Work Done (F)

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]**

2. A wooden block has a mass of 2 kg and a specific heat capacity of 2000 J/kg °C.

Calculate the energy needed to raise its temperature by 6 °C.

Use the equation:

Change in thermal energy = Mass × Specific Heat Capacity × Change in Temperature

A 1 200 J
B 2 400 J
C 12 000 J
D 24 000 J

Your answer ☐ **[1]**

3. A student wants to find out which heater produces the largest temperature rise.

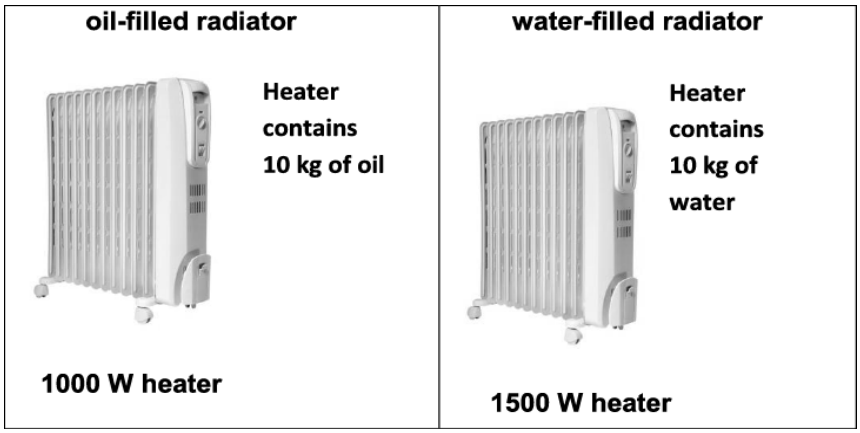
Look at the results she collects and the calculations she makes.

Heater	Starting temperature (°C)	Finishing temperature (°C)	Change in temperature (°C)
A	18	28	20
B	18	36	16
C	18	44	26
D	18	51	23

Which heater has results that are correctly calculated?

Your answer ☐ **[1]**

4(a). Alex has two radiators in her home. They are filled with 10 kg of different liquids.



The table below shows information about oil and water.

Material	Specific heat capacity (J/kg°C)	Freezing point (°C)	Boiling point (°C)
Oil	1 700	−24	250
Water	4 200	0	100

Alex's conservatory can be very cold.

Sometimes it can get as low as −6 °C.

Alex thinks that the oil radiator may be better for the conservatory.

Suggest why.

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[1]

(b). Radiators in a home have a 'cut-out' which prevents them getting hotter than 60 °C.

Suggest why.

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[1]

(c). Alex does a calculation.

She knows that the oil heater produces 800 J of energy each second.

Calculate the energy produced by the oil heater in 10 minutes.

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answer: ……J **[2]**

(d).

i. Alex wants the oil heater to heat up by 40°C.

How much energy is needed? Show your working.

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answer: ……J **[2]**

ii. She supplies enough energy to heat up the oil radiator by 40°C but it only heats up to 32°C.

Suggest two reasons why.

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[2]

5. Explain how energy is transferred and lost from a ball when it bounces.

_____ **[2]**

6. A lorry has a mass of 3500 kg. It travels at a speed of 30 m/s.

Use the equation: Kinetic Energy = 0.5 × Mass × Speed^2

Calculate the kinetic energy of this lorry.

A 10 500 J
B 52 500 J
C 1 575 000 J
D 3 150 000 J

Your answer ☐ **[1]**

7.

Seatbelts in cars are made of a wide material that stretches in a crash.

i. Explain why it is important that the material is **wide.**

_____

_____ **[1]**

ii. Explain why it is important that the material is **stretchy.**

_____

_____ **[1]**

8. Fig. 20.1 shows thinking, braking and stopping distances for the same car travelling at different speeds.

Speed (m/s)	Thinking distance (m)	Braking distance (m)	Stopping distance (m)
8	6	6	12
16	12	24	36
32	24	96	120

Fig. 20.1

* Explain why the stopping distances are different for each speed in **Fig. 20.1.**

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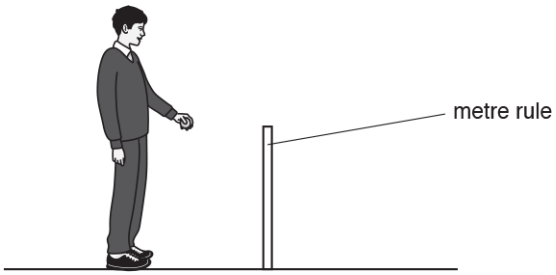
[6]

9(a). A student wants to investigate how a ball bounces.

