CCEA GCSE SCIENCE: DOUBLE AWARD (MODULAR)

SCIENCE



EXAM QUESTION PACK

END OF MODULE TEST C FOUNDATION TIER GDC01 PAPERS

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Rewarding Learning

Centre Number

71	

Candidate Number

General Certificate of Secondary Education
2011–2012

Science: Double Award (Modular)

Forces and Energy

End of Module Test

Foundation Tier

C

[GDC01]

GDC01

THURSDAY 24 MAY 2012, 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.

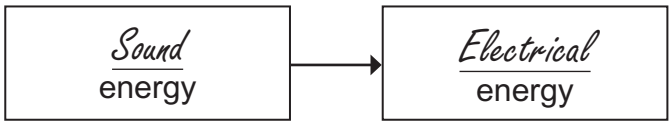
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Question Number	**Marks**
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12	
Total Marks	

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Examiner Only	
Marks	Remark

1 A microphone changes **sound** energy into **electrical** energy, as shown in the energy flow diagram below.

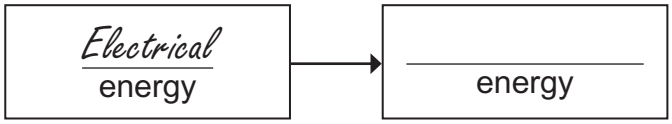




Fill in the the spaces below to show the energy changes each device is designed to bring about.

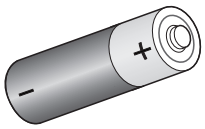
(a) Electrical oven

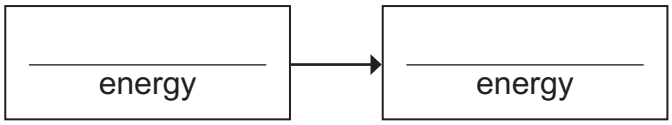




[1]

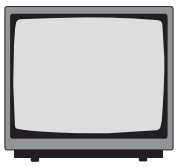
(b) Battery

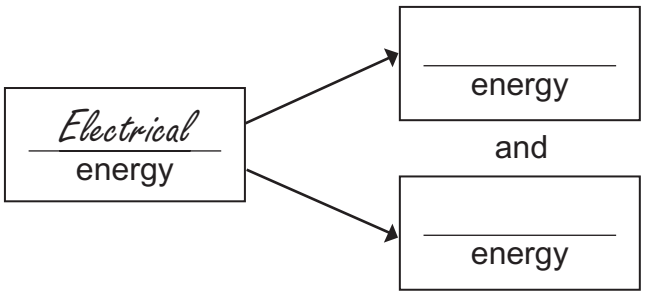




[2]

(c) Television





[2]

2 Coal, oil, solar, nuclear and wind are examples of energy resources used in the United Kingdom to generate electricity.

Examiner Only

Marks	Remark

(a) (i) Write down an example of a non-renewable energy resource from the list above.

_____ [1]

(ii) Explain the meaning of the term non-renewable energy resource.

_____

_____ [1]

(b) (i) Write down an example of a renewable energy resource from the list above.

_____ [1]

(ii) Explain the meaning of the term renewable energy resource.

_____

_____ [1]

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3 A cyclist can travel 5040 m in a time of 1200 s.



Calculate the average speed of the cyclist.

You are advised to show your working out.

Average speed = _____ m/s [3]

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Marks	Remark

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4 **(i)** Fibreglass is often used in the roof space to reduce heat loss.

Explain, fully, why fibreglass is a suitable material for this purpose.

_____

_____ [2]

(ii) Name two other methods of reducing heat loss from the home.

1. _____

2. _____ [2]

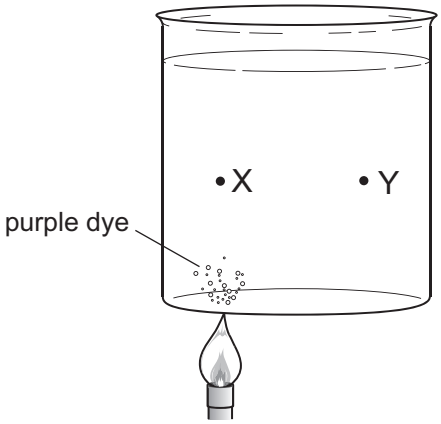
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Marks	Remark

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Examiner Only	
Marks	Remark

5 Purple dye may be used to trace heat transfer in water, heated with a Bunsen burner.



(a) (i) Draw **two** arrows, one at **X** and one at **Y**, to show the direction of heat flow in the water. [2]

(ii) Name the **main** process by which heat travels through the water.

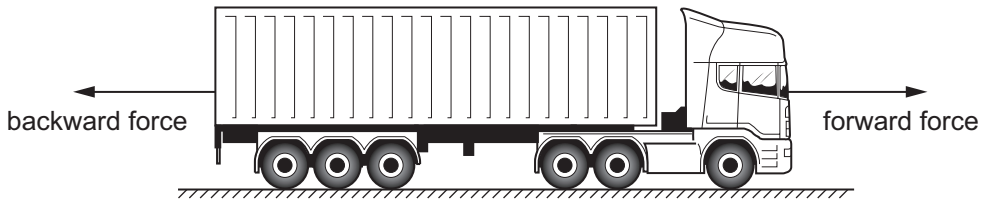
_____ [1]

(b) One method of heat transfer can take place in a vacuum. What is the name of this method of heat transfer?

_____ [1]

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6 A lorry is moving at a **constant** speed, in a straight line.



(a) The forward force due to the engine is 40 000 N.

(i) Tick (✓) the correct statement.

The backward force is less than 40 000 N ☐

The backward force is equal to 40 000 N ☐

The backward force is greater than 40 000 N ☐

[1]

(ii) What is the name of the backward force acting on the lorry?

_____ [1]

(b) The forward force due to the engine increases to 60 000 N.

If the backward force does not change, what happens to the speed of the lorry?

_____ [1]

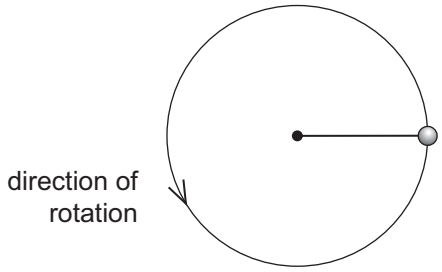
Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

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



(a) Draw an arrow to show the direction in which the ball moves as soon as the string breaks. [1]

(b) The ball has a mass of 0.6 kg and at the instant the string breaks the velocity of the ball is 3.0 m/s.

Calculate the momentum of the ball.

You are advised to show your working out.

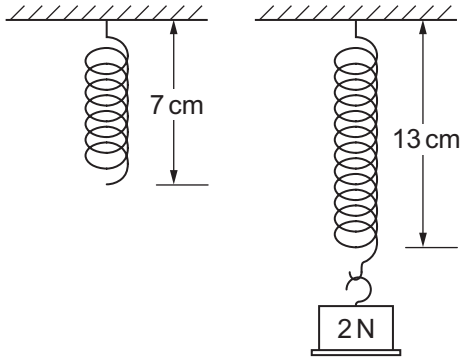
Momentum = _____ kg m/s [3]

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Marks	Remark

8 **(a)** A spring has a natural length of 7 cm.

When loaded with a 2 N weight, the total length of the spring is 13 cm.



What weight would extend the spring so that its total length is 22 cm?

You are advised to show your working out.

Weight = _____ N [3]

(b) Describe what happens to the spring if it is stretched beyond its elastic limit.

_____ [1]

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Examiner Only	
Marks	Remark

9 A soldier on guard weighs 650 N. His boots have a total area of 0.02 m^2 in contact with the ground.



Calculate the pressure the soldier exerts on the ground.

Remember to include the unit for pressure.

You are advised to show your working out.

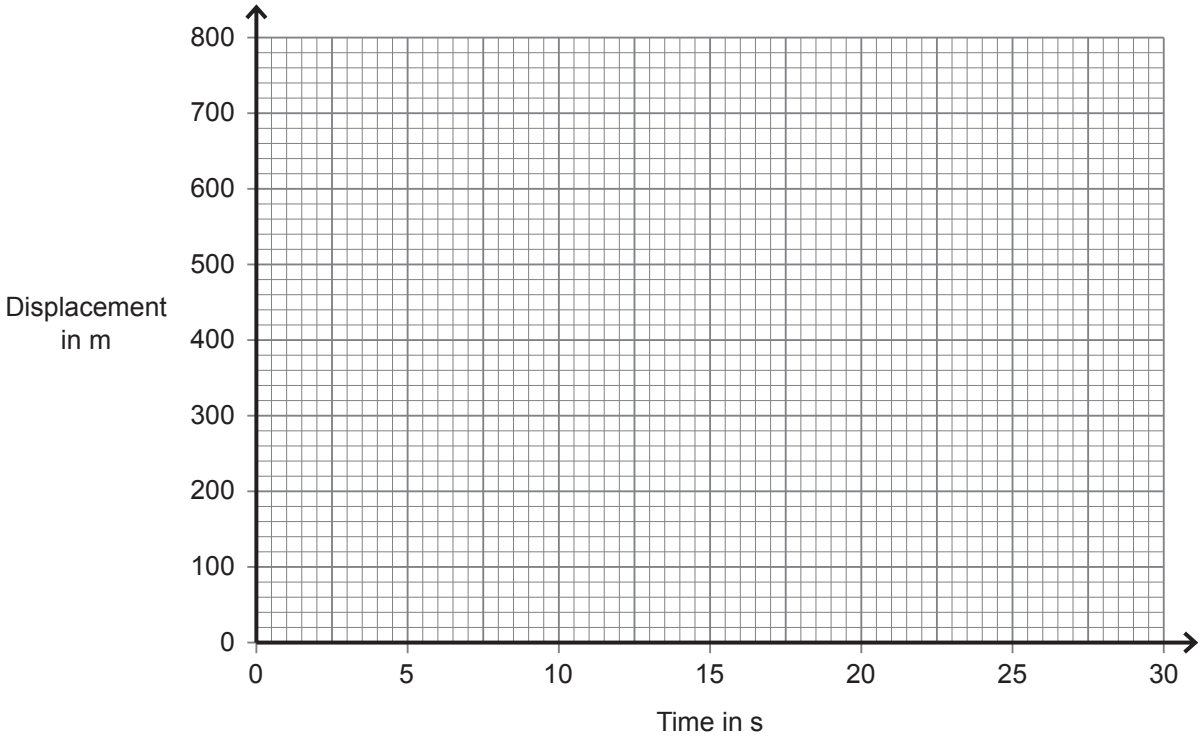
Pressure = _____ [4]

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10 The table of results shows how the displacement of a car varies with time.

Displacement in m	0	150	300	450	600	750
Time in s	0	5	10	15	20	25

(a) Use the grid to draw a graph of displacement against time for the car.



[2]

(b) Use the graph to calculate the velocity of the car.

You are advised to show your working out.

Velocity = _____ m/s [3]

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Marks	Remark

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Marks	Remark

11 (a) When a lawnmower is supplied with 1500 J of electrical energy, the useful work done is 240 J.

Calculate the efficiency of the lawnmower.

You are advised to show your working out.

Efficiency = _____ [3]

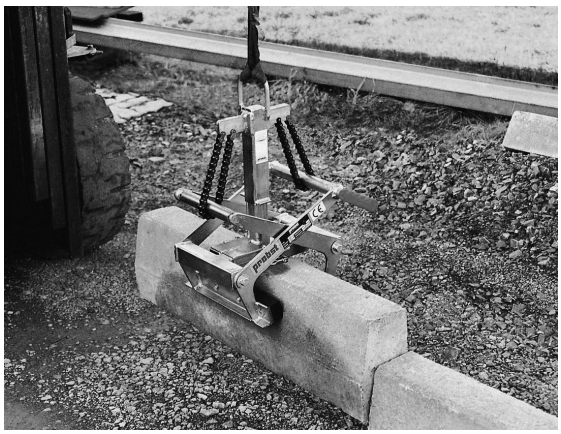
(b) Calculate the amount of energy converted into heat and sound.

Energy converted = _____ J [1]

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

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Marks	Remark



© Probst Handling Equipment

(a) Calculate the work done by the motor in lifting the block of stone of weight 120 N through a height of 1.5 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 15 seconds.

You are advised to show your working out.

Power = _____ W [3]

THIS IS THE END OF THE QUESTION PAPER

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112920

Rewarding Learning

General Certificate of Secondary Education
2011–2012

Science: Double Award (Modular)

Forces and Energy
End of Module Test
Foundation Tier

C

[GDC01]

THURSDAY 24 MAY 2012
9.15 am–10.00 am

MARK SCHEME

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			AVAILABLE MARKS
1	**(a)** Heat **or** Thermal	[1]	
	(b) Chemical [1] Electrical [1]	[2]	
	(c) Sound [1] Light [1]	[2]	5
2	**(a)** **(i)** Coal **or** oil **or** nuclear	[1]	
	(ii) Limited supply **or** used quicker than replaced **or** will run out	[1]	
	(b) **(i)** Solar **or** Wind	[1]	
	(ii) Limitless **or** will never run out **or** equivalent	[1]	4
3	Av. Speed $= \frac{\text{distance}}{\text{time}}$ [1] $= \frac{5040}{1200}$ [1] $= 4.2$ (m/s) [1]	[3]	3
4	**(i)** Trap air [1] so is a (good) insulator [1]	[2]	
	(ii) Urea formaldehyde in cavity **or** Cavity Wall Insulation Double glazing Carpets, Draught proofing Any **two** [1] each	[2]	4
5	**(a)** **(i)** Vertically upwards at X [1] Vertically down at Y [1]	[2]	
	(ii) Convection	[1]	
	(b) Radiation	[1]	4
6	**(a)** **(i)** "is equal to" – middle box ☑	[1]	
	(ii) Friction **or** Air Resistance **or** Drag	[1]	
	(b) Increases **or** accelerates	[1]	3

			AVAILABLE MARKS
7	**(a)** Arrow tangentially upwards	[1]	
	(b) Momentum = Mass × Velocity **or** p = mv [1] = 0.6 × 3.0 [1] = 1.8 (kg m/s) [1]	[3]	4
8	**(a)** 2 N ≡ 6 cm [1] 1 N ≡ 3 cm [1] 5 N ≡ 15 cm [1]	[3]	
	(b) Permanently deformed **or** Plastically deformed **or** It will not return to its original dimensions	[1]	4
9	Pressure = $\frac{\text{Force}}{\text{Area}}$ **or** P = F/A [1] = $\frac{650}{0.02}$ [1] = 32 500 [1] Pa **or** N/m^2 [1]	[4]	5
10	**(a)** 5 or 6 points correct [1] Straight line through (0,0) [1]	[2]	
	(b) e.g. Grad. = Velocity [1] = $\frac{300}{10}$ or any suitable pair of coordinates [1] = 30 (m/s) [1]	[3]	5
11	**(a)** Efficiency = $\frac{\text{Useful output energy}}{\text{Input energy}}$ [1] = $\frac{240}{1500}$ [1] = 0.16 or 16% [1]	[3]	
	(b) 1260 (J)	[1]	4
12	**(a)** WD = F × d [1] = 120 × 1.5 [1] = 180 (J) [1]	[3]	
	(b) Power = $\frac{WD}{t}$ [1] = $\frac{180}{15}$ [1] allow e.c.f. from **(a)** = 12 (W) [1]	[3]	6
		Total	**50**

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Rewarding Learning

Centre Number	
71	

Candidate Number

General Certificate of Secondary Education
2011–2012

Science: Double Award (Modular)

Forces and Energy

End of Module Test

Foundation Tier

C

[GDC01]

GDC01

WEDNESDAY 29 FEBRUARY 2012
9.30 am–10.15 am

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

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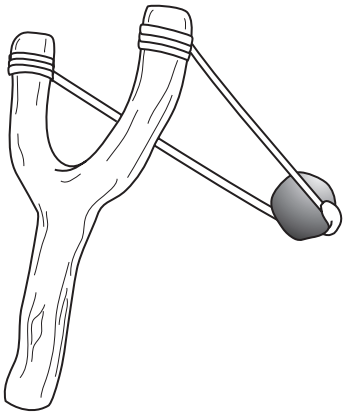
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Question Number	Marks
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12	
Total Marks	

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Examiner Only	
Marks	Remark

1 A catapult is used to fire a stone into the air. Use the words in the box below to complete the sentences.

Chemical	**Strain**	**Kinetic**
Heat	**Potential**	**Sound**



(i) The energy stored in the rubber band is _____ energy. [1]

(ii) The instant the catapult is released the stone gains

_____ energy. [1]

(iii) As the stone rises upwards it gains _____ energy. [1]

(iv) When the stone hits the ground all the energy is changed into

_____ and _____ . [2]

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2 Much of the electricity produced in Northern Ireland comes from burning oil.

