

# DOT POINT

WACE PHYSICS UNITS 1 AND 2

• Brian Shadwick •



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## Words to Watch

**account, account for** State reasons for, report on, give an account of, narrate a series of events or transactions.

**analyse** Interpret data to reach conclusions.

**annotate** Add brief notes to a diagram or graph.

**apply** Put to use in a particular situation.

**assess** Make a judgement about the value of something.

**calculate** Find a numerical answer.

**clarify** Make clear or plain.

**classify** Arrange into classes, groups or categories.

**comment** Give a judgement based on a given statement or result of a calculation.

**compare** Estimate, measure or note how things are similar or different.

**construct** Represent or develop in graphical form.

**contrast** Show how things are different or opposite.

**create** Originate or bring into existence.

**deduce** Reach a conclusion from given information.

**define** Give the precise meaning of a word, phrase or physical quantity.

**demonstrate** Show by example.

**derive** Manipulate a mathematical relationship(s) to give a new equation or relationship.

**describe** Give a detailed account.

**design** Produce a plan, simulation or model.

**determine** Find the only possible answer.

**discuss** Talk or write about a topic, taking into account different issues or ideas.

**distinguish** Give differences between two or more different items.

**draw** Represent by means of pencil lines.

**estimate** Find an approximate value for an unknown quantity.

**evaluate** Assess the implications and limitations.

**examine** Inquire into.

**explain** Make something clear or easy to understand.

**extract** Choose relevant and/or appropriate details.

**extrapolate** Infer from what is known.

**hypothesise** Suggest an explanation for a group of facts or phenomena.

**identify** Recognise and name.

**interpret** Draw meaning from.

**investigate** Plan, inquire into and draw conclusions about.

**justify** Support an argument or conclusion.

**label** Add labels to a diagram.

**list** Give a sequence of names or other brief answers.

**measure** Find a value for a quantity.

**outline** Give a brief account or summary.

**plan** Use strategies to develop a series of steps or processes.

**predict** Give an expected result.

**propose** Put forward a plan or suggestion for consideration or action.

**recall** Present remembered ideas, facts or experiences.

**relate** Tell or report about happenings, events or circumstances.

**represent** Use words, images or symbols to convey meaning.

**select** Choose in preference to another or others.

**sequence** Arrange in order.

**show** Give the steps in a calculation or derivation.

**sketch** Make a quick, rough drawing of something.

**solve** Work out the answer to a problem.

**state** Give a specific name, value or other brief answer.

**suggest** Put forward an idea for consideration.

**summarise** Give a brief statement of the main points.

**synthesise** Combine various elements to make a whole.



# Introduction

## What the book includes

This book provides questions and answers for each dot point in the syllabus for WACE Physics Units 1 and 2:

### Unit 1 Thermal, Nuclear and Electrical Physics

- Topic 1 Heating Processes
- Topic 2 Ionising Radiation and Nuclear Reactions
- Topic 3 Electrical Circuits

### Unit 2 Linear Motion and Waves

- Topic 1 Linear Motion and Force
- Topic 2 Waves

## Format of the book

The book has been formatted in the following way:

### 1.1 Subtopic from syllabus.

#### 1.1.1 Assessment statement from syllabus.

1.1.1.1 First question for this assessment statement.

1.1.1.2 Second question for this assessment statement.

The number of lines provided for each answer gives an indication of how many marks the question might be worth in an examination. As a rough rule, every two lines of answer might be worth 1 mark.

## How to use the book

Completing all questions will provide you with a summary of all the work you need to know from the syllabus. You may have done work in addition to this with your teacher as extension work. Obviously this is not covered, but you may need to know this additional work for your school exams.

When working through the questions, write the answers you have to look up in a different colour to those you know without having to research the work. This will provide you with a quick reference for work needing further revision.

