IGCSE Physics equation sheet

Equations are not given in the 0625 exam, so you need to recall them. Some are for Extended (Supplement) only; check with your teacher or tutor which ones your papers use.

1 Motion, forces and energy

Quantity	Equation	Units
Speed	**$v = s \div t$**	m/s
Average speed	**total distance ÷ total time**	m/s
Acceleration	**$a = \Delta v \div \Delta t$**	m/s²
Weight	**$W = mg$**	N (g = 9.8 N/kg)
Density	**$\rho = m \div V$**	kg/m³ or g/cm³
Spring constant	**$k = F \div x$**	N/m
Resultant force	**$F = ma$**	N
Moment of a force	**moment = F × perpendicular distance from pivot**	N m
Momentum	**$p = mv$**	kg m/s
Impulse	**impulse = $F\Delta t = \Delta(mv)$**	N s
Resultant force and momentum	**$F = \Delta p \div \Delta t$**	N
Kinetic energy	**$E_k = \frac{1}{2}mv^2$**	J
Change in gravitational potential energy	**$\Delta E_p = mg\Delta h$**	J
Work done	**$W = Fd = \Delta E$**	J
Efficiency	**(useful energy output ÷ total energy input) × 100%**	%
Power	**$P = W \div t = \Delta E \div t$**	W
Pressure	**$p = F \div A$**	Pa (N/m²)
Pressure change in a liquid	**$\Delta p = \rho g \Delta h$**	Pa

2 Thermal physics

Quantity	Equation	Units
Gas at constant temperature (fixed mass)	**pV = constant**	–
Kelvin and Celsius	**T (K) = θ (°C) + 273**	K
Specific heat capacity	**$c = \Delta E \div (m\Delta\theta)$**	J/(kg °C)

3 Waves

Quantity	Equation	Units
Wave speed	**$v = f\lambda$**	m/s
Refractive index	**$n = \sin i \div \sin r$**	no unit
Critical angle	**$n = 1 \div \sin c$**	no unit

4 Electricity and magnetism

Quantity	Equation	Units
Current	$I = Q \div t$	A
Potential difference and e.m.f.	$V = W \div Q$	V
Resistance	$R = V \div I$	Ω
Electrical power	$P = IV$	W
Electrical energy	$E = IVt$	J (1 kW h = 3.6 × 10⁶ J)
Resistors in series	$R = R_1 + R_2 + \ldots$	Ω
Resistors in parallel	$1/R = 1/R_1 + 1/R_2 + \ldots$	Ω
Potential divider	$V_1 \div V_2 = R_1 \div R_2$	–
Transformer turns	$V_p \div V_s = N_p \div N_s$	–
Ideal (100% efficient) transformer	$I_pV_p = I_sV_s$	W
Power lost in a cable	$P = I^2R$	W

6 Space physics

Quantity	Equation	Units
Orbital speed	$v = 2\pi r \div T$	m/s
Hubble constant	$H_0 = v \div d$	s^{-1}
Age of the Universe (estimate)	$d \div v = 1 \div H_0$	s

Constants and values
g = 9.8 m/s² (9.8 N/kg)
Speed of light in a vacuum: 3.0 × 10⁸ m/s
Speed of sound in air: about 330–350 m/s
Human hearing: about 20 Hz to 20 kHz
Absolute zero: 0 K = -273 °C

Worked example
A 1.5 kW kettle runs for 2 minutes. Energy?
E = Pt = 1500 W × 120 s = **180 000 J**

A 0.5 kg ball falls 2 m. Kinetic energy at the bottom (no air resistance)?
$\Delta E_p = mg\Delta h = 0.5 \times 9.8 \times 2 =$ **9.8 J**, so $E_k = 9.8$ J

Self-test (answers at the bottom)

1. A car speeds up from 4 m/s to 24 m/s in 5 s. What is its acceleration?
2. What is the weight of a 60 kg student on Earth?
3. A 2 kg block is pushed with a resultant force of 10 N. What is its acceleration?
4. How much energy heats 2 kg of water by 10 °C? (c = 4200 J/(kg °C))
5. A wave has a frequency of 500 Hz and a wavelength of 0.68 m. What is its speed?
6. A 6 Ω and a 3 Ω resistor are in parallel. What is the combined resistance?
7. A transformer has 100 primary turns and 2000 secondary turns. The input is 12 V. What is the output?
8. A 20 kg box is lifted 3 m. What is its gain in gravitational potential energy?

Answers: 1. 4 m/s² 2. 588 N 3. 5 m/s² 4. 84 000 J 5. 340 m/s 6. 2 Ω 7. 240 V 8. 588 J