A number of statements are given below.

Tick (✓) the **three** which apply to oil.

It is renewable. ☐

It is a fossil fuel. ☐

Its energy originally comes from the sun. ☐

It does not cause pollution. ☐

It is formed over millions of years. ☐

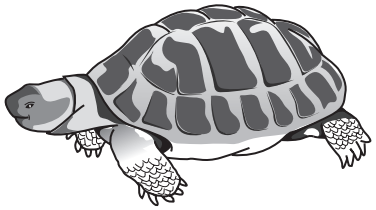
It is formed when vegetation is compressed. ☐ [3]

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Marks	Remark

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3 A tortoise travels 45 mm in 3 seconds.



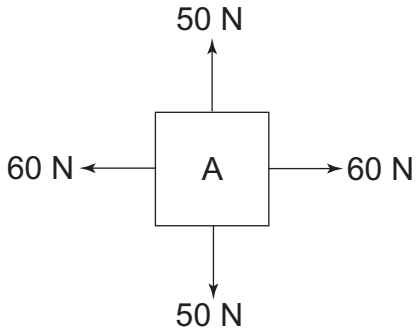
Calculate the speed of the tortoise in mm/s.

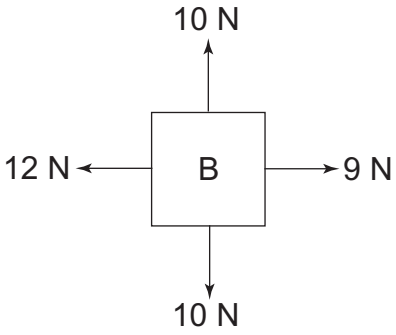
You are advised to show your working out.

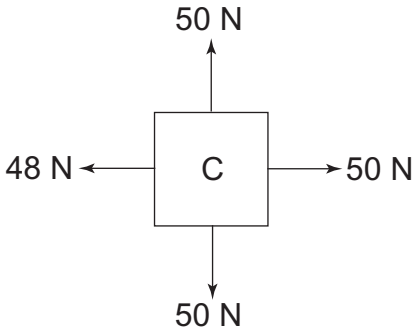
Speed = _____ mm/s [3]

Examiner Only	
Marks	Remark

4 The diagrams below show identical objects with different forces acting on them.







(a) Which object could be at rest?

Letter _____ [1]

(b) Which object could be moving at constant speed?

Letter _____ [1]

(c) Which object has an unbalanced force of 2 N?

Letter _____ [1]

(d) Give two possible effects of an unbalanced force on the **motion** of an object.

1. _____

2. _____ [2]

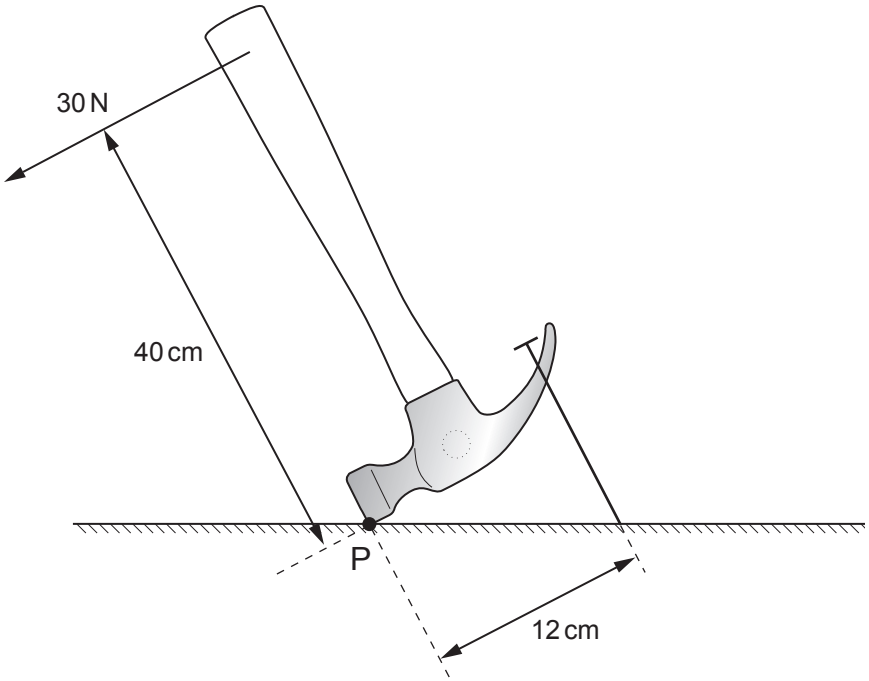
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Marks	Remark

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Examiner Only	
Marks	Remark

5 Benjamin tries to remove a nail from a piece of wood.



He exerts a force of 30 N as shown.

(i) Choose information from the diagram above to help you calculate the moment Benjamin is exerting, about the pivot P.

Remember to include the unit.

You are advised to show your working out.

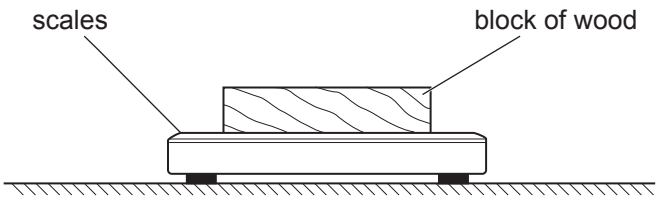
Moment = _____ [4]

(ii) State the direction of the moment.

_____ [1]

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6 A block of wood sits on top of a set of scales.



The scales give a reading of 12 N.

A mass of 1.5 kg is now set on top of the block.

What is the new reading on the scales?

You are advised to show your working out.

Reading = _____ N [3]

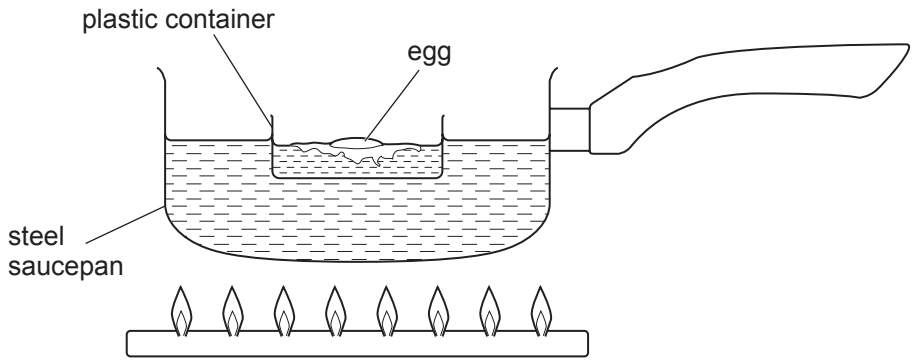
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Marks	Remark

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Marks	Remark

7 Jamie poaches an egg by setting it in a plastic container which floats in a saucepan of hot water. The saucepan is made of steel and sits on a gas cooker.



(a) (i) What is the method of heat transfer through the bottom of the steel saucepan?

_____ [1]

(ii) What is the particle mainly responsible for this process?

_____ [1]

(b) (i) What is the method of heat transfer through the plastic container?

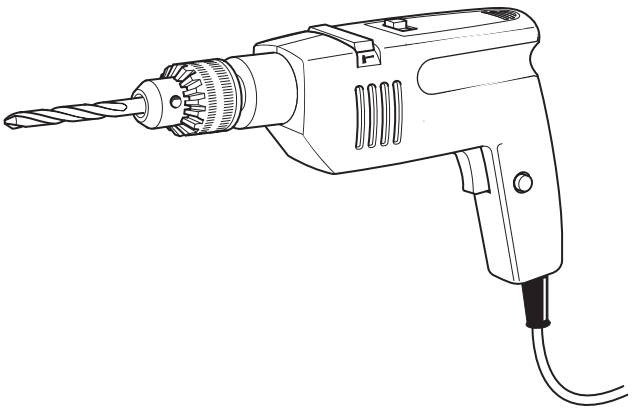
_____ [1]

(ii) What is the particle responsible for this process?

_____ [1]

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8 Patricia uses an electric drill to drill a hole.



Choose the appropriate data to calculate the efficiency of the drill.

75 J of heat energy were produced.
200 J of electrical energy were used.
80 J of kinetic energy were produced in the drill bit.
45 J of sound energy were produced.

You are advised to show your working out.

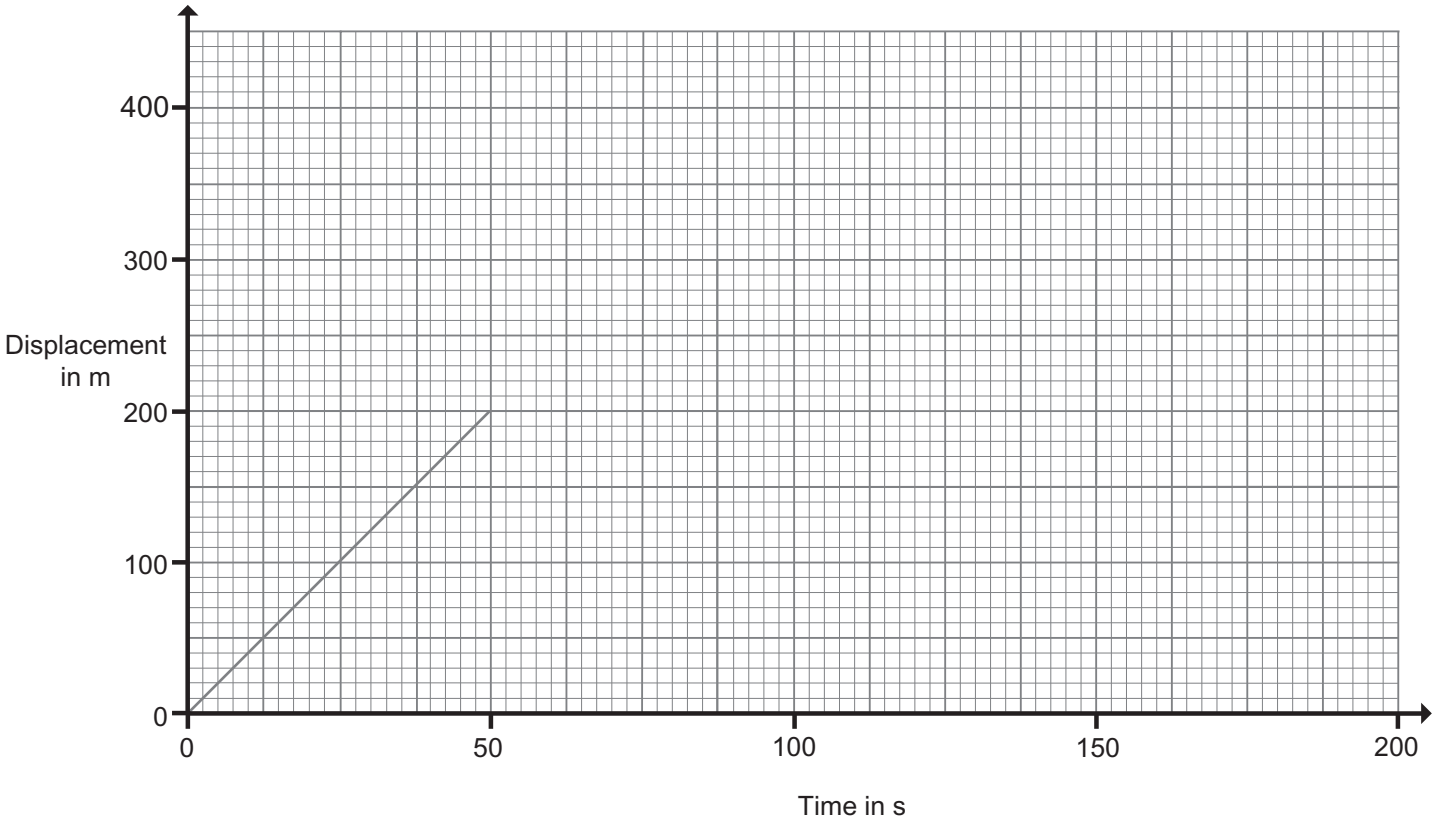
Efficiency = _____ [3]

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9 A cyclist travels a distance of 200 m in 50 seconds. This is shown in the displacement–time graph below.



The cyclist then rests for 50 seconds before returning to his starting point at a steady speed in a further 100 seconds.

(i) Complete the displacement–time graph for the journey. [2]

(ii) What is the total distance travelled by the cyclist in 200 seconds?

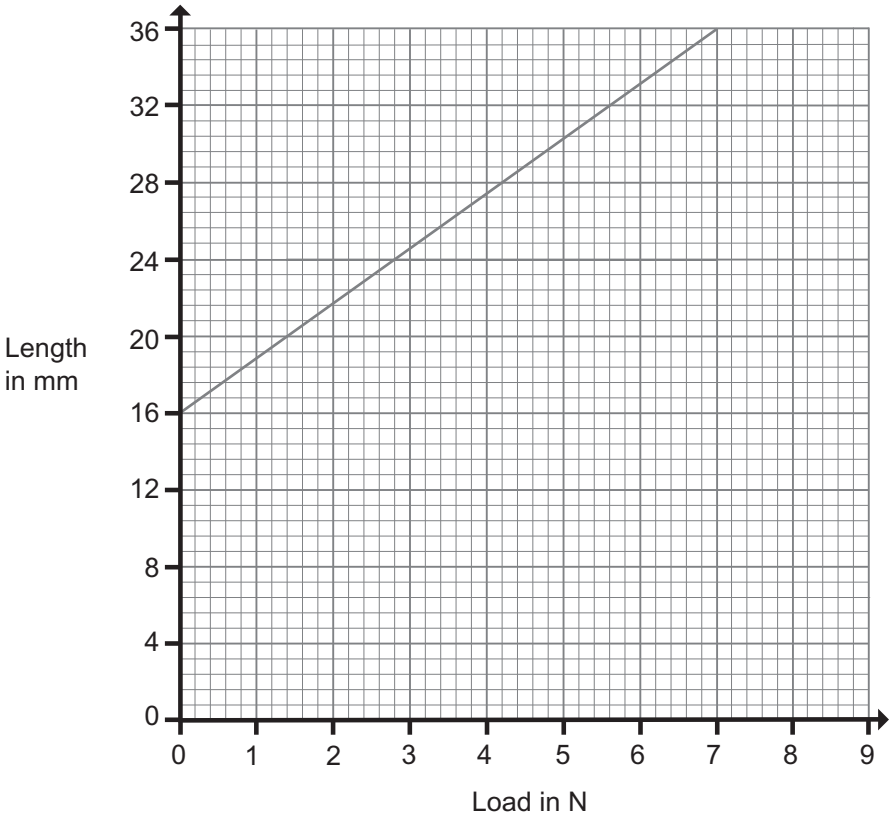
Total distance = _____ m [1]

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Marks	Remark

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10 Phyllis carries out a Hooke's Law investigation using a spiral spring.

She plots her results on a graph as shown.



(a) What is the unstretched length of the spring?

Unstretched length = _____ mm [1]

(b) How can you tell, from the graph, that the spring has not been stretched beyond its elastic limit?

_____ [1]

(c) **(i)** Phyllis could have investigated Hooke's Law by plotting a more suitable graph. What should she have plotted on the vertical y-axis?

_____ [1]

(ii) An unknown load is hung on the spring and the extension produced is 20 mm.
What is the unknown load?

You are advised to show your working out.

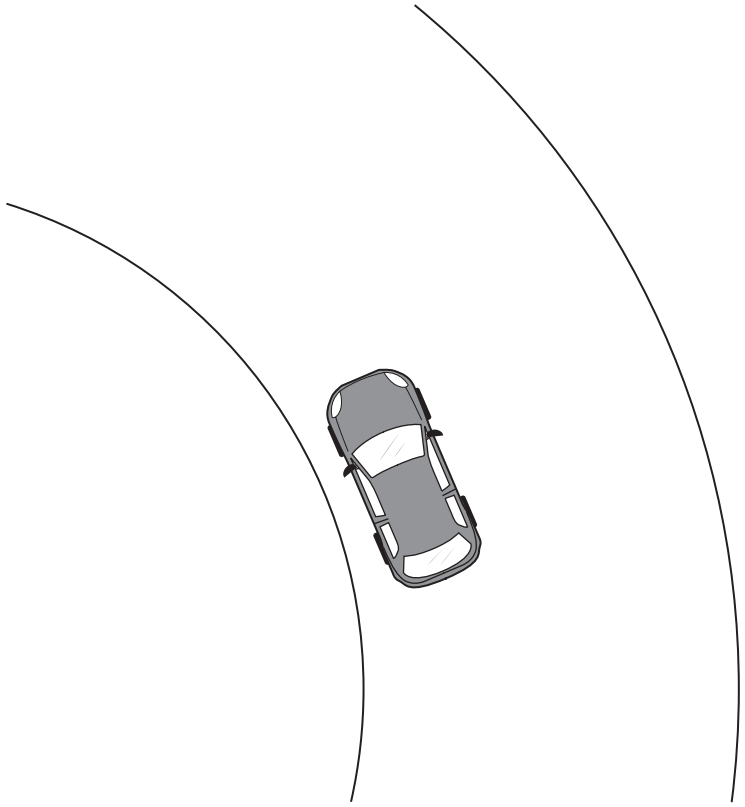
Load = _____ N [2]

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Marks	Remark

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11 The diagram shows a bird's eye view of a car of mass 2000 kg going round a circular track at a constant speed of 7 m/s.



