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Rewarding Learning

Centre Number

71	

Candidate Number

General Certificate of Secondary Education
2010–2011

Science: Double Award (Modular)

Forces and Energy

End of Module Test

Higher Tier

C

[GDC02]

GDC02

FRIDAY 25 FEBRUARY 2011, MORNING

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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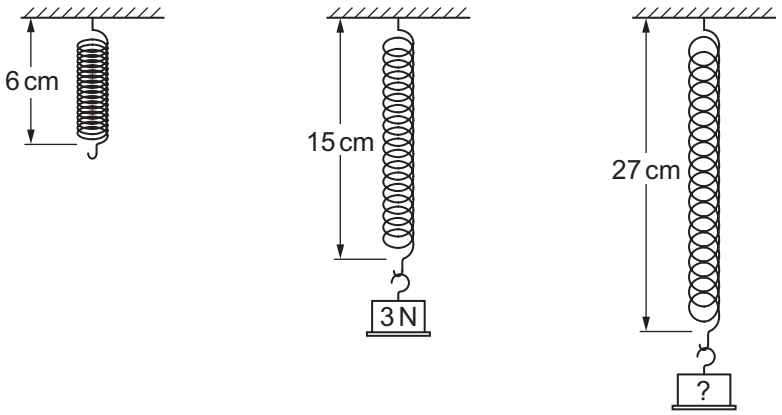
Marks	Remark

1 **(a)** A spring has a natural length of 6 cm.

When loaded with a 3 N weight, the total length of the spring is 15 cm.



What weight would extend the spring so that its total length is 27 cm?

You are advised to show your working out.

Weight = _____ N [3]

(b) Describe fully what happens to the spring if it is stretched beyond its elastic limit and the load is then removed.

_____ [1]

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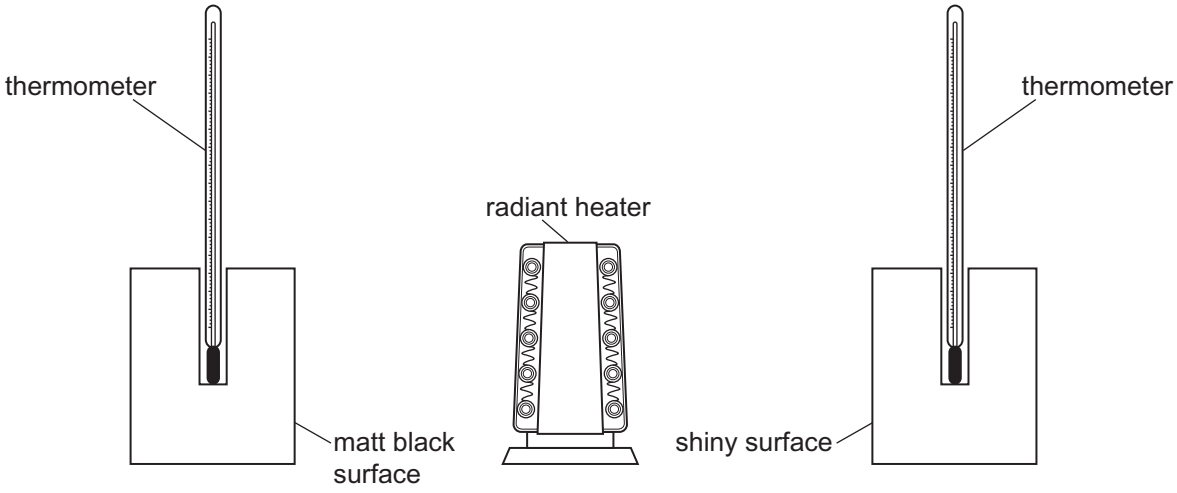
2 The nature of the surfaces of materials was investigated in a laboratory to find their effect on heat absorption.

Julie used two metal cylinders, identical in shape and size, with a thermometer in each.

One cylinder had a matt black surface while the other had a shiny surface, as shown in the diagram below.



An electrical radiant heater was placed the same distance from each cylinder.

After a time the two thermometers showed different readings.

