Science

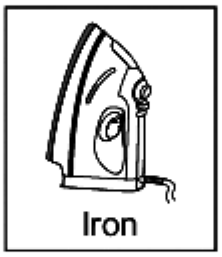
Energy Test

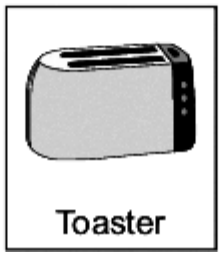
Instructions

1. **Please Answer the questions under Test condition**
2. **Please give the Answer sheet to a Parent**
3. **Once the Test has been done, go through the paper with your Parent**
4. **You can use a Calculator if they is any calculations to be done.**

Q1.

The appliances shown below transfer electrical energy to other types of energy.





(a) The vacuum cleaner is designed to transfer electrical energy to kinetic energy.

Three more of the appliances are also designed to transfer electrical energy to kinetic energy. Which **three**?

Draw a ring around each correct appliance.

3

(b) Which **two** of the following statements are true?

Tick (✓) **two** boxes.

Appliances only transfer part of the energy usefully. ☐

The energy transferred by appliances will be destroyed. ☐

The energy transferred by appliances makes the surroundings warmer. ☐

The energy output from an appliance is bigger than the energy input. ☐

(2)

(Total 5 marks)

Q2.

Figure 1 shows a mobile phone being recharged by a portable power source.

Figure 1

(a) Why does the battery in the phone need recharging?

Tick **one** box.

The store of chemical energy in the battery has reduced. ☐

The store of thermal energy in the battery has reduced. ☐

The store of kinetic energy in the battery has reduced. ☐

The store of gravitational energy in the battery has reduced. ☐

(1)

(b) The power source provides a current of 1.86 A at a potential difference of 3.90 V

Calculate the power of the power source.

Use the equation:

power = potential difference × current

Choose the correct unit from the box.

C	J	W

Power = _____

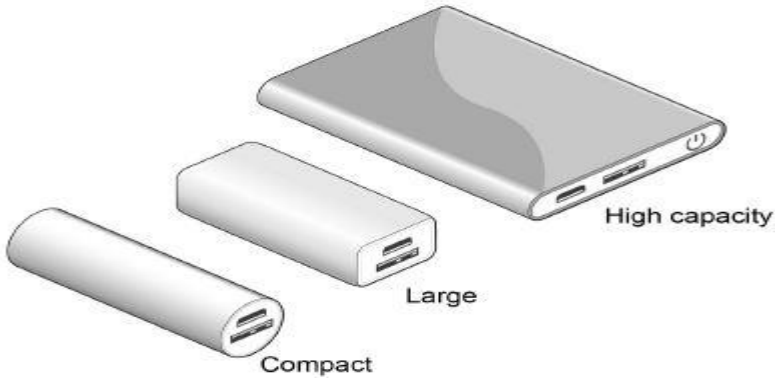
Unit _____

(3)

(c) A student needs a new power source.

Figure 2 shows three different sized power sources.

Figure 2



The table below gives data about the different power sources.

Power source	Number of charges	Mass in grams
Compact	1	100
Large	5	200
High capacity	10	600

The student chose the large power source.

Suggest why the student chose the large power source.

_____

_____

_____

_____

_____

_____

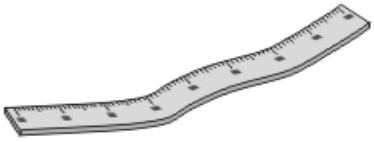
_____

(4)

(Total 8 marks)

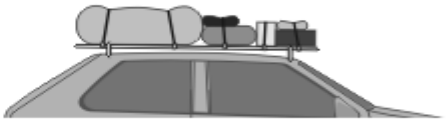
Q3.

(a) The pictures show four objects. Each object has had its shape changed.



Bent metal ruler

A



Stretched bungee cords

B

Springs on a playground ride

C

Moulded plastic model car body

D

Which of the objects are storing elastic potential energy?

_____

Explain the reason for your choice or choices.