(a) Calculate the momentum of the car.

You are advised to show your working out.

Momentum = _____ kgm/s [3]

In order to move in a curve around the corner a force, called a centripetal force, must act on the car.

(b) What supplies the centripetal force in this case?

Centripetal force supplied by _____ [1]

(c) In what direction does this force act?

_____ [1]

Examiner Only

Marks	Remark

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12 A weightlifter raises a set of weights into the air.

Examiner Only	
Marks	Remark



The weight at each end of the bar is 200 N and the bar weighs 100 N.

(a) What is the **total** weight lifted by the weightlifter?

Total weight = _____ N [1]

The weightlifter raises the total weight through a distance of 2 m into the air in a time of 1.5 seconds.

(b) Calculate the power developed by the weightlifter.
Remember to include the unit.

You are advised to show your working out.

Power = _____ [5]

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Rewarding Learning

General Certificate of Secondary Education
2011–2012

Science: Double Award (Modular)

Forces and Energy

End of Module Test

Foundation Tier

C

[GDC01]

WEDNESDAY 29 FEBRUARY 2012

9.30 am–10.15 am

MARK SCHEME

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			AVAILABLE MARKS
1	**(i)** Strain	[1]	
	(ii) Kinetic or Potential	[1]	
	(iii) Potential	[1]	
	(iv) Heat and sound	[2]	5
2	Boxes 2, 3 and 5 ticked	[3]	3
3	Speed = dist/time [1] = 45/3 [1] = 15 [1]	[3]	3
4	**(a)** A	[1]	
	(b) A	[1]	
	(c) C	[1]	
	(d) change speed (accelerate) [1] change direction [1]	[1] [1]	5
5	**(i)** Moment = F × d [1] = 30 × 40 [1] or = 30 × 0.4 = 1200 [1] = 12 Ncm [1] Nm	[4]	
	(ii) Anticlockwise [1]	[1]	5
6	W = mg or 1.5 × 10 [1] 12 N ≡ 1.2 kg [1] W = 15 (N) [1] or Total mass = 2.7 kg [1] Reading = 27 (N) [1]	[3]	3
7	**(a)** **(i)** conduction **(ii)** electron (independently marked)	[1] [1]	
	(b) **(i)** conduction **(ii)** atom/molecule (independently marked)	[1] [1]	4
8	E = useful energy output/energy input [1] = 80/200 [1] = 0.4 (40%) [1]	[3]	3

				AVAILABLE MARKS
9	**(i)**	horizontal line from (50, 200) to (100, 200) [1] line from (100, 200) to (200, 0) [1] } allow ± 1 sq tolerance	[2]	
	(ii)	400 (m) [1]	[1]	3
10	**(a)**	16 (mm)	[1]	
	(b)	line is straight	[1]	
	(c) **(i)**	Extension	[1]	
	(ii)	Total length = 36 mm (or 20 + 16) [1] Load = 7 (N) [1]	[2]	5
11	**(a)**	momentum = mass × vel [1] = 2000 × 7 [1] = 14 000 (kgm/s) [1]	[3]	
	(b)	friction [1]	[1]	
	(c)	towards the centre (of the curve) [1]	[1]	5
12	**(a)**	500 (N)	[1]	
	(b)	Power = work done/time [1]	[1]	
		= (500 × 2)/1.5 [2] allow ecf from (a)	[2]	
		= 666.7 [1] W [1]	[2]	6
			Total	**50**

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Rewarding Learning

Centre Number

71	

Candidate Number

General Certificate of Secondary Education
2011–2012

Science: Double Award (Modular)

Forces and Energy

End of Module Test

C

Foundation Tier

[GDC01]

GDC01

MONDAY 14 NOVEMBER 2011
1.30 pm–2.15 pm

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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Examiner Only	
Marks	Remark

1 **(a)** Name the main type of energy in the following:

(i) a bowl of cornflakes

_____ energy [1]

(ii) a wound up spring in a toy

_____ energy [1]

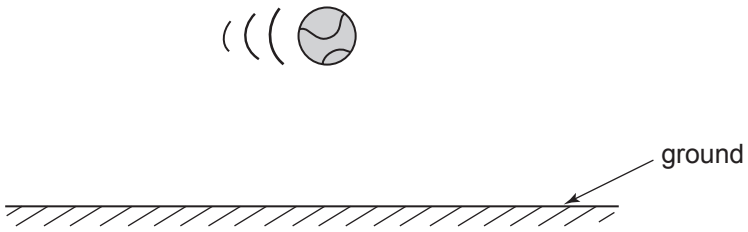
(iii) the energy from a loudspeaker



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_____ energy [1]

(b) A ball moving through the air has two types of energy.
What are they?



_____ energy and _____ energy [2]

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Examiner Only

Marks | Remark

2 **(a)** Explain what is meant by a renewable energy resource.

_____

_____ [1]

(b) For each energy resource below place a tick (✓) to indicate whether the resource is renewable or non-renewable.

Energy resource	Renewable	Non-renewable
Coal		
Wind		
Nuclear		
Gas		

[4]

3 There has been a big increase in the amount of the most important greenhouse gas in recent times.

(a) State the name of this greenhouse gas.

_____ [1]

(b) How is most of this greenhouse gas produced?

_____ [1]

Scientists believe that an increase in greenhouse gas will lead to a rise in temperature of the atmosphere.

(c) What environmental harm will this cause?

_____ [1]

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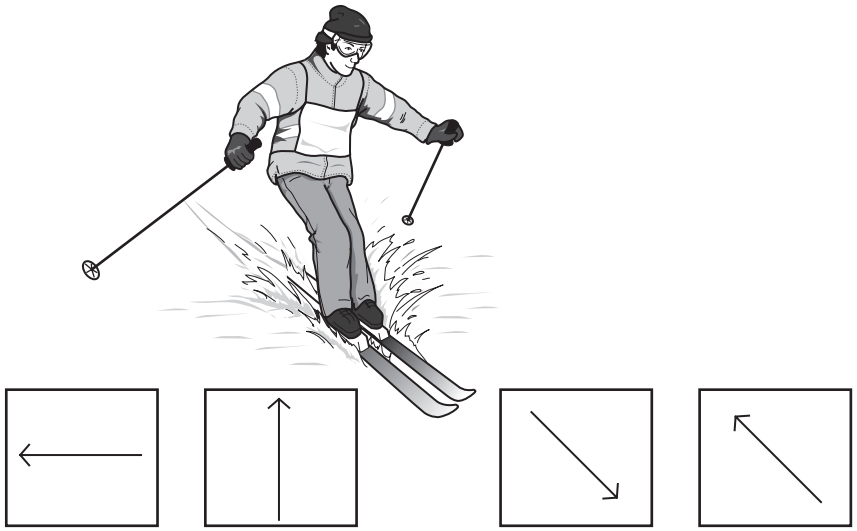
Examiner Only	
Marks	Remark

4 **(a)** Explain fully what is meant by the word friction.

_____

_____ [2]

Benjamin skis down a snow slope.



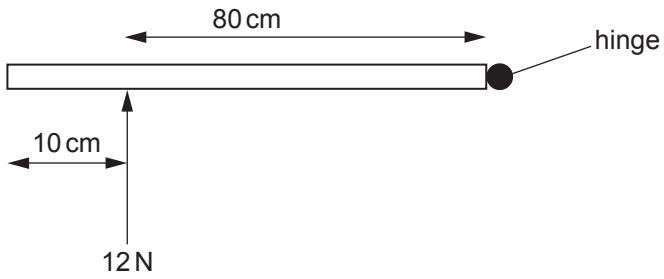
(b) **(i)** Circle the box to show the direction that friction acts on his skis. [1]

(ii) As a result of the action of friction on the skis Benjamin will lose energy. Name **one** of the forms in which this energy is lost.

_____ energy [1]

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5 The diagram shows a bird's eye view of a door being pushed by a force of 12 N.



(a) Calculate the moment exerted by the force about the hinge.
Remember to include the unit with your answer.

You are advised to show your working out.

Moment = _____ [4]

(b) State the direction of the moment about the hinge.

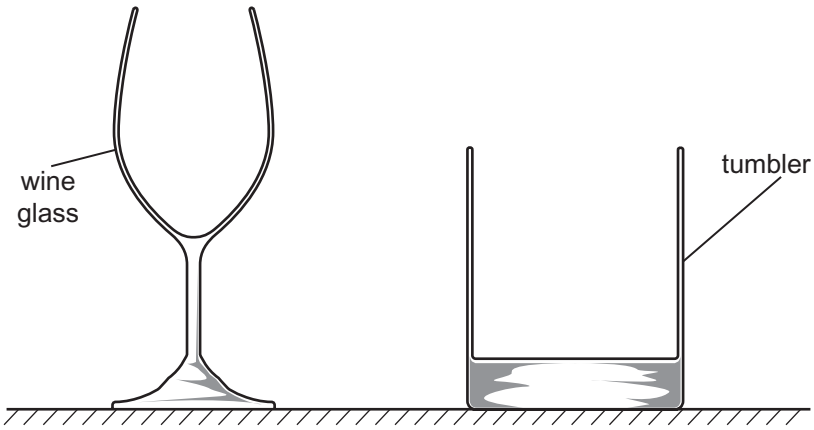
_____ [1]

Examiner Only

Marks	Remark

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6 A wine glass and a glass tumbler sit on a table.



(i) Tick (✓) the correct statement below.

The wine glass is more stable than the tumbler. ☐

The tumbler is more stable than the wine glass. ☐

Both are equally stable. ☐ [1]

(ii) Give two reasons for your answer.

1. _____

2. _____ [2]

Examiner Only

Marks	Remark

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7 An electric drill uses 800 J of electrical energy. 200 J of this energy is turned into heat and sound.

Calculate the efficiency of the electric drill.

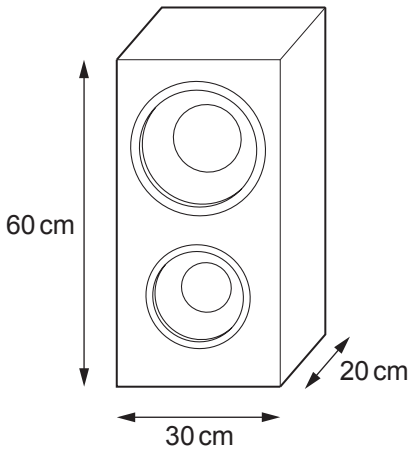
You are advised to show your working out.

Efficiency = _____ [3]

Examiner Only	
Marks	Remark

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8 A loudspeaker sits on a floor.



(i) Calculate the base area of the loudspeaker, in cm^2.

Area = _____ cm^2 [1]

(ii) The weight of the loudspeaker is 200 N. Use your answer to part **(i)** to calculate the pressure it exerts on the floor, in N/cm^2.

You are advised to show your working out.

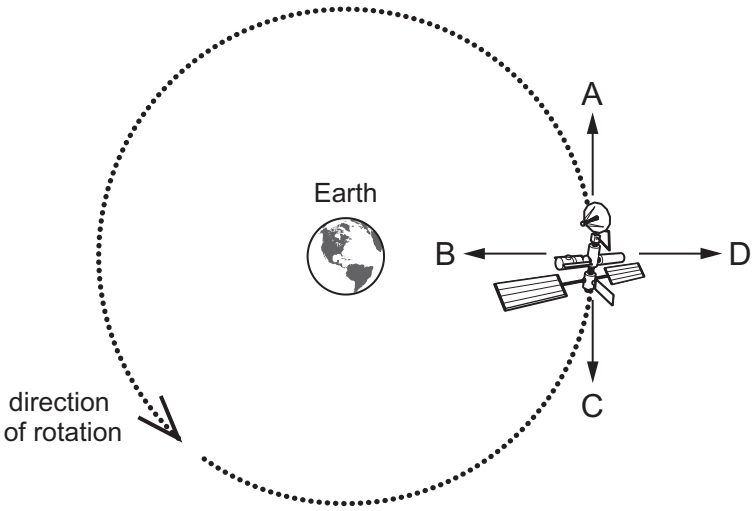
Pressure = _____ N/cm^2 [3]

Examiner Only

Marks	Remark

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9 A satellite orbits the earth. Four directions are shown on the satellite.



(a) (i) Which letter gives the direction of the force which keeps the satellite moving in a circular orbit?

Letter _____ [1]

(ii) Which letter gives the direction of the weight of the satellite?

Letter _____ [1]

(b) The mass of the satellite is 160 kg and it is moving at a steady speed of 2000 m/s. Calculate the satellite's momentum.

You are advised to show your working out.

Momentum = _____ kg m/s [3]

Examiner Only

Marks	Remark

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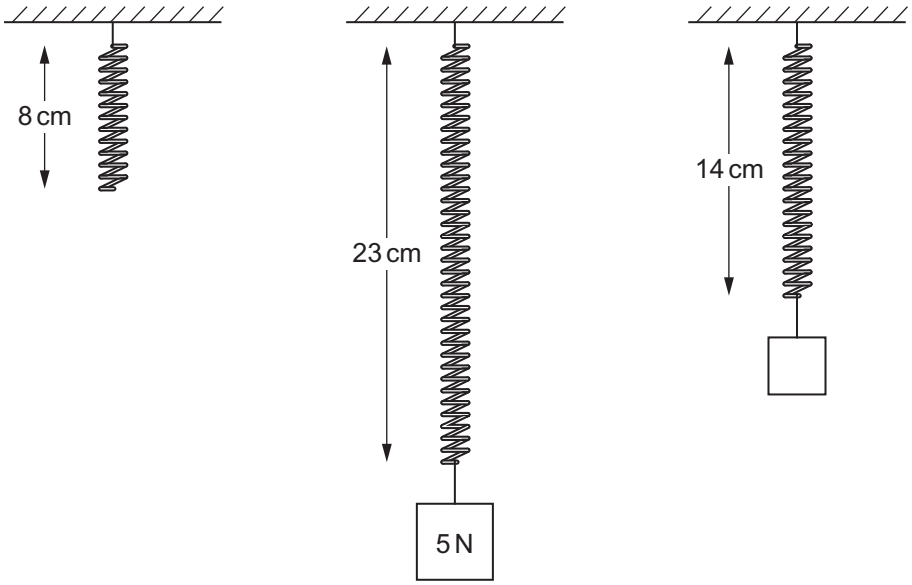
10 (a) State Hooke's Law.

Examiner Only

Marks	Remark

_____

_____ [2]



(b) A spring has a natural length of 8 cm. When loaded with a 5 N weight the total length of the spring is 23 cm. What weight would extend the spring so that its total length is 14 cm?

You are advised to show your working out.

Weight = _____ N [3]

11 Heat energy can be transferred from one point to another by different methods.

Listed below are a number of different statements. After each statement write down the name of the relevant method of heat transfer.

