**PHYSICS**

**ATAR COURSE YEAR 11**

**FORMULAE AND DATA**

**2025**

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| **Motion, forces and energy** |  |
| Displacement |  |
| Average velocity |  |
| Equations of motion |  |
| Momentum |  |
| Force |  |
| Change in momentum (impulse) |  |
| Weight force |  |
| Friction |  where *μ* is the coefficient of static or kinetic friction |

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| **Mechanical and thermal energy** |  |
| Kinetic energy |  |
| Gravitational potential energy |  |
| Conservation of energy |  |
| Elastic collisions |  |
| Work done |  |
| Power |  |
| Change of temperature |  |
| Change of state |  |

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| **Waves** |  |  |
| Wave velocity |  |  |
| Period |  |  |
| Strings and open pipes |  | where *n* = the number of the appropriate harmonic |
| Closed pipes |  | where *n* = the number of the appropriate harmonic |
| Beat frequency |  |

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| **Ionising radiation and nuclear reactions** |
| Half-life |  |
| Absorbed radiation dose |  |
| Dose equivalent |  |
| Mass–energy relationship |  |

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| **Electrical forces and energy** |  |
| Work and energy |  |
| Electric current |  |
| Power |  |
| Ohm’s law |  |
| Resistance in series(*I* = constant) |  |
| Resistance in parallel(*V* = constant) |  |

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| **Prefixes of the metric system** |
| Factor | Prefix | Symbol | Factor | Prefix | Symbol |
| 1012 | tera | T | 10-3 | milli | m |
| 109 | giga | G | 10-6 | micro | μ |
| 106 | mega | M | 10-9 | nano | n |
| 103 | kilo | k | 10-12 | pico | p |

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| **Physical constants** |
| Speed of light in vacuum or air *c* | = 3.00 × 108 m s-1 |
| Electron charge *e* | = -1.60 × 10-19 C |
| Electron volt 1.00 eV | = 1.60 × 10-19 J |
| Unified atomic mass unit 1.00 u | = 1.66 × 10-27 kg |
| Mass of electron *me* | = 9.11 × 10-31 kg |
| Mass of proton *mp* | = 1.67 × 10-27 kg |
| Mass of neutron *mn* | = 1.67 × 10-27 kg |
| Mass of alpha particle *mα* | = 6.64 × 10-27 kg |
| Mass–energy equivalent 1.00 u | = 931 MeV |
| Tonne 1.00 t | = 103 kg = 106 g |
| Absolute zero 0 K | = −273 °C |

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| **Physical data** |
| Mean acceleration due to gravity on Earth *g* | = 9.80 m s-2 |
| Specific heat capacity of water *cw* | = 4.18 × 103 J K-1 kg-1 |
| Specific heat capacity of ice *ci* | = 2.10 × 103 J K-1 kg-1 |
| Specific heat capacity of steam *cs* | = 2.00 × 103 J K-1 kg-1 |
| Latent heat of fusion for H2O *Lf* | = 3.34 × 105 J kg-1 |
| Latent heat of vaporisation for H2O *Lv* | = 2.26 × 106 J kg-1 |
| Speed of sound in air at 25 °C *vs* | = 346 m s-1 |

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| **Quality factors** |
| Approximate quality factor for alpha radiation *QFα* | = 20 |
| Approximate quality factor for beta radiation *QFβ* | = 1 |
| Approximate quality factor for gamma radiation *QFγ* | = 1 |
| Approximate quality factor for slow neutrons *QFsn* | = 3 |
| Approximate quality factor for fast neutrons *QFfn* | = 10 |

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| **Mathematical expressions** |
| **Quadratic equations** |  |
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**Triangles**

The following expressions apply to the triangle ABC as shown:



