

**CAMBRIDGE OCR**

**June 2027**

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

**J250 05/06/11/12 Physics**

**Equation Sheet**

## **INSTRUCTIONS**

**You can write on this Equation Sheet but it will NOT be sent for marking.**

# EQUATIONS IN PHYSICS

Key: HT = Higher Tier only

|  |                                                                                                   |                                |
|--|---------------------------------------------------------------------------------------------------|--------------------------------|
|  | <b>P1 MATTER</b>                                                                                  |                                |
|  | density = $\frac{\text{mass}}{\text{volume}}$                                                     | $\rho = \frac{m}{V}$           |
|  | change in thermal energy<br>= mass $\times$ specific heat capacity $\times$ change in temperature | $\Delta E = m c \Delta \theta$ |
|  | thermal energy for a change in state = mass $\times$ specific latent heat                         | $E = m l$                      |

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|  |                                                                                                                 |                         |
|--|-----------------------------------------------------------------------------------------------------------------|-------------------------|
|  | <b>P2 FORCES</b>                                                                                                |                         |
|  | distance travelled = speed $\times$ time                                                                        | $s = vt$                |
|  | acceleration = $\frac{\text{change in velocity}}{\text{time}}$                                                  | $a = \frac{v - u}{t}$   |
|  | $(\text{final velocity})^2 - (\text{initial velocity})^2 = 2 \times \text{acceleration} \times \text{distance}$ | $v^2 - u^2 = 2as$       |
|  | kinetic energy = $\frac{1}{2} \times \text{mass} \times (\text{speed})^2$                                       | $E = \frac{1}{2} m v^2$ |
|  | force = mass $\times$ acceleration                                                                              | $F = ma$                |

|    |                                                                                                            |                         |
|----|------------------------------------------------------------------------------------------------------------|-------------------------|
|    | <b>P2 FORCES</b>                                                                                           |                         |
| HT | momentum = mass × velocity                                                                                 | $p = m v$               |
|    | work done = force × distance (along the line of action of the force)                                       | $W = F s$               |
|    | power = $\frac{\text{work done}}{\text{time}}$                                                             | $P = \frac{W}{t}$       |
|    | force exerted by a spring = spring constant × extension                                                    | $F = k x$               |
|    | energy transferred in stretching = $\frac{1}{2} \times \text{spring constant} \times (\text{extension})^2$ | $E = \frac{1}{2} k x^2$ |
|    | gravitational force = mass × gravitational field strength                                                  | $W = m g$               |
|    | gravitational potential energy<br>= mass × gravitational field strength × height                           | $E = m g h$             |

|  |                                                    |           |
|--|----------------------------------------------------|-----------|
|  | <b>P3 ELECTRICITY AND MAGNETISM</b>                |           |
|  | charge flow = current × time                       | $Q = I t$ |
|  | potential difference = current × resistance        | $V = I R$ |
|  | energy transferred = charge × potential difference | $E = Q V$ |
|  | power = potential difference × current             | $P = V I$ |

|    |                                                                                                                                       |             |
|----|---------------------------------------------------------------------------------------------------------------------------------------|-------------|
|    | <b>P3 ELECTRICITY AND MAGNETISM</b>                                                                                                   |             |
|    | power = (current) <sup>2</sup> × resistance                                                                                           | $P = I^2 R$ |
|    | energy transferred = power × time                                                                                                     | $E = Pt$    |
| HT | force on a conductor (at right angles to a magnetic field)<br>carrying a current:<br>force = magnetic flux density × current × length | $F = BIl$   |

|  |                                     |                |
|--|-------------------------------------|----------------|
|  | <b>P4 WAVES AND RADIOACTIVITY</b>   |                |
|  | wave speed = frequency × wavelength | $v = f\lambda$ |

|  |                                                                                          |  |
|--|------------------------------------------------------------------------------------------|--|
|  | <b>P5 ENERGY</b>                                                                         |  |
|  | efficiency = $\frac{\text{useful output energy transfer}}{\text{input energy transfer}}$ |  |

|  |                                                                                                                                                   |                     |
|--|---------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
|  | <b>P6 GLOBAL CHALLENGES</b>                                                                                                                       |                     |
|  | potential difference across primary coil × current in primary coil<br>= potential difference across secondary coil<br>× current in secondary coil | $V_p I_p = V_s I_s$ |

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