

# MARINA INTERNATIONAL SCHOOL

# MECHANICS SCHEME OF WORK

## FORM 7 - TERM 2

WEEK	TOPIC	TOPIC DETAILS
1.1	Forces	Identify the forces acting in a given situation, e.g. by drawing a force diagram
1.2	Forces	Understand the vector nature of force, and find and use components and resultants; calculations are always required, not approximate solutions by scale drawing
2.1	Equilibrium	Use the principle that, when a particle is in equilibrium, the vector sum of the forces acting is zero, or equivalently, that the sum of the components in any direction is zero; solutions by resolving are usually expected, but equivalent methods (e.g. triangle of forces, Lami's Theorem, where suitable) are also acceptable; these other methods are not required knowledge, and will not be referred to in questions
3.1	Friction	Understand that a contact force between two surfaces can be represented by two components, the normal component and the frictional component
3.2	Friction	Use the model of a 'smooth' contact, and understand the limitations of this model understand the concepts of limiting friction and limiting equilibrium, recall the definition of coefficient of friction, and use the relationship $F = \mu R$ or $F \leq \mu R$ , as appropriate; terminology such as 'about to slip' may be used to mean 'in limiting equilibrium' in questions
3.3	Friction	Use Newton's third law, e.g. the force exerted by a particle on the ground is equal and opposite to the force exerted by the ground on the particle
4.1	Kinematics of a Particle in a straight line	Understand the concepts of distance and speed as scalar quantities, and of displacement, velocity and acceleration as vector quantities; restricted to motion in one dimension only; the term 'deceleration' may sometimes be used in the context of decreasing speed.

WEEK	TOPIC	TOPIC DETAILS
4.2	Kinematics of a Particle in a straight line	Sketch and interpret displacement–time graphs and velocity–time graphs, and in particular appreciate that: <ul style="list-style-type: none"> <li>- the area under a velocity–time graph represents displacement</li> <li>- the gradient of a displacement–time graph represents velocity</li> <li>- the gradient of a velocity-time graph represents acceleration</li> </ul>
5.1	Kinematics of a Particle in a straight line	Use differentiation and integration with respect to time to solve simple problems concerning displacement, velocity and acceleration; calculus required is restricted to techniques from the content for Paper 1: Pure Mathematics 1
5.2	Kinematics of a Particle in a straight line	Use appropriate formulae for motion with constant acceleration in a straight line; questions may involve setting up more than one equation, using information about the motion of different particles.
6.1	Momentum	Use the definition of linear momentum and show understanding of its vector nature; for motion in one dimension only.
6.2	Momentum	Use conservation of linear momentum to solve problems that may be modelled as the direct impact of two bodies; including direct impact of two bodies where the bodies coalesce on impact; knowledge of impulse and the coefficient of restitution is not required.
7.1	Newton's laws of Motion	Apply Newton's laws of motion to the linear motion of a particle of constant mass moving under the action of constant forces, which may include friction, tension in an extensible string and thrust in a connecting rod; if any other forces resisting motion are to be considered (e.g. air resistance) this will be indicated in the question
7.2	Newton's laws of Motion	Use the relationship between mass and weight; $W = mg$ ; in this component, questions are mainly numerical, and use of the approximate numerical value 10 ( $\text{ms}^{-2}$ ) for $g$ is expected.
8.1	Newton's laws of Motion	Solve simple problems which may be modelled as the motion of a particle moving vertically or on an inclined plane with constant acceleration; including, for example, motion of a particle on a rough plane where the acceleration while moving up the plane is different from the acceleration while moving down the plane.
8.2	Newton's laws of Motion	Solve simple problems which may be modelled as the motion of connected particles, e.g. particles connected by a light inextensible string passing over a smooth pulley, or a car towing a trailer by means of either a light rope or a light rigid towbar.

<b>WEEK</b>	<b>TOPIC</b>	<b>TOPIC DETAILS</b>
9.1	Energy , Work and Power.	Understand the concept of the work done by a force, and calculate the work done by a constant force when its point of application undergoes a displacement not necessarily parallel to the force; $W = Fd \cos \theta$ ; use of the scalar product is not required
9.2	Energy , Work and Power.	Understand the concepts of gravitational potential energy and kinetic energy, and use appropriate formulae.
9.3	Energy , Work and Power.	Understand and use the relationship between the change in energy of a system and the work done by the external forces, and use in appropriate cases the principle of conservation of energy; including cases where the motion may not be linear (e.g. a child on a smooth curved 'slide'), where only overall energy changes need to be considered.
9.4	Energy , Work and Power.	Use the definition of power as the rate at which a force does work, and use the relationship between power, force and velocity for a force acting in the direction of motion; including calculation of (average) power as ; $P = Fv$ Solve problems involving, for example, the instantaneous acceleration of a car moving on a hill against a resistance.