_____

_____

_____

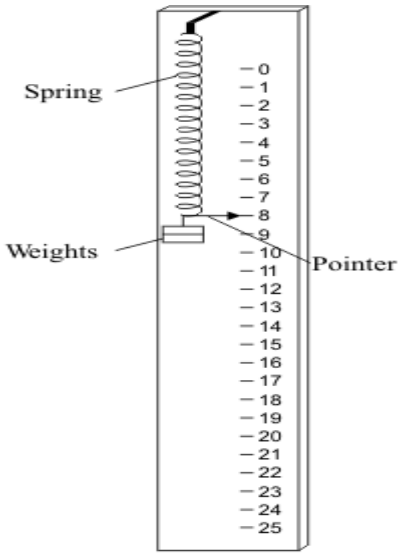
_____

_____

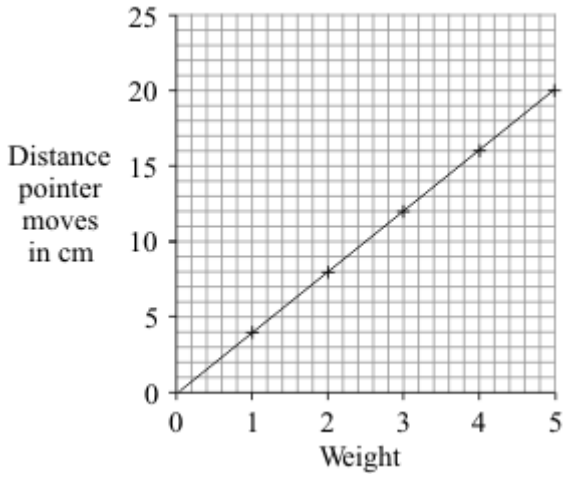
_____

(3)

(b) A student makes a simple spring balance. To make a scale, the student uses a range of weights. Each weight is put onto the spring and the position of the pointer marked



The graph below shows how increasing the weight made the pointer move further.



(i) Which **one** of the following is the unit of weight?.

Draw a ring around your answer.

joule **kilogram** **newton** **watt**

(1)

(ii) What range of weights did the student use?

_____

(1)

(iii) How far does the pointer move when 4 units of weight are on the spring?

_____

(1)

(iv) The student ties a stone to the spring. The spring stretches 10 cm.

What is the weight of the stone?

_____

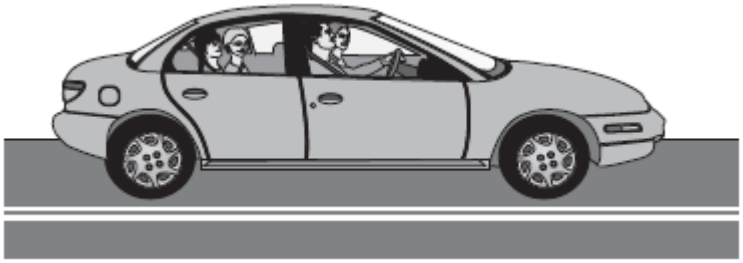
(1)

(Total 7 marks)

Q4.

The figure below shows a car with an electric motor.

The car is moving along a flat road.



(a) (i) Use the correct answers from the box to complete each sentence.

light	**electrical**	**kinetic**	**potential**	**sound**

The car's motor transfers _____ energy

into useful _____ energy as the car moves.

Some energy is wasted as _____ energy.

(3)

(ii) What happens to the wasted energy?

_____

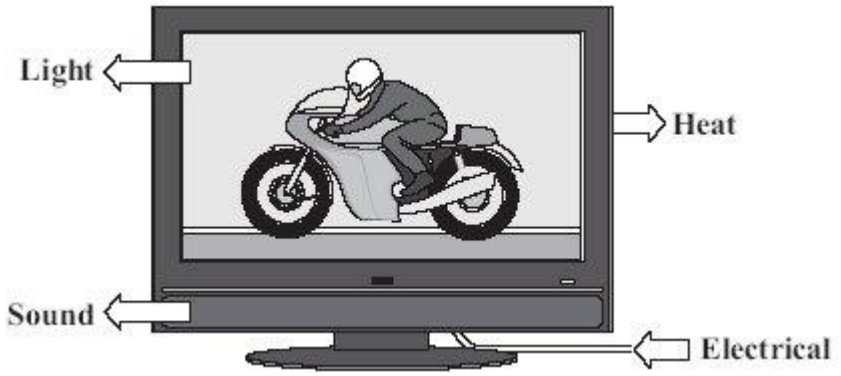
_____

(1)

(Total 4 marks)

Q5.

