Energy and Resources

Energy can be stored, transferred and used in many different ways — understanding energy resources and transfers is a key KS3 physics topic that leads into GCSE Science.

7. The drawings below show six ways of providing energy.



A



B



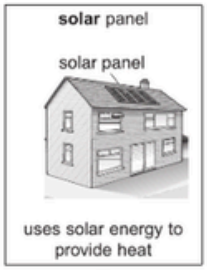
F



C



D



E

(a) From the opposite page, give the names of **two** fossil fuels.

1. _____

2. _____

(b) (i) What is the source of energy for a solar panel?

_____

(ii) Why can the solar panel **not** work at night?

_____

(c) What makes the blades of the turbine in drawing B go round?

_____

7a 1 mark

7a 1 mark

7bi 1 mark

7bii 1 mark

7c

KS3 Science SATs, Tier 3-6, Paper 1 (2007) - Q7

(b) (i) Which part provides energy for the circuit?

_____

8bi
1 mark

(ii) Some of this energy is used to turn the blades.
The rest of the energy is wasted.

Complete the sentence below. Choose words from the list.

chemical **heat** **light** **sound**

When the blades are turning, energy is wasted as

_____ energy and _____ energy.

8bii
1 mark

8bii
1 mark

KS3 Science SATs, Tier 3-6, Paper 1 (2007) - Q8(b)

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.

15c
1 mark

15c
1 mark

15c
1 mark

15c
1 mark

KS3 Science SATs, Tier 3-6, Paper 1 (2008) - Q15(c)

(b) George listens to music on his headphones.

Complete the sentence below using words from the box.

chemical	**electrical**	**gravitational potential**
sound	**thermal**	

The useful energy change in the headphones is from _____

energy into _____ energy.

maximum 5 marks

10b
1 mark

KS3 Science SATs, Tier 3-6, Paper 1 (2009) - Q10(b)

(b) Give **one** advantage and **one** disadvantage of using a solar cell to power the water feature.

advantage _____

_____

disadvantage _____

_____

8b
1 mark

8b
1 mark

KS3 Science SATs, Tier 3-6, Paper 2 (2005) - Q8(b)

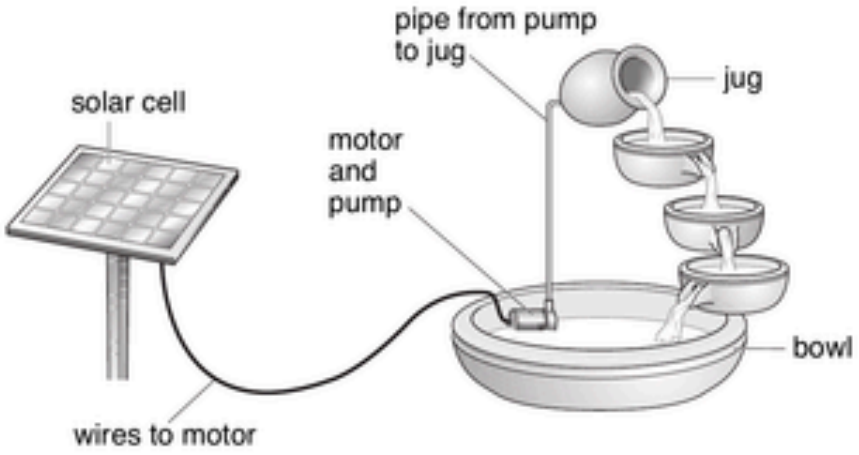
(c) The buggy uses solar panels to generate electrical energy.

The solar panels generate less electrical energy on Mars than on Earth. Give a reason why.

_____

KS3 Science SATs, Tier 5-7, Paper 1 (2007) - Q13(c)

8. The drawing below shows a garden water feature. It is solar-powered.



The solar cell absorbs energy from the Sun.
The solar cell is connected to a motor in the bowl.
The motor drives a pump.
Water is pumped up to the jug and it flows back down to the bowl.

