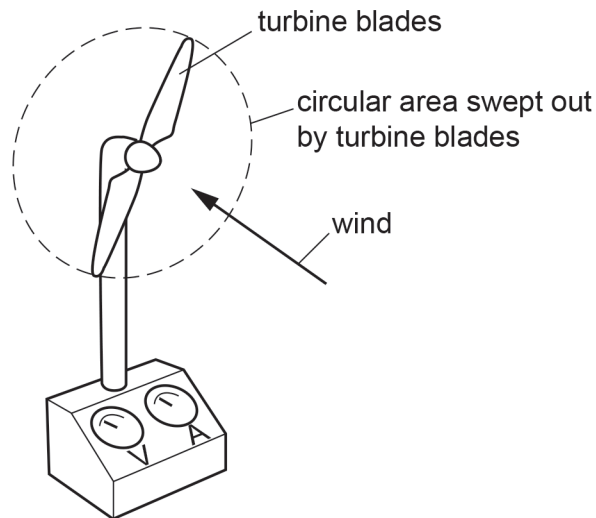


- 1 The diagram shows a model of a wind turbine used to demonstrate the use of wind energy to generate electricity. The wind is blowing towards the model, as shown.



The mass of air passing through the circular area swept out by the turbine blades each second is 7.5 kg. The kinetic energy of the air that passes through this circular area each second is 240 J.

- (a) The kinetic energy of the air drives a generator. State the input power of the air passing through the turbine blades.

input power = [1]

- (b) The output current of the generator is 2.0 A. The output potential difference (p.d.) of the generator is 11 V.

- (i) Calculate the output power of the generator.

output power = [2]

- (ii) Calculate the efficiency of the wind turbine.

efficiency = % [2]

[Total: 5]

- 2 The diagram shows solar cells used to generate electrical energy.



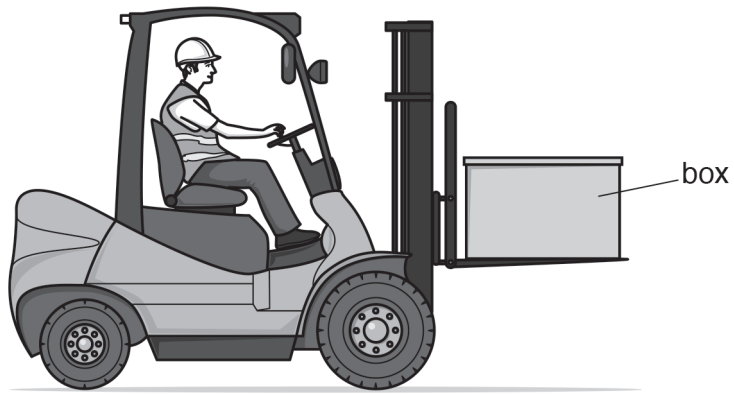
Each group of solar cells is arranged in a rectangle $1.2\text{ m} \times 2.8\text{ m}$. The solar cells are situated in a region where 260 W of solar energy is received per square metre of the cells. The electrical output of each group of solar cells is a current of 2.5 A with a potential difference of 86 V .

Calculate the efficiency of the solar cells.

efficiency = % [4]

[Total: 4]

- 3 The diagram shows a fork-lift truck lifting a box.



The lifting mechanism raises a box of mass 32 kg through a vertical distance of 2.5 m in 5.4 s.

(a) Calculate the gravitational potential energy gained by the box.

gravitational potential energy = [2]

(b) The efficiency of the lifting mechanism is 0.65 (65%).

Calculate the input power to the lifting mechanism.

input power = [3]

[Total: 5]

- 4 (a) Describe a renewable process by which electrical energy is obtained from the energy stored in water. You may draw a diagram in the space.

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.....

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.....

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.....

[4]

- (b) Explain why the process described in (a) can be regarded as renewable.

.....

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.....

[2]

- (c) Explain whether the Sun is the source of the energy stored in the water in (a).

