

AQA AS SI Units, Prefixes and Unit Conversions worksheet

35-40 minutes independent practice + 15-20 minutes review | 35 marks

Specification points covered

- 3.1.1(a) Know the fundamental SI base quantities used in AQA Physics and their associated SI units.
- 3.1.1(b) Use SI derived units correctly in calculations and written answers.
- 3.1.1(c) Use standard form and the prefixes T, G, M, k, c, m, μ , n, p and f.
- 3.1.1(d) Convert between units of the same quantity, including J and eV, and J and kW h.

Nanosatellite commissioning log

Engineers are checking telemetry, radio links, pulsed lasers, an ion thruster and the station energy budget. Show every prefix conversion explicitly, keep SI units with numerical answers and use sensible significant figures.

1. SI foundations

1. Three telemetry values are 18.0 kg, 0.420 A and 294 K. State the fundamental quantity represented by each value. [3 marks]

2. Express the newton, joule and pascal in SI base units. [3 marks]

3. Convert: (a) 4.80 GHz to Hz; (b) 725 nm to m; (c) 0.0360 μ A to A; (d) 12.0 fJ to J. [4 marks]

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2. Diagnosing conversions

4. A nanosatellite report contains four conversions: $6.2 \times 10^{-3} \text{ m} = 6.2 \text{ mm}$; $4800 \mu\text{s} = 4.80 \text{ ms}$; $0.45 \text{ GW} = 4.5 \times 10^8 \text{ W}$; $72 \text{ pm} = 7.2 \times 10^{-10} \text{ m}$. Identify any incorrect conversion and correct it. [4 marks]

5. A laser emits pulses of energy 3.20 mJ at a frequency of 25.0 Hz for 40.0 s . Calculate the total energy emitted. [2 marks]

6. A radio signal travels $2.40 \times 10^7 \text{ m}$ at $3.00 \times 10^8 \text{ m s}^{-1}$. Calculate the travel time in seconds and milliseconds. [2 marks]

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3. Energy across scales

7. An ion leaves a thruster with kinetic energy 35.0 keV. Convert this energy to joules. Use $1 \text{ eV} = 1.60 \times 10^{-19} \text{ J}$.
[2 marks]

8. A station battery stores 0.840 kW h. Convert this energy to joules and calculate how long it can supply a 42.0 W instrument, assuming no losses. [3 marks]

9. Only 18.0% of the battery energy in Question 8 is transferred to identical ions, each receiving 35.0 keV. Estimate the number of ions accelerated. [3 marks]

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4. Units as a physics check

10. Pressure is defined by $p = F/A$. Starting from the base units of force, show that the pascal can be written as $\text{kg m}^{-1} \text{s}^{-2}$. [3 marks]

11. The equation $v^2 = u^2 + 2as$ is proposed for linear motion. Show that every term has the same SI base units. [2 marks]

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5. Unfamiliar application

12. A femtosecond system produces a light pulse lasting 85.0 fs. (a) Calculate the length of the pulse in vacuum. (b) Successive pulses enter a fibre every 12.5 ns and travel at $2.00 \times 10^8 \text{ m s}^{-1}$. Calculate their separation in the fibre. [4 marks]

Review and improve

- ☐ I can move confidently between prefix notation and standard form.
- ☐ I keep derived units consistent with their defining equations.
- ☐ I can convert eV and kW h into joules before applying physics.

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