The diagram shows the energy transformations produced by a TV.



(a) Use words from the diagram to complete the following sentence.

The TV is designed to transform _____ energy into

light and _____ energy.

(2)

(b) Which **one** of the following statements is **false**?

Put a tick (✓) in the box next to the **false** statement.

The energy transformed by the TV makes the surroundings warmer.	☐
The energy transformed by the TV becomes spread out.	☐
The energy transformed by the TV will be destroyed.	☐

(1)

(c) Two different makes of television, **A** and **B**, transform energy at the same rate. Television **A** wastes less energy than television **B**.

Complete the following sentence by drawing a ring around the correct line in the box.

Television **A** has

a higher efficiency than
the same efficiency as
a lower efficiency than

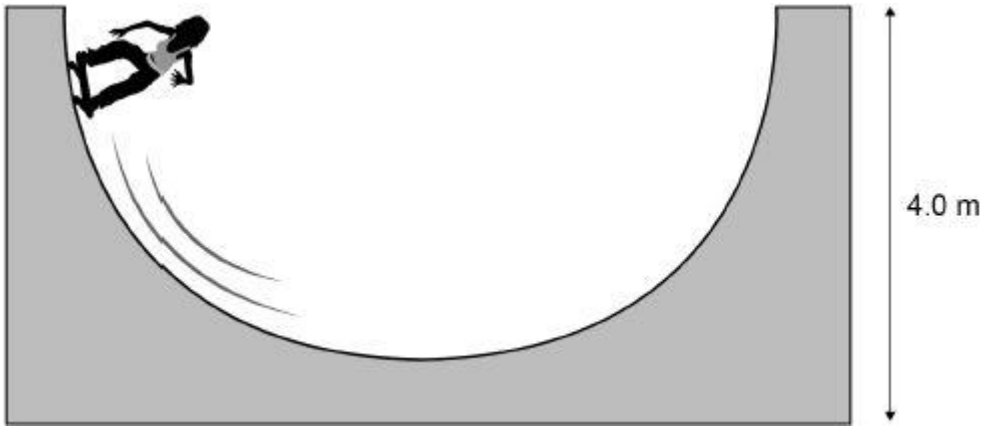
television **B**.

(1)

(Total 4 marks)

Q6.

The diagram below shows a girl skateboarding on a semi-circular ramp.



The girl has a mass of 50 kg

(a) Calculate the gravitational potential energy (g.p.e.) of the girl at the top of the ramp.

Use the equation:

g.p.e. = mass × gravitational field strength × height

gravitational field strength = 9.8 N/kg

_____

_____

g.p.e. = _____ J

(2)

(b) The girl has a speed of 7 m/s at the bottom of the ramp.

Calculate the kinetic energy of the girl at the bottom of the ramp.

Use the equation:

kinetic energy = 0.5 × mass × $(\text{speed})^2$

_____

_____

Kinetic energy = _____ J

(2)

(c) Not all of the g.p.e. has been transferred to kinetic energy.

Which **two** statements explain why?

Tick **two** boxes.

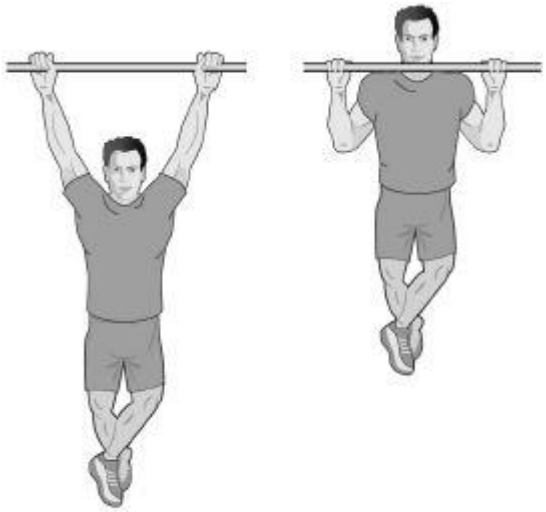
Some energy is wasted.	☐
The mass of the girl is too low.	☐
The ramp is not high enough.	☐
The g.p.e. of the girl is not zero.	☐
The speed of the girl is too great.	☐

(2)

(Total 6 marks)

Q7.

