



KS3 Science

Energy Transfer

Question Paper

Time available: 30 minutes

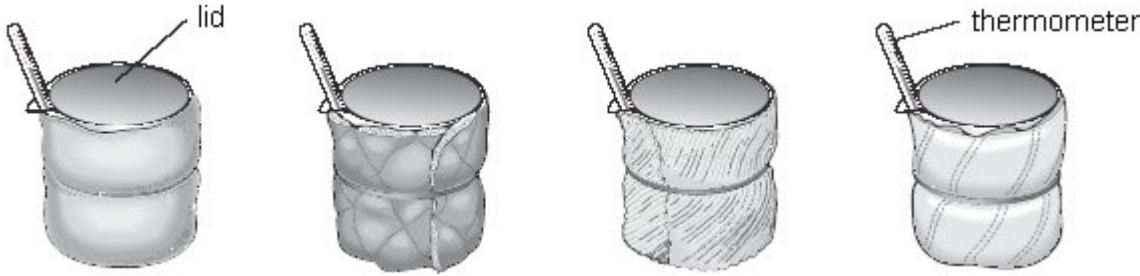
Marks available: 41 marks

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1.

A company has made a new material called 'Wellwarm'. They want to use 'Wellwarm' to make coats.

(a) A scientist tested 'Wellwarm' to see how well it insulated a beaker of hot water. She tested 'Wellwarm' and three other materials as shown below.



material A

material B

material C

material D

She wrapped each beaker in a different material. She recorded the temperature at the start and 20 minutes later.

(i) What was the independent variable that the scientist **changed**?

.....

1 mark

(ii) What was the dependent variable that the scientist **measured** during the investigation?

.....

1 mark

(b) The results of the investigation are shown below.

time (minutes)	temperature of water (°C) wrapped in			
	material A	material B	material C	material D
0	60	60	60	60
20	34	40	38	36

(i) The scientist said that the 'Wellwarm' material is the best insulator. Which material was 'Wellwarm'? Use the results to help you. Tick the correct box.

A B C D

1 mark

(ii) Use the evidence in the results table to explain your choice.

.....
.....

1 mark

(c) The company made a coat from each of the four materials they tested.



A person tested the different coats by wearing each one in a cold room. He measured the temperature inside each coat for 30 minutes.

Write down two **other** variables that should be controlled to make this a fair test.

1.

1 mark

2.

1 mark

(d) Write down one thing the scientists should do to make sure the person testing the coats is safe.

.....

1 mark

(e) Suggest **one** advantage of using a temperature sensor and data logger instead of a thermometer in this experiment.

.....
.....

1 mark
maximum 8 marks

2.

(a) The diagrams below show how much heat is lost from different parts of a house every second.



Through which part of the house above is most heat lost?

.....

1 mark

(b) Part of the house is insulated to reduce the loss of heat. This is shown below.



(i) Which part of the house has been insulated?

.....

1 mark

(ii) Explain your answer.

.....
.....

1 mark

(c) The table below gives information about three fossil fuels that can be used to heat a house.

fuel	physical state	energy released when 1g is burned (J)	Does the fuel produce these substances when burned?	
			water	sulphur dioxide
coal	solid	25000	yes	yes
oil	liquid	42000	yes	yes
methane	gas	55000	yes	no

(i) Which fuel in the table releases the **least** energy when 1 g is burned?

.....

1 mark

(ii) Methane **can** be compressed.
Which information in the table shows that methane can be compressed?

.....

1 mark

(iii) Sulphur dioxide causes acid rain.
Use the table to explain why burning methane does **not** produce acid rain.

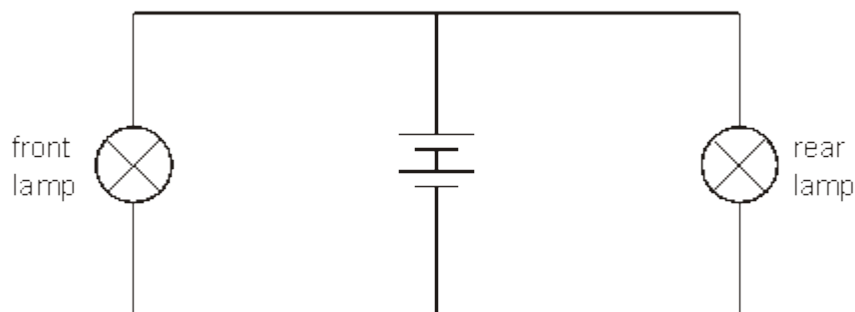
.....
.....

1 mark
maximum 6 marks

3. Nina's bicycle has a front lamp and a rear lamp.
Both lamps are connected to the same battery.



(a) The circuit diagram for the lamps is drawn below.



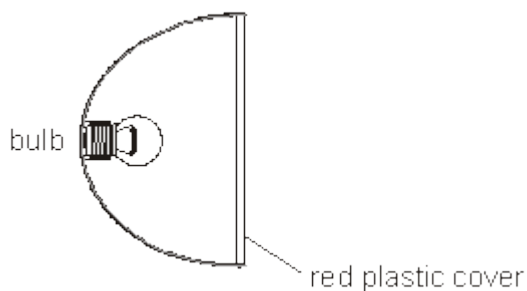
(i) **On the circuit diagram above**, place a letter **A** to show the position of a switch to turn **only** the front lamp on and off.

1 mark

(ii) **On the circuit diagram above**, place a letter **B** to show the position of a switch to turn **both** lamps on and off at the same time.

1 mark

(b) The bulb in the rear lamp gives out white light.
White light is a mixture of all the colours of light.



The plastic cover acts as a red filter.
Red light passes through the filter.

What happens to the other colours that do **not** pass through?

.....

1 mark

- (c) Nina replaces the battery with a generator called a dynamo. When Nina pedals her bicycle, the back wheel turns the generator.

Complete the sentences below using words from the box.

chemical	electrical	gravitational
kinetic	light	sound
	thermal	

As Nina pedals, energy in her muscles is changed to kinetic energy.

When the generator turns, kinetic energy is changed to useful energy in the wires. This energy in the wires is changed to useful energy in the bulb.

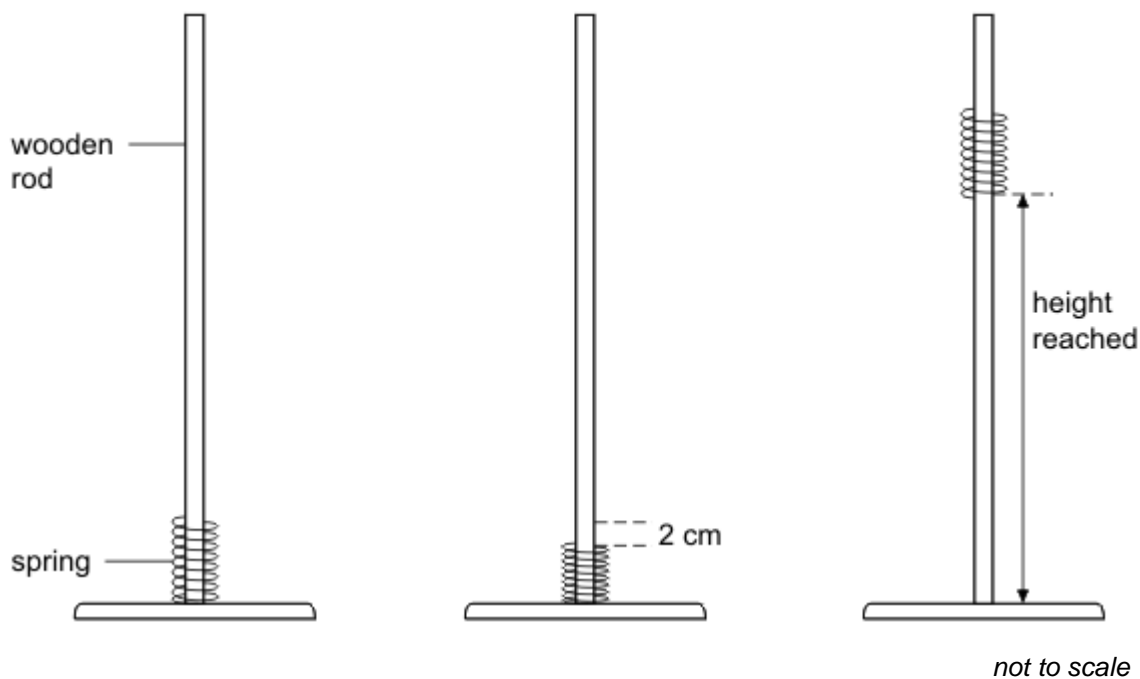
When the lamps are on, some of the energy in the bulb is wasted as energy.

4 marks
maximum 7 marks

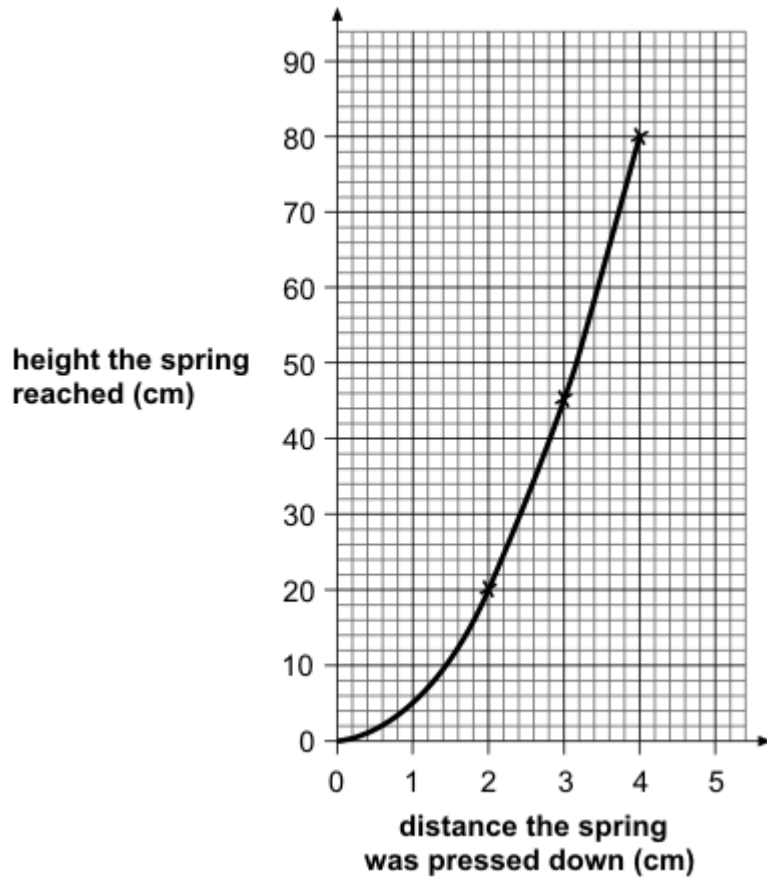
4. Jenny put a spring over a wooden rod.

She pressed the spring down 2 cm.

She let go of the spring and measured the height it reached.



Jenny repeated her experiment. She pressed the spring down more each time. Her results are shown in the graph below.



(a) Use Jenny's graph to complete the table below.

distance the spring was pressed down (cm)	height the spring reached (cm)
2	
3	
4	

1 mark

(b) Jenny said, 'If I double the distance I press the spring down, the height it reaches will also double'.