(a) Use the information above to help you to complete the following sentences.
Choose words from the list.

chemical	**electrical**	**gravitational potential**	**kinetic**
light	**sound**	**thermal**	

(i) The useful energy change in the solar cell is from

light to _____ energy. 8ai 1 mark

(ii) The useful energy change in the motor is from

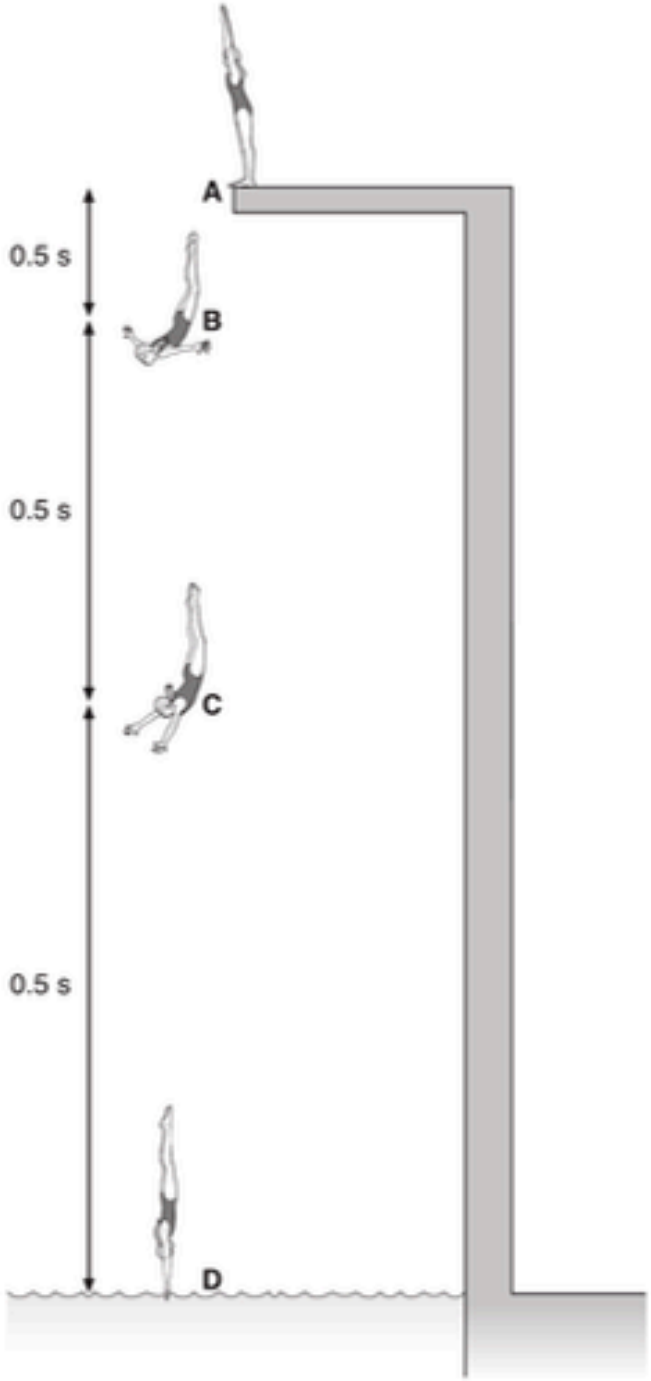
electrical energy to _____ energy. 8aii 1 mark

(iii) As the water flows from the jug to the bowl _____

energy is changed into _____ energy. 8aiii 1 mark 8aiii 1 mark

Modern Tuition

9. The drawings below show Caroline diving into a swimming pool.
As she falls, gravitational potential energy is changed into kinetic energy.



(a) Why does Caroline have **no** kinetic energy at A?

_____

_____

Modern Tuition

(b) The table shows Caroline's gravitational potential energy and kinetic energy at four stages of the dive.

stage of the dive	total energy (kJ)	gravitational potential energy (kJ)	kinetic energy (kJ)
A	8	8	0
B	8	7	1
C	8	4	4
D	8	0	

(i) Write the missing kinetic energy value for stage D in the table.

1 mark

(ii) As Caroline falls there is **no** loss of energy to the air.
How do the energy values for stages A, B, C and D show this?

_____

_____

1 mark

(c) (i) Give the name of the force that causes Caroline to speed up as she falls.

_____

1 mark

(ii) Caroline takes 0.5 s to fall from A to B **and** from B to C **and** from C to D.
How can you tell from the drawings opposite that she is speeding up as she falls?

_____

_____

1 mark

(d) When Caroline enters the water she slows down.
Give the name of the force that slows her down.

_____

1 mark

Modern Tuition

(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	

9a 1 mark

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

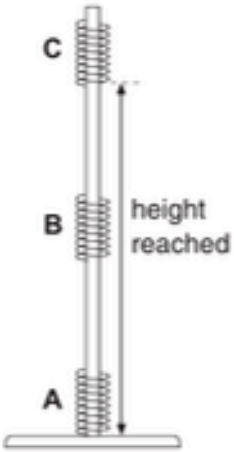
How do the results show she was wrong?

_____

_____

9b 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.

9ci 1 mark

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

9cii 1 mark

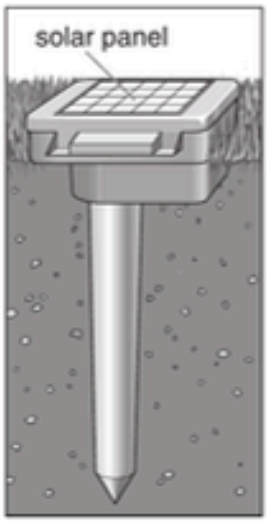
(iii) When the spring stops at **A** it has _____ kinetic energy and _____ gravitational potential energy.

9ciii 1 mark

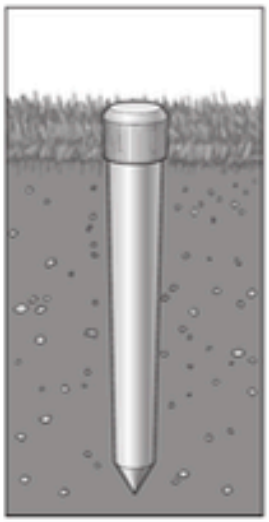
Modern Tuition

(c) Some people use mole-scarers to get rid of moles from their gardens.

Two different mole-scarers are shown below.
They both produce sounds that scare moles away.



solar-powered mole-scarer



battery-powered mole-scarer

(i) Where does the energy come from for the solar-powered mole-scarer?

_____

7ci

1 mark

(ii) Suggest **one** reason for using a solar-powered mole-scarer instead of a battery-powered mole-scarer.

_____

_____

7cii

1 mark

(iii) Some gardeners use poison to kill moles.

Suggest **one** reason for using a mole-scarer rather than poison to get rid of moles.

