Essential Notes on AQA Mechanics 1

Newtons Laws of Motion

1. Every particle continues in a state of uniform motion unless acted upon by an external force.
2. The net force is equal to the rate of change of momentum. $F = ma$
3. Every action has an equal and opposite reaction
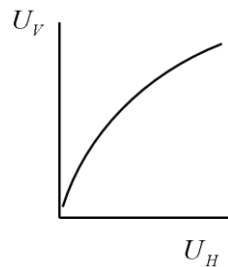
Suvat

$$v = u + at \qquad\qquad \text{(no } s\text{)}$$

$$s = ut + \tfrac{1}{2}at^2 \qquad\qquad \text{(no } u\text{)}$$

$$s = vt - \tfrac{1}{2}at^2 \qquad\qquad \text{(no } v\text{)}$$

$$s = \tfrac{1}{2}(u + v)t \qquad\qquad \text{(no } a\text{)}$$

$$v^2 = u^2 + 2as \qquad\qquad \text{(no } t\text{)}$$

Projectiles

U_H acts constantly $\qquad$ U_V subject to g ms^{-2}

Care required with stating which is positive vertical direction.

Friction

$$F = \mu R \text{ where } 0 < \mu < 1$$

Equilibrium

Result force equals zero

Principal of Conservation of Momentum

The total momentum in a system before an impact is equal to the total momentum in the system after the impact. $m_1 v_1 = m_2 v_2$

Common Modelling Assumptions

Ignore air resistance
Force of gravity acts constantly

Inextensible	$\Rightarrow$	no stretching
Thin	$\Rightarrow$	no diameter or thickness
Light	$\Rightarrow$	no mass
Rigid	$\Rightarrow$	no bending
Smooth	$\Rightarrow$	no friction
Particle	$\Rightarrow$	no size

Vectors

$(r \sin \theta) j$

$(r \cos \theta) i$
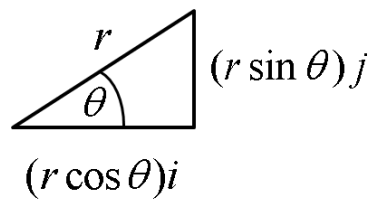
$$r = ai + bj \qquad |r| = \sqrt{a^2 + b^2} \qquad \tan \theta = \frac{b}{a}$$

Pulleys and Tension

$T \qquad T$

$3g$

$5g$