Involves vibrating atoms. _____

Does not require a medium. _____

Involves electrons colliding with atoms. _____

Involves movement of atoms from one place to another. _____

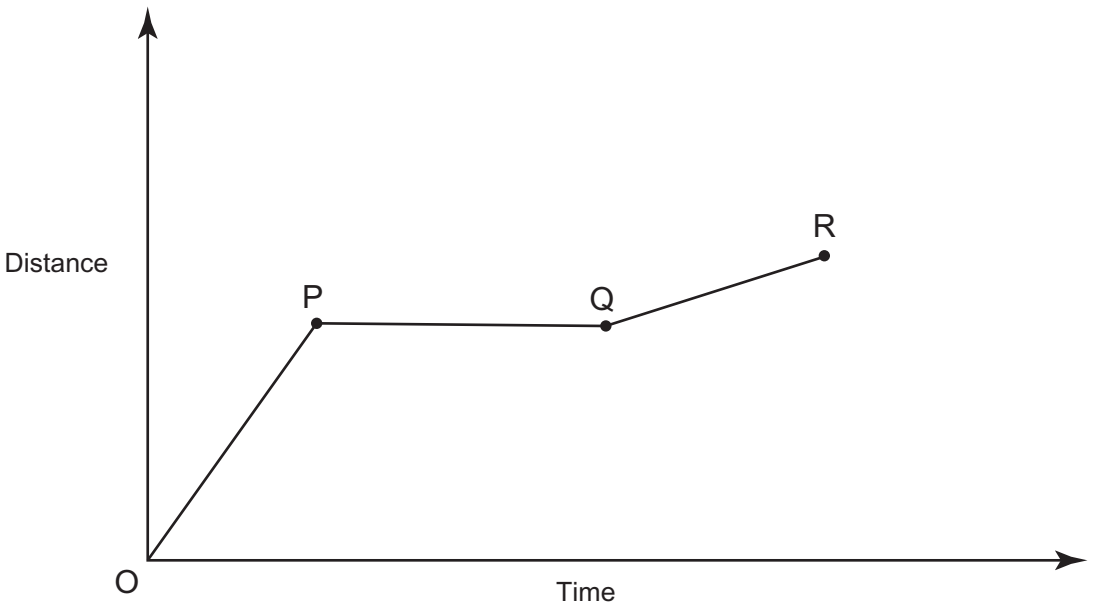
[4]

Examiner Only	
Marks	Remark

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12 Flora walks to school and her distance–time graph is shown.

Examiner Only	
Marks	Remark



(a) During which part of the journey does Flora walk fastest?

_____ [1]

A number of statements are made below.

(b) Tick (✓) **two** correct statements which refer to Flora's walk.

Flora stops walking during PQ. ☐

The distance to Flora's school is given by the area under the graph. ☐

Flora's speed is increasing during OP. ☐

Flora's speed during QR could be found by calculating the gradient of QR. ☐

Flora walks slower during OP than during QR. ☐ [2]

(c) Distance and displacement are both measured in metres. What is the difference between distance and displacement?

_____ [1]

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Rewarding Learning

General Certificate of Secondary Education
2011–2012

Science: Double Award (Modular)

Forces and Energy

End of Module Test

C

Foundation Tier

[GDC01]

MONDAY 14 NOVEMBER 2011
1.30 pm–2.15 pm

MARK SCHEME

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			AVAILABLE MARKS
1	**(a)** **(i)** Chemical [1]		
	(ii) Strain/Elastic [1]		
	(iii) Sound [1]	[3]	
	(b) Potential/GPE [1] and kinetic/movement [1] (either order)	[2]	5
2	**(a)** Never runs out/can be replaced in a lifetime/limitless supply	[1]	
	(b) Renewable: ✓ ; Non-renewable: ✓ ✓ ✓	[4]	5
3	**(a)** Carbon dioxide/CO_2	[1]	
	(b) Burning fossil fuels/examples (cars, power stations etc.)	[1]	
	(c) Raised sea water levels/flooding/(polar) ice (caps) melting/changing weather patterns/any response illustrating the change (e.g. hotter weather) References to temp. increasing alone [0] marks	[1]	3
4	**(a)** A force [1] which opposes motion [1] dependent marking	[2]	
	(b) **(i)** Arrow parallel to and up the slope ↖	[1]	
	(ii) Heat/sound	[1]	4
5	**(a)** Moment $= F \times d$ $= 12 \times 80$ $= 960$ $=$ Ncm	[1] [1] [1] [1]	
	(b) Clockwise not ↻	[1]	5
6	**(i)** The tumbler is more stable. (✓)	[1]	
	(ii) Broader/wider base/bigger base area lower c of g [1] dependent marking	[2]	3

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				AVAILABLE MARKS
7	Efficiency = (useful) energy out/energy in or $\frac{EO}{EI}$		[1]	
	= 600/800		[1]	
	= 0.75 (75%)		[1]	3
	or Eff = $\frac{EO}{EI}$			
8	**(i)** 600 (cm^2)		[1]	
	(ii) P = weight/area or $\frac{F}{A}$ or equivalent		[1]	
	= 200/600		[1]	
	= 0.33 (N/cm^2)		[1]	4
	allow e.c.f.			
	or P = $\frac{F}{A}$			
9	**(a)** **(i)** B [1]			
	(ii) B [1]		[2]	
	(b) p = m × v or Mom = mv etc.		[1]	
	= 160 × 200		[1]	
	= 320 000 (kg m/s)		[1]	5
10	**(a)** Extension is (directly) proportional to force		[1]	
	up to elastic limit		[1]	
	(b) 5 N causes 15 cm ext		[1]	
	1 N causes 3 cm ext		[1]	
	(Ext of 6 cm caused by) 2 (N)		[1]	5
11	Conduction [1] Radiation [1] Conduction [1] Convection [1]		[4]	4
12	**(a)** OP		[1]	
	(b) Statements (i) [1] and (iv) [1] are correct		[2]	
	(c) Displacement is a vector **or** displacement has direction (converse reason acceptable)		[1]	4
		Total		**50**

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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
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

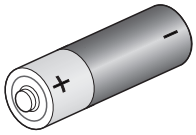
The total mark for this paper is 50.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

For Examiner's use only	
Question Number	Marks
1	
2	
3	
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10	
11	
12	
Total Marks	

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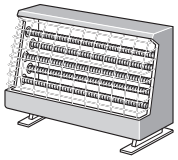
Examiner Only	
Marks	Remark

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

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]

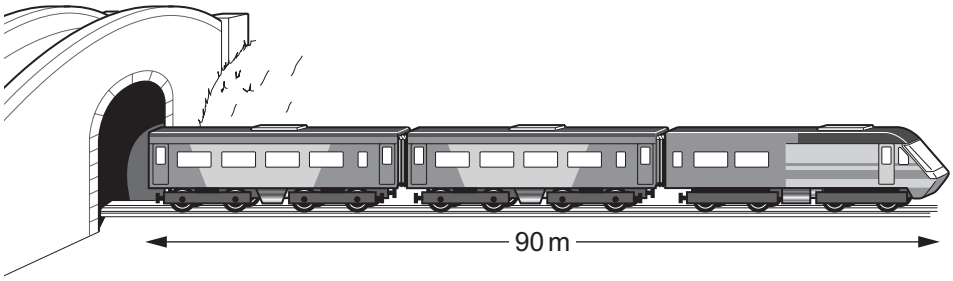
Many power stations in the United Kingdom use fossil fuels such as oil.

(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.

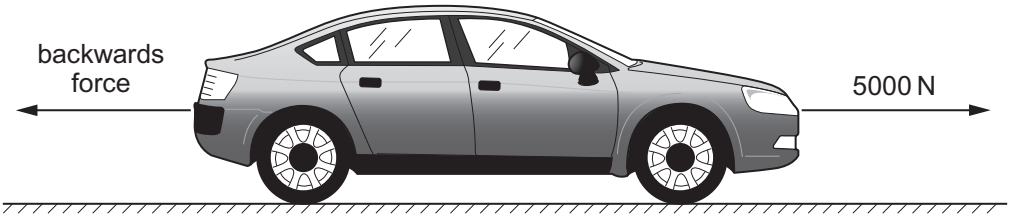
You are advised to show your working out.

Average speed = _____ m/s [3]

Examiner Only	
Marks	Remark

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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

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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.



© iStockphoto / Thinkstock

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

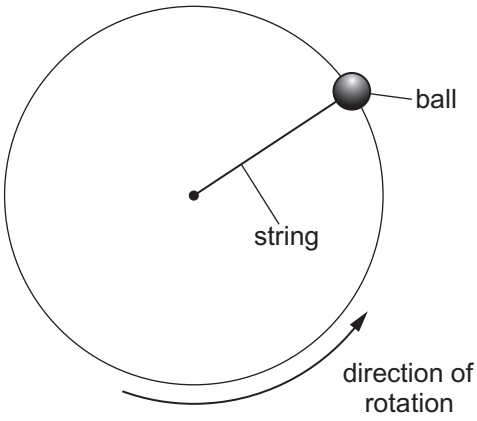
You are advised to show your working out.

Pressure = _____ [4]

Examiner Only	
Marks	Remark

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.

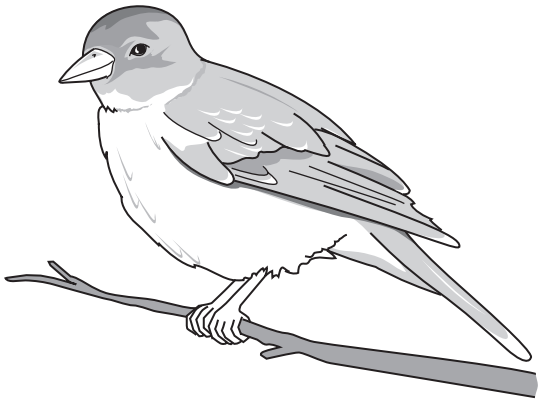
You are advised to show your working out.

Momentum = _____ kg m/s [3]

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Examiner Only	
Marks	Remark

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

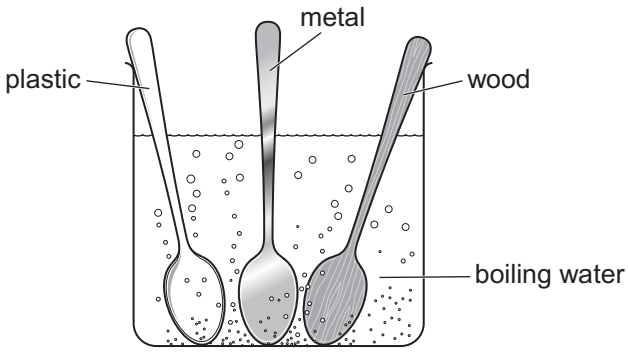


(a) Explain fully how the ruffling of feathers can help keep a bird warm.

_____

_____ [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]

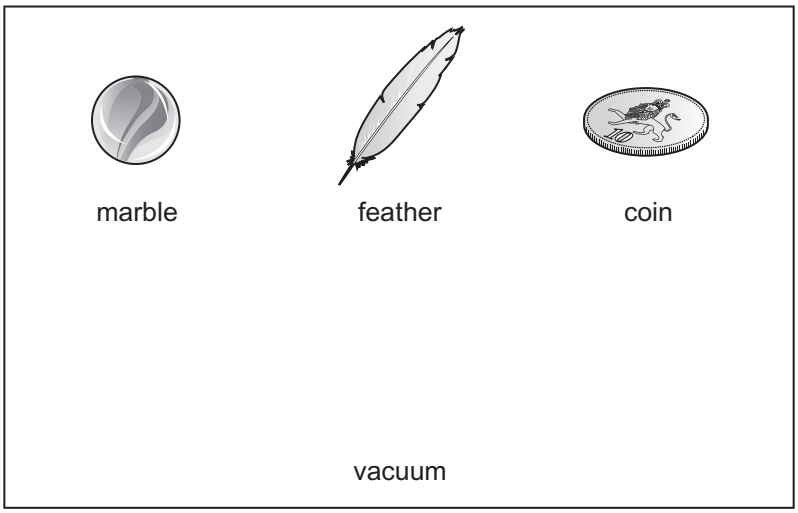
(ii) Explain your answer.

_____

_____ [1]

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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?

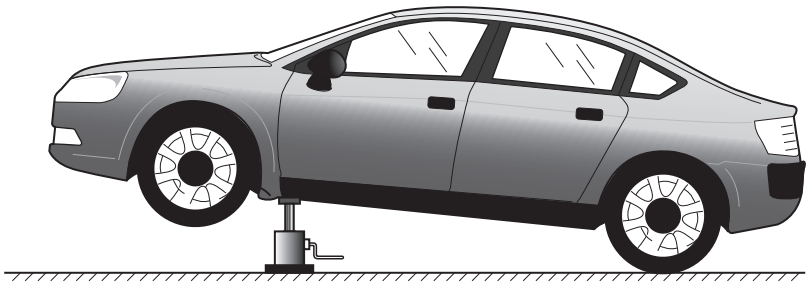
_____ [1]

Examiner Only
Marks | Remark

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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.

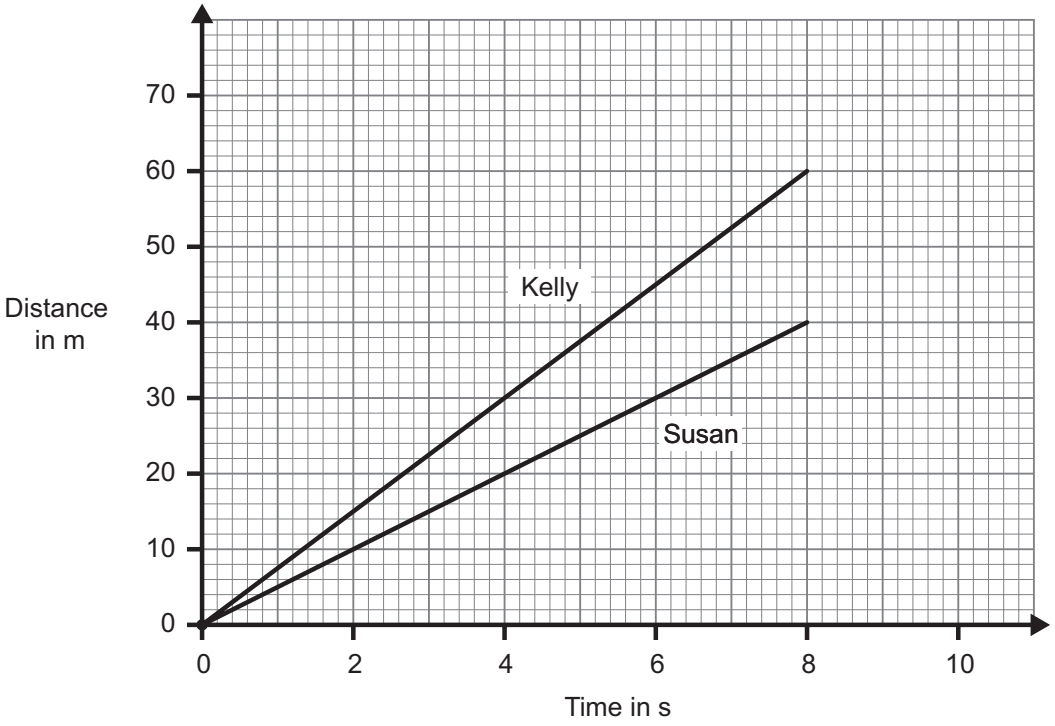
Efficiency = _____ [3]

(b) What fraction of input energy is wasted?

_____ [1]

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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.

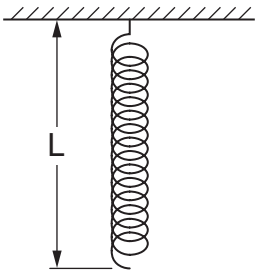
You are advised to show your working out.

