

Name of the Student: \_\_\_\_\_

Max. Marks : 24 Marks

Time : 24 Minutes

**Q1.**

In a sport called far-leaping, an athlete uses a long pole to cross a river.

Figure 1 shows an athlete far-leaping.

**Figure 1**

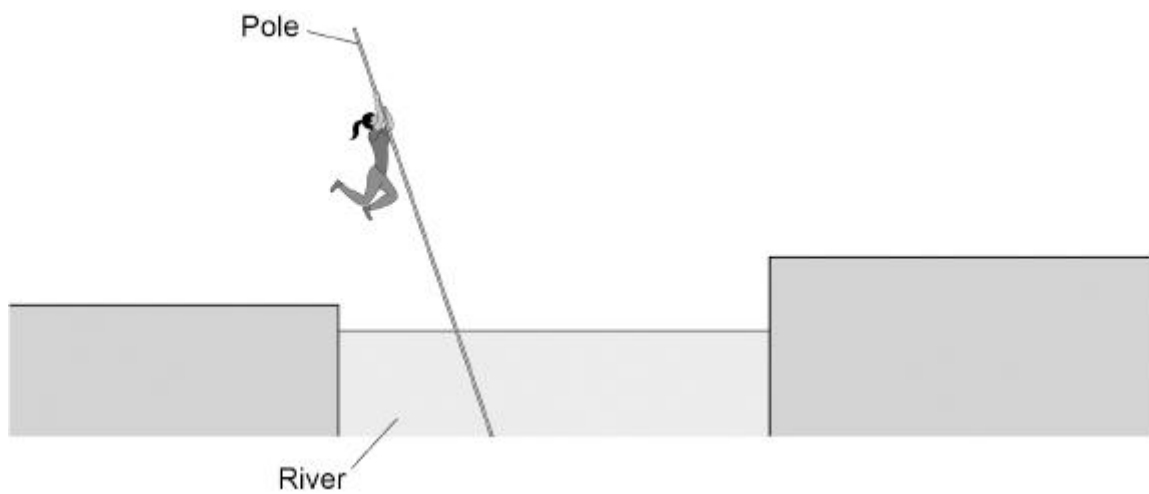
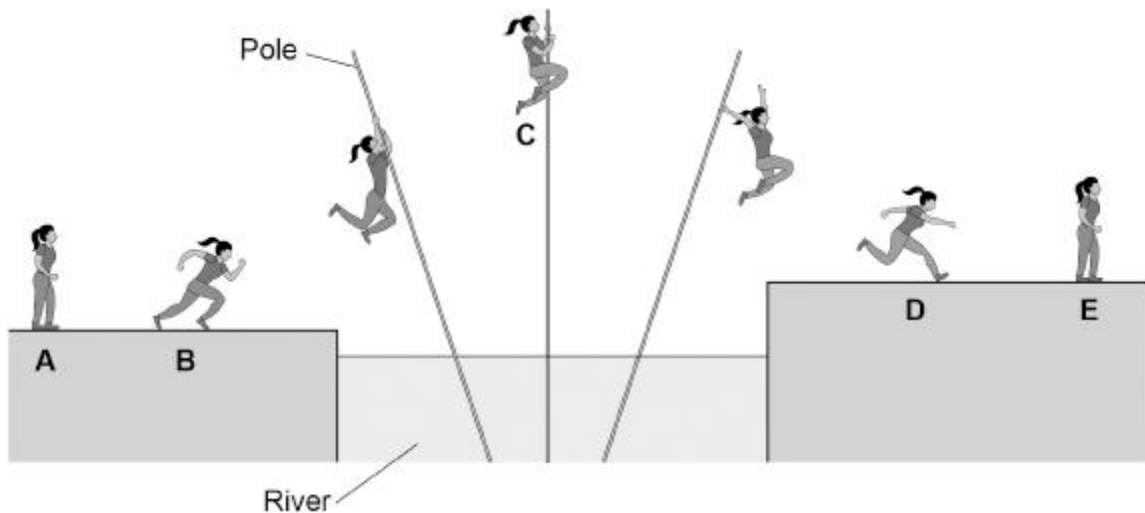


Figure 2 shows the athlete in different stages of far-leaping.

**Figure 2**



(a) Complete the sentence.

