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 inEfficiency = 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**

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| 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  |