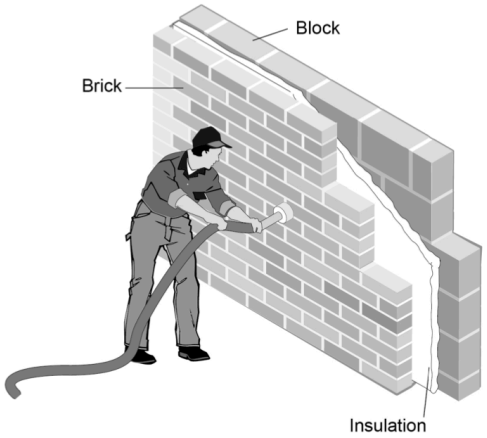
Q1. (2018)

0 5 **Figure 7** shows cavity wall insulation being installed in the wall of a house.

Figure 7



a)

0 5 . 1 Explain how the wall reduces unwanted energy transfers.

[3 marks]

b)

0 5 . 2 The cavity insulation was tested.

- The heating inside the house was switched off.
- The temperature inside the house was measured every 20 minutes for 2 hours.

Table 4 shows the results.

Table 4

Time in minutes	Temperature in °C
0	25.0
20	20.8
40	17.4
60	14.5
80	12.1
100	10.0
120	8.4

Determine the temperature inside the house after 30 minutes.

[2 marks]

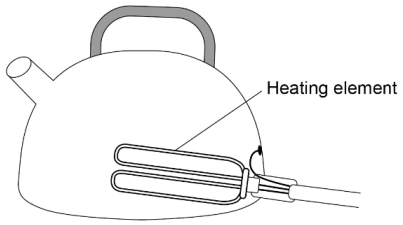
Q2. (2019)

0 5 A student investigated how the mass of water in an electric kettle affected the time taken for the water to reach boiling point.

The kettle switched off when the water reached boiling point.

Figure 4 shows the kettle.

Figure 4



a)

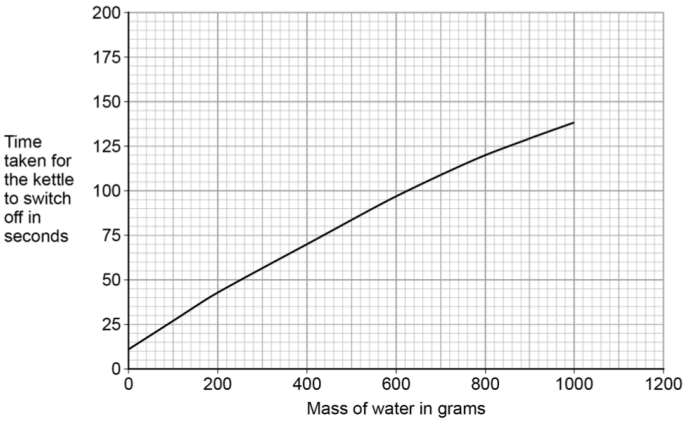
0 5 . 2 Give **one** variable that the student should have controlled.

[1 mark]

b)

Figure 5 shows how the mass of water in the kettle affected the time taken for the kettle to switch off.

Figure 5



0 5 . 3 Suggest why the line on **Figure 5** does **not** go through the origin.

[1 mark]

c)

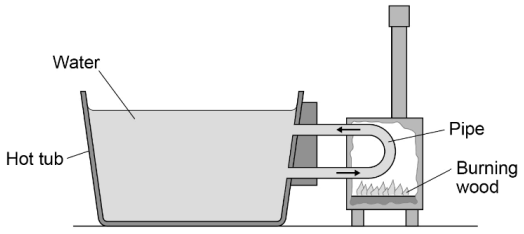
0 5 . 4 Suggest why the results give a non-linear pattern.

[1 mark]

Q3. (2020)

0 4 **Figure 5** shows a wood-fired hot tub.

Figure 5



a)

0 4 . 3 Describe the change to the stores of energy of the wood, pipe and water as the water is heated.

[3 marks]

Wood _____

_____

Pipe _____

_____

Water _____

_____

b)

0 4 . 4 The temperature of the water reaches 42 °C

The temperature then stays constant even though the fire continues to burn.

Explain why the temperature of the water stays constant.

[2 marks]

Q4. (2020)

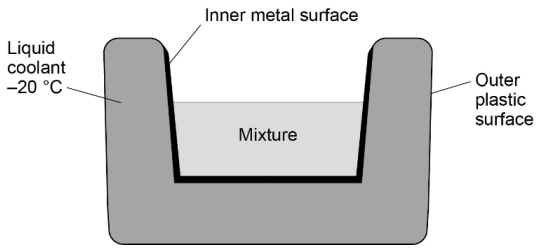
Figure 6 shows a bowl used for making ice cream.

The walls of the bowl contain a liquid coolant.

The bowl is cooled to –20 °C before the mixture is put in the bowl.

The bowl causes the mixture to cool down and freeze.

Figure 6



0 5 . 3 Explain why the different thermal conductivities of metal and plastic are important in the design of the bowl.

