Energy – 2021/20 GCSE Gateway Physics A

1. Nov/2021/Paper_J249/02/No.2

Which of the following is a renewable energy source?

A Coal

B Hydro-electricity

C Nuclear fuel

D Oil

Your answer ☐ **[1]**

2. Nov/2021/Paper_J249/02/No.10

A 3.0 kW oven is switched on for 1.5 hours.

Calculate the energy transferred by the oven.

Use the equation: energy transferred = power × time

A 2.0 J

B 2.0 kWh

C 4.5 J

D 4.5 kWh

Your answer ☐ **[1]**

3. Nov/2021/Paper_J249/02/No.20

A group of students compare the power of three kettles **A**, **B** and **C** using this method:

- They pour water in each kettle.
- They plug the kettles in and switch the kettles on.
- They measure the temperature of the water every 20 s.
- They calculate the change in thermal energy of the water every 20 s.

(a) Each kettle has the **same** efficiency and is used for the **same** time.

Describe **one other** factor the students should control in their method.

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

(b)* The students test the kettles using a valid method.

Fig. 20.1 shows how the change in thermal energy varies with time:

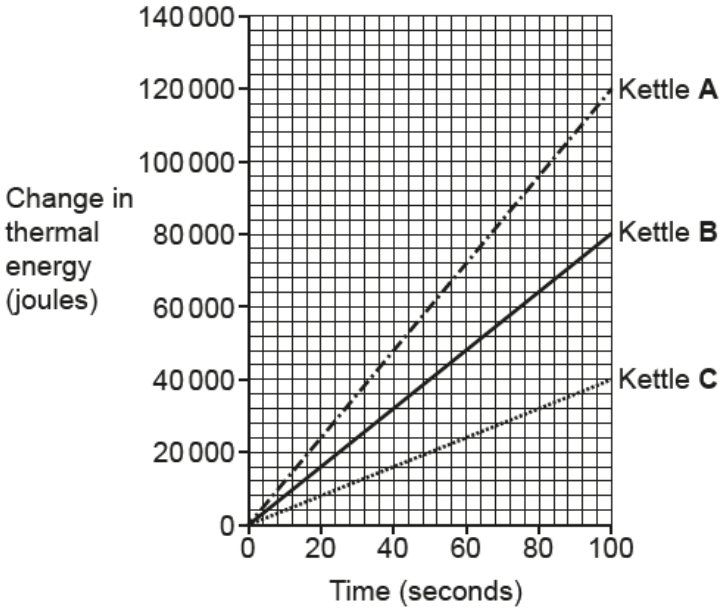

Fig. 20.1

Each kettle has the **same** efficiency.

Use data from **Fig. 20.1** to:

- Describe in detail how the change in thermal energy varies with time.
- Compare the **power** of the kettles.

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..... **[6]**

(c) How is energy transferred from the power station to the kettle?

In your answer write about:

- How electricity is distributed.
- The type of voltage used.

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..... **[2]**

4. Nov/2020/Paper_J249/02/No.1

A motor has an input energy of 800 J. The useful output energy is 500 J.

What is the wasted energy?

A 300 J

B 500 J

C 800 J

D 1300 J

Your answer ☐ **[1]**

5. Nov/2020/Paper_J249/02/No.3

A radiator has a power of 2 kilowatts (2 kW).

Convert 2 kW into watts.

A 0.002 W

B 200 W

C 2000 W

D 2 000 000 W

Your answer ☐ **[1]**

6. Nov/2020/Paper_J249/02/No.22

A student investigates the rate of cooling using a cardboard box to model the walls of a building.

She puts a beaker of hot water into the cardboard box. She measures the temperature of the water every two minutes.

She investigates how the rate of cooling changes with the thickness of the walls.

(a) Describe a method she can use to do this investigation.

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..... **[3]**

(b) Here are the results of one of her experiments.

Time (minutes)	Temperature of water (°C)
0	90
2	75
4	63
6	54
8	47
10	41
12	37

(i) Plot the results on the grid in **Fig. 22.1**.