_____

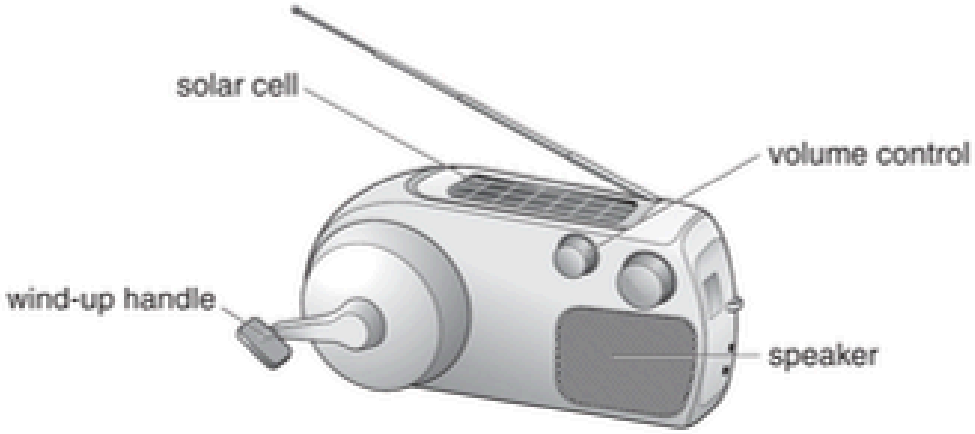
_____

7ciii

1 mark

Modern Tuition

9. Keith has a wind-up radio.
It does **not** use batteries. It is powered by a steel spring.



(a) Keith winds up the spring.
As the spring unwinds, potential energy in the spring is transferred to a generator, which then turns.

The generator provides electrical energy for the radio.

Fill the gaps in the sentences below to show the useful energy changes which take place in the generator and the speaker.

(i) As the generator turns, _____ energy is changed to electrical energy.

1 mark

(ii) In the speaker, electrical energy is changed to _____ energy.

1 mark

Modern Tuition

(b) When Keith turns the volume up so that the radio is louder, the spring unwinds more quickly.

Why does the spring unwind more quickly?

_____

_____

9b

1 mark

(c) The radio has a solar cell which can also provide electrical energy.

Keith winds up his radio and takes it outside without changing the volume. The steel spring unwinds more slowly when sunlight falls on the solar cell. Explain why.

_____

_____

9c

1 mark

(d) The wind-up radio was designed for use in poorer countries.

Suggest why wind-up radios are useful in poorer countries.

_____

_____

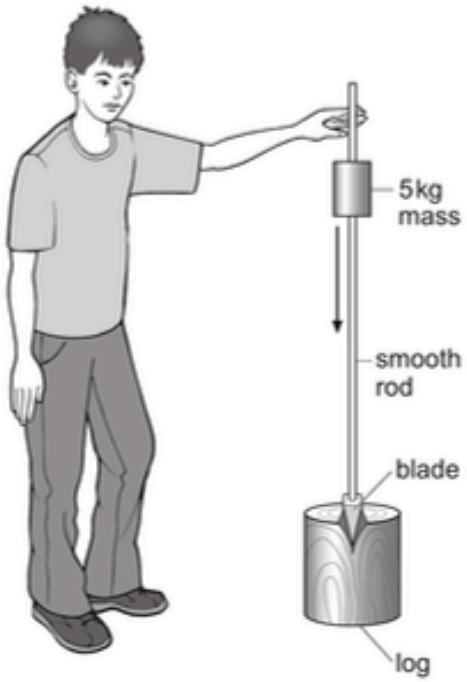
9d

1 mark

Modern Tuition

13. David uses a falling mass to split wooden logs.

The 5 kg mass slides down the rod and hits the metal blade.
The force on the blade splits the log.



(a) To lift the mass David uses energy stored in his muscles.

What energy transfer occurs when David's muscles lift the mass?

13a

1 mark

from _____ energy in his muscles to

gravitational potential energy of the mass

(b) David lifts the mass. The mass gains 50 J of gravitational potential energy. The falling mass changes this energy into kinetic energy.

(i) As it falls, what is the maximum amount of energy the mass can change from gravitational potential energy to kinetic energy?

13bi

1 mark

_____ J

Modern Tuition

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

without insulation



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

_____

4a

1 mark

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

with insulation



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

_____

4bi

1 mark

(ii) Explain your answer.