Choose answers from the box.

|                          |                |                                |
|--------------------------|----------------|--------------------------------|
| <b>chemical</b>          | <b>nuclear</b> | <b>kinetic</b>                 |
| <b>elastic potential</b> |                | <b>gravitational potential</b> |

Between positions **A** and **B** the athlete speeds up. There is an increase in the athlete's \_\_\_\_\_ energy and a decrease in the athlete's \_\_\_\_\_ store of energy.

(2)

(b) Between positions **B** and **C** the athlete jumps to the pole and climbs up it.

Which statement describes a change in the athlete's energy between positions **B** and **C**?

Tick (✓) **one** box.

Elastic potential energy decreases.

Elastic potential energy increases.

Gravitational potential energy decreases.

Gravitational potential energy increases.

(1)

(c) The pole falls over from position **C**. The athlete lets go of the pole and lands at position **D**.

The change in height of the athlete between positions **C** and **D** is 3.0 m.

mass of athlete = 50 kg

gravitational field strength = 9.8 N/kg

Calculate the change in gravitational potential energy of the athlete between positions **C** and **D**.

Use the equation:

$$\text{change in gravitational potential energy} = \text{mass} \times \text{gravitational field strength} \times \text{change in height}$$

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Change in gravitational potential energy = \_\_\_\_\_ J

(2)

(d) The kinetic energy of the athlete at position **D** is 1600 J.

mass of athlete = 50 kg

Calculate the speed of the athlete at position **D**.

Use the equation:

$$\text{speed} = \sqrt{\frac{2 \times \text{kinetic energy}}{\text{mass}}}$$

Choose the unit from the box.

|            |             |            |
|------------|-------------|------------|
| <b>m/s</b> | <b>J/kg</b> | <b>J/s</b> |
|------------|-------------|------------|

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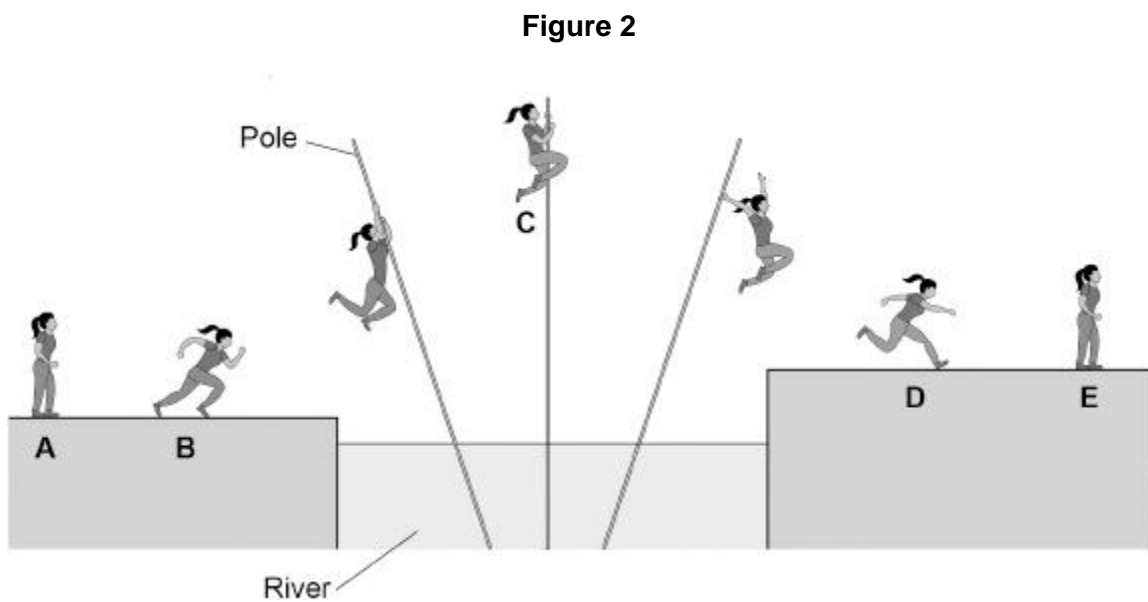
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Speed = \_\_\_\_\_ Unit \_\_\_\_\_

(3)

Figure 2 is repeated below.



(e) At positions **A** and **E**, the athlete is standing still.