Two of the points have been plotted for you. **[2]**

(ii) Draw a line of best fit on your graph. **[1]**

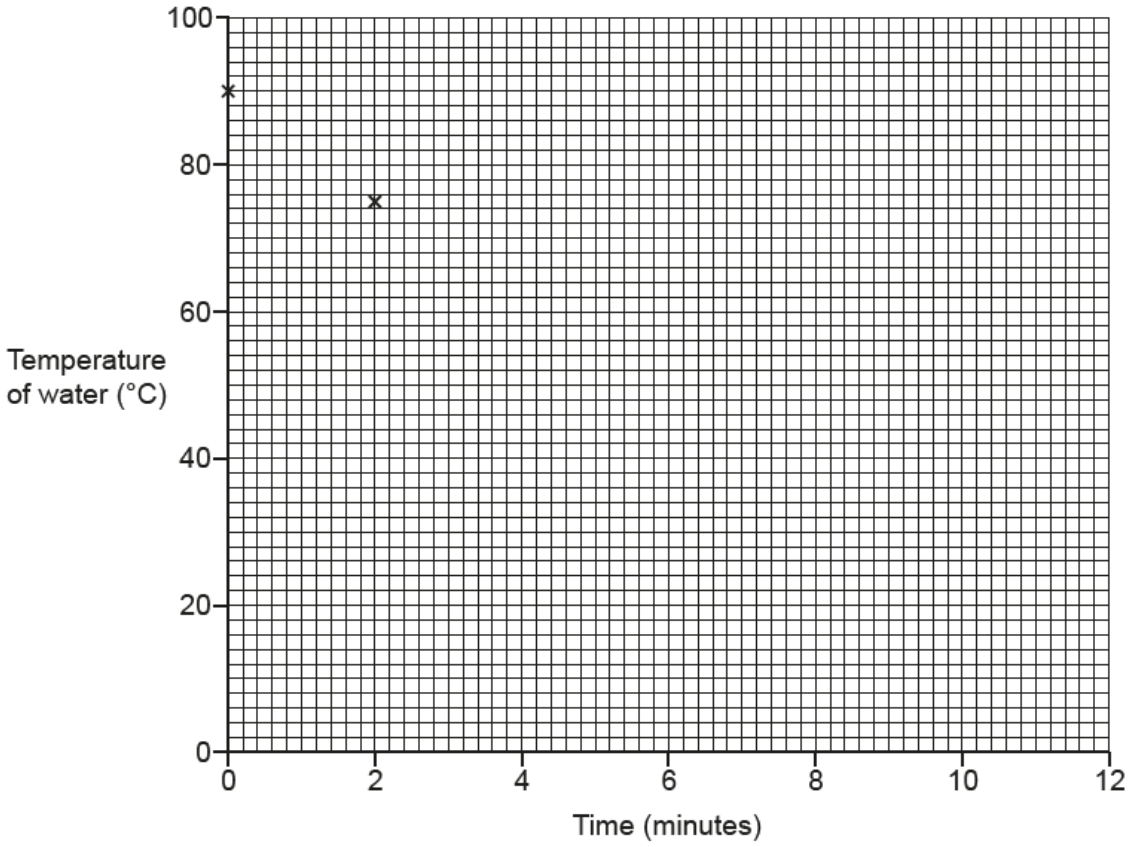

Fig. 22.1

(iii) Describe how the temperature of the water changes with time.
Use data from the graph in **Fig. 22.1** in your answer.

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..... **[2]**

(iv) The thickness of the cardboard box is doubled. Everything else stays the same.

Sketch a line on the graph in **Fig. 22.1** to suggest what these new results may look like.
Label your line **Z**. **[1]**

(v) Suggest **one** way to improve the investigation.

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

(c) Explain why the rate of cooling of a metal box is different to a cardboard box.
Assume the thickness of the walls is the same in both boxes.

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

7. Nov/20201Paper_J249/04/No.5

How can unwanted energy transfer be reduced?

A By adding lubrication

B By decreasing efficiency

C By increasing friction

D By removing thermal insulation

Your answer ☐ **[1]**

8. Nov/2021Paper_J249/04/No.20

A student uses an electric heater to raise the temperature of water.