.....

.....

.....

.....

[2]

[Total: 8]

- 5 Electrical energy is provided to homes and industry from a coal-fired power station.

The main stages in the operation of a coal-fired power station are listed below.

They are **not** in the correct order.

- A** The boiler produces steam.
- B** The turbine turns a generator.
- C** Thermal energy transfers to water in a boiler.
- D** Chemical energy in coal transfers to thermal energy.
- E** The generator produces electrical energy.
- F** Steam turns a turbine.
- G** Coal burns in a furnace.

Complete the flow chart to describe how a coal-fired power station works.

Insert the missing letters in the empty boxes.



[3]

[Total: 3]

- 6 Electrical energy is provided to homes and industry from a coal-fired power station. Some people are against the use of coal-fired power stations.

Give **two** environmental problems caused by coal-fired power stations.

1.

.....

2.

.....

[2]

[Total: 2]

- 7 A solar panel receives energy from the Sun and the thermal energy is transferred from the solar panel to water.

State and explain **one** advantage and **one** disadvantage of heating the water in a solar panel compared with heating the water in a coal-burning boiler.

advantage.....

explanation.....

.....

disadvantage.....

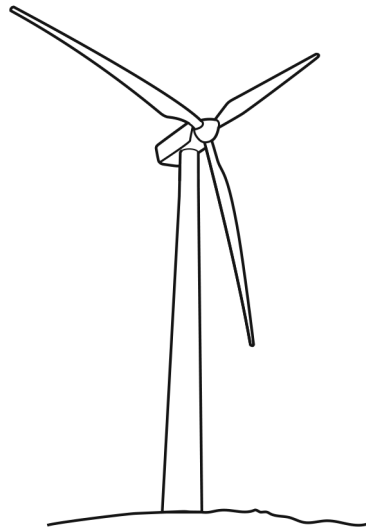
explanation.....

.....

[4]

[Total: 4]

- 8 The diagram shows a wind turbine.



Describe how the wind turbine produces electrical energy

.....

.....

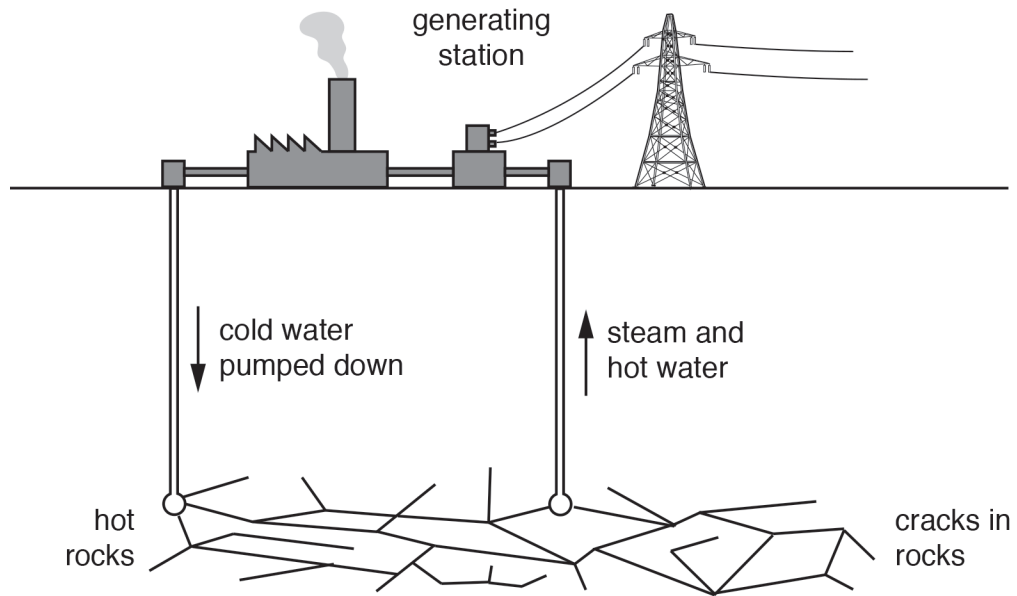
.....