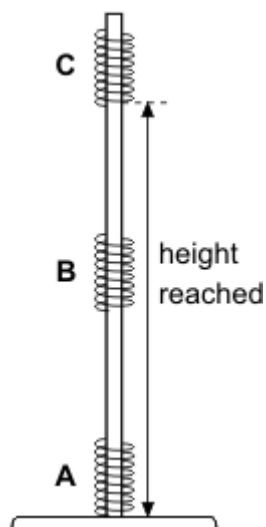
How do the results show she was wrong?

.....

.....

1 mark

(c) This diagram shows the moving spring in three different positions.



Complete the sentences below by choosing words from the box.
You can use each word more than once.

most	some	least
-------------	-------------	--------------

(i) When the spring is moving at **B** it has kinetic energy and
..... gravitational potential energy.

1 mark

(ii) When the spring reaches **C** it has gravitational potential
energy and kinetic energy.

1 mark

(iii) When the spring stops at **A** it has kinetic energy and
..... gravitational potential energy.

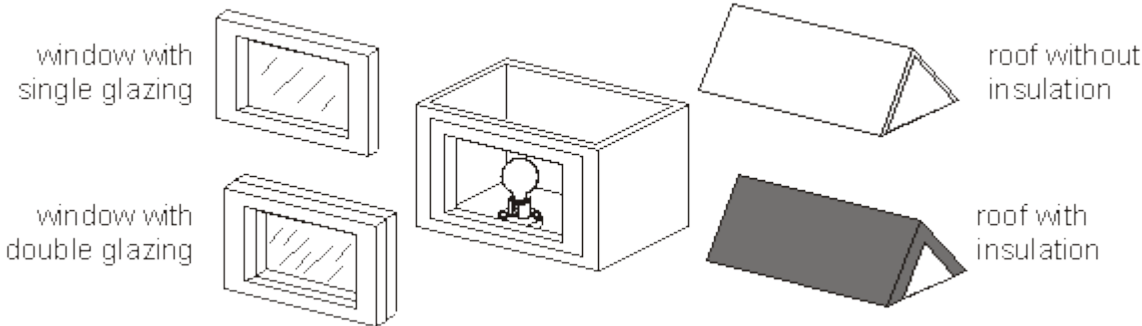
1 mark
maximum 5 marks

5.

Some pupils investigate whether double glazing or roof insulation is more efficient at reducing heat loss from houses.

They have a model house which can have these features:

- window with single glazing
- window with double glazing
- roof without insulation
- roof with insulation.



(a) A temperature sensor and a small lamp are placed inside the house. The lamp is used as a heat source. When the model house reaches a given temperature, **the lamp is switched off**. A datalogger then records temperature regularly over time.

(i) What can the combination of single glazing and **no** roof insulation tell pupils that is relevant to their investigation?

.....

1 mark

(ii) Which **two** combinations **must** they use to find the more efficient way of preventing heat loss in their model house?

..... and

..... and

1 mark

- (b) The pupils predicted that the roof insulation will be more effective than double glazing at reducing heat loss.

What evidence would support this prediction?

.....
.....
.....