(a) Explain fully why they had different readings.

_____

_____

_____ [2]

(b) Explain why a paramedic will sometimes wrap a patient in an aluminium blanket to keep the patient warm.

_____

_____ [1]

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Marks	Remark

3 The skier below weighs 650 N. His skis have a total area of $0.5\,m^2$ when in contact with the snow.

Calculate the pressure the skier exerts on the snow.

Remember to include the unit for pressure.

You are advised to show clearly your working out.

Pressure = _____ [4]

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4 **(a)** No machine can have an efficiency greater than 1 (100%). What does this mean?

_____

_____ [1]

(b) An electric motor is supplied with 600 J of electrical energy. The motor does 240 J of useful work.

Calculate the efficiency of the electric motor.

You are advised to show your working out.

Efficiency = _____ [3]

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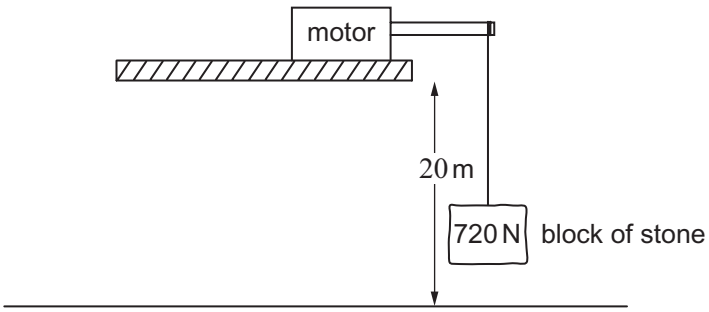
5 A motor is used on a building site to lift a block of stone.



(a) Calculate the work done in lifting the block of stone which has a weight of 720 N through a height of 20 m.

You are advised to show your working out.

Work done = _____ J [3]

(b) Calculate the power of the motor if it does this work in 24 seconds.

You are advised to show your working out.

Power = _____ W [3]

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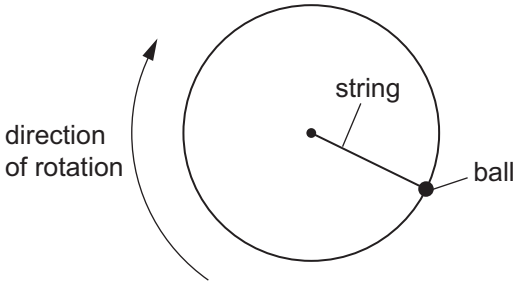
6 The diagram shows a bird's eye view of a ball being whirled in a horizontal circle.



(a) What is the name of the force which acts towards the centre of the circle?

_____ [1]

(b) The ball has a mass of 2.5 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]

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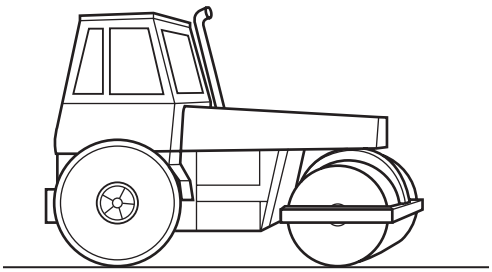
7 A resultant force of 600 N acts on a steam roller of mass 2400 kg.



Calculate the acceleration of the steam roller.

You are advised to show clearly your working out.

Acceleration = _____ m/s^2 [3]

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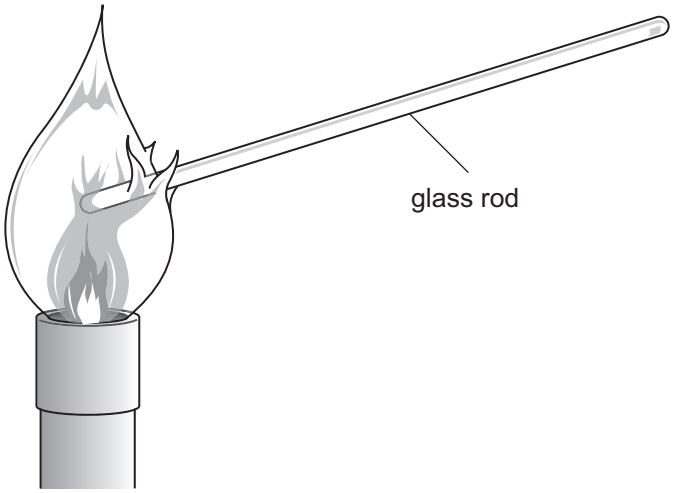
8 Both copper and glass contain electrons.

