

Physics unit 1 homework – Energy

For each of the questions below: -

Highlight the command word if there is one & annotate what the command word means. - Answer the question!

1) **Figure 1** shows a student making potato soup.

Figure 1



(a) The student places 0.5 kg of potato into a pan of water.

During cooking, the temperature of the potato increases from 20 °C to 100 °C

The specific heat capacity of the potato is 3400 J/kg °C

Calculate the change in thermal energy of the potato.

Use the equation:

$$\text{change in thermal energy} = \text{mass} \times \text{specific heat capacity} \times \text{temperature change}$$

$$\text{Change in thermal energy} = \text{_____ J}$$

(3)

(b) Why is the energy supplied by the cooker greater than that calculated in part (a)?

(1)

(c) Suggest **one** way that the student could reduce the time to heat the potato to 100 °C

(1)

Figure 2 shows a food processor.

Figure 2



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For each of the questions below: -

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- (d) The student places the cooked potato into the jug of the food processor.
The food processor contains a motor that spins blades to chop the potato.
The total power input to the motor is 500 W
The useful power output from the motor is 300 W
Calculate the efficiency of the motor in the food processor.
Use the equation:

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

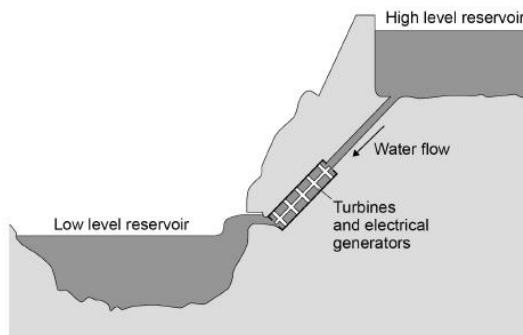
Efficiency = _____

(2)

- (e) The jug is made of plastic with a low thermal conductivity.
Explain why this is an advantage.

(2)

2) The diagram shows the flow of water through a hydroelectric power station.



The falling water turns the turbines.
The movement of the turbines causes the electrical generators to generate electricity.

- (a) Write the equation which links kinetic energy, mass and speed.

(1)

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- (b) In 1 minute, a mass of 9 000 kg of water flows through the turbines.

The speed of the water is 30 m/s

Calculate the total kinetic energy of the water passing through the turbines in 1 minute.

Give your answer in kilojoules (kJ).

Kinetic energy = _____ kJ

(3)

- (c) Write the equation which links efficiency, total input energy transfer and useful output energy transfer.

(1)

- (d) The efficiency of the turbines and generators is 80%

Calculate the useful output energy transfer from the hydroelectric power station in 1 minute.

Use your answer to part (b).

Useful output energy transfer = _____ kJ

(3)

- (e) A small group of people live in an area in the mountains.

The people plan to buy an electricity generating system that uses either the wind or the flowing water in a nearby river.

- The wind turbine costs £50 000 to buy and install.
- The hydroelectric generator costs £20 000 to buy and install.
- The average power output from the wind turbine is 10 kW
- The hydroelectric generator will produce a constant power output of 8 kW

Compare the advantages and disadvantages of the two methods of generating electricity.

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Use your knowledge of energy resources and information given.

(4)

3) A student investigated the specific heat capacity of metals.

(a) Describe an experiment the student could do to measure the specific heat capacity of a metal.

(6)