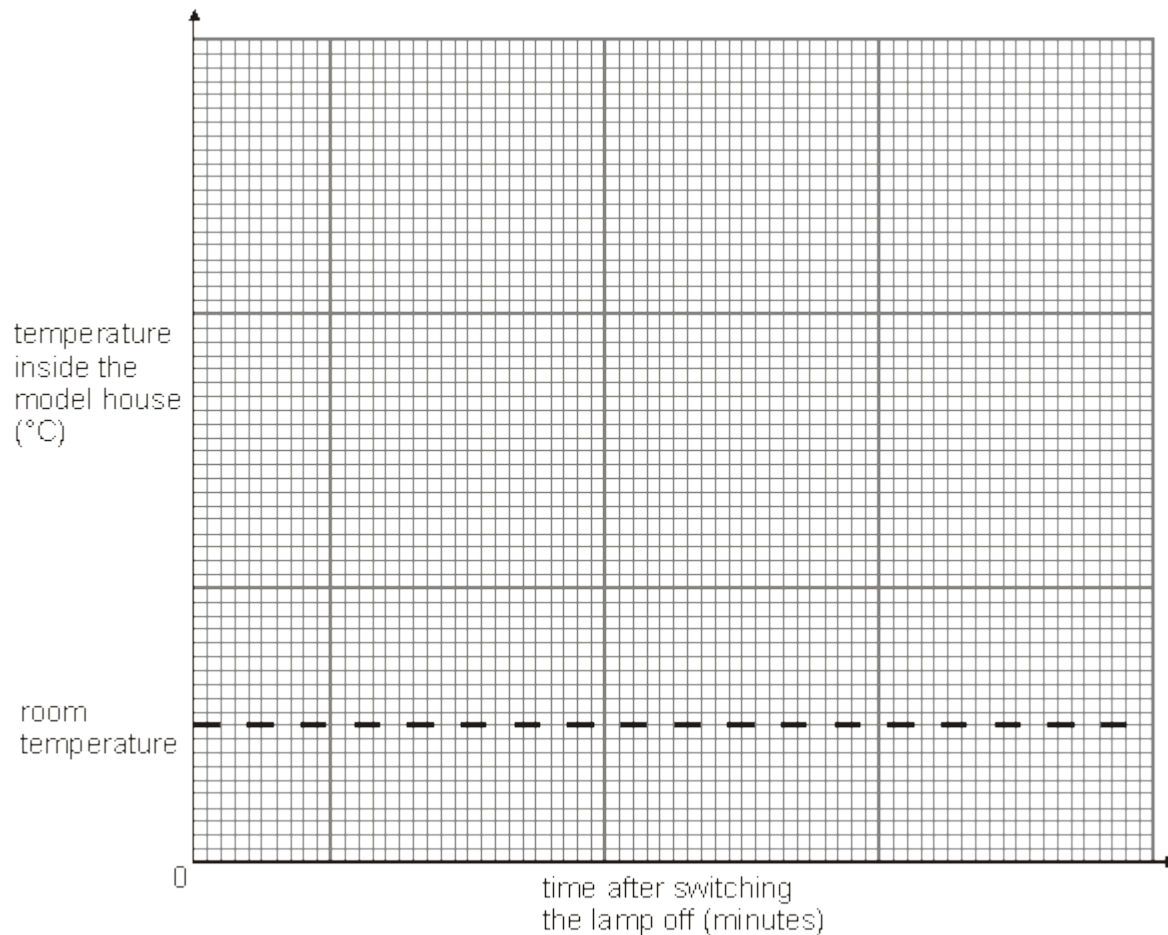
1 mark

- (c) On the grid below, sketch the shape of the two graphs you would expect to see on the datalogger if the pupils' prediction is correct.

You do **not** need to add scales to the axes.

Use a solid line (——) to show the graph for double glazed windows.

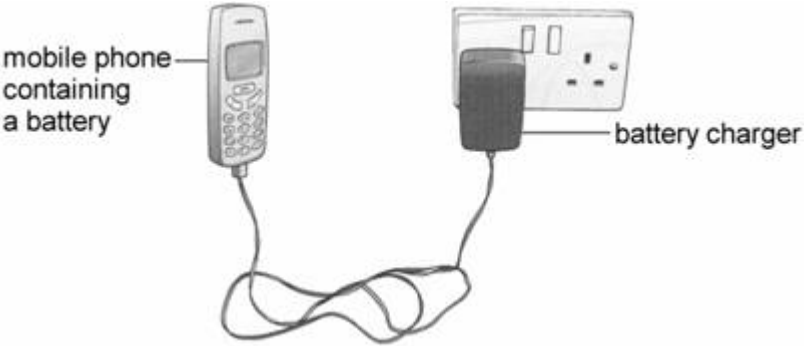
Use a dotted line (-----) to show the graph for roof insulation.