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[3]

[Total: 3]

- 9 The diagram shows a geothermal power station.



Describe how the geothermal power station generates electricity.

.....

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.....

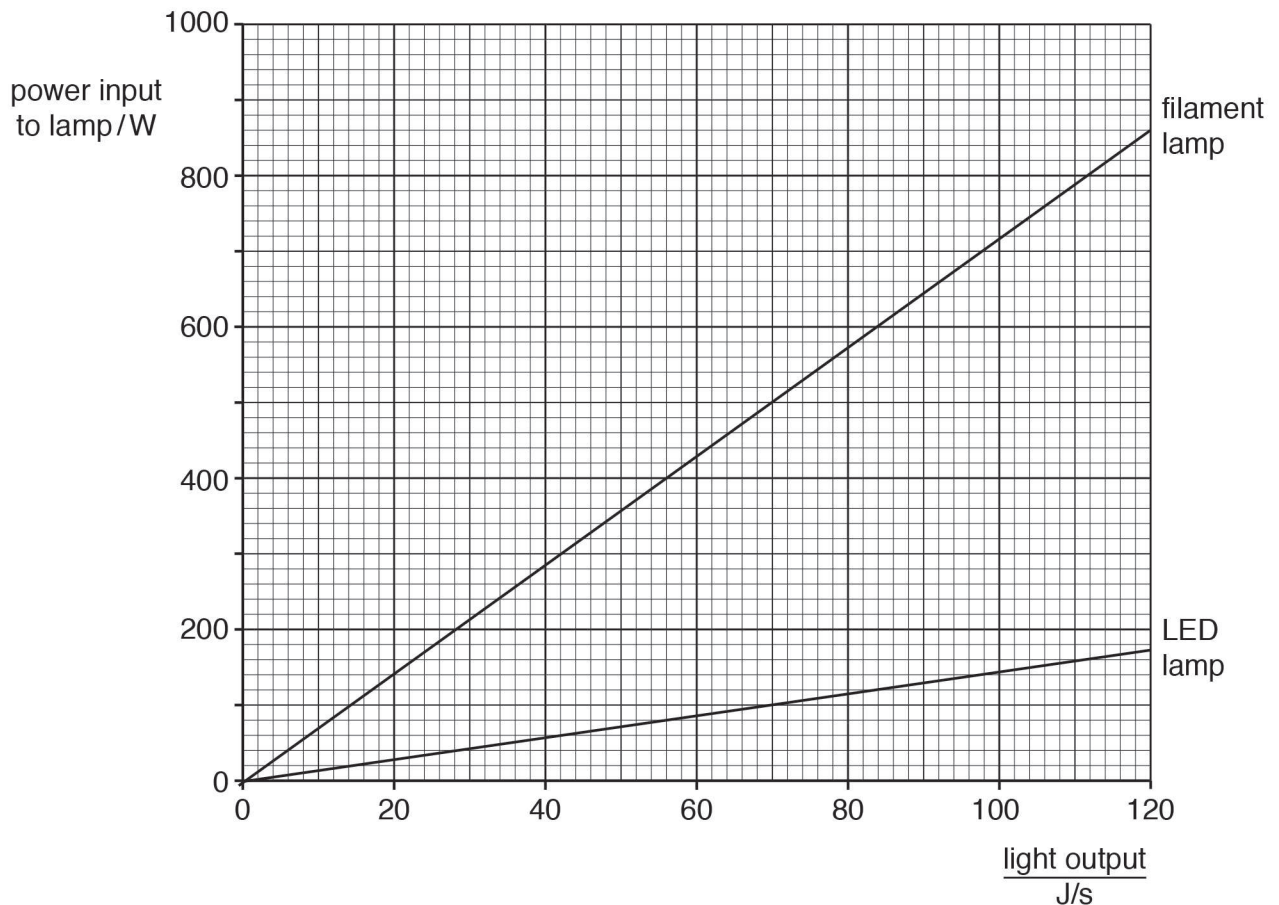
.....