# Unit 1 Thermal, Nuclear and Electrical Physics

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| <b>Topic 1 Heating Processes</b>                                                                                                                                                                                                 |      | <b>1.3 Heat transfer by conduction, convection and/or radiation</b>                                                                                                                                                                                                  | 22   |
| <b>1.1 The kinetic particle model, internal thermal energy and temperature</b>                                                                                                                                                   | 5    | Heat transfer occurs between and within systems by conduction, convection and/or radiation.                                                                                                                                                                          |      |
| The kinetic particle model describes matter as consisting of particles in constant motion, except at absolute zero.                                                                                                              |      | 1.3.1 Heat conduction.                                                                                                                                                                                                                                               | 22   |
| All systems have internal thermal energy due to motion of particles in the system.                                                                                                                                               |      | 1.3.2 Heat convection.                                                                                                                                                                                                                                               | 24   |
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| 1.1.3 Temperature and the kinetic theory.                                                                                                                                                                                        | 8    | 1.4.1 Transferring heat energy 2.                                                                                                                                                                                                                                    | 27   |
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| <b>1.2 Temperature change, heat capacity, change of state and latent heat</b>                                                                                                                                                    | 12   | A system with thermal energy has the capacity to do mechanical work (that is, to apply a force over a distance); when work is done the internal energy of the system changes.                                                                                        |      |
| Provided a substance does not change state, its temperature change is proportional to the amount of energy added to or removed from the substance; the constant of proportionality describes the heat capacity of the substance. |      | Because energy is conserved, the change in internal energy of a system is equal to the energy added or removed by heating plus the work done on or by the system.                                                                                                    |      |
| Change of state involves internal energy changes to form or break bonds between atoms or molecules; latent heat is the energy required to be added to or removed from a system to change the state of the system.                |      | Energy transfers and transformations in mechanical systems (for example, internal and external combustion engines, electric motors) always result in the production of thermal energy, so that the usable energy is reduced and the system cannot be 100% efficient. |      |
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# Unit 1 Thermal, Nuclear and Electrical Physics

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| Science is a global enterprise that relies on clear communication, international conventions, peer review and reproducibility.                         |           | <b>2.1 The nuclear model of the atom, models and theories</b>                                                                                                                                                                                       | <b>41</b> |
| Development of complex models and/or theories often requires a wide range of evidence from multiple individuals and across disciplines.                |           | The nuclear model of the atom describes the atom as consisting of an extremely small nucleus which contains most of the atom's mass and is made up of positively charged protons and uncharged neutrons surrounded by negatively charged electrons. |           |
| Advances in science understanding in one field can influence other areas of science, technology and engineering.                                       |           | Models and theories are contested and refined or replaced when new evidence challenges them, or when a new model or theory has greater explanatory power.                                                                                           |           |
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| The use of scientific knowledge is influenced by social, economic, cultural and ethical considerations.                                                |           | Nuclear stability is the result of the strong nuclear force between nucleons, which operates over a very short distance and opposes the electrostatic repulsion between protons in the nucleus.                                                     |           |
| Scientific knowledge can enable scientists to offer valid explanations and make reliable predictions.                                                  |           | 2.2.1 The strong nuclear force.                                                                                                                                                                                                                     | 44        |
| Scientific knowledge can be used to develop and evaluate projected economic, social and environmental impacts and to design action for sustainability. |           | <b>2.3 Nuclides and decay</b>                                                                                                                                                                                                                       | <b>45</b> |
| 1.7.1 The energy balance of Earth.                                                                                                                     | 36        | Some nuclides are unstable and spontaneously decay, emitting alpha, beta and/or gamma radiation over time until they become stable nuclides.                                                                                                        |           |
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| Each species of nuclide has a specific half-life.                                                                                                                                                                      |      | Neutron induced nuclear fission is a reaction in which a heavy nuclide captures a neutron and then splits into two smaller radioactive nuclides, with the release of neutrons and energy.                                                                           |      |
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| Advances in science understanding in one field can influence other areas of science, technology and engineering. Scientific knowledge can enable scientists to offer valid explanations and make reliable predictions. |      | A fission chain reaction is a self-sustaining process that may be controlled to slowly produce thermal energy, or uncontrolled to rapidly release energy explosively.                                                                                               |      |
| ICT and other technologies have dramatically increased the size, accuracy and geographic and temporal scope of data sets with which scientists work.                                                                   |      | 2.10.1 Controlled and uncontrolled chain reactions.                                                                                                                                                                                                                 | 69   |
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| Alpha, beta and gamma radiation have sufficient energy to ionise atoms.                                                                                                                                                |      | Nuclear fusion is a reaction in which light nuclides combine to form a heavier nuclide, with the release of energy. More energy is released per nucleon in nuclear fusion than nuclear fission because a greater percentage of the mass is transformed into energy. |      |
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| Development of complex models and/or theories often requires a wide range of evidence from multiple individuals and across disciplines. The use of scientific knowledge may have beneficial and/or harmful and/or unintended consequences. |      | Resistance for ohmic and non-ohmic components is defined as the ratio of potential difference across the component to the current in the component.                                        |      |
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| Energy is required to separate positive and negative charge carriers; charge separation produces an electrical potential difference that can be used to drive current in circuits.                                                         |      | Circuit analysis and design involve calculation of the potential difference across, the current in, and the power supplied to components in series, parallel and series/parallel circuits. |      |
| The energy available to charges moving in an electrical circuit is measured using electric potential difference, defined as the change in potential energy per unit charge between two points in the circuit.                              |      | 3.5.1 Conductors in series and in parallel.                                                                                                                                                | 111  |
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# Unit 1 Thermal, Nuclear and Electrical Physics