[4 marks]

Metal _____

_____

_____

_____

Plastic _____

_____

_____

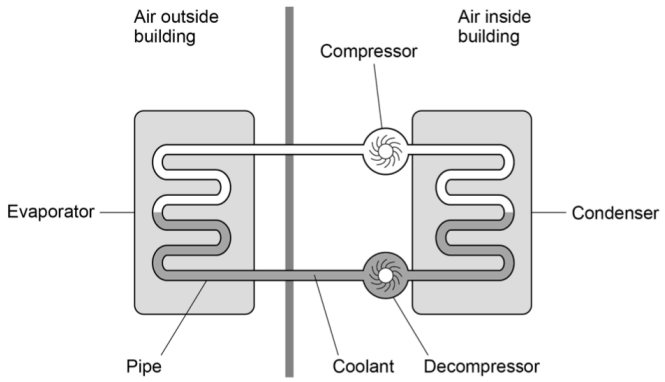
_____

Q5. (2021)

0 6 An air source heat pump transfers energy from the air outside a building to increase the temperature of the air inside the building.

Figure 13 shows an air source heat pump.

Figure 13



The compressor is connected to the mains electricity supply.

The pipe in the heat pump contains a substance called coolant.

In the evaporator, energy is transferred from the air outside the building to the liquid coolant.

The temperature of the coolant increases and it evaporates.

a)

0 6 . 5 The condenser transfers energy from the coolant to the air in the building.

When the total energy input to the heat pump system is 1560 kJ the temperature of the air in the building increases from 11.6 °C to 22.1 °C.

The efficiency of the heat pump system is 87.5%.

The mass of the air inside the building is 125 kg.

Calculate the specific heat capacity of the air in the building.

Give your answer in standard form.

[6 marks]

b)

0 6 . 6 The air in the building gains 400 J for every 100 J of energy transferred from the mains electricity supply to the compressor.

An advertisement claims that the heat pump system has an efficiency of 400%.

Explain why the advertisement is **not** correct.

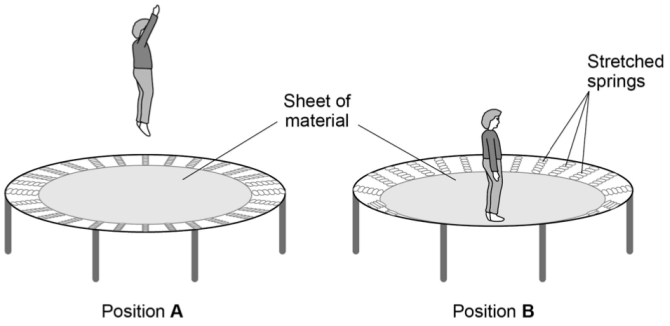
[3 marks]

Q6. (2022)

0 3 A trampoline is made from a sheet of material held in place by stretched springs.

Figure 5 shows a child on a trampoline.

Figure 5



a)

0 3 . 1 Position **A** shows the child's maximum height above the trampoline.

Position **B** shows the lowest position reached by the child when landing on the trampoline.

Describe the changes to the stores of energy of the:

- child
- springs
- surroundings

as the child moves from position **A** to position **B**.

[4 marks]

b)

0 3 . 3 As the child bounces on the trampoline the child does work.

What is the work done by the child equal to?

[1 mark]

Tick (✓) **one** box.

The average force applied by the child ☐

The maximum force applied by the child ☐

The total energy store of the child ☐

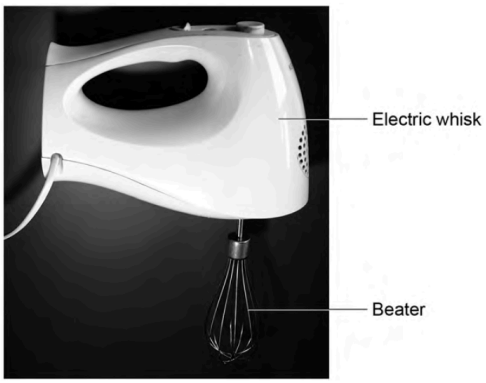
The total energy transferred by the child ☐

Q7. (2024)

0 1 **Figure 1** shows an electric whisk that plugs into the mains electricity supply.

The whisk can mix food by spinning a beater.

Figure 1



Use the Physics Equations Sheet to answer questions **01.2** and **01.3**.

a)

0 1 . 2 Work is done by the whisk when it is used to mix food.

Write down the equation that links power (*P*), time (*t*) and work done (*W*).

[1 mark]

b)

0 1 . 3 The power output of the whisk is 92 W.

Calculate the time for the whisk to do 23 000 J of work.

[3 marks]

Q8. (2024)

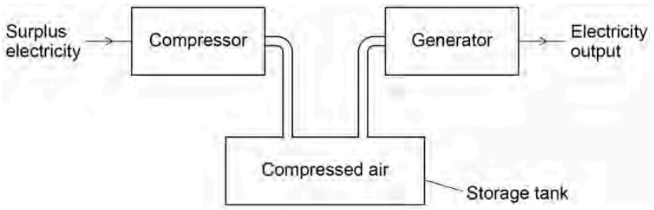
0 6 Energy can be stored using a Compressed Air Energy Storage (CAES) system.

When more electricity is generated than is needed, a CAES system uses the surplus electricity to compress air in a storage tank.

When there is a greater demand for electricity, the CAES system releases the compressed air to generate electricity.

Figure 7 shows a diagram of the CAES system.

Figure 7



0 6 . 1 The CAES system has two processes:

- compressing air to store energy. This process has an efficiency of 0.72
- releasing the air to generate electricity. This process has an efficiency of 0.86

Calculate the efficiency of the CAES system.

Give your answer to 2 significant figures.

[3 marks]