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..... [4]

[Total: 4]

- 10 Electrical energy from a power station is used to power two different lamps. The graph shows how the light outputs from two types of lamp vary with the power input.



- (a) An experiment requires a lamp with a light output of 70 J/s.

For the LED lamp and for the filament lamp determine the input power required to give a light output of 70 J/s. Use information from the graph.

1. For the LED lamp, input power = W
2. For the filament lamp, input power = W

[2]

- (b) Explain why using LED lamps is better for the environment. Use information from the graph in your answer.

.....

.....

.....

.....

[2]

[Total: 4]

- 11** State **two** advantages and **two** disadvantages of using natural gas as an energy source.

advantages

1.

.....

2.

.....

disadvantages

1.

.....

2.

.....

[4]

[Total: 4]

- 12** Electrical energy can be obtained from renewable and non-renewable sources of energy.

(a) State two renewable sources of energy.

Source 1

Source 2

[2]

(b) State **one** social, economic or environmental disadvantage of one of your answers to **(a)**.

.....

.....

.....

[1]

[Total: 3]

- 13 The diagram shows solar cells used to generate electrical energy.



State and explain whether this source of electrical energy is renewable.

.....

..... [1]

[Total: 1]

- 14 The diagram shows solar cells used to generate electrical energy.



Consider the generation of electrical energy by a large number of solar cells, as shown in the diagram.

State **one** environmental advantage and **one** environmental disadvantage.

advantage

.....

disadvantage

.....

[2]

[Total: 2]

- 15 The diagram shows solar cells used to generate electrical energy.

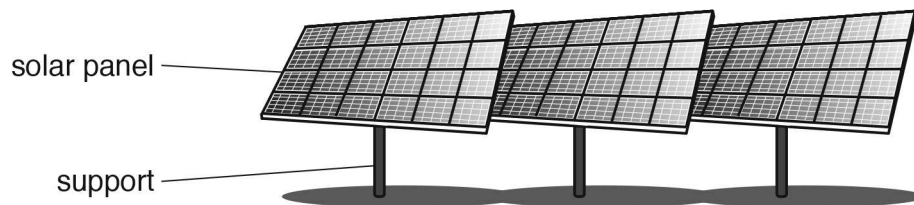


State the main form of energy transferred from the Sun to the solar cells for the generation of electrical energy.

..... [1]

[Total: 1]

- 16 The diagram shows part of a solar farm. The solar panels tilt and rotate.

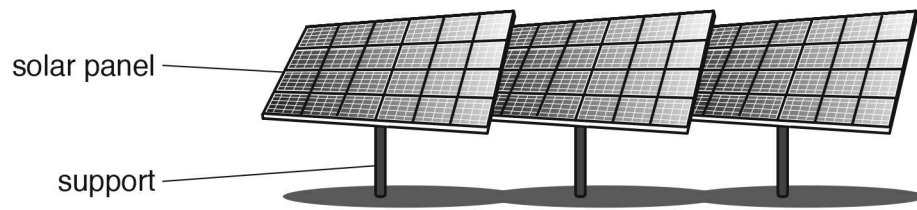


Suggest why it is useful that the panels can tilt and rotate.

.....
..... [1]

[Total: 1]

- 17 The diagram shows part of a solar farm. The solar panels tilt and rotate.



Solar farms have advantages and disadvantages.

(a) State **two** advantages of a solar farm.

1.

2. [2]

(b) State **one** disadvantage of a solar farm.