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| Electrical circuits enable electrical energy to be transferred efficiently over large distances and transformed into a range of other useful forms of energy including thermal, light and kinetic energy.           |      | The use of scientific knowledge is influenced by social, economic, cultural and ethical considerations.                                                |      |
| Energy is conserved in the energy transfers and transformations that occur in an electrical circuit.                                                                                                                |      | Scientific knowledge can be used to develop and evaluate projected economic, social and environmental impacts and to design action for sustainability. |      |
| Science is a global enterprise that relies on clear communication, international conventions, peer review and reproducibility.                                                                                      |      | 3.8.1 Edison versus Westinghouse.                                                                                                                      | 145  |
| Scientific knowledge can be used to develop and evaluate projected economic, social and environmental impacts and to design action for sustainability.                                                              |      | 3.8.2 Energy efficiency of batteries.                                                                                                                  | 147  |
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| The development of electrical technologies for industrial and residential use in the late 19th century transformed society; electrical power is now a core element of modern societies.                             |      |                                                                                                                                                        |      |
| Increasing use of electricity has environmental impacts and this has informed government programs, private investment, community action and incentives for the development of energy efficient systems and devices. |      |                                                                                                                                                        |      |
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## Unit 2 Linear Motion and Waves

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| <b>1.1 Uniformly accelerated motion and quantities</b>                                                                                                                         | 153  | Newton's three laws of motion describe the relationship between the force or forces acting on an object, modelled as a point mass, and the motion of the object due to the application of the force or forces.                      |      |
| Uniformly accelerated motion is described in terms of relationships between measurable scalar and vector quantities, including displacement, speed, velocity and acceleration. |      | 1.4.1 Analysing some motion experiments.                                                                                                                                                                                            | 190  |
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| Collisions may be elastic or inelastic; kinetic energy is conserved in elastic collisions.                                                                                                              |      | A ray model of light may be used to describe reflection, refraction and image formation from lenses and mirrors.                                                                                                                  |      |
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| Waves are periodic oscillations that transfer energy from one point to another.                                                                                                                         |      | 2.3.5 Images formed by convex mirrors.                                                                                                                                                                                            | 261  |
| Longitudinal and transverse waves are distinguished by the relationship between the direction of oscillation relative to the direction of the wave velocity.                                            |      | 2.3.6 Applications of reflection of sound.                                                                                                                                                                                        | 264  |
| A transverse electromagnetic theory is needed to explain the polarisation of light.                                                                                                                     |      | <b>2.4 The wave model of light</b>                                                                                                                                                                                                | 266  |
| 2.1.1 Properties of waves.                                                                                                                                                                              | 231  | A wave model explains a wide range of light-related phenomena including reflection, refraction, total internal reflection, dispersion, diffraction and interference; a transverse wave model is required to explain polarisation. |      |
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| <b>2.2 Wave diagrams, period, amplitude, wavelength, frequency and velocity</b>                                                                                                                         | 244  | 2.4.5 Refraction 3.                                                                                                                                                                                                               | 272  |
| Waves may be represented by time and displacement wave diagrams and described in terms of relationships between measurable quantities, including period, amplitude, wavelength, frequency and velocity. |      | 2.4.6 Refraction 4.                                                                                                                                                                                                               | 274  |
| 2.2.1 Analysing wave diagrams 1.                                                                                                                                                                        | 244  | 2.4.7 Images formed by concave lenses.                                                                                                                                                                                            | 276  |
| 2.2.2 Analysing wave diagrams 2.                                                                                                                                                                        | 246  | 2.4.8 Images formed by convex lenses.                                                                                                                                                                                             | 279  |
| 2.2.3 More about soundwaves.                                                                                                                                                                            | 248  | <b>2.5 Superposition of waves in a medium</b>                                                                                                                                                                                     | 282  |
|                                                                                                                                                                                                         |      | The superposition of waves in a medium may lead to the formation of standing waves and interference phenomena, including standing waves in pipes and on stretched strings.                                                        |      |
|                                                                                                                                                                                                         |      | 2.5.1 Superposition of waves.                                                                                                                                                                                                     | 282  |
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|                                                                                                                                                                                                         |      | 2.5.3 Standing waves in pipes.                                                                                                                                                                                                    | 285  |

