

GCSE Physics

Worksheet: Efficiency

TIME 35 min	TOTAL 32 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
----------------	-------------------	-----------------------	----------------------------

Topics: Efficiency

NAME	CLASS	DATE
------	-------	------

- 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

A toy motor is supplied with 200 J of energy and wastes 80 J.

01.1

Calculate the efficiency of the motor.
Give your answer as a decimal.
Use the equation:
efficiency = useful output energy transfer ÷ total input energy transfer

Efficiency =
[2 marks]

0 2

Table 1 shows the total input energy and the useful output energy for three appliances.

Table 1

Appliance	Total input energy in J	Useful output energy in J
hairdryer	2000	1800
television	1500	450
electric drill	600	360

0 2 . 1

Calculate the efficiency of the electric drill.

Use the equation:

efficiency = useful output energy transfer ÷ total input energy transfer

Give your answer as a decimal.

.....

.....

.....

.....

Efficiency =

[2 marks]

0 2 . 2

Which appliance wastes the most energy?

Tick (✓) **one** box.

hairdryer

☐

television

☐

electric drill

☐

[1 mark]

0 2 . 3

Which appliance is the most efficient?

Tick (✓) **one** box.

hairdryer

☐

television

☐

electric drill

☐

[1 mark]

0 3

A petrol lawnmower engine is supplied with 400 J of energy. It transfers 112 J of this energy usefully.

0 3 . 1

Calculate the efficiency of the engine.

Give your answer as a decimal.

Use the equation:

efficiency = useful output energy transfer ÷ total input energy transfer

.....

.....

.....

.....

Efficiency =

[2 marks]

0 4

A washing machine motor is supplied with 4500 J of energy. It transfers 3240 J of this energy usefully.

0 4 . 1

Calculate the efficiency of the motor.

Give your answer as a decimal.

Use the equation:

efficiency = useful output energy transfer ÷ total input energy transfer

.....

.....

.....

.....

Efficiency =

[2 marks]

0 5

An electric motor in a fan has an efficiency of 0.65.

0 5 . 1

The useful power output of the motor is 390 W.
Calculate the total power input to the motor.

.....

.....

.....

.....

.....

Total power input = W

[3 marks]

0 5 . 2

Calculate the power wasted by the motor.

.....

.....

.....

Power wasted = W

[1 mark]

0 5 . 3

The fan runs for 5.0 minutes.
Calculate the energy wasted by the motor in this time.

.....

.....

.....

.....

Energy wasted = J

[2 marks]

0 6

Table 2 shows information about two lamps that give out the same amount of light.

Table 2

Lamp	Total power input in W	Useful power output in W
filament lamp	60	3.0
LED lamp	7.5	3.0

0 6 . 1

Write down the equation that links efficiency, total power input and useful power output.

.....

.....

[1 mark]

0 6 . 2

Calculate the efficiency of the LED lamp.
Give your answer as a percentage.

.....

.....

.....

.....

Efficiency = %

[2 marks]

0 6 . 3

Both lamps are switched on for 2.0 hours.
Calculate how much less energy is wasted by the LED lamp than by the filament lamp.

.....

.....

.....

.....

.....

Difference in energy wasted = J

[3 marks]

0 6 . 4

Explain why LED lamps waste less energy than filament lamps.

.....

.....

[1 mark]

.....

0 7

Table 3 shows the total input energy and the useful output energy for three kitchen appliances.

Table 3

Appliance	Total input energy in J	Useful output energy in J
blender	1200	900
vacuum cleaner	3000	2100
hair straightener	800	680

0 7 . 1

Calculate the efficiency of each appliance.
Give each answer as a decimal.

.....

.....

.....

.....

.....

.....
[3 marks]

0 7 . 2

State which appliance is the most efficient.

.....

.....

.....

.....
[1 mark]

.....

0 8

An electric pump lifts water from a well to a storage tank.
Gravitational field strength = 9.8 N/kg

0 8 . 1

Calculate the increase in gravitational potential energy when 0.80 kg of water is lifted through a height of 12 m .

.....

.....

.....

.....

Increase in gravitational potential energy = J

[2 marks]

0 8 . 2

The pump lifts 0.80 kg of water through 12 m every second. The total power input to the pump is 150 W .
Calculate the efficiency of the pump.
Give your answer as a decimal.

.....

.....

.....

.....

Efficiency =

[2 marks]

0 8 . 3

Give **one** way that energy is wasted by the pump.

.....

.....