2 marks
maximum 5 marks

6.

(a) Jacque has a mobile phone. Energy is stored in the battery of the phone. The drawing shows the battery being charged.



(i) Which energy transfer takes place in the battery as it is being charged? Tick the correct box.

chemical to sound	<input type="checkbox"/>	sound to thermal	<input type="checkbox"/>
electrical to chemical	<input type="checkbox"/>	thermal to electrical	<input type="checkbox"/>

1 mark

(ii) When the battery is fully charged, Jacque unplugs the phone.

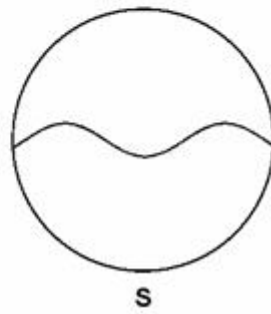
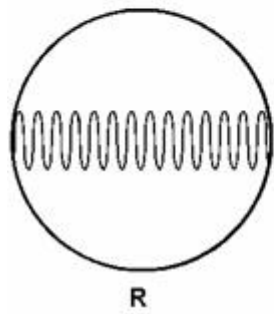
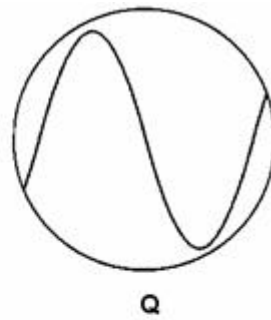
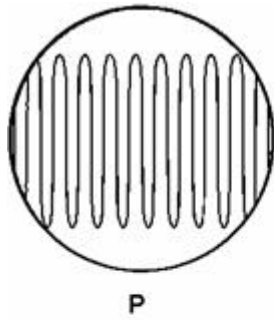
Which energy transfers take place when the mobile phone rings?
Tick the correct box.



chemical to electrical to sound	<input type="checkbox"/>
electrical to chemical to sound	<input type="checkbox"/>
kinetic to electrical to sound	<input type="checkbox"/>
thermal to electrical to sound	<input type="checkbox"/>

1 mark

- (b) Jacquie can change the ring-tone of her phone.
 The diagrams below show the patterns made by four sound waves on an oscilloscope screen.
 They are all drawn to the same scale.

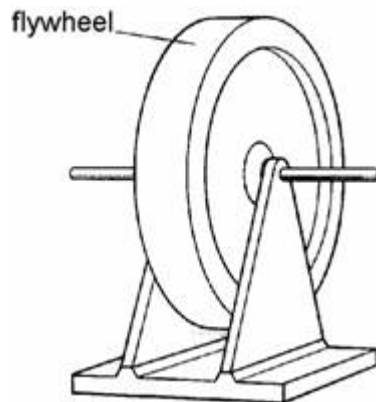


Write the letter of the sound wave that matches each of the descriptions below.

- (i) a loud sound with a low pitch
- (ii) a quiet sound with a high pitch
- (iii) a loud sound with a high pitch

3 marks
 Maximum 5 marks

- 7.** A flywheel is a rotating wheel which is used to store energy.



(a) Energy must be transferred to a flywheel to make it rotate. How is the energy in the rotating flywheel classified?

Tick the correct box.

as chemical energy

as kinetic energy

as potential energy

as thermal energy

1 mark

(b) A flywheel is rotating at a high speed. No energy is being supplied to it. The flywheel is used to turn a dynamo, and the energy from the dynamo is used to light a bulb.

(i) The bulb is left connected until the flywheel stops rotating. Not all the energy stored in the flywheel is transferred to the bulb. Some of it is lost. Give **two** places from which it is lost, and explain how it is lost.

1.
.....

2.
.....

2 marks

(ii) The experiment is repeated using a different bulb which gives out more energy each second. Compared to the first light bulb, describe how the second light bulb will affect the motion of the flywheel, and explain your answer.

.....
.....
.....
.....

2 marks

Maximum 5 marks