## Unit 2 Linear Motion and Waves

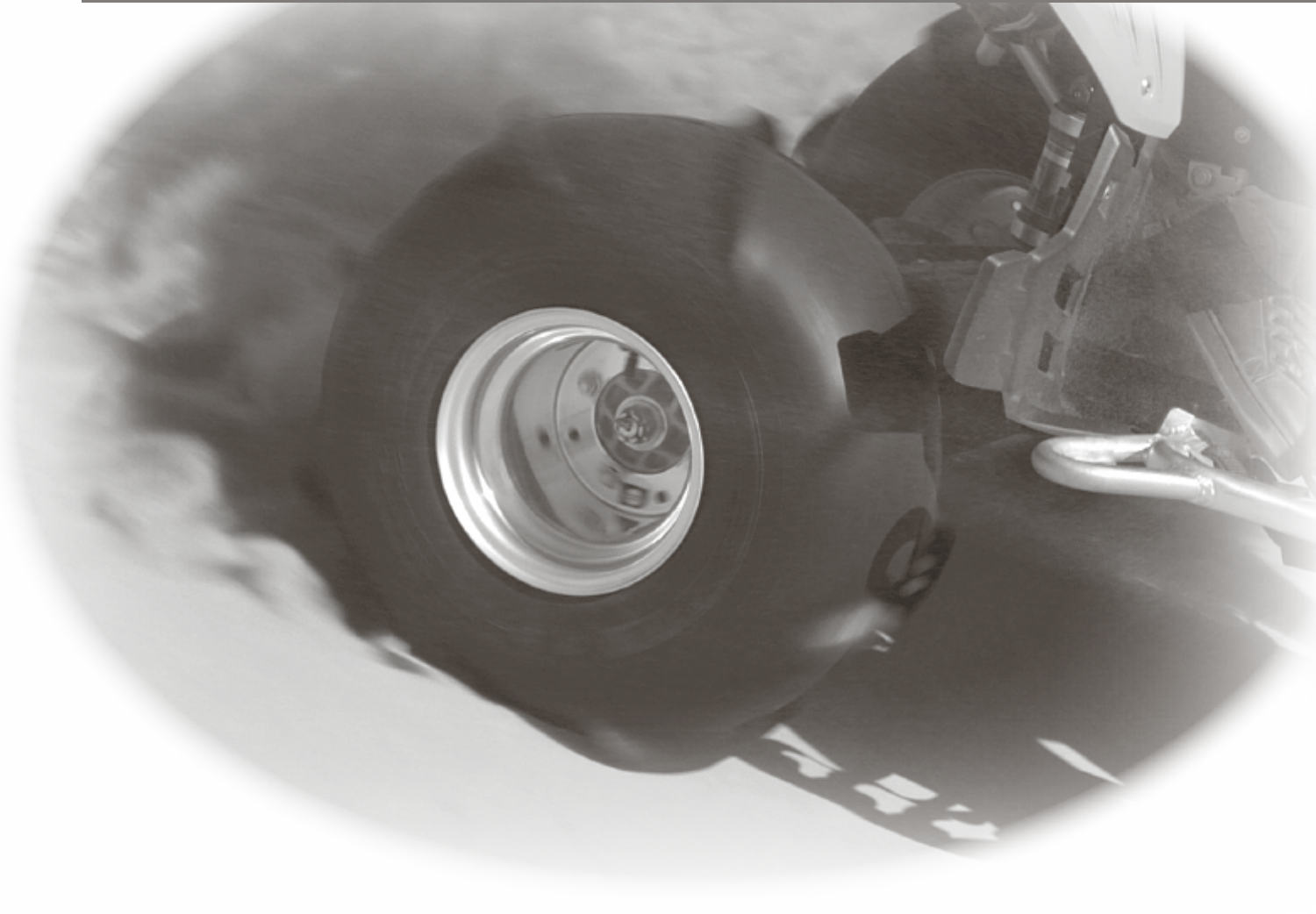
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|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| <b>2.6 Mechanical waves</b>                                                                                                                                                   | 287  | <b>2.9 Developing models and theories</b>                                                                                                                                                      | 293  |
| A mechanical system resonates when it is driven at one of its natural frequencies of oscillation; energy is transferred very efficiently into systems under these conditions. |      | Development of complex models and/or theories often requires a wide range of evidence from multiple individuals and across disciplines.                                                        |      |
| Mechanical waves transfer energy through a medium; mechanical waves may oscillate the medium or oscillate the pressure within the medium.                                     |      | Scientific knowledge can enable scientists to offer valid explanations and make reliable predictions.                                                                                          |      |
| 2.6.1 Mechanical waves.                                                                                                                                                       | 287  | 2.9.1 The Michelson-Morley experiment.                                                                                                                                                         | 293  |
| <b>2.7 Particle, electromagnetic and quantum theories of light</b>                                                                                                            | 288  | <b>2.10 The speed of light and the inverse square law</b>                                                                                                                                      | 295  |
| The mechanical wave model can be used to explain phenomena related to reflection and refraction (for example, echoes, seismic phenomena).                                     |      | The speed of light is finite and many orders of magnitude greater than the speed of mechanical waves; its intensity decreases in an inverse square relationship with distance from the source. |      |
| Light exhibits many wave properties; however, it cannot be modelled as a mechanical wave as it can travel through a vacuum.                                                   |      | 2.10.1 The inverse square law 1.                                                                                                                                                               | 295  |
| 2.7.1 The particle theory of light.                                                                                                                                           | 288  | 2.10.2 The inverse square law 2.                                                                                                                                                               | 296  |
| 2.7.2 The electromagnetic wave theory of light.                                                                                                                               | 288  |                                                                                                                                                                                                |      |
