



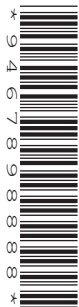
Oxford Cambridge and RSA

**June 2022 only**

**GCSE (9–1) Physics A (Gateway Science)**

**J249 01/02/03/04**

Data Sheet



**INSTRUCTIONS**

- Do **not** send this Data Sheet for marking. Keep it in the centre or recycle it.

**INFORMATION**

- This Data Sheet is for the June 2022 examination series only.
- This Data Sheet has **4** pages.

## Equations in physics

Key:

HT = Higher Tier only

### P1 Matter

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

change in thermal energy = mass × specific heat capacity × change in temperature

thermal energy for a change in state = mass × specific latent heat

for gases: pressure × volume = constant

(for a given mass of gas and at a constant temperature)

HT pressure due to a column of liquid = height of column × density of liquid × g

### P2 Forces

distance travelled = speed × time

$$\text{acceleration} = \frac{\text{change in velocity}}{\text{time}}$$

$(\text{final velocity})^2 - (\text{initial velocity})^2 = 2 \times \text{acceleration} \times \text{distance}$

kinetic energy =  $0.5 \times \text{mass} \times (\text{speed})^2$

force = mass × acceleration

HT momentum = mass × velocity

work done = force × distance (along the line of action of the force)

$$\text{power} = \frac{\text{work done}}{\text{time}}$$

force exerted by a spring = extension × spring constant

energy transferred in stretching =  $0.5 \times \text{spring constant} \times (\text{extension})^2$

gravitational force = mass × gravitational field strength, g

(in a gravitational field) potential energy = mass × height × gravitational field strength, g

$$\text{pressure} = \frac{\text{force normal to a surface}}{\text{area of that surface}}$$

moment of a force = force × distance (normal to direction of the force)

**P3 Electricity**

charge flow = current  $\times$  time

potential difference = current  $\times$  resistance

energy transferred = charge  $\times$  potential difference

power = potential difference  $\times$  current

power = (current)<sup>2</sup>  $\times$  resistance

energy transferred = power  $\times$  time

**P4 Magnetism and magnetic fields**

**HT** force on a conductor (at right angles to a magnetic field) carrying a current = magnetic flux density  $\times$  current  $\times$  length

**HT**  $\frac{\text{potential difference across primary coil}}{\text{potential difference across secondary coil}} = \frac{\text{number of turns in primary coil}}{\text{number of turns in secondary coil}}$

**P5 Waves in matter**

wave speed = frequency  $\times$  wavelength

**P7 Energy**

efficiency =  $\frac{\text{useful output energy transfer}}{\text{input energy transfer}}$

**P8 Global challenges**

potential difference across primary coil  $\times$  current in primary coil =  
potential difference across secondary coil  $\times$  current in secondary coil

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