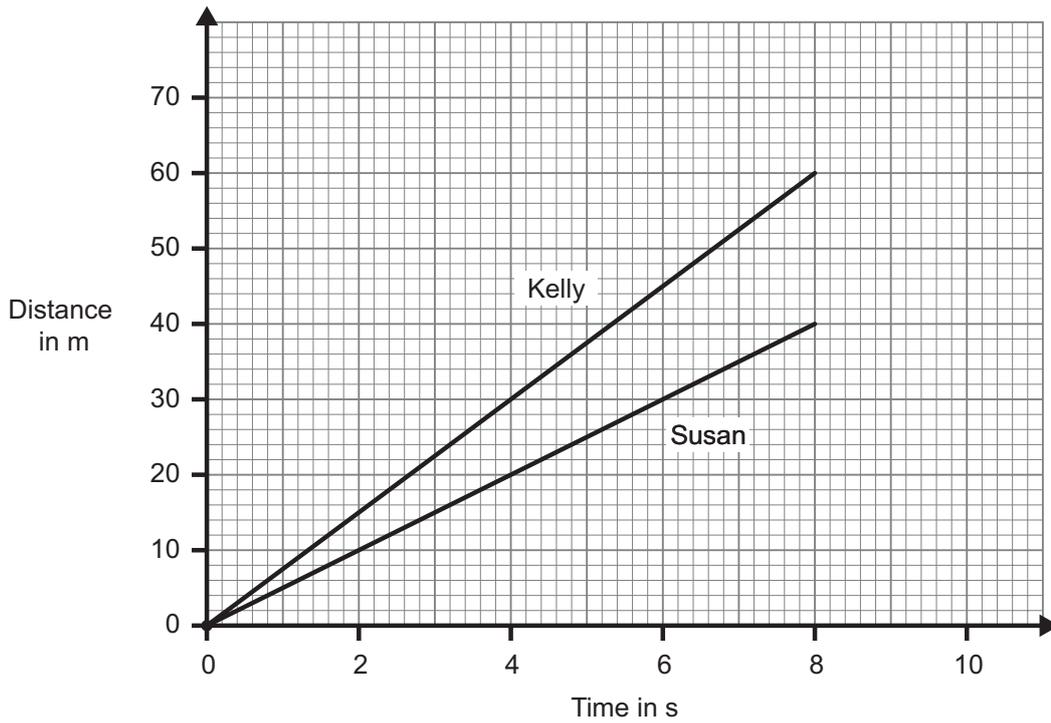
Efficiency = \_\_\_\_\_ [3]

- (b) What fraction of input energy is wasted?

\_\_\_\_\_ [1]

Examiner Only	
Marks	Remark
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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]

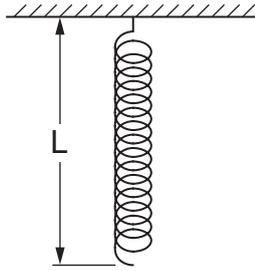
(b) Use the graph to calculate Kelly's speed.

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

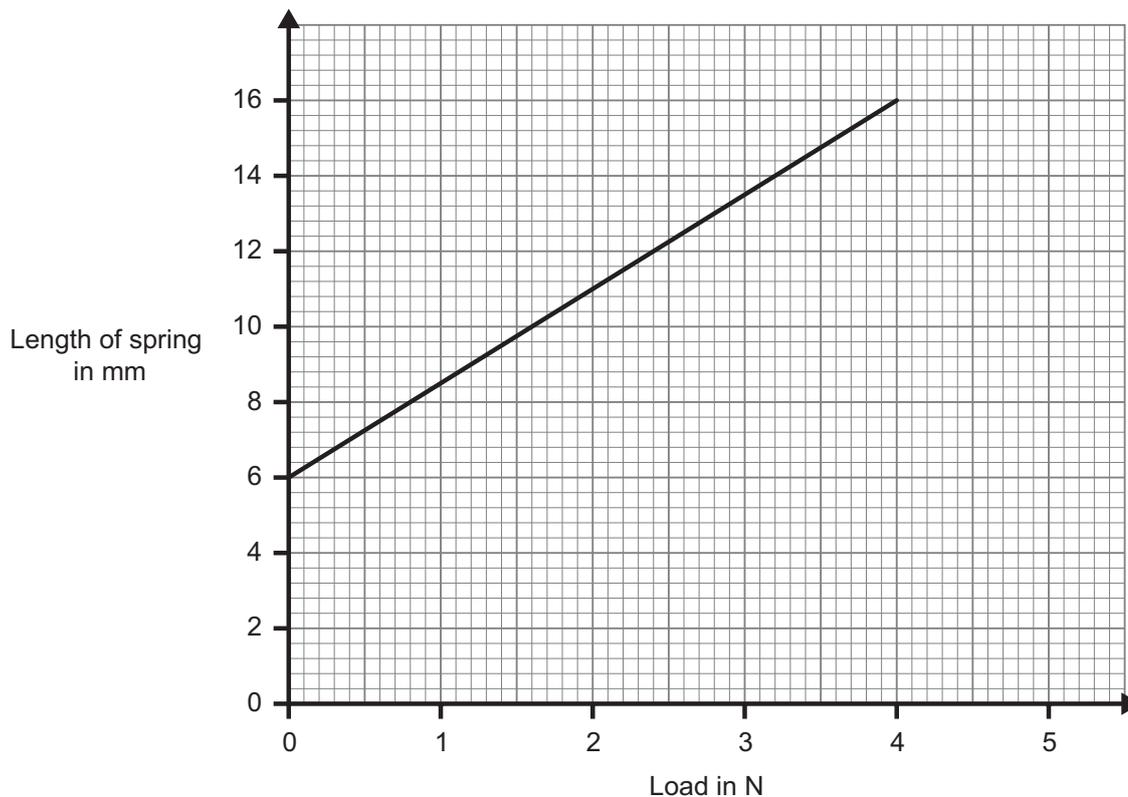
Speed = \_\_\_\_\_ m/s [3]

Examiner Only	
Marks	Remark
○	○

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.



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]

Examiner Only	
Marks	Remark
○	○

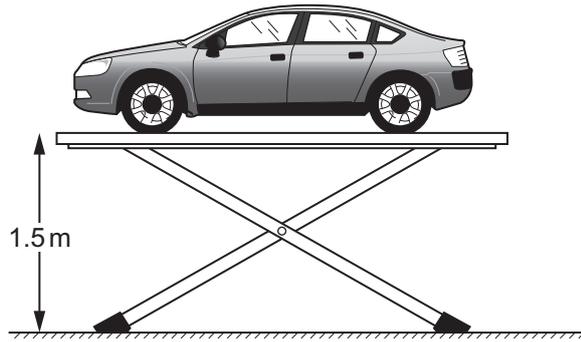
- (b) An unknown load is hung on the spring and the extension produced is 10 mm. Use the graph to find the unknown load.

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

Load = \_\_\_\_\_ N [2]

Examiner Only	
Marks	Remark

12 A garage lift is used to raise a car of mass 2500 kg a distance of 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 42000 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]

Examiner Only	
Marks	Remark
○	○

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**THIS IS THE END OF THE QUESTION PAPER**

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