PHYSICS

\* These equations will be provided on the exam paper

**Energy**

|  |  |  |
| --- | --- | --- |
| Equation | Symbol | Unit |
| Ek = ½ mv2 | Ek = kinetic energy  m = mass  v = speed | Ek = J (joules)  m = kg (kilograms)  v = m/s (meters per second) |
| \* Ee = ½ ke2 | Ee = elastic potential energy  k = spring constant  e = extension | Ee = J (joules)  k = N/m (newtons per meter)  e = m (meters) |
| Ep = mgh | Ep = gravitational potential energy  m = mass  g = gravitational field strength  h = height | Ep = J (joules)  m = kg (kilograms)  g = N/kg (newtons per kilogram)  h = m (meters) |
| \* ΔE = mcΔθ | ΔE = change in thermal energy  m = mass  c = specific heat capacity  Δθ = temperature change | ΔE = J (joules)  m = kg (kilograms)  c = J/kg˚C (joules per kilogram degree Celsius)  Δθ = ˚C (degree Celsius) |
| P = E  T | P = power  E = energy transferred  t = time | P = W (watts)  E = J (joules)  t = s (seconds) |
| P = W  T | P = power  W = work done  t = time | P = W (watts)  E = J (joules)  t = s (seconds) |
| Efficiency = useful energy out  total energy in  Efficiency = useful power out  total power in | | |

**Electricity**

|  |  |  |
| --- | --- | --- |
| Equation | Symbols | Units |
| Q = It | Q = Charge  I = Current t = Time | Q = C (coulombs)  I = A (amps) t = s (seconds) |
| V = IR | V = Potential difference  I = Current  R = Resistance | V = V (volts)  I = A (amps)  R = Ω (ohms) |
| P = VI | P = Power  V = Potential difference  I = Current | P = W (watts)  V = V (volts)  I = A (amps) |
| P = I2R | P = Power  I = Current  R = Resistance | P = W (watts)  I = A (amps)  R = Ω (ohms) |
| E = Pt | E = Energy  P = Power  t = Time | E = J (joules)  P = W (watts)  t = s (seconds) |
| E = QV | E = Energy  Q = Charge  V = Potential difference | E = J (joules)  Q = C (coulombs)  V = V (volts) |

**Particle Model of Matter**

|  |  |  |
| --- | --- | --- |
| Equation | Symbols | Units |
| ρ = m  V | ρ = density  m = mass  V = volume | ρ = kg/m3 (kilograms per meter cubed  m = kg (kilograms)  V = m3 (meters cubed) |
| \* ΔE = mcΔθ | ΔE = change in thermal energy  m = mass  c = specific heat capacity  Δθ = temperature change | ΔE = J (joules)  m = kg (kilograms)  c = J/kg˚C (joules per kilogram degree Celsius)  Δθ = ˚C (degree Celsius) |
|  | | |
| \* E = mL | E = Energy  m = mass  L = specific latent heat | E = J (joules)  m = kg (kilograms)  L = J/kg (joules per kilogram) |
|  | | |
| \* pV = constant | p = pressure  V = volume | p = Pa (pascals)  V = m3 (meters cubed) |
| Physics only | | |

**Forces**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Equation | | | Symbols | | | | Units |
| W = mg | | | W = weight  m = mass  g = gravitational field strength | | | | W = N (newton’s)  m = kg (kilograms)  g = N/kg (newtons per kilogram) |
| W = Fs | | | W = work done  F = force  s = distance | | | | W = J (joules)  F = N (newtons)  s = m (meters) |
| F = ke | | | F = force  k = spring constant  e = extension | | | | F = N (newtons)  k = N/m (newtons per meter)  e = m (meters) |
| \*Ee = ½ ke2 | | | Ee = elastic potential energy  k = spring constant  e = extension | | | | Ee = J (joules)  k = N/m (newtons per meter)  e = m (meters) |
|  | | | | | | | |
| M = Fd | | | M = moment  F = force  d = distance | | | | M = Nm (newton-meters)  F = N (newtons)  d = m (meters) |
| Physics only | | | | | | | |
| p = F  A | | | p = pressure  F = force  A = area | | | | p = Pa (pascals)  F = N (newtons)  A = m2 (meters squared) |
| Physics only | | | | | | | |
| \*p = hρg | | | p = pressure  h = height  ρ = density  g = gravitational field strength | | | | p = Pa (pascals)  h = m (meters)  ρ = kg/m3 (kilograms per meter cubed  g = N/kg (newtons per kilogram) |
| Physics only/Higher tier only | | | | | | | |
| s = vt | | | s = distance  v = speed  t = time | | | | s = m (meters)  v = m/s (meters per second)  t = s (seconds) |
| a = Δv  t | | | a = acceleration  Δv = change in velocity  t = time | | | | a = m/s2 (meters per second squared)  Δv = m/s (meters per second)  t = s (seconds) |
| \*v2 – u2 = 2as | | | v = final velocity  u = initial velocity  a = acceleration  s = distance | | | | v = m/s (meters per second)  u = m/s (meters per second)  a = m/s2 (meters per second squared)  s = m (meters) |
| F = ma | | | F = force  m = mass  a = acceleration | | | | F = N (newtons)  m = kg (kilograms)  a = m/s2 (meters per second squared) |
| p = mv | | | p = momentum  m = mass  v = velocity | | | | p = kg m/s (kilograms metre per second)  m = kg (kilograms)  v = m/s (meters per second) |
| Higher tier only | | | | | | | |
| \*F = m Δv  Δt | | | F = force  m = mass  v = velocity  t = time | | | | F = N (newtons)  m = kg (kilograms)  v = m/s (meters per second)  t = s (seconds) |
| Physics only Higher tier only | | | | | | | |
| **Waves** | | | | | | | |
| Equation | Symbols | | | | Units | | | |
| \*T = 1  F | T = Period  f = frequency | | | | T = s (seconds)  f = Hz (hertz) | | | |
| v = fλ | v = velocity  f = frequency  λ = wavelength (lambda) | | | | v = m/s (meters per second)  f = Hz (hertz)  λ = m (meters) | | | |
| \*Magnification = image height  object height | | | | Ratio, so has no units | | | | |
| Physics only | | | | | | | | |
| Equation | | Symbols | | | | Units | | |
| \*F = BIl | | F = force  B = magnetic flux density  I = Current  l = length | | | | F = N (newtons)  B = T (tesla)  I = A (Amps or Amperes)  l = m (meters) | | |
| Note this is a capital I and a lowercase l Higher tier only | | | | | | | | |
| \*Vp = np  Vs ns | | Vp = potential difference across the primary coil  Vs = potential difference across the secondary coil  np = number of turns on the primary coil  ns = number of turns on the secondary coil | | | | Vp = V (volts)  Vs = V (volts)  np and ns have no units as they are just numbers | | |
| Physics only Higher tier only | | | | | | | | |
| \*Vs Is = Vp Ip | | Vs = potential difference across the secondary coil  Vp = potential difference across the primary coil  Is = current in the secondary coil  Ip = current in the primary coil  Vs Is = power output  Vp Ip = power input | | | | Vs = V (volts)  Vp = V (volts)  Is = A (Amps or Amperes)  Ip = A (Amps or Amperes) | | |
| Physics only Higher tier only | | | | | | | | |