1 – Scalars and Vector Quantities	
Scalars	**Quantities** that only have **magnitude**.
Scalar examples	**Distance, speed, energy, time, mass, temperature.**
Vectors	**Quantities** that have both **direction** and **magnitude**.
Vector examples	**Displacement, velocity, force, acceleration, momentum.**
2 - Forces	
Contact forces	Objects have to be **touching**, e.g. **friction**, **tension**, **air resistance**, **normal contact force**.
Non-contact forces	Objects do **not** need to be **touching**, e.g. **electrostatic** force, **magnetic** force, **gravitational** force.
Resultant force	A **single force** that gives the **same effect** as **multiple forces** acting together on an object.
Work done by forces	When a **force moves** an object -> **energy transferred** -> **work** is **done** -> **work = force x distance** -> **W = F x d**
3 - Mass and Weight	
Mass	Measure of the **amount** of **matter** -> units = **kilograms** -> measure with a **mass balance**.
Weight	**Force** due to **gravity** -> units = **Newtons** > measure with a **Newton meter**.
Relationship	**Weight** is **directly proportional** to **mass**.
Equation	**Weight = mass x gravitational field strength** -> **W = m x g**
Centre of mass	**Point** through which an **object's weight** appears to **act**.
4 - Forces and Elasticity	
Deformation	**Stretch**, **compress** or **bend** -> requires **more** than **1 force.**
Elastic deformation	Object returns to **original shape/size** when forces removed. All energy transferred to **elastic potential store**.
Inelastic deformation	Object does **not** return to **original shape/size** when forces removed.
Hooke's law	**Extension** of **spring** is **directly proportional** to **force applied** -> up to the **limit** of **proportionality**.
Equation	**Force = spring constant x extension** -> **F = k x e**

5 – Motion	
Speed equation	**speed = distance / time** -> **v = d / t**
Distance-time graphs	**Gradient** = **speed** **Horizontal line** = **stationary**
Acceleration	**Rate of change of velocity** -> **units = m/s^2**
Acceleration equations	**a = $\frac{\Delta v}{t}$** **$v^2 - u^2 = 2 \times a \times d$**
Velocity-time graphs	**Gradient** = **acceleration** **Horizontal line** = **constant velocity** **Area under graph** = **distance travelled**
Terminal velocity	**Maximum constant velocity** -> **forwards force** and **backwards friction/drag force** are **balanced**.
6 – Newton's Laws of Motion	
1st Law	**Balanced** forces -> object **stationary** or **constant velocity**. **Unbalanced** forces -> object **accelerates** in **direction** of **resultant force**.
2nd Law	**Force = mass x acceleration** -> **F = m x a**
3rd Law	Two interacting objects exert **equal** and **opposite forces** on each other.
7 – Stopping Distances	
Equation	**Stopping distance** = **thinking distance** + **braking distance**
Thinking distance	**Distance** moved during **reaction time**. Increased by **vehicle speed** and **slower reaction times** (e.g. alcohol).
Braking distance	**Distance** moved whilst **brakes applied.** Increased by **vehicle speed**, poor **road surface**, **wet/icy** weather, worn **brakes/tyres**
8 – Momentum	
Equation	**Momentum = mass x velocity** -> **p = m x v** -> units = **kg m/s**
Conservation	For an **event** (e.g. a **collision**) in a **closed system**: **momentum before** = **momentum after**.

GCSE Science

Physics P5 – Forces