Speed = _____ m/s [3]

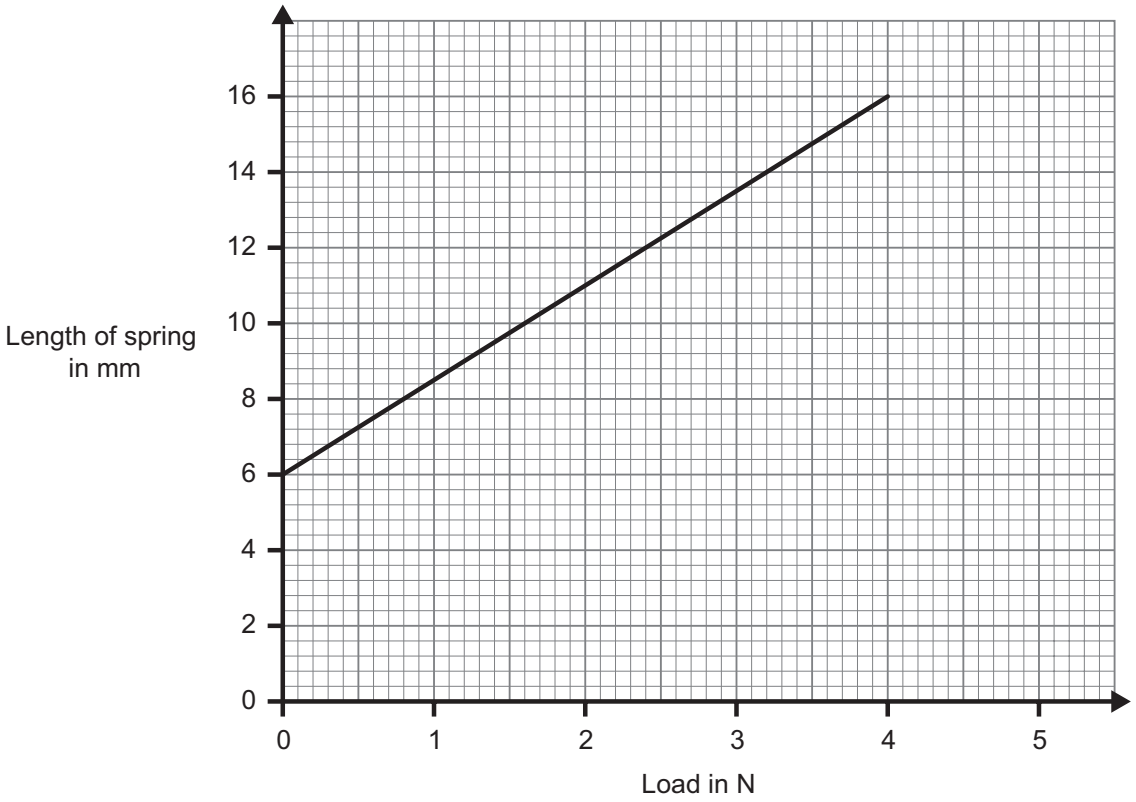
Examiner Only

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

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

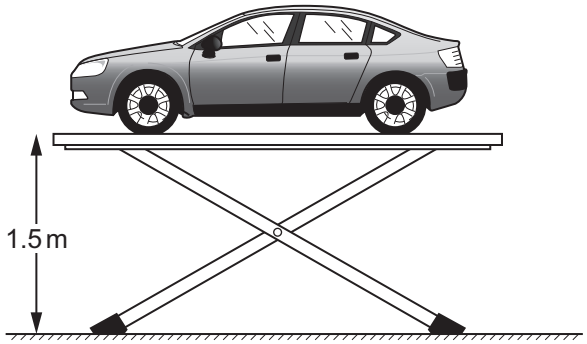
You are advised to show your working out.

Load = _____ N [2]

Examiner Only	
Marks	Remark

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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 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]

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Marks	Remark

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111920

Rewarding Learning

General Certificate of Secondary Education
2010–2011

Science: Double Award (Modular)

Forces and Energy
End of Module Test

Foundation Tier

[GDC01]

FRIDAY 20 MAY 2011, AFTERNOON

MARK SCHEME

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			AVAILABLE MARKS
1	**(a)** Electrical [1] to Heat/Thermal [1]	[2]	
	(b) Sound [1] to Electrical [1]	[2]	
	(c) Sound/Light	[1]	5
2	**(a)** **(i)** Limitless or cannot be used faster than it is made Never run out	[1]	
	(ii) Solar/Geothermal/Tidal/Biomass/HEP/wind Any two [1] each	[2]	
	(b) Coal, (Natural) gas, Peat/Turf any two	[2]	5
3	(Average) speed $= \frac{\text{distance}}{\text{time}}$ or equivalent [1]		
	$= \frac{90}{6}$ [1]		
	$= 15$ [1]	[3]	3
4	**(a)** **(i)** Friction or Air resistance or Drag	[1]	
	(ii) …. “is equal to” ….	[1]	
	(b) Accelerates/(Velocity) increases/faster	[1]	3
5	Pressure $= \frac{\text{Force}}{\text{Area}}$ or $\frac{F}{A}$ or equivalent [1]		
	$= \frac{300}{0.02}$ [1]		
	$= 15\,000$ [1] N/m^2 or Pa [1]	[4]	4
6	**(a)** **(i)** Inward arrow	[1]	
	(ii) Tension	[1]	
	(b) Momentum $=$ m $\times$ v or equivalent [1]		
	$= 1.2 \times 8$ [1]		
	$= 9.6$ [1] (kg m/s)	[3]	5

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			AVAILABLE MARKS
7	**(a)** Air is trapped [1] which is a good insulator [1]	[2]	
	(b) **(i)** Metal	[1]	
	(ii) Best conductor of heat	[1]	4
8	**(i)** C	[1]	
	(ii) All bodies fall at the same rate under gravity	[1]	
	(iii) Feather	[1]	3
9	**(a)** Efficiency $= \frac{\text{useful output energy}}{\text{input energy}}$ [1]		
	$= \frac{1200}{3000}$ [1]		
	$= 0.4$ or 40% [1]	[3]	
	(b) $\frac{3}{5}$ or 60% or 0.6 [1] allow e.c.f. from **(a)**	[1]	4
10	**(a)** 20 (m)	[1]	
	(b) Speed $=$ Gradient $= \frac{\text{distance}}{\text{time}}$ [1]		
	$= \frac{60}{8}$ [1]		
	$= 7.5$ [1] (m/s)	[3]	4
11	**(a)** **(i)** 6 (mm)	[1]	
	(ii) Extension	[1]	
	(b) Extended length $=$ 16 [1] (mm) or from graph		
	Load $=$ 4 [1] (N)	[2]	4

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		AVAILABLE MARKS
12 **(a)** Work done = Force × distance or equivalent [1]		
= 25 000 × 1.5 [1]		
= 37 500 [1] (J)	[3]	
(b) Power = $\frac{\text{Work done}}{\text{Time taken}}$ [1]		
= $\frac{42000}{30}$ [1]		
= 1400 [1] (W)	[3]	6
	Total	**50**

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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

Foundation Tier

C

[GDC01]

GDC01

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

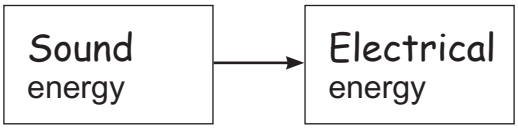
The total mark for this paper is 50.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

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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Examiner Only	
Marks	Remark

1 A microphone changes **sound** energy into **electrical** energy, as shown in the energy flow diagram below.

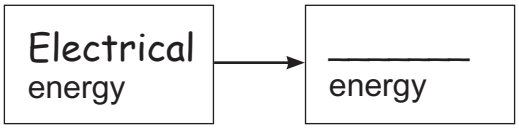


Fill in the spaces below to show the energy changes, for which following devices are designed.

(i)



loudspeaker

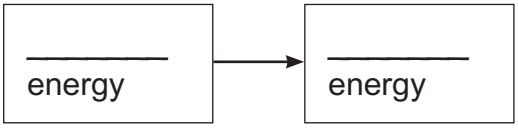


[1]

(ii)

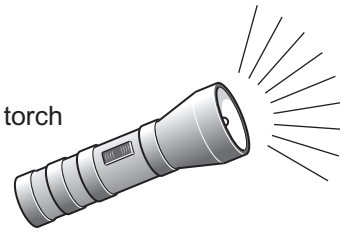


Bunsen burner



[2]

(iii)





[2]

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2 This question is about renewable and non-renewable energy resources.

Examiner Only

Marks	Remark

(a) Name two energy resources used to generate electricity which involve moving water.

_____ and _____ [2]

(b) Which renewable energy source

(i) comes from deep underground? _____

(ii) consists of moving air?

_____ [2]

We must continue to use fossil fuels.

(c) **(i)** What can we do to make fuels last longer before they run out?

_____

_____ [1]

(ii) What type of energy sources will we eventually have to depend on?

_____ [1]

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3 During a World Cup football match, a midfield player ran 2.64 km.

(i) Convert this distance into metres.

Distance = _____ m [1]

(ii) The time taken to run this distance was 1200 s.

Calculate the average speed of the midfield player in m/s.

You are advised to show clearly your working out.

Average speed = _____ m/s [3]

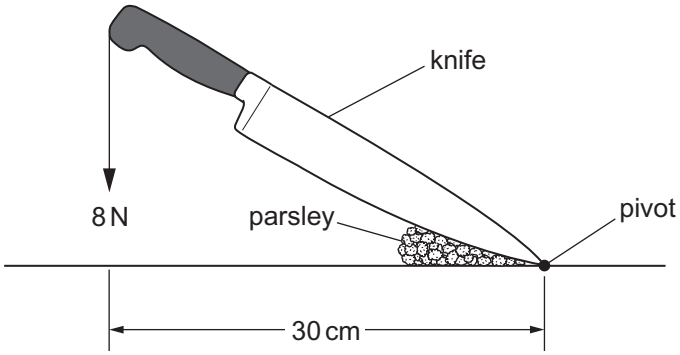
Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

4 The diagram shows a chef using a knife to chop up parsley.
The force exerted by the chef is 8.0 N.



(a) Calculate the moment of the 8.0 N force about the pivot.

You are advised to show clearly your working out.

Moment = _____ N cm [3]

(b) Tick (✓) the correct box to indicate the direction of the moment of the 8.0 N force.

Clockwise	☐
Vertically downwards	☐
Anticlockwise	☐

[1]

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Examiner Only	
Marks	Remark

5 On the planet Jupiter the force of gravity is **five** times that on the Earth.

A spanner weighs 40 N on Earth.

(a) What does the spanner weigh on Jupiter?

_____ N [1]

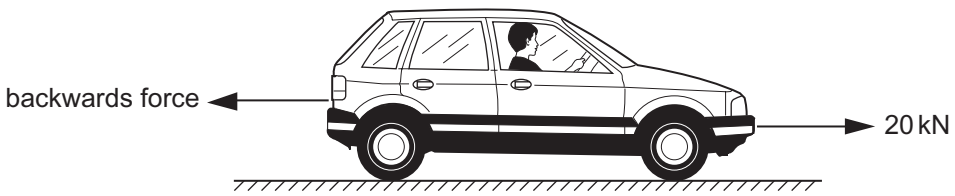
(b) What is the mass of the spanner on Jupiter?

_____ kg [1]

(c) Name the scientific instrument used to measure the weight of the spanner on Jupiter.

_____ [1]

6 A car is moving forwards at a **constant** speed, in a straight line.



(a) The forward force due to the engine is 20 kN.

(i) Tick (✓) the correct statement

The backwards force is less than 20 kN ☐

The backwards force is equal to 20 kN ☐

The backwards force is greater than 20 kN ☐ [1]

(ii) What is the name of the backwards force on the car?

_____ [1]

(b) The forward force due to the engine increases to 30 kN.

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

_____ [1]

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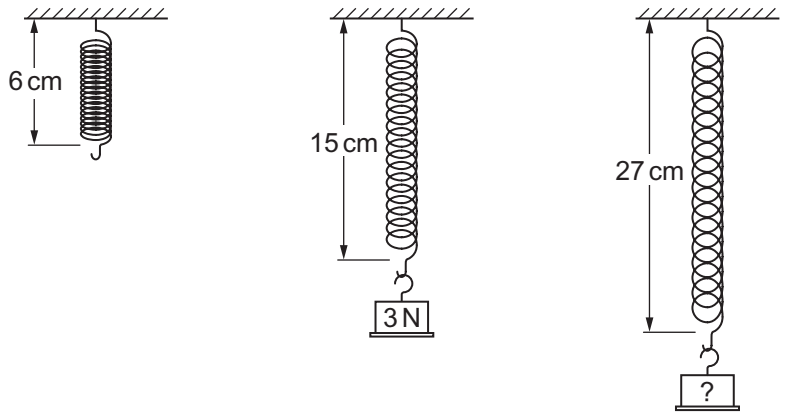
Marks	Remark

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Examiner Only	
Marks	Remark

7 **(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]

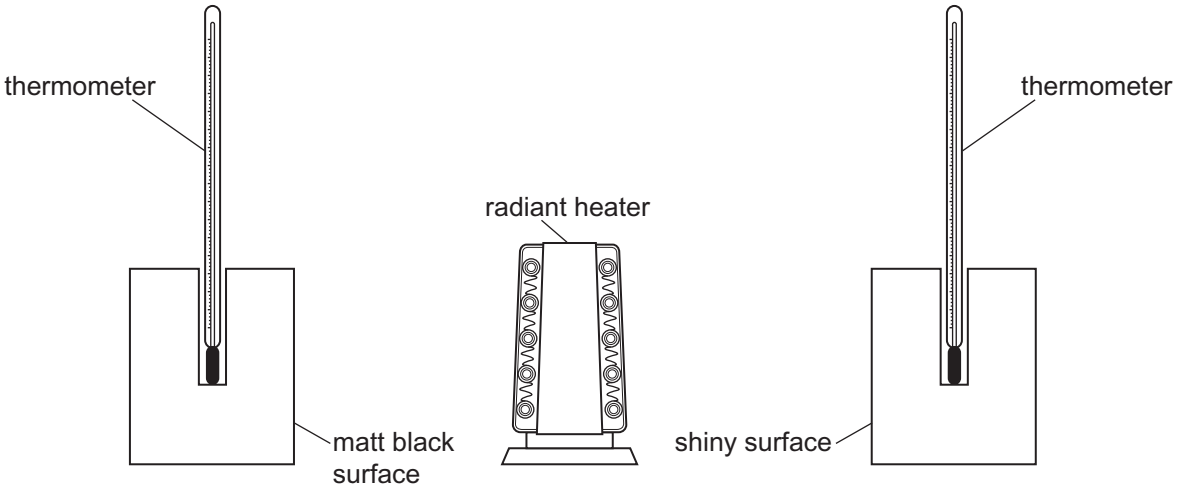
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Examiner Only	
Marks	Remark

8 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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Examiner Only	
Marks	Remark

9 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]

10 **(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.

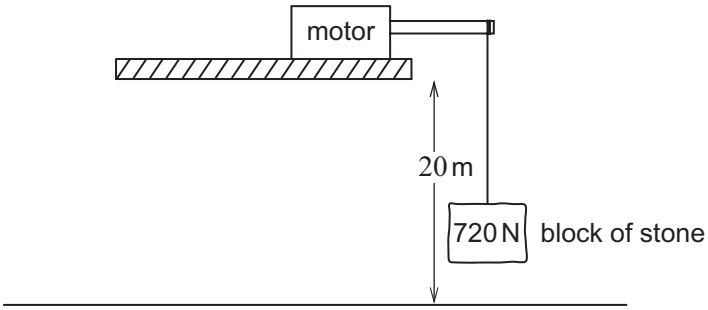
Efficiency = _____ [3]

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Marks	Remark

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11 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.

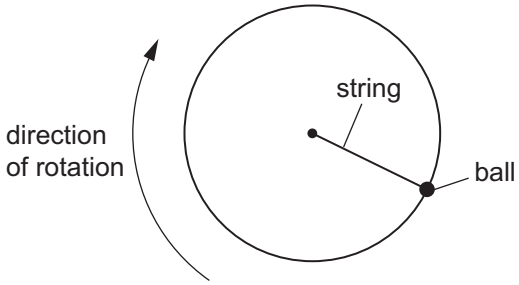
Power = _____ W [3]

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Marks	Remark

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12 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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Marks	Remark

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Rewarding Learning

General Certificate of Secondary Education
2010–2011

Science: Double Award (Modular)

Forces and Energy

End of Module Test

C Foundation Tier

[GDC01]

FRIDAY 25 FEBRUARY 2011, MORNING

MARK SCHEME

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				AVAILABLE MARKS
1	**(i)**	Sound	[1]	
	(ii)	Chemical [1] Heat [1]	[2]	
	(iii)	Chemical [1] Light [1]	[2]	5
2	**(a)**	Any **two** from HEP, tidal, wave	[2]	
	(b) **(i)**	Geothermal	[1]	
	(ii)	Wind	[1]	
	(c) **(i)**	More efficient use (of fuels) or use more renewable sources or use less coal, e.g.	[1]	
	(ii)	Renewable	[1]	6
3	**(i)**	2640 (m)	[1]	
	(ii)	Average speed $= \frac{\text{distance}}{\text{time}}$ [1] $= \frac{2640}{1200}$ [1] ecf from **(i)** $= 2.2$ (m/s) [1]	[3]	4
		Allow ecf from part **(i)**		
4	**(a)**	Moment = force × distance to pivot [1] $= 8 \times 30$ [1] $= 240$ (N cm) [1]	[3]	
	(b)	Anticlockwise	[1]	4
5	**(a)**	200 (N)	[1]	
	(b)	4	[1]	
	(c)	Newtonmeter	[1]	3
6	**(a)** **(i)**	"is equal to"	[1]	
	(ii)	Friction or air resistance	[1]	
	(b)	Accelerates or speeds up	[1]	3

			AVAILABLE MARKS
7	**(a)** 9 cm = 3 N [1] or 1 cm = $\frac{1}{3}$ N [1] or 21 cm = 7 N [1] or 3 N = 9 cm [1] or 1 N = 3 cm [1] or 7 N = 21 cm [1]	[3]	
	(b) **Permanently** deformed	[1]	4
8	**(a)** Black surfaces are better [1] absorbers of heat [1]	[2]	
	(b) Poor radiators of **heat** [1] or reflects **heat** back in [1]	[1]	3
9	P = F/A **or** equivalent [1] = $\frac{650}{0.6}$ [1] = 1 300 [1] N/m^2 **or** Pa [1]	[4]	4
10	**(a)** Contravenes the Law of C of E	[1]	
	(b) Efficiency = $\frac{\text{Useful output energy}}{\text{Input energy}}$ [1] = $\frac{240}{600}$ [1] = 0.4 **or** 40% [1]	[3]	4
11	**(a)** WD = F × d [1] = 720 × 20 [1] = 14 400 (J) [1]	[3]	
	(b) P = $\frac{\text{WD}}{\text{time}}$ [1] = $\frac{14\,400}{24}$ [1] ecf from **(a)** = 600 (W) [1]	[3]	6
12	**(a)** Tension/centripetal force	[1]	
	(b) Momentum = Mass × Velocity [1] = 2.5 × 8 [1] = 20 (kg m/s) [1]	[3]	4
		Total	**50**

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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

Foundation Tier

C

[GDC01]

GDC01

THURSDAY 11 NOVEMBER 2010, 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	
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10	
11	
12	
Total Marks	

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Examiner Only	
Marks	Remark

1 Many power stations in the UK use fossil fuels such as natural gas.

(a) Give the names of two **other** fossil fuels.

1. _____ and 2. _____ [2]

In recent years scientists have been developing renewable energy resources such as solar energy.

(b) Give the names of two **other** renewable energy resources.

1. _____ and 2. _____ [2]

(c) State a reason, other than cost, for developing renewable energy resources.

_____ [1]

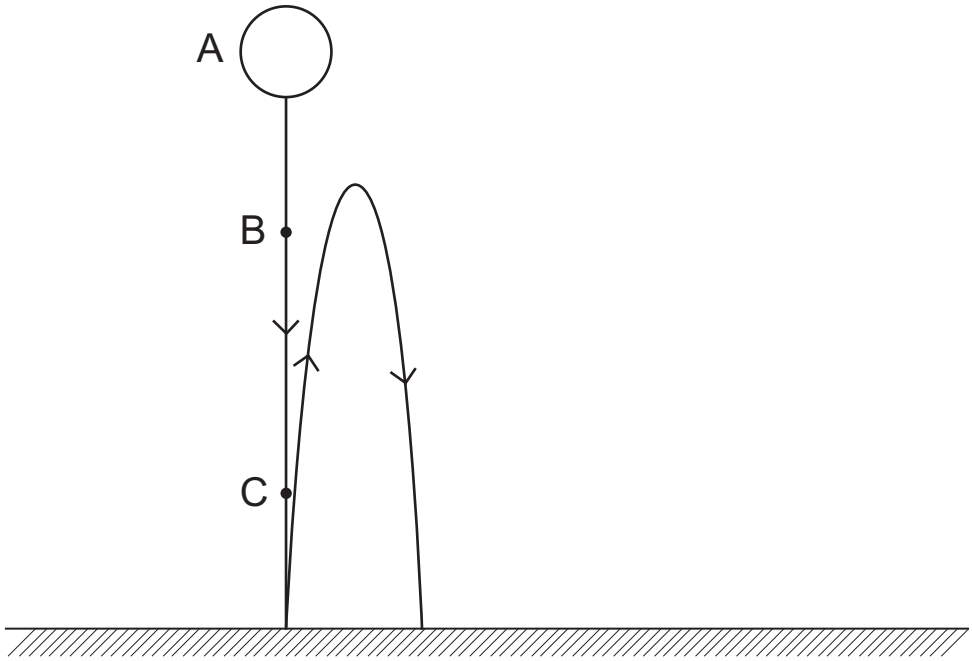
2 A giraffe runs 48 metres in 8 seconds. Calculate the average speed of the giraffe.

You are advised to show your working out.

Average speed = _____ m/s [3]

3 A ball is dropped from rest and allowed to bounce on a hard floor.

The diagram below shows its motion.



(a) (i) What type of energy does the ball have at its starting point A?

_____ energy [1]

(ii) What type of energy does the ball lose as it moves from B to C?

_____ energy [1]

(iii) What type of energy is at a maximum just before the ball hits the floor?

_____ energy [1]

(b) What type of energy is lost when the ball hits the ground?

_____ [1]

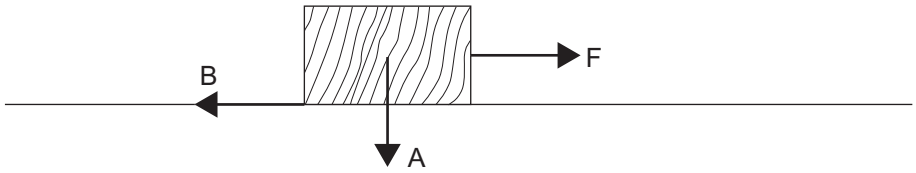
Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

4 Kevin pulls a block of wood over rough surface with a force F.



Other forces act on the block. One force acts in a downward direction and the other in a horizontal direction.

(a) Give the names of the downward force A and the horizontal force B.

Downward force A _____

Horizontal force B _____ [2]

The block is accelerating.

(b) What must happen if it is to move at **constant speed** to the right?

Tick (✔) the correct box.

Force B must become greater than force F. ☐

Force B must become equal to force F. ☐

Force B must become zero. ☐ [1]

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5 A pot of cold water is heated on a gas ring.



The base of the pot is made of copper and the handle is made of wood.

(a) **(i)** What is the method of heat transfer through the base of the pot?

_____ [1]

(ii) What is the method of heat transfer through the water?

_____ [1]

(b) What particle is responsible for heat transfer through the wooden handle?

_____ [1]

(c) What method of heat transfer is reduced by making the outside surface of the copper pot shiny?

_____ [1]

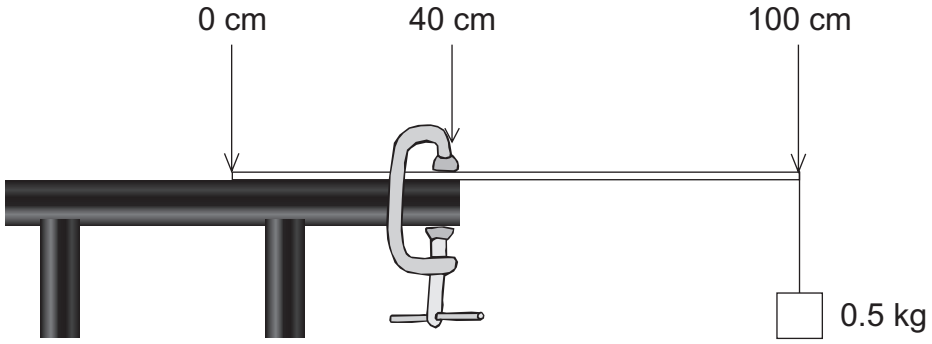
Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

6 A metre stick is clamped to a laboratory bench and a 0.5 kg load is suspended from the metre stick as shown.



The edge of the bench corresponds with the 40 cm mark on the metre stick.

(a) What is the weight of the 0.5 kg load?

Weight = _____ N [2]

(b) **(i)** Calculate the moment exerted by the load in N cm.

You are advised to show your working out.

Moment = _____ N cm [3]

(ii) What is the direction of this moment.

Tick (✔) the correct box.

Clockwise ☐

Anticlockwise ☐

Down ☐ [1]

Examiner Only	
Marks	Remark

7 Flora lifts a bag of potatoes onto a shelf 200 cm high. The bag weighs 80 N.

Calculate the amount of work Flora does in joules.

You are advised to show your working out.

Work = _____ J [4]

8 A jeep and a sports car are shown.



© Hemera/Thinkstock



© Hamann Mot

Give two reasons why the sports car is more stable than the jeep.

1. _____ [1]

2. _____ [1]

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Examiner Only	
Marks	Remark

9 A loudspeaker changes energy from one type to another.



© CVR - Audio

The loudspeaker shown produces 3 J of sound energy for every 75 J of electrical energy input.

(i) Calculate the efficiency of the loudspeaker.

You are advised to show your working out.

Efficiency = _____ [3]

(ii) Circle the unit, if any, for efficiency from the following list.

joule

newton

no unit

watt [1]

(iii) Why can the efficiency of the loudspeaker never be greater than 1?

_____

_____ [1]

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10 A cyclist rides around a bend as shown.



© Cycle Logic Racing

(a) What force allows the cycle to go round the bend?

_____ [1]

The total mass of cyclist and cycle is 115 kg and he goes around the bend at a constant speed of 6 m/s.

(b) Calculate their total momentum.

Remember to include the correct unit.

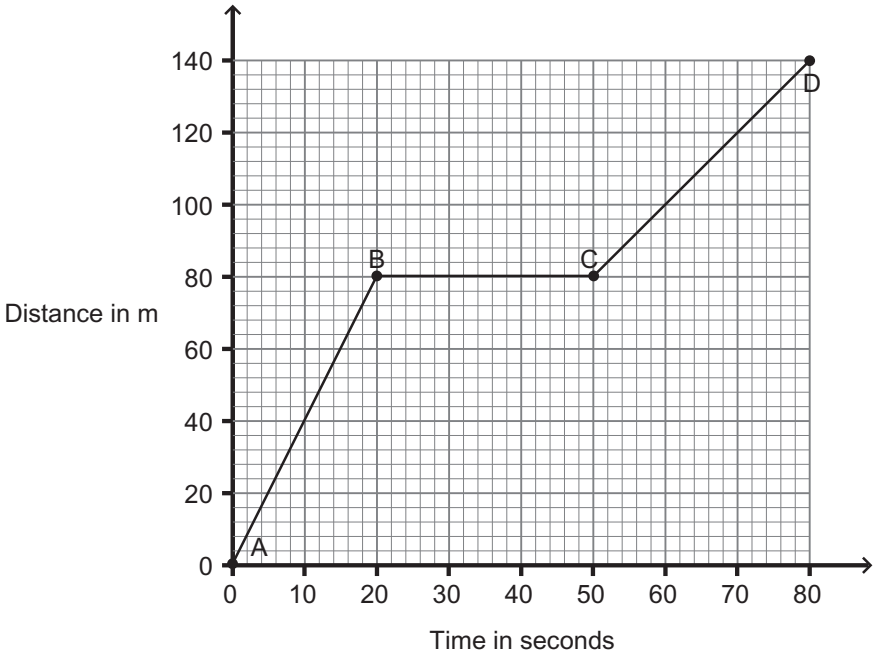
You are advised to show your working out.

Momentum = _____ [4]

Examiner Only

Marks	Remark

11 The distance-time graph for an athlete is shown.



(a) During which region **AB, BC, or CD** is the athlete running fastest? Give a reason for your answer.

Region _____ [1]

Reason _____

_____ [1]

(b) Calculate the athlete's speed during the region **CD**.

You are advised to show your working out.

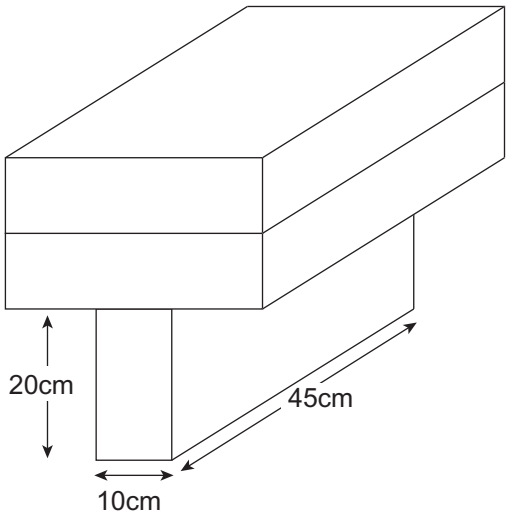
Speed = _____ m/s [3]

Examiner Only

Marks	Remark

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12 The diagram shows three stacked building blocks. Each block has a weight of 300 N.



(a) With the help of the figures on the diagram, calculate the pressure exerted on the ground in N/cm^2.

You are advised to show your working out.

Pressure = _____ N/cm^2 [3]

It is possible to change the bottom block so that the pressure exerted is greater than the value you have calculated.

(b) Suggest how the bottom block should be arranged to give this greater pressure.

_____ [1]

THIS IS THE END OF THE QUESTION PAPER

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Marks	Remark

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110974

Rewarding Learning

General Certificate of Secondary Education
2010–2011

Science: Double Award (Modular)

Forces and Energy

End of Module Test

C

Foundation Tier

[GDC01]

THURSDAY 11 NOVEMBER 2010, AFTERNOON

MARK SCHEME

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			AVAILABLE MARKS
1	**(a)** Any **two** from: coal, oil, lignite, turf (or peat)	[2]	
	(b) Any **two** from: hydroelectric, tidal, geothermal, wind, waves, biomass, wood	[2]	
	(c) Preserve fossil fuels or will never run out Less polluting or less global warming or reduce carbon footprint	[1]	5
2	Av. speed $= \frac{d}{t}$ [1] $= \frac{48}{8}$ [1] = 6 [1] (m/s)	[3]	3
3	**(a)** **(i)** (Gravitational) potential or GPE	[1]	
	(ii) Potential or GPE	[1]	
	(iii) Kinetic or movement or KE	[1]	
	(b) Heat or Sound or Kinetic or KE	[1]	4
4	**(a)** Weight/gravity or gravitational Friction	[1] [1]	
	(b) Equal	[1]	3
5	**(a)** **(i)** Conduction	[1]	
	(ii) Convection	[1]	
	(b) atom/molecule	[1]	
	(c) Radiation	[1]	4
6	**(a)** 5 (N) award [1] for suitable working e.g. W = mg	[2]	
	(b) **(i)** Moment = Force × dist = 5 × 60 e.c.f. from (a) = 300 (N cm)	[1] [1] [1]	
	(ii) clockwise	[1]	6

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			AVAILABLE MARKS
7	W = F × d [1] = 80 × 2 [1] [1] = 160 (J) [1] (Note: 200 cm → 2 m is a free-standing mark)	[4]	4
8	Lower c of g/lower com Wider wheel base or wider base or wider base area	[1] [1]	2
9	**(i)** $E = \frac{\text{energy out}}{\text{energy in}}$ or equiv. or $\frac{EO}{EI}$ $= \frac{3}{75}$ = 0.04 or 4%	[3]	
	(ii) No unit	[1]	
	(iii) Energy wasted, Breaks Principle of Conservation of energy, all output is not sound	[1]	5
10	**(a)** Friction or centripetal force	[1]	
	(b) Momentum = mass × vel. [1] or p = mv = 115 × 6 [1] = 690 [1] kg m/s [1] (or Ns)	[4]	5
11	**(a)** AB Biggest slope/gradient OR biggest distance in same time interval	[1] [1]	
	(b) Speed = grad or $\frac{d}{t}$ [1] $= \frac{60}{30}$ [1] = 2 (m/s) [1]	[3]	5
12	**(a)** $P = \frac{\text{Weight}}{\text{Area}}$ [1] or $\frac{W}{A}$ or $\frac{F}{A}$ $= \frac{900}{450}$ [1] = 2 (N/cm^2) [1]	[3]	
	(b) on 10 cm by 20 cm side/on smallest side	[1]	4
		Total	**50**

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Rewarding Learning

Centre Number	
71	

Candidate Number

General Certificate of Secondary Education
2009–2010

Science: Double Award (Modular)

Forces and Energy
End of Module Test
Foundation Tier

C

[GDC01]

GDC01

THURSDAY 20 MAY 2010, 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	
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10	
11	
12	
Total Marks	

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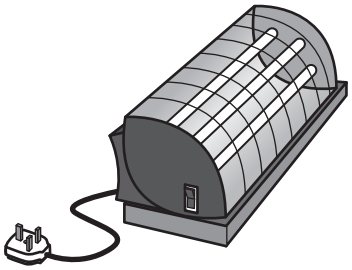
Examiner Only	
Marks	Remark

1 Many devices convert energy from one form to another. Complete the boxes to show the **main** energy change taking place in each device. The first one has been completed for you.



Microphone

Sound energy → Electrical energy



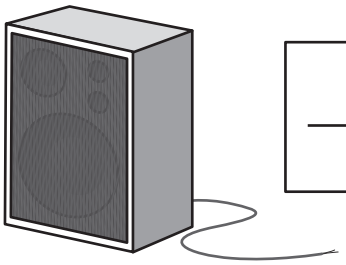
Electric fire

energy → energy



Match

energy → energy



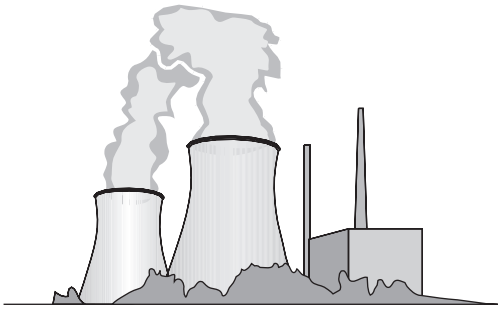
Loudspeaker

energy → energy

[6]

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2 The diagram shows a coal-fired power station.
It burns coal to produce electricity.



