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DYNAMICS AND SPACE

Study Guide

2.1 Kinematics

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

- ❑ 1 Carry out calculations involving distance, time and average speed.
- ❑ 2 Describe what is meant by vector and scalar quantities.
- ❑ 3 State the difference between distance and displacement.
- ❑ 4 State the difference between speed and velocity.
- ❑ 5 Explain the terms ‘speed’, ‘velocity’ and ‘acceleration’.
- ❑ 6 Use a scale diagram, or otherwise, to find the magnitude and direction of the displacement of an object.
- ❑ 7 Carry out calculations to find the velocity of an object.
- ❑ 8 State that acceleration is the change in velocity per unit time.
- ❑ 9 Draw velocity – time graphs involving more than one constant acceleration.
- ❑ 10 Describe the motions represented by a velocity–time graph.
- ❑ 11 Calculate displacement and acceleration from velocity–time graphs involving more than one constant acceleration.
- ❑ 12 Carry out calculations involving the relationship between initial velocity, final velocity, time and uniform acceleration.

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2.2 Dynamics

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 the use of 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 9.8 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 force is a vector quantity.
- ❑ 10 State that forces which are equal in size but act in opposite directions on an object are called balanced forces and are equivalent to no force at all.
- ❑ 11 Explain the movement of objects in terms of Newton's First Law.
- ❑ 12 Describe the qualitative effects of change of mass or of force on the acceleration of an object.
- ❑ 13 Carry out calculations using the relationship between acceleration, unbalanced force and mass, and involving more than one force (Newton's Second Law).

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

- ❑ 14 Apply Newton's Second Law to calculations involving space travel and rocket launch and landing.
- ❑ 15 State that Newton's Third Law states that every action force has an equal but opposite reaction force.
- ❑ 16 Apply Newton's Third Law to everyday situations.
- ❑ 17 Apply Newton's Laws of Motion to explain the term 'freefall' and 'terminal velocity'.
- ❑ 18 Explain the equivalence of acceleration due to gravity and gravitational field strength.
- ❑ 19 Explain the curved path of a projectile in terms of the force of gravity.
- ❑ 20 Explain how projectile motion can be treated as two independent motions.
- ❑ 21 Solve numerical problems using the above method for an object projected horizontally.
- ❑ 22 Explain how a satellite stays in orbit.
- ❑ 23 Explain that the period of a satellite depends upon the orbital height.
- ❑ 24 Describe how curved reflectors can be used as both transmitters and receivers in satellite communication.

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2.3 Space

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

- ❑ 1 Describe how the electromagnetic spectrum has been used to obtain information about astronomical objects.
- ❑ 2 Explain how telescopes are used to better understand the Universe.
- ❑ 3 Explain how space exploration has enabled us to better understand the Universe.
- ❑ 4 Explain how space exploration and satellites have helped us to better understand Earth.
- ❑ 5 Describe the benefits and potential problems associated with space travel and the impact it has on our society.
- ❑ 6 Describe how the challenge of re-entry to a planet's atmosphere can be overcome.
- ❑ 7 Use correctly in context the term 'light-year'.
- ❑ 8 Convert distances in light years into metres.
- ❑ 9 Give a description of the Universe in terms of its origin and age.
- ❑ 10 Identify continuous and line spectra.
- ❑ 11 Use continuous and line spectra for known elements to identify the elements present in stars.