Fig. 20.1 shows some of the equipment the student uses.

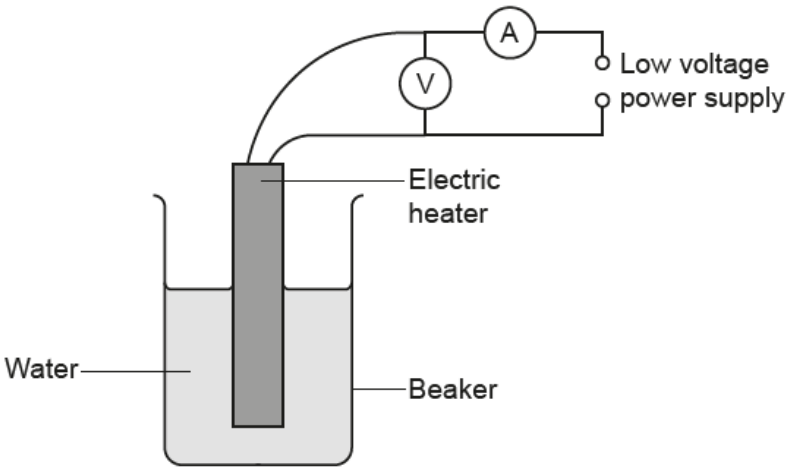

Fig. 20.1

The student obtains the data in **Table 20.1**:

Energy input to the heater	12000 J
Increase in thermal energy store of the water	8400 J

Table 20.1

(a) Use the data in **Table 20.1** to calculate the efficiency of the heater.

Efficiency = ... **[3]**

(b) The heater is used for 5 minutes.

Calculate the power of the heater.

Use the data in **Table 20.1** and the equation: energy transferred = power × time

Power = ... W **[3]**

(c)* Explain how the student uses the equipment in **Fig. 20.1** to obtain the data in **Table 20.1**.

In your answer you should:

- Include how any extra equipment is used.
- Explain how the quantities are calculated.

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9. Nov/2020Paper_J249/03/No.2

A student uses 2250 J of energy climbing up steps. It takes the student 15 seconds to climb the steps.

Calculate the power of the student.

Use the equation: power = work done ÷ time taken

A 15 W

B 150 W

C 9000 W

D 33750 W

Your answer ☐ **[1]**

10. Nov/2020Paper_J249/03/No.13

A student is measuring power of different machines. Which two measurements show the **same** power measured?

A 10 GW and 1.0×10^{10} W

B 4.0 kW and 40×10^{3} W

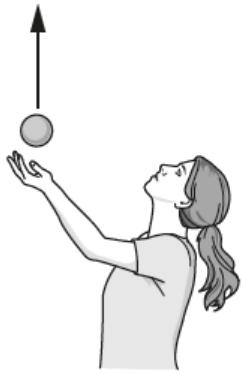
C 10 mW and 10×10^{3} W

D 10 MW and 1.0×10^{6} W

Your answer ☐ **[1]**

11. Nov/2020Paper_J249/04/No.4

A ball is thrown vertically into the air.



Energy is transferred from a chemical store.

Where is the useful energy transferred to?

A A gravitational store and a thermal store only.

B A gravitational store only.

C A gravitational store and a chemical store only.

D A thermal store and a chemical store only.

Your answer ☐ **[1]**

12. Nov/2020Paper_J249/04/No.7

A car has a mass of 1000 kg and is travelling at a speed of 20 m/s.

Calculate the kinetic energy of the car.

A 10 000 J

B 20 000 J

C 200 000 J

D 400 000 J

Your answer ☐ **[1]**

13. Nov/2020Paper_J249/04/No.17

A student investigates the rate of cooling using a cardboard box to model the walls of a building.

She puts a beaker of hot water into the cardboard box. She measures the temperature of the water every two minutes.

She investigates how the rate of cooling changes with the thickness of the walls.

(a) Describe a method she can use to do this investigation.

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..... **[3]**

(b) Here are the results of one of her experiments.

