

GCSE Physics

Worksheet: Energy transfers in everyday appliances

TIME 35 min	TOTAL 31 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: Energy transfers in everyday appliances

NAME	CLASS	DATE
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- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Answer all questions in the spaces provided.
- In all calculations, show clearly how you work out your answer.
- The marks for questions are shown in brackets.

01

01.1

Which quantity, when multiplied by power, gives energy transferred?

Tick (✓) **one** box.

Current	☐
Charge	☐
Time	☐
Resistance	☐

[1 mark]

01.2

A 100 W lamp is switched on for 10 s.
Calculate the energy transferred.

.....

.....

.....

.....

Energy transferred = J

[2 marks]

0 2

A games console has a power of 180 W. It is switched on for 1800 s.

0 2 . 1

Calculate the energy transferred.

Use the equation:

energy transferred = power $\times$ time

.....

.....

.....

.....

Energy transferred = J

[2 marks]

0 3

An oven has a power of 3.4 kW. It is used for 1 hour.

The energy transferred in kilowatt-hours (kWh) is the power in kilowatts multiplied by the time in hours. Electricity costs 25p per kWh.

0 3 . 1

Calculate the cost of using the oven for this time.

Give your answer in pence.

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.....

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.....

Cost = p

[3 marks]

0 4

Everyday electrical appliances are designed to bring about energy transfers.

0 4 . 1

An electric kettle has a power of 2000 W. It is switched on for 180 s.

Calculate the energy transferred by the kettle.

Use the equation:

energy transferred = power $\times$ time

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.....

Energy transferred = J

[2 marks]

0 4 . 2

An electric fan is switched on.

Which energy store of the fan blades increases?

Tick (✓) **one** box.

chemical

☐

elastic potential

☐

kinetic

☐

nuclear

☐

[1 mark]

0 4 . 3

The energy transferred by an appliance depends on the power of the appliance and on one other factor.

What is the other factor?

Tick (✓) **one** box.

how long the appliance is switched on for

☐

the length of the cable

☐

the mass of the appliance

☐

the colour of the appliance

☐

[1 mark]

0 5

0 5 . 1 Write down the equation that links energy transferred (E), power (P) and time (t).

.....

.....

[1 mark]

0 5 . 2 A 1500 W heater is switched on for 120 s.
Calculate the energy transferred.

.....

.....

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.....

Energy transferred = J

[2 marks]

0 6

Two kettles, A and B, are each used to heat 1.0 kg of water from the same starting temperature to boiling point.

Kettle A has a power of 2.0 kW. Kettle B has a power of 3.0 kW.

Assume that both kettles transfer all of the energy supplied to the water.

0 6 . 1 Kettle A takes 3.0 minutes to heat the water to boiling point.
Calculate the energy transferred by kettle A.

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Energy transferred = J

[2 marks]

0 6 . 2

Calculate the time kettle B takes to heat the water to boiling point.

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.....

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.....

Time = s

[2 marks]

0 6 . 3

Explain, in terms of energy and power, why kettle B heats the water in less time.

.....

.....

.....

.....

[2 marks]

0 7

An oven has a power of 2800 W. It is used for 100 minutes.
The energy transferred in kilowatt-hours (kWh) is the power in kilowatts multiplied by the time in hours. Electricity costs 28p per kWh.

0 7 . 1

Calculate the cost of using the oven for this time.
Give your answer to the nearest penny.

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.....

Cost = p

[4 marks]

0 8

Table 1 shows the power of two items of workshop equipment and how long each is switched on for each day.

Table 1

Appliance	Power in W	Time switched on per day in minutes
soldering iron	45	90
bench light	20	480

0 8 . 1

A student says: ‘The bench light has the lower power, so it must transfer less energy each day.’
Evaluate this statement. Use calculations to support your answer.

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[3 marks]

0 9

A kettle is connected to a potential difference of 230 V. It transfers 667 000 J of energy.

0 9 . 1

Calculate the charge that flows.

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.....

.....

Charge = C

[3 marks]

END OF QUESTIONS

Mark scheme

GCSE Physics · Worksheet: Energy transfers in everyday appliances · 31 marks

Question 1 (3 marks)

01.1 [1 mark]

Correct: Time

01.2 [2 marks]

Answer: 1000 J

- $E = 100 \times 10$ (1)
 - $E = 1000$ (J) (1)
-

Question 2 (2 marks)

02.1 [2 marks]

Answer: 324 000 J

- $E = 180 \times 1800$ (1)
 - $E = 324\,000$ (J) (1)
-

Question 3 (3 marks)

03.1 [3 marks]

Answer: 85p

- $\text{energy} = 3.4 \times 1$ (1)
 - $\text{energy} = 3.4$ (kWh) (1)
 - $\text{cost} = 3.4 \times 25 = 85$ (p) (1)
-

Question 4 (4 marks)

04.1 [2 marks]

Answer: 360 000 J

- $E = 2000 \times 180$ (1)
 - $E = 360\,000$ (J) (1)
-

04.2 [1 mark]

Correct: kinetic

04.3 [1 mark]

Correct: how long the appliance is switched on for

Question 5 (3 marks)

05.1 [1 mark]

Answer: $E = P t$

- $E = P \times t$ / energy transferred = power $\times$ time (1)
-

05.2 [2 marks]

Answer: 180 000 J

- $E = 1500 \times 120$ (1)
 - $E = 180\,000$ (J) (1)
-

Question 6 (6 marks)

06.1 [2 marks]

Answer: 360 000 J

- $E = 2000 \times 180$ (1)
- $E = 360\,000$ (J) (1)

06.2 [2 marks]

Answer: 120 s

- $t = 360\,000 \div 3000$ (1)
- $t = 120$ (s) (1)

Notes: Allow ECF from an incorrect energy.

06.3 [2 marks]

Answer: The same energy must be transferred to the water, but kettle B has a greater power, so it transfers more energy each second.

- the same (amount of) energy is needed (to boil the water) (1)
- kettle B transfers energy at a higher rate / more energy per second (1)

Question 7 (4 marks)

07.1 [4 marks]

Answer: 131p

- power = 2.8 kW and time = $100 \div 60 = 1.67$ (hours) (1)
- energy = 2.8×1.67 (= 4.67 kWh) (1)
- cost = 4.67×28 (= 131p) (1)
- cost = 131 (p) to the nearest penny (1)

Notes: An answer of 131 (p), not rounded to the nearest penny, scores 3 marks. Not converting W to kW or minutes to hours scores at most 2 marks.

Question 8 (3 marks)

08.1 [3 marks]

Answer: The statement is wrong: the soldering iron transfers $45 \times 90 \times 60 = 243\,000$ J (243 kJ) a day, but the bench light transfers $20 \times 480 \times 60 = 576\,000$ J (576 kJ), more than the soldering iron, because it is switched on for much longer. Energy transferred depends on both power and time.

- soldering iron: $45 \times 90 \times 60 = 243\,000$ (J) (1)
 - bench light: $20 \times 480 \times 60 = 576\,000$ (J) (1)
 - the statement is wrong: the bench light transfers more energy because it is on for much longer (energy transferred depends on power and time) (1)
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Question 9 (3 marks)

09.1 [3 marks]

Answer: 2900 C

- $667\,000 = Q \times 230$ (1)
 - $Q = 667\,000 \div 230$ (1)
 - $Q = 2900$ (C) (1)
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