The diagram below shows a man doing two stages of a pull up. In both diagrams the man is stationary.



(a) Complete the sentence.

Choose the answers from the box.

equal to	**less than**	**more than**

In stage 1 the downwards force of the man on the bar is _____

the upwards force of the bar on the man.

(1)

(b) The man has a mass of 85 kg

Gravitational field strength = 9.8 N/kg

Calculate the weight of the man.

Use the equation:

weight = mass × gravitational field strength

_____

_____

Weight = _____ N

(2)

(c) The man raises his body a vertical distance of 0.63 m to go from stage 1 to stage 2

Calculate the work done by the man.

Use your answer to part **(b)**

Use the equation:

work done = force × distance

_____

_____

Work done = _____ J

(2)

(d) The man was **not** moving at stage 2

How much work is done by the man at stage 2?

Work done = _____ J

(1)

(e) A woman uses the bar to do a pull up.

The woman has a mass of 62 kg

She accelerates at 11 m/s^2

Calculate the resultant force on the woman.

Use the equation:

force = mass × acceleration

_____

_____

Force = _____ N

(2)

(Total 8 marks)

Mark schemes

Q1.

(a) fan

1

drill

1

washing machine

*four circled including correct three scores **1** mark*
five circled scores zero

1

(b) Appliances only transfer part of the energy usefully

1

The energy transferred by appliances makes the surroundings warmer

1

[5]

Q2.

(a) the store of chemical energy in the battery has reduced

1

(b) P = 3.90 × 1.86

1

P = 7.254

allow 7.25 or 7.3

1

W

1

(c) **comparison with compact power source**

5 times as many charges

1

(only) twice the mass

allow (only) twice as heavy as the compact

1

comparison with the high capacity power source

although half the number of charges

1

(only) one third the mass

allow (only) a third as heavy as the high capacity

1

or

calculation of charge / mass ratio for large power source

$= \frac{5}{200}$ (1)

allow mass / charge ratio

$= \frac{200}{5}$

= 0.025 (1)

allow 40

calculation of charge / mass ratio for high capacity and compact power sources (1)

allow mass / charge ratio

charge / mass ratio greatest for large source (1)

allow lowest mass / charge ratio

[8]

Q3.

(a) **B** or bungee cords

1

C or springs or playground ride

*each additional answer loses **1** mark minimum mark zero*

1

will go back to original shape/size

1

(b) (i) newton

1

(ii) 0 – 5 (N) or 5

accept1 – 5 (N)
*do **not** accept 4*

1

(iii) 16 (cm)

1

(iv) 2.5 (N)

accept answer between 2.4 and 2.6 inclusive

1

[7]

Q4.

(a) (i) electrical

correct order only

1

kinetic

1

sound

1

(ii) transferred into surroundings / atmosphere

accept warms the surroundings
allow released into the environment
becomes heat or sound is insufficient

1

Q5.

(a) electrical

1

sound

correct order only

1

(b) the energy transformed by the TV will be destroyed

1

(c) a higher efficiency than

1

[4]

Q6.

(a) $E_p = 50 \times 9.8 \times 4.0$

1

$E_p = 1960$ (J)

allow an answer rounded to 2000 (J)

1

*allow a maximum of **1** mark if g = 10 N/kg is used*
*an answer of 1960 scores **2** marks*

(b) $E_k = 0.5 \times 50 \times 7^2$

1

$E_k = 1225$ (J)

allow 1200 or 1230 (J)

1

*an answer of 1225 scores **2** marks*

(c) some energy is wasted

1

the g.p.e of the girl is not zero

1

[9]

Q7.

(a) equal to

1

(b) weight = 85 × 9.8

1

weight = 833 (N)

allow weight = 830 (N)

1

*an answer of 833 (N) **or** 830 (N) scores **2** marks*

(c) work done = 833 × 0.63

*allow their calculated value from part **(b)** × 0.63*

1

work done = 525 (J)

*allow an answer that is consistent with their calculated value from part **(b)***

1

*an answer that rounds to 525 (J) scores **2** marks*

(d) work done = 0 (J)

1

(e) force = 62 × 11

1

force = 682 (N)

allow force = 680 (N)

1

*an answer of 682 (N) **or** 680 (N) scores **2** marks*

[8]