Power and efficiency

Physics Paper 1 calculations | AQA Combined Science 8464 and AQA GCSE Physics 8463 | 13 questions, 40 marks

GCSE science calculations

Scan for the solutions

Equations for this topic (cover this box to practise recalling them)

- power = $\frac{\text{energy transferred}}{\text{time}}$ learn this one
- efficiency = $\frac{\text{useful output energy transfer}}{\text{total input energy transfer}}$ learn this one
- power = $\frac{\text{work done}}{\text{time}}$ learn this one
- efficiency = $\frac{\text{useful power output}}{\text{total power input}}$ learn this one
- gravitational potential energy = mass × gravitational field strength × height learn this one
- energy transferred = power × time learn this one

Name: _____ **Date:** _____ **Score:** _____ **/ 40**

1 A kettle transfers 264 000 J of energy in 120 s.

Calculate the power of the kettle.

(2 marks)

Answer _____

2 An electric motor is supplied with 500 J of energy. It transfers 400 J of this usefully to kinetic energy.

Calculate the efficiency of the motor. Give your answer as a decimal.

(2 marks)

Answer _____

3 A crane on a building site does 36 000 J of work lifting a pallet of bricks. The lift takes 20 s.

Calculate the power of the crane.

(2 marks)

Answer _____

4 Mei heats her lunch in a microwave oven. The microwave transfers 54 kJ of energy in 1 minute.

Calculate the power of the microwave oven in watts.

(3 marks)

Answer _____

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5 Gabriel uses a hairdryer for 5 minutes. In this time it transfers 495 kJ of energy.

Calculate the power of the hairdryer in watts.

(3 marks)

Answer _____

6 The motor of an e-scooter has a total power input of 0.5 kW. Its useful power output is 410 W.

Calculate the efficiency of the motor as a percentage.

(3 marks)

Answer _____

7 A 1200 W electric heater is used to warm a garden office. It transfers 360 000 J of energy.

Calculate how long the heater was switched on. Give your answer in seconds.

(3 marks)

Answer _____

8 A gas boiler has an efficiency of 92%. In one minute it is supplied with 80 000 J of energy from the gas.

Calculate the useful energy transferred to the water in the central heating in this minute.

(3 marks)

Answer _____

9 An electric drill has an efficiency of 0.75. The drill transfers 600 J of energy usefully as it drills a hole in a wall.

Calculate the total energy supplied to the drill.

(3 marks)

Answer _____

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10 A lift in a block of flats raises a total mass of 750 kg through a height of 12 m in 15 s.

The total power input to the lift motor is 7.5 kW. Gravitational field strength = 9.8 N/kg

Calculate the efficiency of the lift system as a percentage. Give your answer to 2 significant figures. Show your working.

(4 marks)

Answer _____

11 Ravi boils water in a 2.4 kW kettle. The kettle is switched on for 3 minutes. The efficiency of the kettle is 0.85.

Calculate the energy wasted by the kettle. Give your answer in standard form to 2 significant figures. Show your working.

(4 marks)

Answer _____

12 Chloe is choosing between two vacuum cleaners.

Vacuum cleaner	Total power input in W	Useful power output in W
A	1600	1040
B	900	630

a. Calculate the efficiency of vacuum cleaner A as a percentage.

b. Calculate the efficiency of vacuum cleaner B as a percentage.

c. Which vacuum cleaner is more efficient, A or B? Show your working.

(5 marks)

Answer _____

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13 Lucy uses a blender for 20 s. In this time it transfers 3600 J of energy usefully to the kinetic energy store of the blades. It wastes 2400 J of energy by heating and sound.

Calculate the efficiency of the blender as a percentage.

(3 marks)

Answer _____

End of questions | Total 40 marks

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