(a) (i) Coal is a fossil fuel.
Name two other fossil fuels which may be used to produce electricity.

1. _____

2. _____ [2]

(ii) What is the original source of the energy in all fossil fuels?

_____ [1]

(b) What gas, produced by coal-fired power stations, contributes to the greenhouse effect?

_____ [1]

Examiner Only

Marks	Remark

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3 During a cycling race, a cyclist of mass 60 kg travelled at an average speed of 15 m/s.



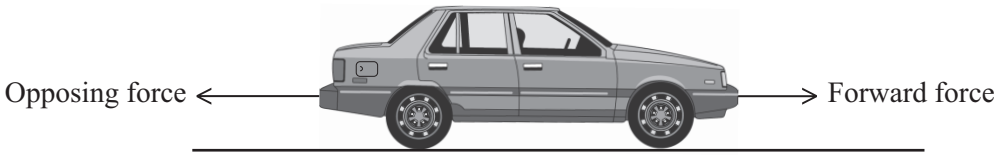
Calculate the average momentum of the cyclist.
Remember to include the units in your answer.
You are advised to show your working out.

Average momentum = _____ [4]

Examiner Only	
Marks	Remark

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4 The diagram shows a car moving to the right.



(a) Name the force opposing the forward motion of the car.

_____ [1]

(b) The forward force is 1800 N when the car is travelling at **constant speed** in a straight line.
What is the size of the opposing force?

Opposing force = _____ N [1]

(c) The driver takes his foot off the accelerator and this reduces the size of the forward force. Describe the motion of the car assuming that the opposing force remains the same as before.

_____ [1]

Examiner Only

Marks	Remark

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5 An ice skater weighs 500 N. The area of the blade of her boot is 2.5 cm^2.



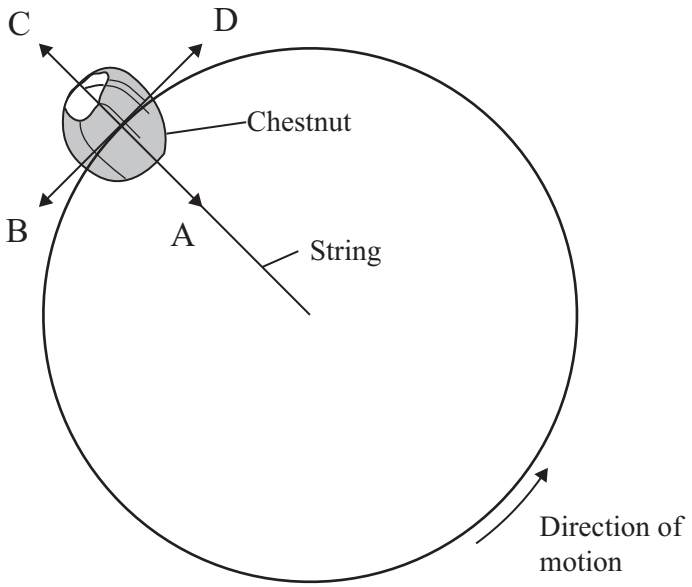
Calculate the pressure the ice skater exerts when only one boot is in contact with the ice.
You are advised to show your working out.

Pressure = _____ N/cm^2 [3]

Examiner Only	
Marks	Remark

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6 A chestnut is whirled in a horizontal circle.



(a) What is the name of the force which keeps the chestnut moving in a circle?

_____ [1]

(b) Which letter, **A**, **B**, **C** or **D**, gives the direction of this force?

Letter _____ [1]

(c) If the string breaks, in which direction, **A**, **B**, **C** or **D**, will the chestnut move?

Letter _____ [1]

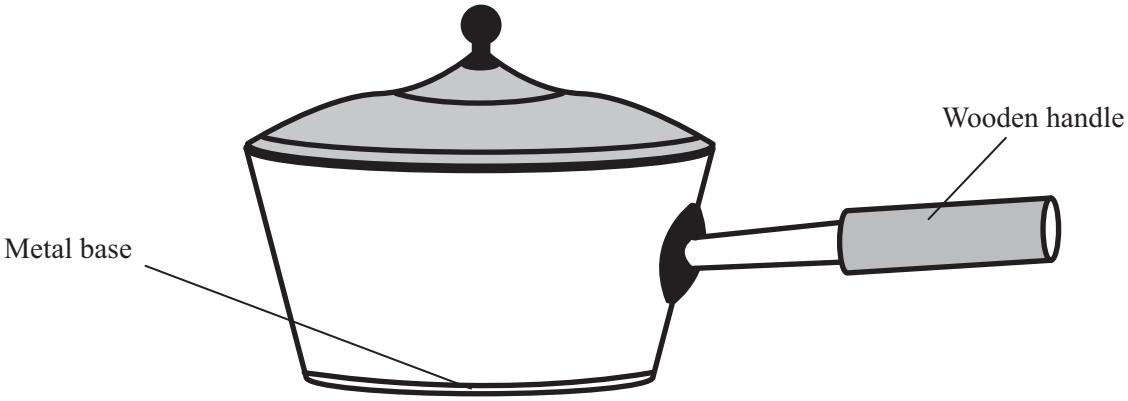
Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

7 **(a)** The diagram below shows a saucepan designed to cook food.



(i) Why is copper a suitable metal for the base of the saucepan?

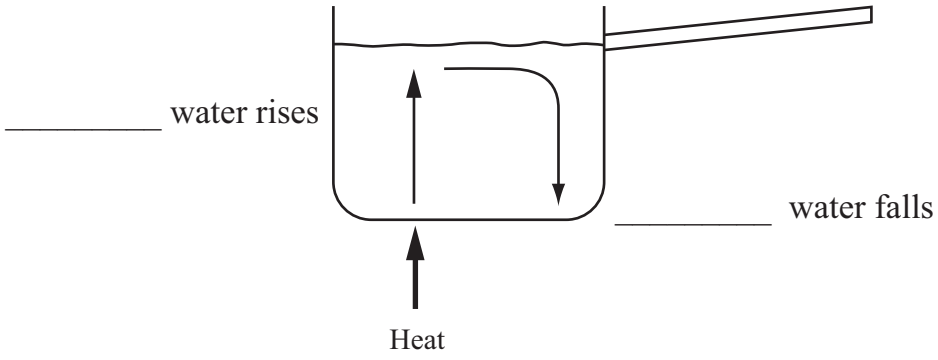
_____ [1]

(ii) Why is the handle of the saucepan made of wood?

_____ [1]

(b) This diagram shows how water in the saucepan becomes hot.

(i) Complete the labels on the diagram.



[2]

(ii) Complete the following sentence.

The movement of the water in the saucepan is called a

_____ current. [1]

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8 **(a)** The table below gives information about three balls. Complete the table.

Ball	Mass	Weight
glass	50 g	0.5 N
brass	250 g	
steel		2.0 N

[2]

The three balls are dropped from the same height at the same instant.

(b) Which ball, if any, will hit the ground first? (Assume air resistance can be ignored.)

Tick (✓) the correct box.

The glass ball will hit the ground first. ☐

The brass ball will hit the ground first. ☐

The steel ball will hit the ground first. ☐

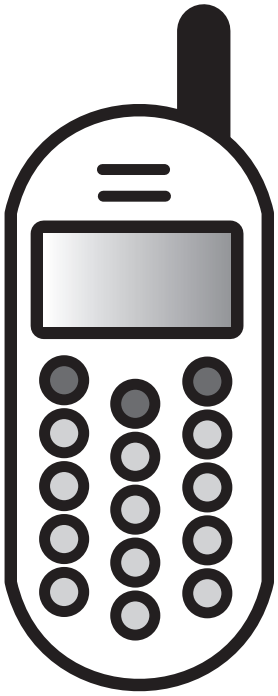
They all hit the ground at the same instant. ☐ [1]

Examiner Only

Marks	Remark

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9 A mobile phone **wastes** 5 J of energy as heat when the input electrical energy is 25 J.



Find the useful output energy and use your answer to calculate the efficiency of the mobile phone.
You are advised to show your working out.

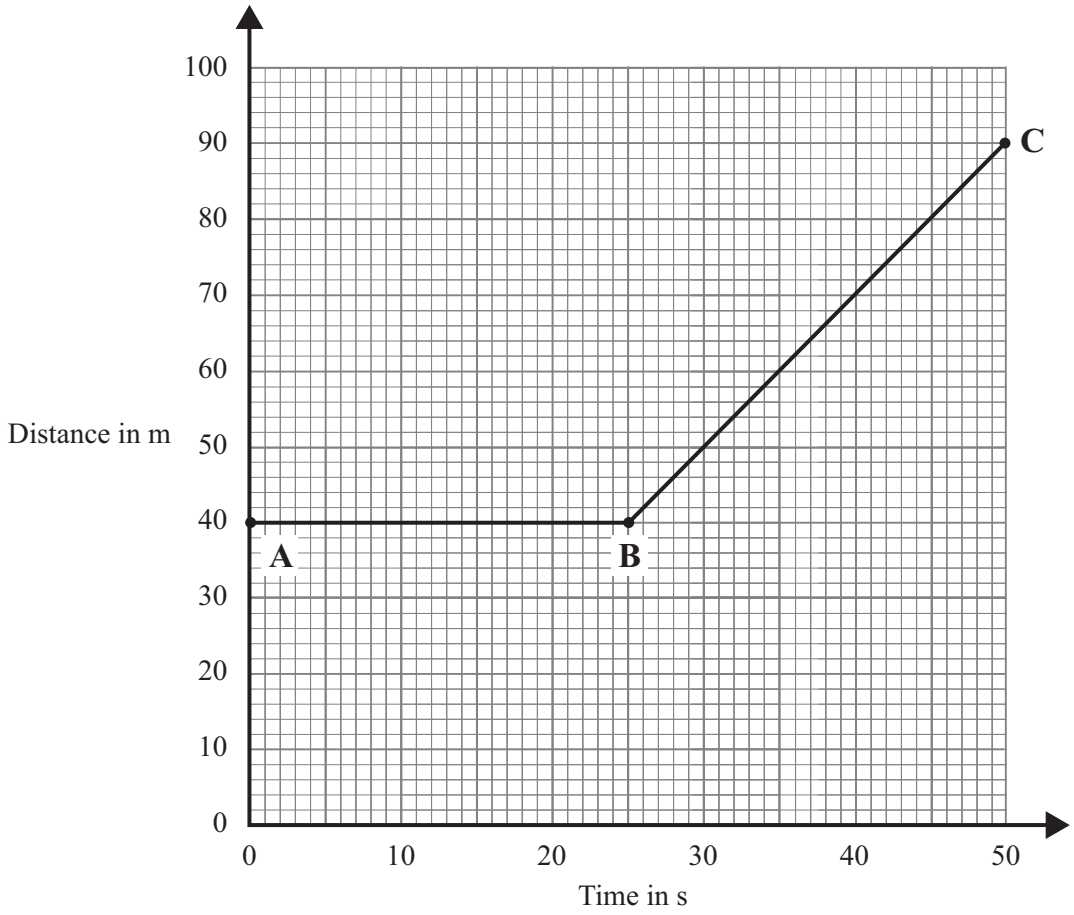
Efficiency = _____ [4]

Examiner Only

Marks	Remark

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10 The distance–time graph for a train is shown below.



(i) Describe the motion of the train from:

A to B. _____

_____

B to C. _____

_____ [2]

(ii) Calculate the average speed of the train between **B and C**.
You are advised to show your working out.

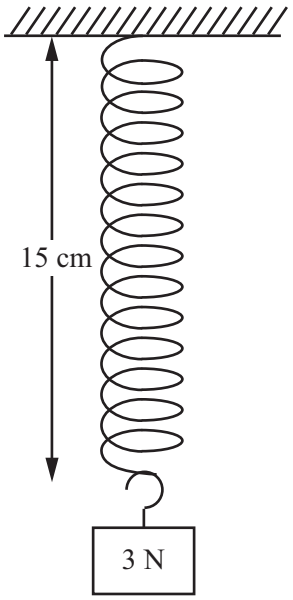
Average speed = _____ m/s [3]

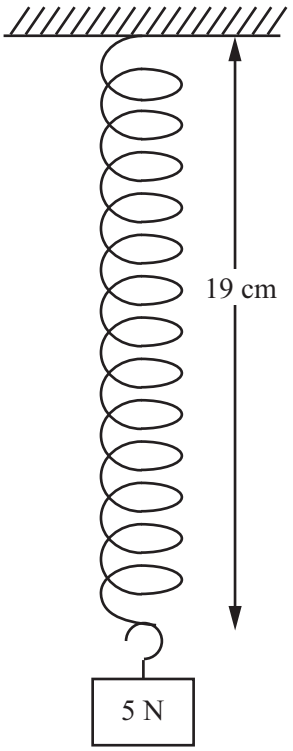
Examiner Only

Marks	Remark

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11 When a load of 3 N hangs from a spiral spring, its total length is 15 cm. When the load is 5 N, the total length is 19 cm.





(i) What extension would be caused by a load of 1 N?
You are advised to show your working out.

Extension = _____ cm [2]

(ii) Calculate the natural (unextended) length of the spring.
You are advised to show your working out.

Natural (unextended) length = _____ cm [2]

Examiner Only

Marks	Remark

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12 The photograph shows the space shuttle *Discovery* taking off.



© *NASA*

(a) The work done by the engines of the space shuttle during lift-off is 9 400 000 J. This takes the space shuttle 5 seconds.
Calculate the average power generated by the engines during lift-off.
You are advised to show your working out.

Average power = _____ W [3]

(b) One of the engines in the space shuttle exerts a force of 11 750 N. In this time interval of 5 seconds, the space shuttle rises to a height of 200 m.
Calculate the work done by this engine.
You are advised to show your working out.

Work done = _____ J [3]

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Marks	Remark

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GCSE

Science: Double Award (Modular)

End of Module Tests

May 2010

Mark Schemes

Issued: October 2010

Rewarding Learning

General Certificate of Secondary Education
2009–2010

Science: Double Award (Modular)

Forces and Energy
End of Module Test
Foundation Tier

[GDC01]

THURSDAY 20 MAY 2010, AFTERNOON

MARK SCHEME

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			AVAILABLE MARKS
1	• Electrical → Heat • Chemical → Heat/Light • Electrical → Sound [1] each	[6]	6
2	**(a)** **(i)** Oil Gas Turf/peat Any 2 for [1] each	[2]	
	(ii) Sun	[1]	
	(b) Carbon dioxide or CO_2	[1]	4
3	Momentum = Mass × Speed [1] = 60 × 15 [1] = 900 [1] kg m/s [1]	[4]	4
4	**(a)** Air resistance/drag/friction	[1]	
	(b) 1800 (N)	[1]	
	(c) Velocity/speed is reduced **or** decelerates	[1]	3
5	Pressure = Force/Area [1] = 500 ÷ 2.5 [1] = 200 [1] (N/cm^2)	[3]	3
6	**(a)** Tension/centripetal	[1]	
	(b) **A**	[1]	
	(c) **B**	[1]	3
7	**(a)** **(i)** good conductor	[1]	
	(ii) poor conductor/insulator	[1]	
	(b) **(i)** hot [1] cold [1]	[2]	
	(ii) convection	[1]	5

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			AVAILABLE MARKS
8	**(a)** 2.5 N [1] 200 g [1] or 0.2 kg	[2]	
	(b) They all hit the ground at the same instant	[1]	3
9	Efficiency = $\frac{\text{Useful output energy}}{\text{Input energy}}$ [1] = $\frac{20}{25}$ [2] showing energy output = 20 J award [1] = 0.8 **or** 80% [1]	[4]	4
10	**(i)** Stationary [1] or stopped [1] Constant speed [1] or steady speed	[2]	
	(ii) (Average) speed = $\frac{\text{(Total) distance}}{\text{(Total) time}}$ [1] = $\frac{50}{25}$ [1] = 2 (m/s) [1]	[3]	5
11	**(i)** 2 N ≡ 4 cm [1] 1 N ≡ 2 cm [1]	[2]	
	(ii) $3 \times 2 = 6$ $15 - 6 = 9$ **or** $5 \times 2 = 10$ [1] $19 - 10 = 9$ [1] Answer = 9 (cm) allow ecf from **(i)** if ext ⩽ 3 cm	[2]	4
12	**(a)** Power = Work done ÷ time [1] or equivalent = 9 400 000 ÷ 5 [1] = 1 880 000 [1] (W)	[3]	
	(b) Work done = Force × distance [1] = 11 750 × 200 [1] = 2 350 000 [1] (J)	[3]	6
		Total	**50**

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Rewarding Learning

Centre Number	
71	

Candidate Number

General Certificate of Secondary Education
2009–2010

Science: Double Award (Modular)

Forces and Energy
End of Module Test
Foundation Tier

C

[GDC01]

GDC01

THURSDAY 25 FEBRUARY 2010, 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	
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7	
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9	
10	
11	
12	
Total Marks	

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Examiner Only	
Marks	Remark

1 **(a)** **(i)** Explain what is meant by a **renewable** resource of energy.

