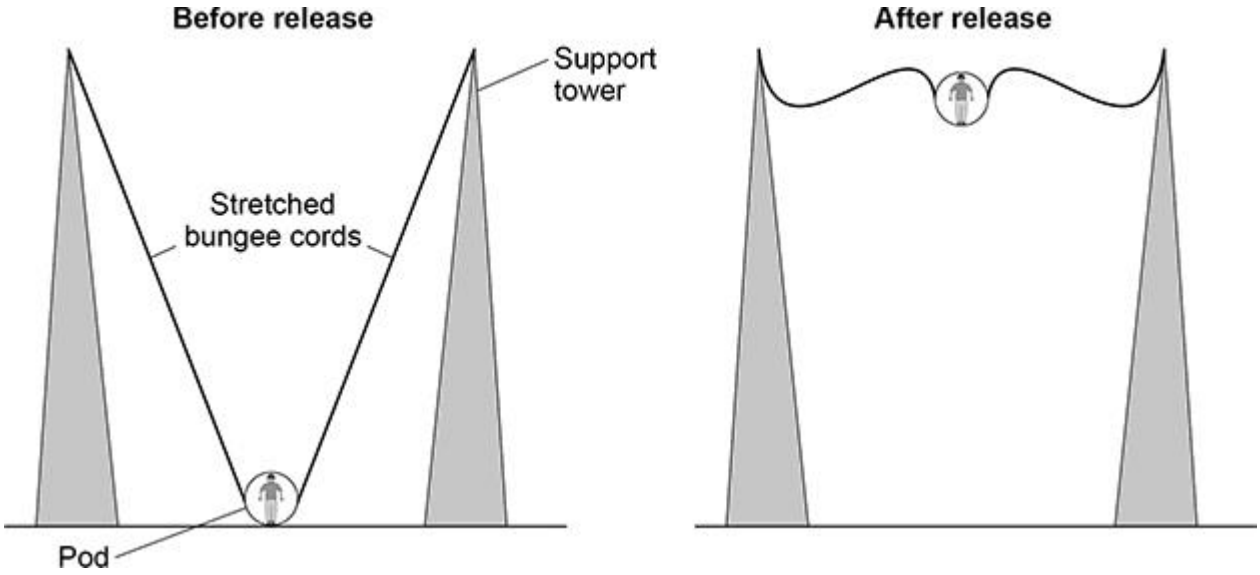
**Questions are for both separate science and combined science students unless indicated in the question**

## Q1.

In a ride at a theme park, a person is strapped into a pod that is attached to two stretched bungee cords.

The bungee cords behave like springs.

The figure below shows a person using the ride.




(a) Which energy store increases as the bungee cords are stretched?

_____

**(1)**

(b) When the pod is released, the pod accelerates upwards.

Before the pod is released the extension of **each** of the two bungee cords is 8.0 m.

The spring constant of each bungee cord is 735 N/m.

The mass of the pod is 240 kg.

gravitational field strength = 9.8 N/kg

Calculate the maximum height reached by the pod.

Use the Physics Equations Sheet. **(Physics only)**

_____

_____

_____

_____

Maximum height = _____ m

**(6)**

(c) The actual maximum height reached by the pod will be lower than the correct answer to part (b).

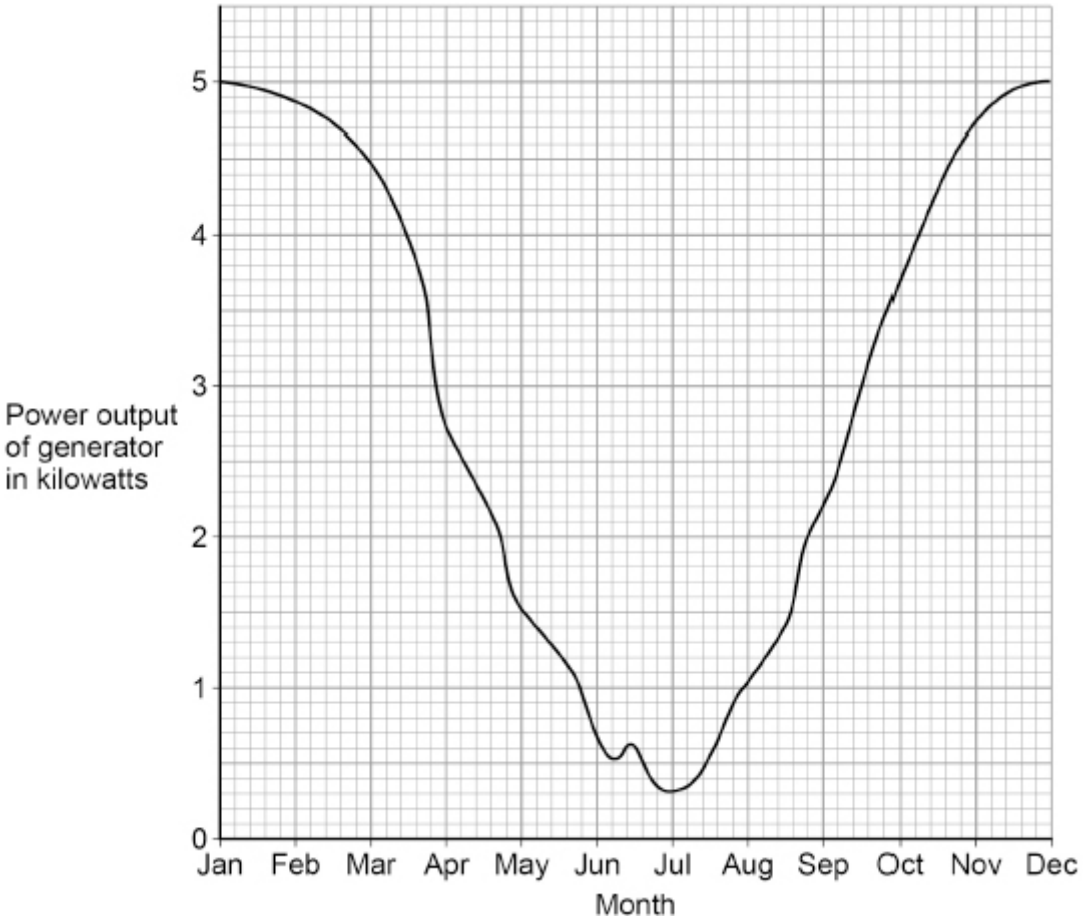
Explain why.