..... [1]

[Total: 3]

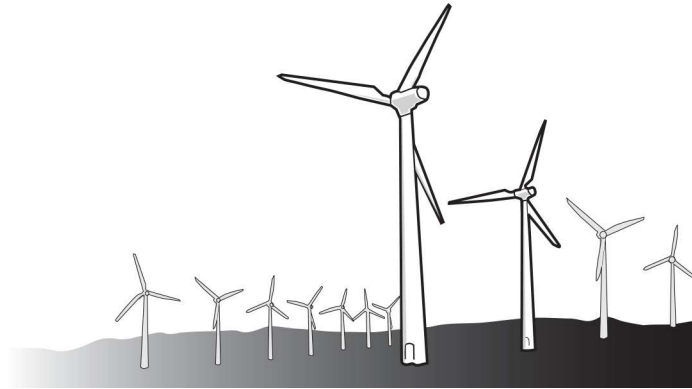
18 State **one** advantage and **one** disadvantage of using a wind turbine as a source of electrical energy.

advantage.....

disadvantage [2]

[Total: 2]

- 19 The diagram shows devices that generate electricity.



Describe how the devices shown in the diagram generate electrical energy.

.....

.....

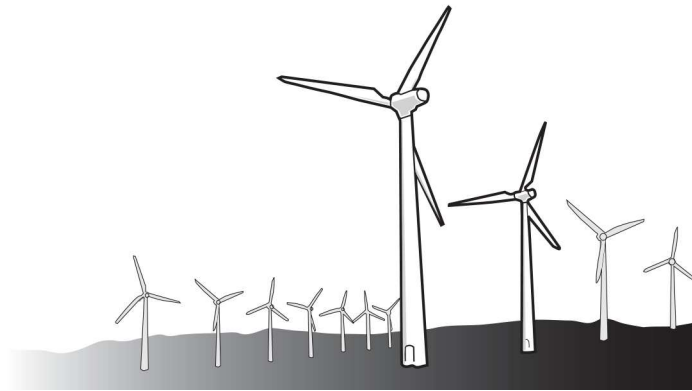
.....

.....

[3]

[Total: 3]

20 The diagram shows devices that generate electricity.



Describe the advantages and disadvantages of generating electrical energy by using a coal-fired power station compared with the devices shown in the diagram.

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.....

.....

.....

.....

[4]

[Total: 4]

21 Describe two environmental problems that are due to using nuclear power stations.

1.

.....

2.

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[2]

[Total: 2]

22 Nuclear fission is used in nuclear power stations to release thermal energy.

Describe how the thermal energy is used to generate electricity.

.....

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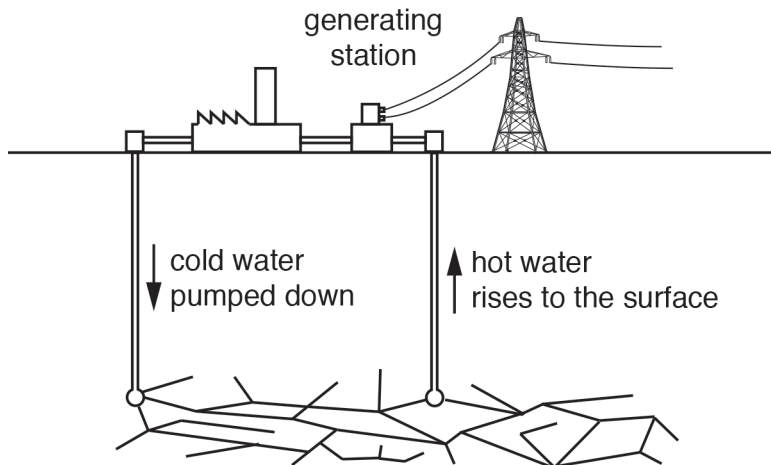
.....

.....

[3]

[Total: 3]

23 The diagram shows a geothermal power station. It generates electricity.



In a geothermal power station, the process of generating electricity includes seven stages.

Four of the stages are shown below.