(a) In terms of their electrons, what is the difference between copper and glass, which makes copper a much better conductor of heat?

_____ [1]

A glass rod is placed in a Bunsen flame as shown below.



(b) (i) What particle is responsible for heat conduction in the glass rod.

_____ [1]

(ii) In terms of these particles describe how heat energy passes along the glass rod.

_____

_____ [2]

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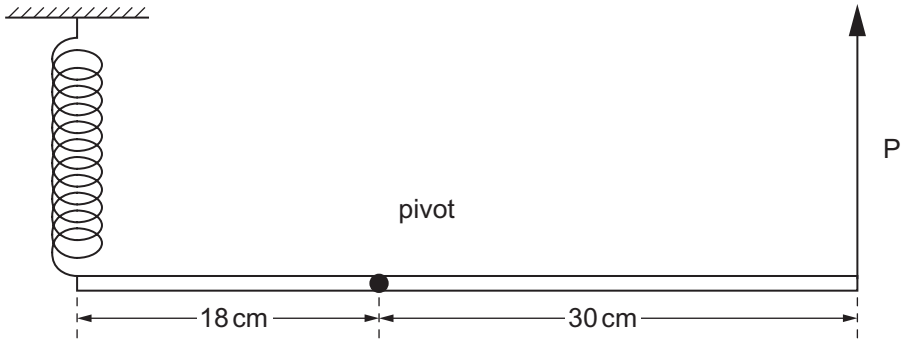
9 An unknown force P acts on one end of a lever as shown below.

The lever is kept in a horizontal position by a spring at the other end of the lever.



It is known that a force of 1 N will stretch the spring by 0.5 cm. In the diagram above it is stretched by 2.5 cm.

(i) What force in the spring stretches it by 2.5 cm?

_____ N [1]

(ii) Use the principle of moments and your answer to **(i)** to calculate the size of the unknown force, P.

You are advised to show clearly your working out.

Force P = _____ N [4]

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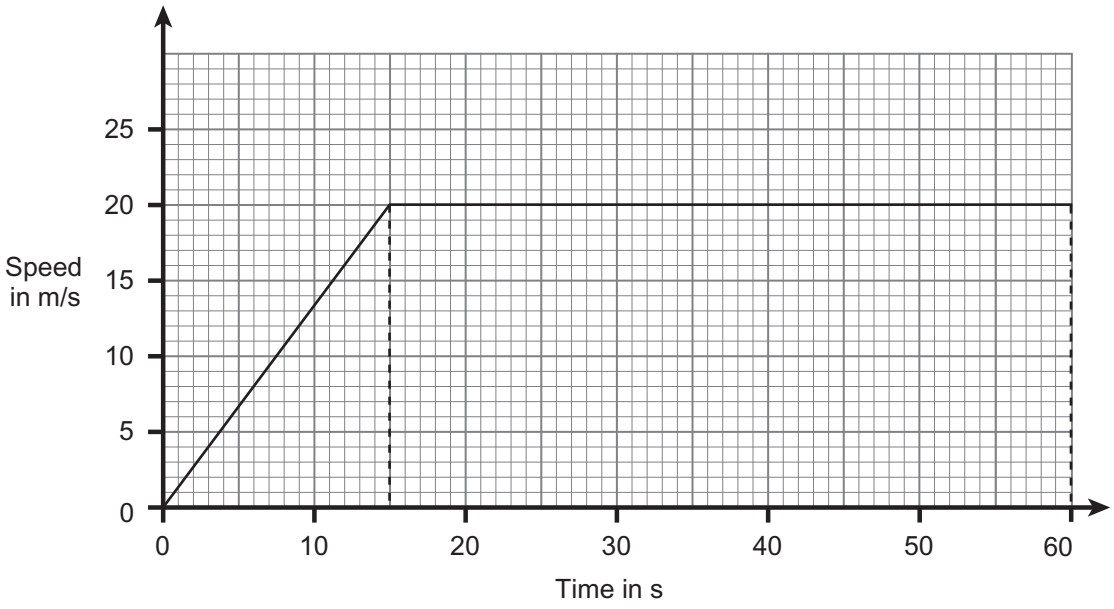
10 The speed – time graph for the first 60 s of a train journey is shown below.