Time (minutes)	Temperature of water (°C)
0	90
2	75
4	63
6	54
8	47
10	41
12	37

(i) Plot the results on the grid in **Fig. 17.1**.

Two of the points have been plotted for you. **[2]**

(ii) Draw a line of best fit on your graph. **[1]**

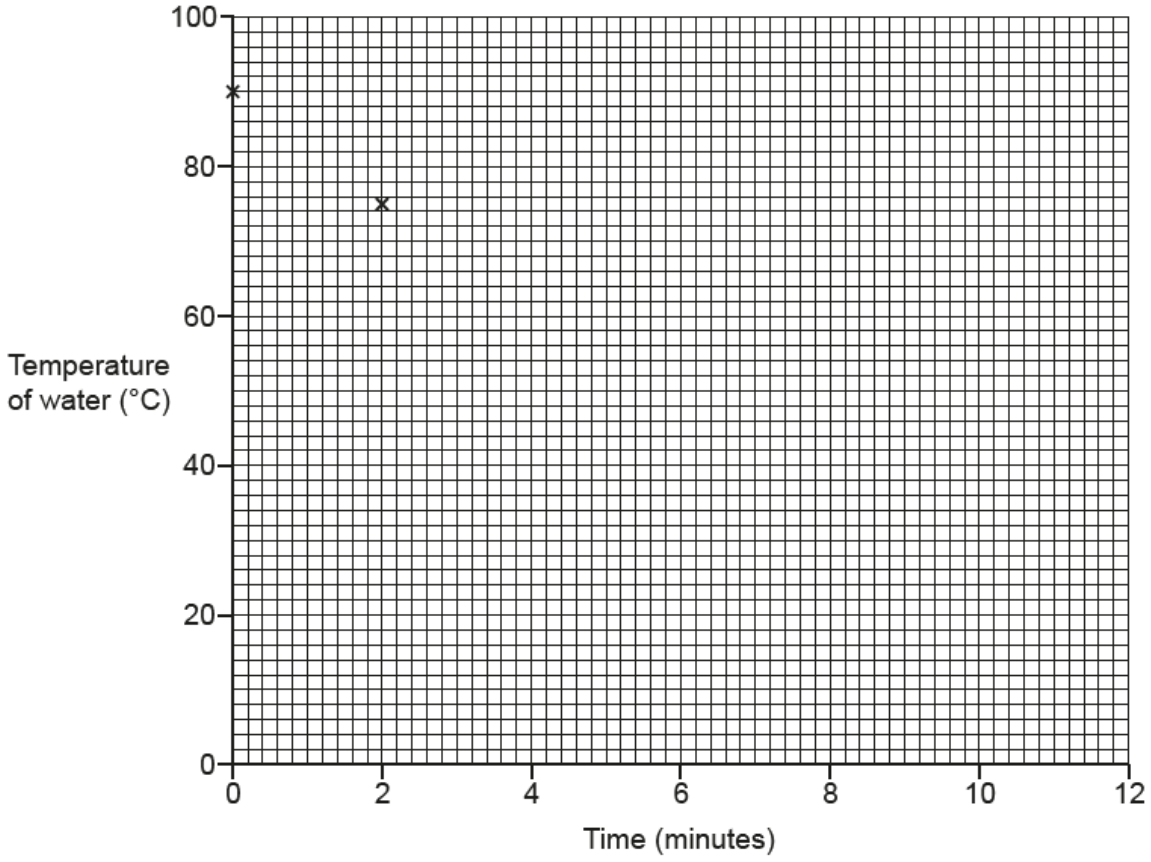

Fig. 17.1

(iii) Describe how the temperature of the water changes with time.
Use data from the graph **Fig. 17.1** in your answer.

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..... **[2]**

(iv) The thickness of the cardboard box is doubled. Everything else stays the same.

Sketch a line on the graph in **Fig. 17.1** to suggest what these new results may look like.
Label your line **Z**. **[1]**

(v) Suggest **one** way to improve the investigation.

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

(c) Explain why the rate of cooling of a metal box is different to a cardboard box.
Assume the thickness of the walls is the same in both boxes.

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