Why does the athlete have less energy in position **E** than in position **A**?

Tick (✓) **one** box.

Energy has been transferred from the athlete to the air.

The air temperature has decreased.

The height of the athlete above the water has increased.

(1)

(f) Athletes have a large power output when they are far-leaping.

What is meant by the power of an athlete?

Tick (✓) **one** box.

The rate at which the athlete transfers energy.

The size of the maximum force exerted by the athlete.

The total energy transferred by the athlete.

(1)

(g) A second athlete crossed the same river by far-leaping.

The second athlete had less power than the first athlete when running between position **A** and position **B**.

Complete the sentences.

Choose answers from the box.

Each answer may be used once, more than once or not at all.

|                  |                    |                  |
|------------------|--------------------|------------------|
| <b>less than</b> | <b>the same as</b> | <b>more than</b> |
|------------------|--------------------|------------------|

Two factors that could explain why the second athlete had less power than the first athlete are:

1. The time taken by the second athlete to run between position **A** and position **B** was \_\_\_\_\_ the first athlete.

2. The work done by the second athlete was \_\_\_\_\_ the first athlete.

(2)

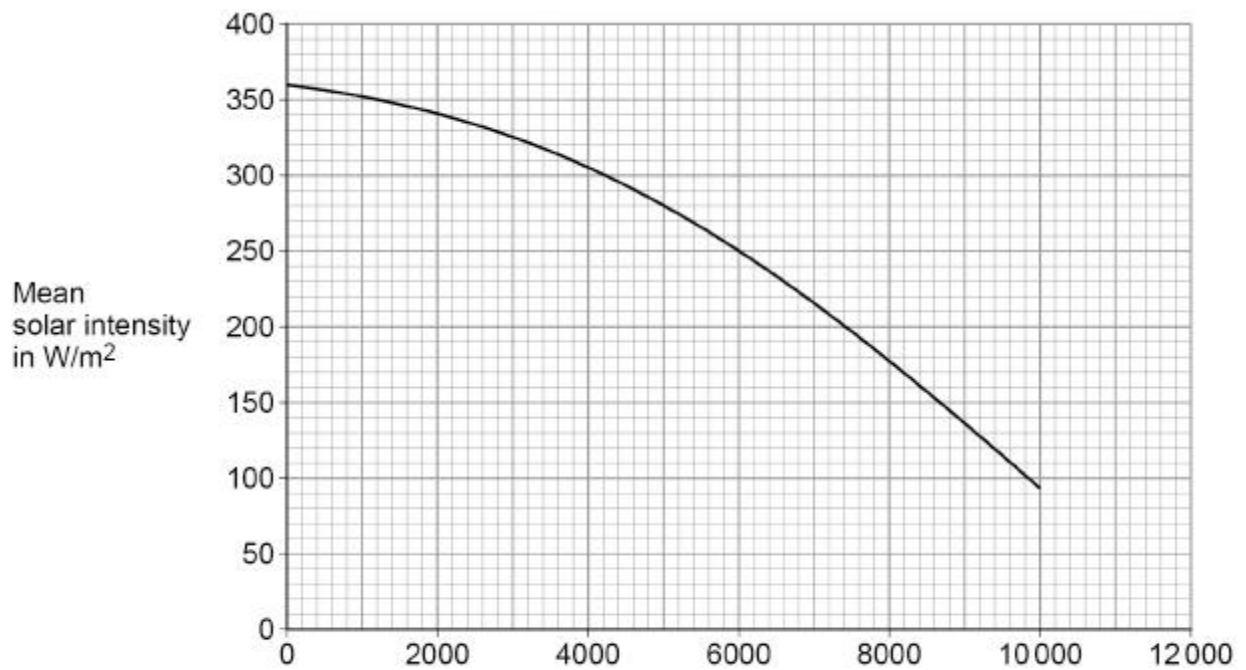
(Total 12 marks)

## Q2.

Solar intensity is a measure of the radiation received from the Sun at the surface of the Earth.

**Figure 1** shows how the mean solar intensity changes with the distance from the equator.

**Figure 1**



(a) The city of Athens is 4200 km from the equator.

What is the mean solar intensity in Athens?