By first using the graph to find the distance travelled, calculate the average speed of the train during this interval of 60 s.

You are advised to show clearly your working out.

Average speed = _____ m/s [6]

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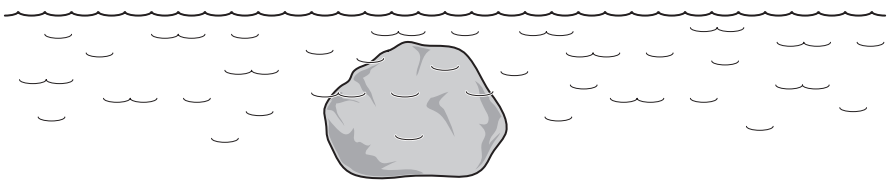
11 A boulder falls vertically into the sea and at the instant shown in the diagram it has a velocity of 3 m/s. It falls through the sea water with an acceleration of 0.5 m/s^2.



Calculate how long it takes the boulder to reach a velocity of 9 m/s.

You are advised to show clearly your working out.

Time = _____ s [3]

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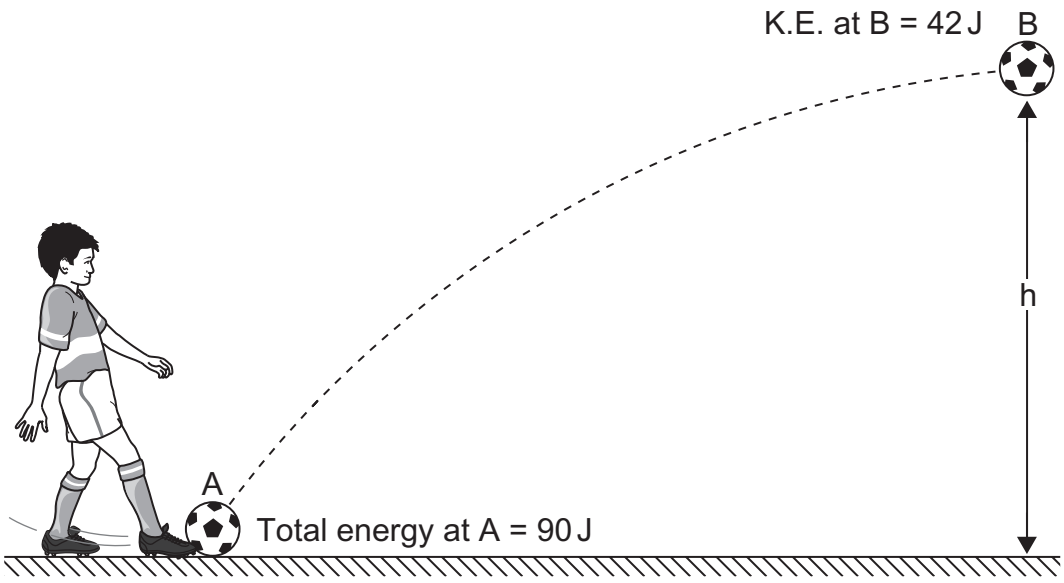
12 Ben hits a football from position A into the air. The total energy of the ball, as it leaves Ben's foot is 90 J.



By the time the ball reaches position B in the diagram it has a kinetic energy of 42 J. The ball has a mass of 0.8 kg.

Calculate the height (h) of the ball above the ground at position B. Assume no energy losses.

You are advised to show clearly your working out.

Height = _____ m [4]

THIS IS THE END OF THE QUESTION PAPER

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