_____

_____[1]

(ii) Give two examples of renewable energy resources.

1. _____

2. _____[2]

Using renewable energy resources saves fossil fuels.

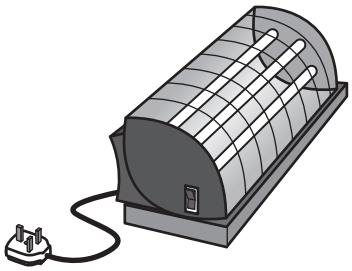
(b) Name two fossil fuels.

1. _____

2. _____[2]

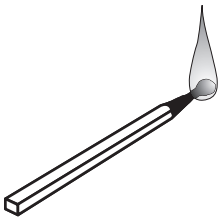
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2 Many devices change energy from one form to another.
Complete the boxes below to show the main energy change which each device is **designed** to bring about.
The first one has been completed for you.



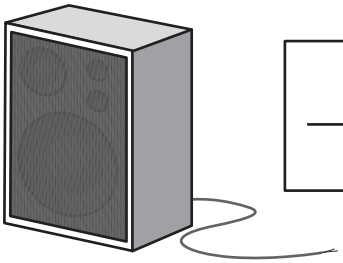
Electric fire

Electrical energy → Heat energy



Match

energy → energy



Loudspeaker

energy → energy

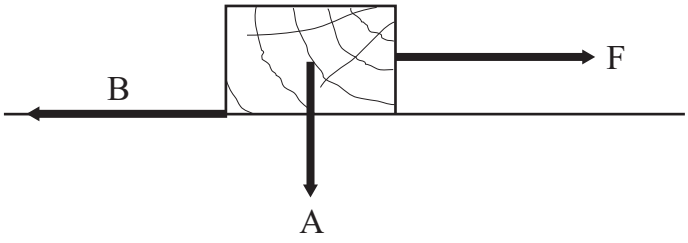
[4]

Examiner Only

Marks	Remark

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3 Patrick pulls a block of wood over a rough surface with a force F.



The diagram shows two other forces acting on the block of wood.

(a) Name the downward force A and the horizontal force B.

Downward force A: _____

Horizontal force B: _____ [2]

(b) The block moves to the right at **constant speed**. Is force B less than, equal to or greater than force F?
Circle the correct answer.

less than

equal to

greater than [1]

(c) Some of Patrick's energy is wasted in overcoming force B. In what form is most of the energy wasted?

Energy wasted as _____ [1]

Examiner Only

Marks	Remark

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4 John stands on a set of laboratory scales and the reading is 650 N. He is then given a suitcase of 25 kg to hold.



(i) What is the new reading on the scales when John is holding the suitcase?

You are advised to show your working out.

Reading on laboratory scales = _____ N [2]

(ii) What physical quantity is being measured by the laboratory scales? Put a tick (✓) in the correct box below.

Mass	☐
Weight	☐
Acceleration	☐

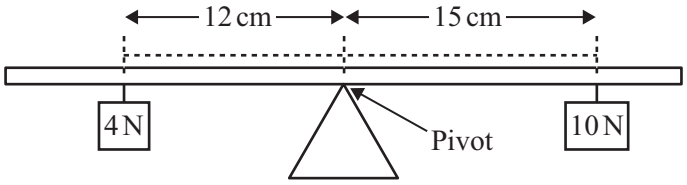
[1]

Examiner Only

Marks	Remark

STEMUP.CO.UK

5 Mary tries to balance a lever by hanging weights from it as shown.
The pivot is at the centre of the lever.



(i) Calculate the anticlockwise moment exerted by the 4 N force about the pivot.
Give your answer in N cm.

You are advised to show your working out.

Anticlockwise moment = _____ N cm [3]

(ii) Calculate the clockwise moment exerted by the 10 N force about the pivot.
Give your answer in N cm.

Clockwise moment = _____ N cm [1]

(iii) Will the lever:

Tip clockwise ☐

or Remain horizontal ☐

or Tip anticlockwise ☐

about the pivot.

Tick (✓) in the correct box. [1]

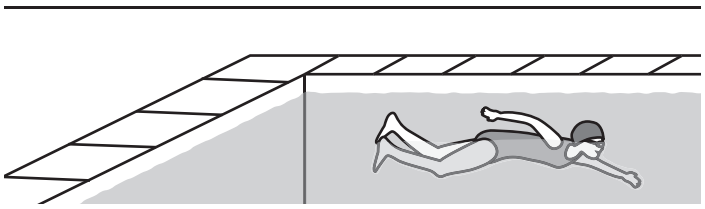
Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

6 Rachel swims two lengths of her 25 m swimming pool. She swims the first length in 18 s and the second length in 22 s.



(a) Calculate the total time taken to complete the two lengths.

Total time = _____ s [1]

(b) Calculate her average speed over the two lengths.

You are advised to show your working out.

Average speed = _____ m/s [3]

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7 A ballet dancer of weight 630 N balances on one toe.



If the area of toe in contact with the floor is 3 cm^2, calculate the pressure exerted on the floor in N/cm^2.

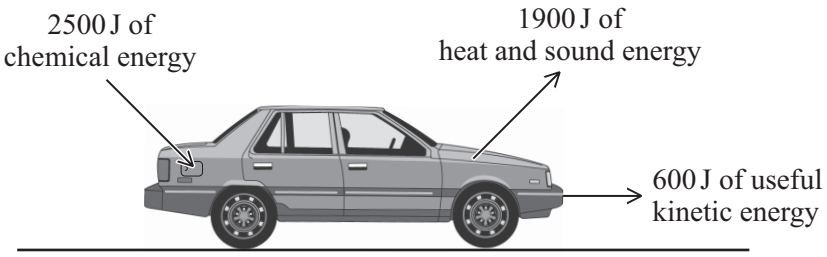
You are advised to show your working out.

Pressure = _____ N/cm^2 [3]

Examiner Only	
Marks	Remark

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8 The diagram below shows what happens to 2500 J of chemical energy input to the engine of a car.



Calculate the efficiency of the car's engine.

You are advised to show your working out.

Efficiency of engine = _____ [3]

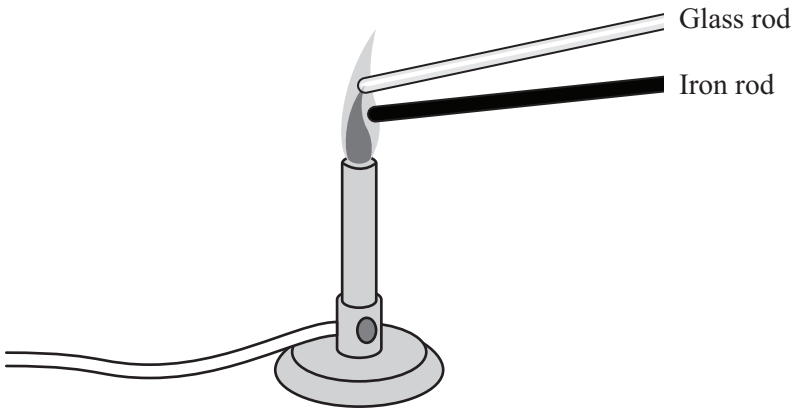
Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

9 Two rods, one made of glass and the other of iron, are placed in a Bunsen flame as shown. The dimensions of the rods are exactly the same.



After each of the statements below, write the letter **G** if the statement applies to glass.
Write **I** if the statement applies to Iron.
If the statement applies to both rods, then put **GI** in the box.

This rod has no free electrons. ☐

Atoms are mainly responsible for heat conduction. ☐

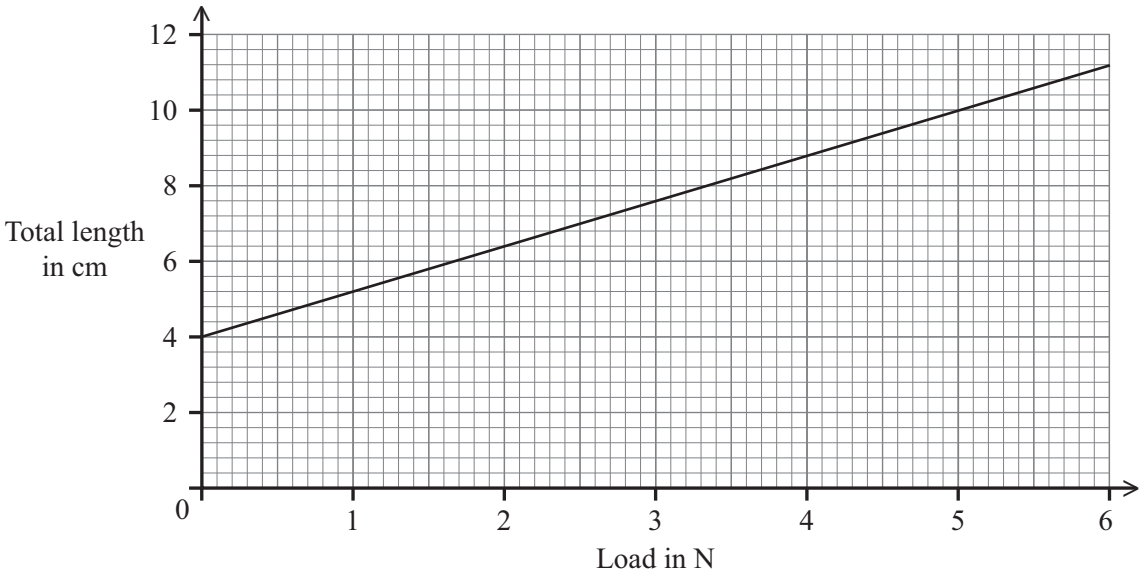
Atoms vibrate more quickly when heat is added. ☐

Heat is transferred when electrons collide with neighbouring atoms. ☐

[4]

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10 The graph below shows results from a Hooke's Law experiment for a steel spring.



(a) Is the load proportional to the total length of the spring?

Tick (✓) the correct box and give a reason for your answer.

Yes ☐

No ☐

Reason: _____ [1]

(b) What is the natural (unextended) length of the spring?

Natural length = _____ cm [1]

(c) An unknown load extends the spring by 6 cm. Use the graph to find the unknown load.

You are advised to show your working out.

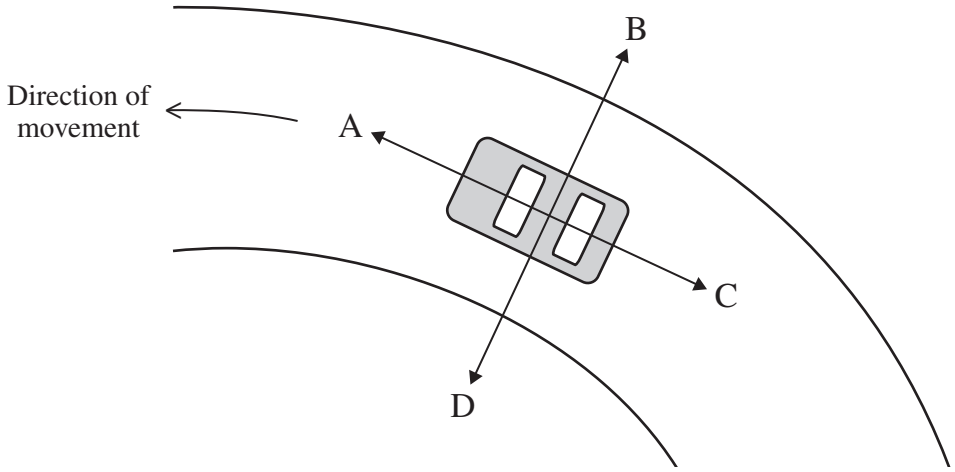
Unknown load = _____ N [2]

Examiner Only

Marks	Remark

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11 The diagram shows a plan view (bird's eye view) of a car going round a circular track.



Four directions, A, B, C and D, are shown.

(a) (i) Which letter indicates the direction of the force which keeps the car moving in a circle?

Letter _____ [1]

(ii) What is the name of this force?

Force _____ [1]

(b) The car has a mass of 1500 kg and it is going at a constant speed of 20 m/s. Calculate the car's momentum.

You are advised to show your working out.

Momentum = _____ kg m/s [3]

Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

12 Patricia wants to calculate the power she develops in running up a flight of steps.



The data sheet below gives one set of results recorded by her classmate.

Data Sheet

Patricia's weight = 700 N
Height of one step = 0.15 m
Number of steps = 20
Time to run up steps = 5 seconds

(a) Use the information in the data sheet to calculate the work done in running up the 20 steps.

You are advised to show your working out.

Work done = _____ J [3]

(b) Use the information in the data sheet and your answer to part **(a)** to calculate the power developed by Patricia.

You are advised to show your working out.

Power developed = _____ W [3]

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THIS IS THE END OF THE QUESTION PAPER

GCSE

Science: Double Award (Modular)

End of Module Tests

March 2010

Mark Schemes

Issued: May 2010

Rewarding Learning

General Certificate of Secondary Education
2009 – 2010

Science: Double Award (Modular)

Forces and Energy
End of Module Test

Foundation Tier

[GDC01]

THURSDAY 25 FEBRUARY, MORNING

MARK SCHEME

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AVAILABLE MARKS

GCSE SCIENCE: DOUBLE AWARD (MODULAR) 2010

Forces and Energy

End of Module Test

Foundation Tier

Mark Scheme

1 **(a)** **(i)** never runs out
or
can be replaced in a lifetime or limitless supply [1]

(ii) **Two** from:
e.g. wind, solar, tidal, biomass, hydroelectric, geothermal [2]

(b) **Two** from:
e.g. coal, oil, gas, natural gas, lignite, turf/peat [2] 5

2 chemical ⟶ heat or thermal [2]

electrical ⟶ sound [2] 4

3 **(a)** A – weight/gravity/gravitational [1]
B – friction [1]

(b) Equal [1]

(c) Heat [1] 4

4 **(i)** 25kg ⟶ 250N [1]

(650 + 250) = 900 (N) [1]

(ii) Weight [1] 3

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				AVAILABLE MARKS
5	**(i)**	Moment $= F \times d$	[1]	
		$= 4 \times 12$	[1]	
		$= 48$ (N cm)	[1]	
	(ii)	Moment $= 150$ (N cm)	[1]	
	(iii)	Clockwise (consistent with above)	[1]	5
6	**(a)**	40(s)	[1]	
	(b)	Av. sp.$= \frac{\text{(total) dist}}{\text{(total) time}}$	[1]	
		$= \frac{50}{40}$ ecf from (a)	[1]	
		$= 1.25$ (m/s)	[1]	4
7		$P = \frac{F}{A}$	[1]	
		$= \frac{630}{3}$	[1]	
		$= 210$ (N/cm^2)	[1]	3
8		$\text{Eff} = \frac{\text{(Useful) energy}}{\text{(Total) energy in}}$	[1]	
		$= \frac{600}{2500}$	[1]	
		$= 0.24$ or 24%	[1]	3
9		G	[1]	
		G	[1]	
		G I	[1]	
		I	[1]	4

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			AVAILABLE MARKS
10	**(a)** No		
	Line does not go through origin	[1]	
	(b) 4 (cm)	[1]	
	(c) Total l = 10 (cm) or line on graph	[1]	
	Unknown load = 5 N ecf from (b)	[1]	4
11	**(a)** **(i)** D	[1]	
	(ii) Friction/centripetal	[1]	
	(b) Momentum = mass × speed or p = mv	[1]	
	= 1500 × 20	[1]	
	= 30 000 (kg m/s)	[1]	5
12	**(a)** W = F × d	[1]	
	= 700 × (20 × 0.15) or 700 × 3	[1]	
	= 2100 (J)	[1]	
	(b) $P = \frac{W.D.}{Time}$	[1]	
	$= \frac{2100}{5}$ (e.c.f.)	[1]	
	= 420 (W)	[1]	6
		Total	**50**

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