_____

_____

4bii

1 mark

Modern Tuition

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

fuel	physical state	energy released when 1 g is burned (J)	Does the fuel produce these substances when burned?	
			water	sulphur dioxide
coal	solid	25 000	yes	yes
oil	liquid	42 000	yes	yes
methane	gas	55 000	yes	no

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

_____

4ci

1 mark

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

_____

4cii

1 mark

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

_____

_____

4ciii

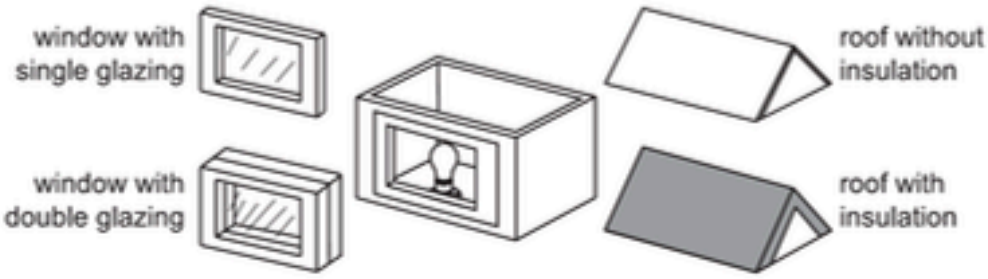
1 mark

Modern Tuition

12. 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?

_____

_____

12ai

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 _____

12aii

1 mark

Modern Tuition

(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?

_____

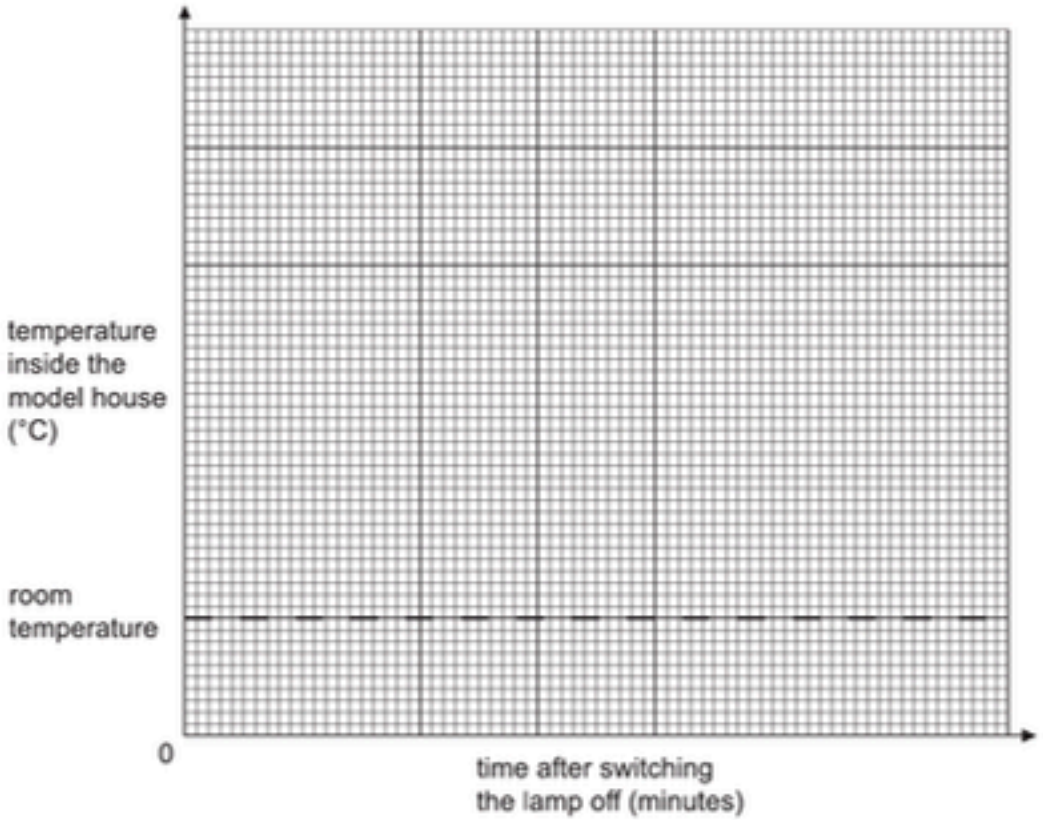
_____

_____

12b
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.



12c
1 mark

12c
1 mark

Modern Tuition