

**National 4**  
**Dynamics and Space**  
Study Guide

***2.1 Speed & Acceleration***

At the end of the section you should be able to :

- 1 Describe how to measure average speed.
- 2 Carry out calculations involving distance, time and average speed.
- 3 Describe how to measure instantaneous speed.
- 4 Carry out calculations involving distance, time and instantaneous speed.
- 5 Explain the terms 'speed' and 'acceleration'.
- 6 State that acceleration is the change in speed per unit time.
- 7 Describe how to measure acceleration.
- 8 Calculate the acceleration of an object using its change in speed and time.
- 9 Describe the motions represented by a speed–time graph.
- 10 Calculate the distance travelled from a speed–time graph.

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**2.2 Forces**

At the end of the section you should be able to :

- 1 Describe the effects of forces in terms of their ability to change the shape, speed and direction of travel of an object.
- 2 Describe how to use a newton balance to measure force.
- 3 State that weight is a force and is the Earth's pull on an object.
- 4 Distinguish between mass and weight.
- 5 State that weight per unit mass is called the gravitational field strength.
- 6 Carry out calculations involving the relationship between weight, mass and gravitational field strength including situations where  $g$  is not equal to 10 N/kg.
- 7 State that the force of friction can oppose the motion of an object.
- 8 Describe and explain situations in which attempts are made to increase or decrease the force of friction.
- 9 State that equal forces acting in opposite directions on an object are called balanced forces.
- 10 State that balanced forces are equivalent to no force at all.
- 11 State that when the balanced forces act on an object its speed remains the same
- 12 State that when the forces acting upon an object are not balanced the object accelerates.
- 13 Carry out calculations using the relationship between force, acceleration and mass.
- 14 Explain in terms of forces why seat belts are used in cars.

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***2.3 Satellites***

At the end of the section you should be able to :

- 1 State that satellites are objects which orbit a planet.
- 2 State that the moon is the only natural satellite of Earth.
- 3 State that man-made satellites are placed in orbits at different heights and the functions are determined by the height.
- 4 State that the period of a satellite depends on its height above the Earth.
- 5 State that a geostationary satellite stays above the same point on the Earth's surface.
- 6 State that curved reflectors are used for sending and receiving signals in satellite communication.
- 7 Explain how curved reflectors on receiving aerials make the signal stronger.
- 8 Describe how geostationary satellites and curved reflectors are used to send and receive signals in intercontinental telecommunications.
- 9 Carry out calculations using speed, distance and time in problems using waves of the electromagnetic spectrum.
- 10 Describe how satellites are used in environmental monitoring.
- 11 Describe how satellites are being used to help understand mankind's impact upon the Earth.

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***2.4 Cosmology***

At the end of the section you should be able to :

- 1 Use correctly in context the following terms : moon, planet, Sun, star, solar system, galaxy, universe.
- 2 Name the planets of the Solar System.
- 3 Use correctly in context the term *light-year*.
- 4 State approximate values for the distance from the Earth to the Sun, to the next nearest star, and to the edge of our galaxy in terms of the time for light to cover these distances.
- 5 Draw a diagram showing the main parts of a refracting telescope – objective lens, eyepiece, light-tight tube.
- 6 State that the objective lens produces an image which is magnified by the eyepiece.
- 7 Explain that the brightness of the image formed by a telescope depends on the diameter of the objective lens.
- 8 State that different kinds of telescope are used to detect different signals from space e.g. optical telescopes and radio telescopes.
- 9 Explain how telescopes and space exploration have helped us to better understand Earth.
- 10 Explain how telescopes and space exploration and satellites has enabled us to better understand the universe.
- 11 Describe the risks associated with space travel/exploration including the challenges of re-entry to a planet's atmosphere.

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***2.4 Cosmology cont.***

At the end of the section you should be able to

- 12 Describe how spacecraft are protected on re-entry to a planet's atmosphere as kinetic energy changes to heat energy.
- 13 State that an exo-planet is a planet that orbits a star other than the Sun.
- 14 Describe the conditions required for an exo-planet to sustain life.