P steam turns a turbine

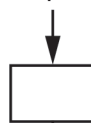
Q hot underground rocks heat the cold water

R the turbine spins a generator

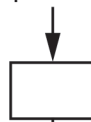
S hot water rises to the surface

The flow chart shows the seven stages, but it is incomplete. Complete the flow chart by adding the letters P, Q, R and S in the correct sequence.

cold water is pumped down



hot water produces steam



electricity is generated

[Total: 3]

24 Oil-fired power stations and wind farms generate electricity.

By comparison with a wind farm, state one advantage and one disadvantage of running a power station using oil.

advantage

.....

disadvantage

.....

[2]

[Total: 2]

25 State **three** advantages of generating electrical energy using a hydroelectric system compared with using a coal-fired power station.

1.

.....

2.

.....

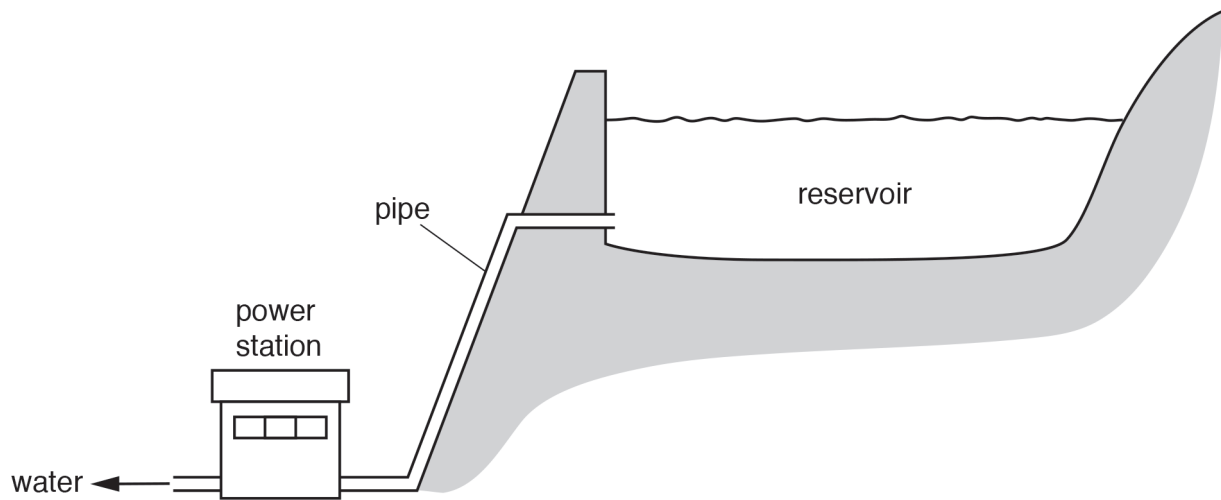
3.

.....

[3]

[Total: 3]

- 26 The diagram represents a hydroelectric system for generating electrical energy.



Describe how the power station uses the water in the reservoir to generate electrical energy.

.....

.....

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.....

.....

[3]

[Total: 3]

- 27 State **two** advantages of using renewable sources for generating electricity compared to using a coal-fired power station.

1.

.....

2.

.....

[2]

[Total: 2]

- 28** An electric generator produces an electromotive force (e.m.f.) of 200 V and produces a current of 3.0 A in a circuit. The generator is driven by an engine with a power of 2.4 kW.

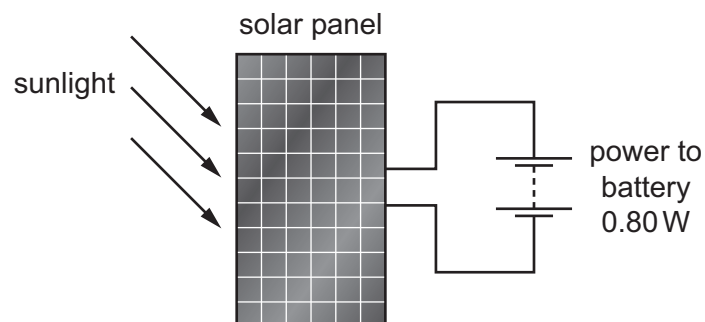
What is the efficiency of the generator?