He drops the ball from different heights and measures the bounce height each time.



He calculates the ratio bounce height / drop height.

The table shows his results.

Drop height (cm)	Bounce height (cm)	Bounce height / drop height
100	70	0.70
80	64	0.80
60	54	0.90
40	40	1.00
20		

The student predicts the ratio bounce height / drop height to be 1:1 when the drop height is 20 cm.

i. Suggest why he has made this prediction.

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[1]

ii. Use ideas about energy to explain why this prediction cannot be correct.

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[1]

(b). Suggest **two** improvements to his experiment.

(c). The mass of the ball is 60 grams.

i. Calculate the mass of the ball in kg.

Mass = ... kg **[1]**

ii. Calculate the potential energy of the ball when it is 0.80 m above the ground.

Use your answer to **(i)** and the equation:

potential energy = mass × height × gravitational field strength

Gravitational field strength = 10 N / kg

Potential energy = ... J **[2]**

10. *A student does an experiment using 0.2 kg of water.

Here is some information from the experiment:

The aim is to find the energy needed to raise the temperature of the water by 20 °C.
An electrical heater is used to heat the water. The temperature of the water increases by 20 °C.
The **specific heat capacity** of water is 4 200 J / kg °C.

Describe how the student should carry out the experiment, including the equipment used.

In your answer calculate the change in internal energy for the water.

You may include a diagram in your answer.

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_____ **[6]**

11 (a). A different TV works with a 12.0 V battery. It has a current of 3.19 A.

Calculate the power rating of the TV.

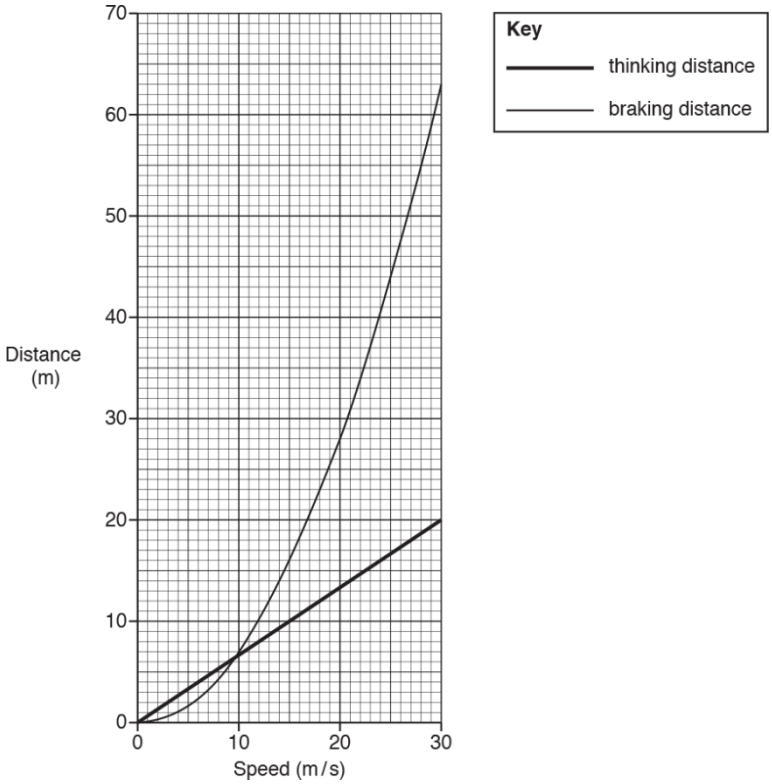
Power = ... W **[3]**

(b). A TV has a power rating of 0.2 kW.

Calculate the energy transferred, in kWh, if the TV is switched on for 4 hours.

Energy transferred =..... kWh **[3]**

12. The graph shows thinking and braking distances for a car at different speeds.



How does the speed affect the **kinetic energy** and **braking distance** of the car?

Use the graph in your answer.

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[3]

END OF QUESTION PAPER