

GCSE Combined Science: Trilogy

Worksheet: Power

TIME 35 min	TOTAL 32 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: Power

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.

0 1

Power is the rate at which energy is transferred or the rate at which work is done.

0 1 . 1

Which unit is the same as one watt?

Tick (✓) **one** box.

joule per second

☐

joule second

☐

kilogram per second

☐

newton per metre

☐

[1 mark]

0 1 . 2

An electric motor transfers 3600 J of energy in 45 s.

Calculate the power of the motor.

Use the equation:

power = energy transferred ÷ time

.....

.....

.....

.....

Power = W

[2 marks]

0 1 . 3

A crane does 72 000 J of work in 60 s.
Calculate the power of the crane.
Use the equation:
power = work done ÷ time

.....

.....

.....

.....

Power = W

[2 marks]

0 2

0 2 . 1

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

.....

.....

[1 mark]

0 2 . 2

A weightlifter does 2400 J of work lifting a barbell in 3.0 s.
Calculate the power of the weightlifter.
Use the equation:
power = work done ÷ time

.....

.....

.....

.....

Power = W

[2 marks]

0 3

0 3 . 1

Which of these is the correct unit for power?

Tick (✓) **one** box.

J

J/s

J s

N/s

☐
☐
☐
☐

[1 mark]

0 3 . 2

A phone charger transfers 720 J of energy in 60 s.

Calculate the power of the charger.

Use the equation:

power = energy transferred ÷ time

.....
.....
.....
.....

Power = W

[2 marks]

0 4

A garden fountain pump transfers 24 750 J of energy in 330 s.

0 4 . 1

Calculate the power of the pump.

Use the equation:

power = energy transferred ÷ time

.....
.....
.....
.....

Power = W

[2 marks]

0 5

0 5 . 1

A kettle transfers 300 000 J of energy in 150 s.

Calculate the power of the kettle.

Tick (✓) **one** box.

300 W

☐

450 W

☐

2000 W

☐

45 000 000 W

☐

[1 mark]

0 5 . 2

Which statement about two lamps, A (60 W) and B (100 W), is correct?

Tick (✓) **one** box.

Lamp A transfers energy at a greater rate than lamp B.

☐

Lamp B transfers energy at a greater rate than lamp A.

☐

Both lamps transfer energy at the same rate.

☐

[1 mark]

0 6

A student wants to find their useful power output by running up a flight of stairs.

0 6 . 1

Describe the measurements the student needs to make. Give the measuring instrument used for each measurement.

.....

.....

.....

.....

.....

.....

[3 marks]

0 6 . 2

The student has a mass of 55 kg. The vertical height of the stairs is 4.2 m. The student takes 5.5 s to run up the stairs.
Gravitational field strength = 9.8 N/kg
Calculate the useful power output of the student.
Give your answer to 2 significant figures.

.....

.....

.....

.....

.....

.....

Useful power output = W

[4 marks]

0 6 . 3

The total power output of the student’s muscles is greater than the power calculated.
Give one reason why.

.....

.....

[1 mark]

.....

0 7

Two electric motors, A and B, are used to lift identical loads.
Each load has a weight of 400 N and is lifted vertically through 3.0 m.
Motor A takes 8.0 s to lift its load. Motor B takes 5.0 s to lift its load.

0 7 . 1

Calculate the work done on each load.

.....

.....

.....

.....

Work done = J

[2 marks]

0 7 . 2

Calculate the useful power output of motor B.

.....

.....

.....

.....

Power = W

[2 marks]

0 7 . 3

Explain why motor B has a greater useful power output than motor A.

.....

.....

.....

.....

[2 marks]

0 8

A winch has a power of 3250 W.

0 8 . 1

Calculate the time it takes to transfer 81 250 J of energy.

.....

.....

.....

.....

.....

Time = s

[3 marks]

END OF QUESTIONS

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

Mark scheme

GCSE Combined Science: Trilogy · Worksheet: Power · 32 marks

Question 1 (5 marks)

01.1 [1 mark]

Correct: joule per second

01.2 [2 marks]

Answer: 80 W

- $P = 3600 \div 45$ (1)
 - $P = 80$ (W) (1)
-

01.3 [2 marks]

Answer: 1200 W

- $P = 72\,000 \div 60$ (1)
 - $P = 1200$ (W) (1)
-

Question 2 (3 marks)

02.1 [1 mark]

Answer: $P = E \div t$

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

02.2 [2 marks]

Answer: 800 W

- $P = 2400 \div 3.0$ (1)
 - $P = 800$ (W) (1)
-

Question 3 (3 marks)

03.1 [1 mark]

Correct: J/s

03.2 [2 marks]

Answer: 12 W

- $P = 720 \div 60$ (1)
 - $P = 12$ (W) (1)
-

Question 4 (2 marks)

04.1 [2 marks]

Answer: 75 W

- $P = 24\,750 \div 330$ (1)
 - $P = 75$ (W) (1)
-

Question 5 (2 marks)

05.1 [1 mark]

Correct: 2000 W

05.2 [1 mark]

Correct: Lamp B transfers energy at a greater rate than lamp A.

Question 6 (8 marks)

06.1 [3 marks]

Answer: Mass (bathroom scales), vertical height of the stairs (tape measure or metre rule), time taken (stopwatch).

- mass of the student using (bathroom) scales (1)
- vertical height of the stairs using a tape measure / metre rule / height of one step measured with a ruler $\times$ number of steps (1)
- time taken to run up the stairs using a stopwatch (1)

Notes: A measurement must be linked to a suitable instrument for each mark. Ignore 'length of the stairs' unless the vertical height is also measured.

06.2 [4 marks]

Answer: 410 W

- $E_p = 55 \times 9.8 \times 4.2$ (1)
- $E_p = 2263.8$ (J) (1)
- $P = 2263.8 \div 5.5$ (= 411.6 W) (1)
- $P = 410$ (W) given to 2 significant figures (1)

Notes: An answer of 410 (W) scores 4 marks. An answer of 411.6 (W) scores 3 marks. Allow ECF within the calculation; the final mark is for a correct answer given to 2 significant figures.

06.3 [1 mark]

Answer: Energy is also transferred to the kinetic store of the student or dissipated by heating the student and surroundings.

- energy is also transferred to the kinetic energy store (of the student) / is dissipated to the thermal store of the student or surroundings (1)
-

Question 7 (6 marks)

07.1 [2 marks]

Answer: 1200 J

- $W = 400 \times 3.0$ (1)
- $W = 1200$ (J) (1)

07.2 [2 marks]

Answer: 240 W

- $P = 1200 \div 5.0$ (1)
- $P = 240$ (W) (1)

Notes: Allow ECF from the previous part.

07.3 [2 marks]

Answer: Both motors do the same work, but motor B does it in less time, so it transfers energy at a greater rate.

- both motors do the same (amount of) work / transfer the same (amount of) energy (1)
- motor B does it in less time / transfers energy at a higher rate (1)

Question 8 (3 marks)

08.1 [3 marks]

Answer: 25 s

- $3250 = 81\,250 \div t$ (1)
 - $t = 81\,250 \div 3250$ (1)
 - $t = 25$ (s) (1)
-