- A** 2.8% **B** 25% **C** 28% **D** 36%

[1]

[Total: 1]

- 29** A solar panel is used to recharge a battery. The solar panel produces 0.80 W of electrical power. The panel is 20% efficient.



What is the power input of the sunlight onto the solar panel?

- A** 0.16 W **B** 4.0 W **C** 8.0 W **D** 16 W

[1]

[Total: 1]

- 30 (a)** State the name of a fuel that is burnt to produce large amounts of electrical energy.

Describe a process by which electrical energy is obtained from the chemical energy stored in this fuel.

name of fuel:

description of process:

.....

.....

.....

.....

[4]

(b) Explain why the Sun is the source of the energy stored in the fuel in (a).

.....

.....

.....

..... [2]

(c) Explain whether the process in (a) is renewable.

.....

.....

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..... [2]

[Total: 8]

31 Describe how electricity may be generated using geothermal resources.

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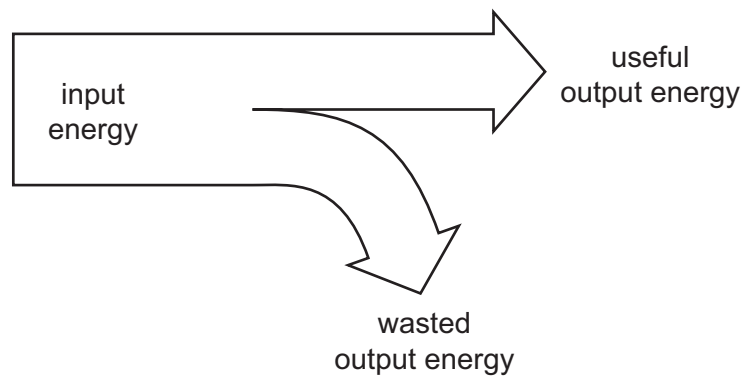
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..... [3]

[Total: 3]

32 The diagram represents the energy transfers for a device.



The device is 50% efficient.

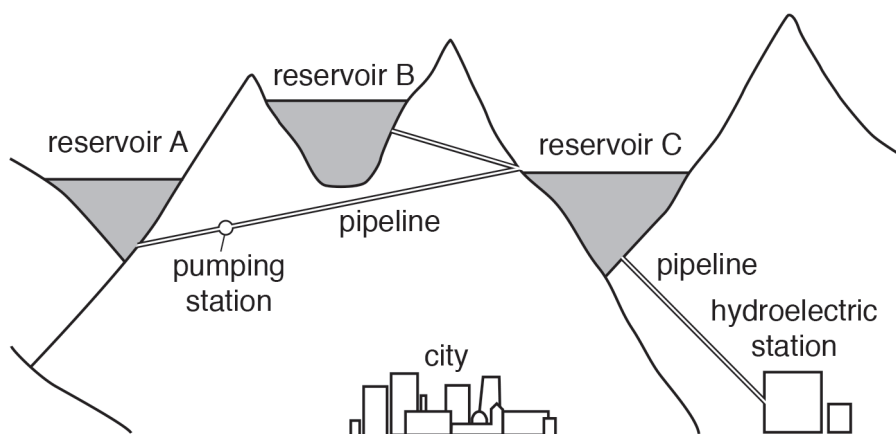
Which equation is correct?

- A $\text{input energy} = \text{useful output energy} \div 2$
- B $\text{useful output energy} = \text{wasted output energy} \div 2$
- C $\text{wasted output energy} = \text{useful output energy}$
- D $\text{wasted output energy} = \text{useful output energy} \div 2$

[1]

[Total: 1]

33 The diagram shows a hydroelectric power system located in the mountains.



(a) The reservoirs store energy.

State the terms used to describe the energy stored in the reservoirs.

..... [1]

- (b) Describe how the energy stored in reservoir C becomes useful energy for the city at the hydroelectric station.