Mean solar intensity = \_\_\_\_\_ W/m<sup>2</sup>

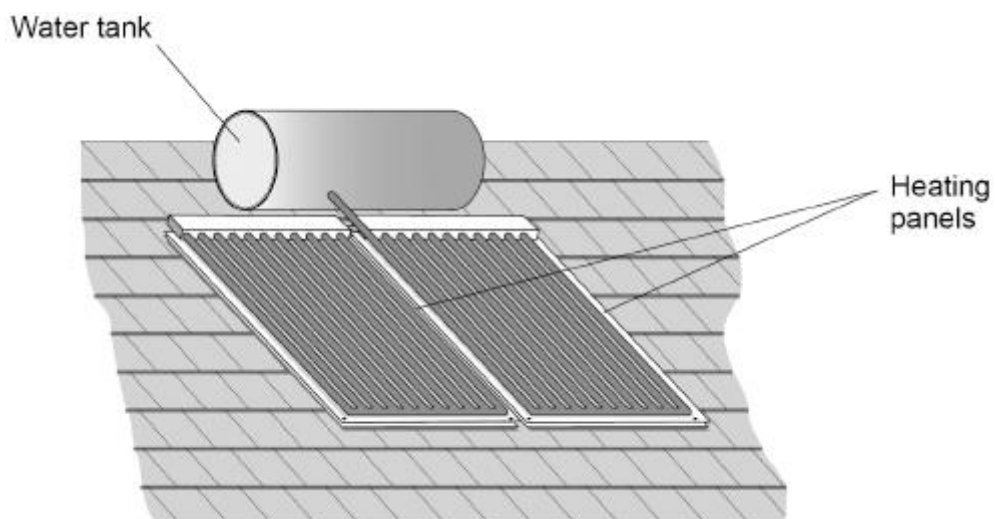
(1)

Solar water heaters use radiation from the Sun to heat water.

The heated water is stored in a water tank.

**Figure 2** shows a solar water heater on the roof of a building.

**Figure 2**



(b) Cities closer to the equator have many more buildings with solar water heaters than cities further away from the equator.

Suggest why.

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(1)

- (c) The use of solar water heaters may reduce the need to burn fossil fuels.

Complete the sentence.

Choose the answer from the box.

|                       |                 |               |
|-----------------------|-----------------|---------------|
| <b>carbon dioxide</b> | <b>nitrogen</b> | <b>oxygen</b> |
|-----------------------|-----------------|---------------|

Burning fossil fuels contributes to global warming because there is an increase in the amount of \_\_\_\_\_ in the atmosphere.

(1)

- (d) The efficiency of the solar water heater is 0.61

Calculate the useful power output when the total power input to the solar water heater is 1100 W.

Use the equation:

$$\text{useful power output} = \text{efficiency} \times \text{total power input}$$

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$$\text{Useful power output} = \text{_____} \text{ W}$$

(2)

- (e) Different solar water heaters have different sized heating panels.

Suggest how the size of the heating panels affects the input power to a solar water heater.

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(1)

- (f) Water has a high specific heat capacity.

What is meant by the specific heat capacity of water?

Tick (✓) **one** box.

The energy required to change the state of 1 kg of water from liquid to gas.

The energy required to increase the temperature of 1 kg of water by 1 °C.

The power required to change the state of 1 kg of water from liquid to gas.

The power required to increase the temperature of 1 kg of water by 1 °C.

(1)

(g) The water tank contained 80 kg of water.

The change in thermal energy of the water was 8 400 000 J.

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

Calculate the temperature change of the water.

Use the Physics Equations Sheet.

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Temperature change = \_\_\_\_\_ °C

(3)

(h) The water tank is thermally insulated.

How does thermal insulation affect the rate of energy transfer from the water in the tank?

Tick (✓) **one** box.

Thermal insulation decreases the rate of energy transfer.

Thermal insulation does not change the rate of energy transfer.

Thermal insulation increases the rate of energy transfer.

(1)

(i) The table below shows information about different materials.

| Material | Thermal conductivity in arbitrary units |
|----------|---|
| A        | 3                                       |
| B        | 2                                       |
| C        | 8                                       |
| D        | 4                                       |

Which material in the table above is the best thermal insulator?

Tick (✓) **one** box.

**A**

**B**

**C**

**D**

(1)  
(Total 12 marks)