Oxford Cambridge and RSA

June 2022 only

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

J249 01/02/03/04

Data Sheet

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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

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

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

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

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

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

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 × time

potential difference = current × resistance

energy transferred = charge × potential difference

power = potential difference × current

power = $(\text{current})^2$ × resistance

energy transferred = power × time

P4 Magnetism and magnetic fields

HT force on a conductor (at right angles to a magnetic field) carrying a current = magnetic flux density × current × 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 × wavelength

P7 Energy

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

P8 Global challenges

potential difference across primary coil × current in primary coil =
potential difference across secondary coil × current in secondary coil