[1 mark]

END OF QUESTIONS

Original practice questions written to match the specification. Not produced by, affiliated with or endorsed by AQA.

Mark scheme

GCSE Physics · Worksheet: Efficiency · 32 marks

Question 1 (2 marks)

01.1 [2 marks]

Answer: 0.60

- useful energy = $200 - 80 = 120$ (J) (1)
- efficiency = $120 \div 200 = 0.60$ (1)

Notes: An answer of 0.40 ($80 \div 200$) scores 0 marks.

Question 2 (4 marks)

02.1 [2 marks]

Answer: 0.60

- efficiency = $360 \div 600$ (1)
- efficiency = 0.60 (1)

Notes: An answer of 60% scores 1 mark (the answer must be given as a decimal).

02.2 [1 mark]

Correct: television

02.3 [1 mark]

Correct: hairdryer

Question 3 (2 marks)

03.1 [2 marks]

Answer: 0.28

- efficiency = $112 \div 400$ (1)
- efficiency = 0.28 (1)

Notes: An answer given as a percentage (28%) scores 1 mark.

Question 4 (2 marks)

04.1 [2 marks]

Answer: 0.72

- $\text{efficiency} = 3240 \div 4500$ (1)
- $\text{efficiency} = 0.72$ (1)

Notes: An answer given as a percentage (72%) scores 1 mark.

Question 5 (6 marks)

05.1 [3 marks]

Answer: 600 W

- $0.65 = 390 \div P_{\text{in}}$ (1)
- $P_{\text{in}} = 390 \div 0.65$ (1)
- $P_{\text{in}} = 600$ (W) (1)

Notes: An answer of 600 W scores 3 marks. An answer of 253.5 (W) scores 0 marks.

05.2 [1 mark]

Answer: 210 W

- $600 - 390 = 210$ (W) (1)

Notes: Allow ECF from the previous part.

05.3 [2 marks]

Answer: 63 000 J

- $E = 210 \times 300$ (1)
- $E = 63\,000$ (J) (1)

Notes: Allow ECF. An answer of 1050 (J) (time in minutes) scores 1 mark.

Question 6 (7 marks)

06.1 [1 mark]

Answer: efficiency = useful power output ÷ total power input

- efficiency = useful power output ÷ total power input (1)

06.2 [2 marks]

Answer: 40%

- efficiency = $3.0 \div 7.5 (= 0.40)$ (1)
- efficiency = 40 (%) (1)

06.3 [3 marks]

Answer: 378 000 J

- wasted power: filament lamp = 57 W and LED lamp = 4.5 W (1)
- difference = $52.5 \text{ (W)} / 57 \times 7200$ and 4.5×7200 (1)
- energy = $52.5 \times 7200 = 378\,000 \text{ (J)}$ (1)

Notes: An answer of 378 000 J scores 3 marks. An answer of 105 (J) (time not converted to seconds) scores 2 marks.

06.4 [1 mark]

Answer: A filament lamp must be very hot to give out light, so most of its input energy is dissipated to the surroundings by heating; an LED produces the same light while dissipating much less energy.

- filament lamps dissipate most of the energy (to the surroundings) by heating / the filament has to be very hot (so LEDs have a higher efficiency) (1)

Question 7 (4 marks)

07.1 [3 marks]

Answer: Blender 0.75; vacuum cleaner 0.70; hair straightener 0.85

- blender efficiency = $900 \div 1200 = 0.75$ (1)
- vacuum cleaner efficiency = $2100 \div 3000 = 0.70$ (1)
- hair straightener efficiency = $680 \div 800 = 0.85$ (1)

07.2 [1 mark]

Answer: The hair straightener

- hair straightener (1)

Notes: Allow ECF from the previous part.

Question 8 (5 marks)

08.1 [2 marks]

Answer: 94.08 J

- $E_p = 0.80 \times 9.8 \times 12$ (1)
- $E_p = 94.08$ (J) (1)

Notes: Allow 94 (J).

08.2 [2 marks]

Answer: 0.63

- $\text{efficiency} = 94.08 \div 150$ (1)
- $\text{efficiency} = 0.63$ (1)

Notes: Allow 0.627. An answer of 63% scores 1 mark (the answer must be given as a decimal). Allow ECF from the previous part.

08.3 [1 mark]

Answer: Friction in the moving parts heats the pump / sound / heating of the motor wires.

- friction (in moving parts) heats the pump / surroundings / sound / heating of the wires in the motor / energy transferred to the kinetic store of the water (1)
-