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.....

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.....

.....

..... [3]

- (c) Some of the stored energy is wasted. Explain what happens to this energy.

.....

..... [2]

- (d) Water from reservoirs A and B may flow into reservoir C. It is more efficient to fill reservoir C using water from reservoir B only.

Suggest a reason for this.

.....

..... [1]

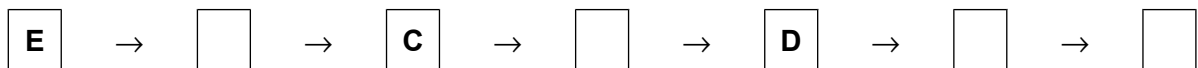
[Total: 7]

34 A nuclear power station generates electricity.

The main stages in the operation of a nuclear power station are listed below. They are **not** in the correct order.

- A** the turbine turns a generator
- B** fission produces thermal energy
- C** water in the boiler becomes hot
- D** steam turns a turbine
- E** nuclei split apart in the reactor
- F** electromagnetic induction produces the output energy
- G** steam is produced

Complete the flow chart to describe how a nuclear power station works. Insert the missing letters in the empty boxes.



[3]

[Total: 3]

35 A 40 W lamp wastes 34 J of energy every second by heating its surroundings.

What is the efficiency of the lamp?

- A** 0.15%
- B** 15%
- C** 18%
- D** 85%

[1]

[Total: 1]

36 Wind turbines are used in many countries to replace coal-fired power stations.

State **two** advantages of using wind turbines instead of coal-fired power stations.

1.

2. [2]

[Total: 2]

- 37** Wind turbines are used in many countries to replace coal-fired power stations.

State **one** disadvantage of using wind turbines compared to coal-fired power stations.

.....

..... [1]

[Total: 1]

- 38** Energy sources used to generate electricity are shown in the box.

gas	oil	tides	waves	wind
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Which energy sources are non-renewable?

Draw a ring around **each** energy source that is non-renewable.

[1]

[Total: 1]

- 39** Here are some statements about energy and energy resources.

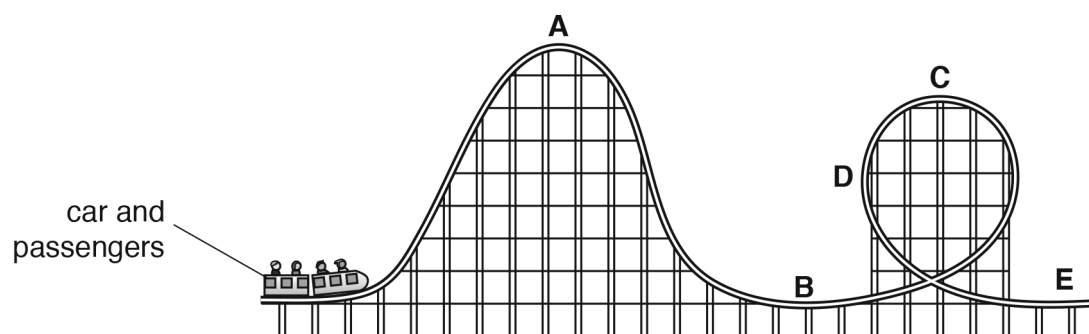
Some statements are correct. Put a tick (✓) in the box alongside each of these.

- ☐ Building hydroelectric power stations has an impact on the environment.
- ☐ Burning fossil fuels produces atmospheric pollution.
- ☐ Wind turbines are turned using gravitational potential energy.
- ☐ Coal and crude oil are sources of renewable energy.
- ☐ Geothermal energy is obtained from hot rocks below the ground.

[3]

[Total: 3]

- 40 The diagram represents part of a roller coaster track.



A machine lifts the car to point **A**. The machine is **not** 100% efficient.

Suggest why the machine is not 100% efficient. Use your ideas about energy.

.....

..... [1]

[Total: 1]