**(2)**

**(Total 9 marks)**

## Q2.

(a) The figure below shows how the power output of the generator varied during one year.




A solar power system is installed in the remote village in addition to the hydroelectric generator.

Explain why this improves the reliability of the electricity supply to the village.

Use information from the figure above.

_____

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**(2)**

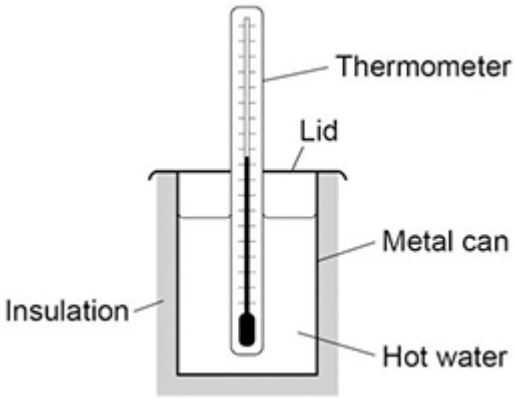
**(Total 2 marks)**

## Q3.

A student investigated the insulating properties of different materials.

**Figure 1** shows some of the equipment used by the student.

**Figure 1**




This is the method used:

1. Wrap insulating material around the can.
2. Put a fixed volume of boiling water in the can.
3. Place the lid on the top of the can.
4. Measure the time taken for the temperature of the water to decrease by a fixed amount.
5. Repeat steps 1 – 4 using the same thickness of different insulating materials.

(a) Identify the independent variable and the dependent variable in this investigation.

Independent variable _____

Dependent variable _____

**(2)**

The student used two different types of thermometer to measure the temperature changes.

**Figure 2** shows a reading on each thermometer.

**Figure 2**


(b) What is the resolution of thermometer **B**?

Resolution = _____ °C

**(1)**

(c) Thermometer **A** is more likely to be misread.

Give **one** reason why.

_____

_____

_____

**(1)**

(d) For one type of insulating material, the temperature of the water decreased from
85.0 °C to 65.0 °C.

The energy transferred from the water was 10.5 kJ.

specific heat capacity of water = 4200 J/kg °C

Calculate the mass of water in the can.

Use the Physics Equations Sheet.

_____

_____

_____

_____

_____

Mass = _____ kg

**(3)**

(e) The table below shows the results for two insulating materials.

| **Material** | **Time for temperature to decrease by 20 °C in seconds** |
|---|---|
| X | 450 |
| Y | 745 |

Explain how the results in above table can be used to compare the thermal conductivity of the two materials.

_____

_____

_____

_____

_____

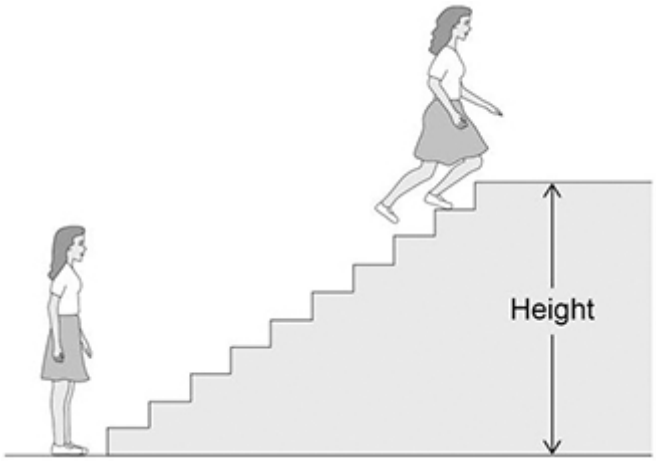
_____

**(2)**

**(Total 9 marks)**

## Q4.

The figure below shows a girl doing an experiment to determine her power output by running to the top of some stairs.




(a) The mass of the girl was 60.0 kg.

The height of the stairs was 175 cm.

The girl ran to the top of the stairs in 1.40 s.

gravitational field strength = 9.8 N/kg

Calculate the power output of the girl.

Use the Physics Equations Sheet.

Power = _____ W

**(5)**

(b) The **total** power output of the girl was greater than the answer to part (a).

Suggest **two** reasons why.

1. _____

_____

2. _____

_____

**(2)**

(c) A boy took more than 1.40 s to run up the same stairs.

The power output of the boy was the same as the power output of the girl.

What conclusion can be made about the boy's mass?

Tick (✓) **one** box.

The boy's mass was greater than the girl's mass. ☐

The boy's mass was lower than the girl's mass. ☐

The boy's mass was the same as the girl's mass. ☐

**(1)**

**(Total 8 marks)**