| 2.7.3 The quantum theory of light.                                                                                                                                            | 289  | <b>Answers to Linear Motion and Waves</b>                                                                                                                                                      | 349  |
| <b>2.8 Advances in science understanding</b>                                                                                                                                  | 290  |                                                                                                                                                                                                |      |
| Advances in science understanding in one field can influence other areas of science, technology and engineering.                                                              |      |                                                                                                                                                                                                |      |
| Scientific knowledge can enable scientists to offer valid explanations and make reliable predictions.                                                                         |      |                                                                                                                                                                                                |      |
| Scientific knowledge can be used to develop and evaluate projected economic, social and environmental impacts and to design action for sustainability.                        |      |                                                                                                                                                                                                |      |
| 2.8.1 Acoustics.                                                                                                                                                              | 290  |                                                                                                                                                                                                |      |
| 2.8.2 Earthquake waves.                                                                                                                                                       | 290  |                                                                                                                                                                                                |      |
| 2.8.3 Tsunamis.                                                                                                                                                               | 291  |                                                                                                                                                                                                |      |
| 2.8.4 Monitoring earthquakes and tsunamis.                                                                                                                                    | 292  |                                                                                                                                                                                                |      |
| 2.8.5 Making buildings earthquake proof.                                                                                                                                      | 292  |                                                                                                                                                                                                |      |

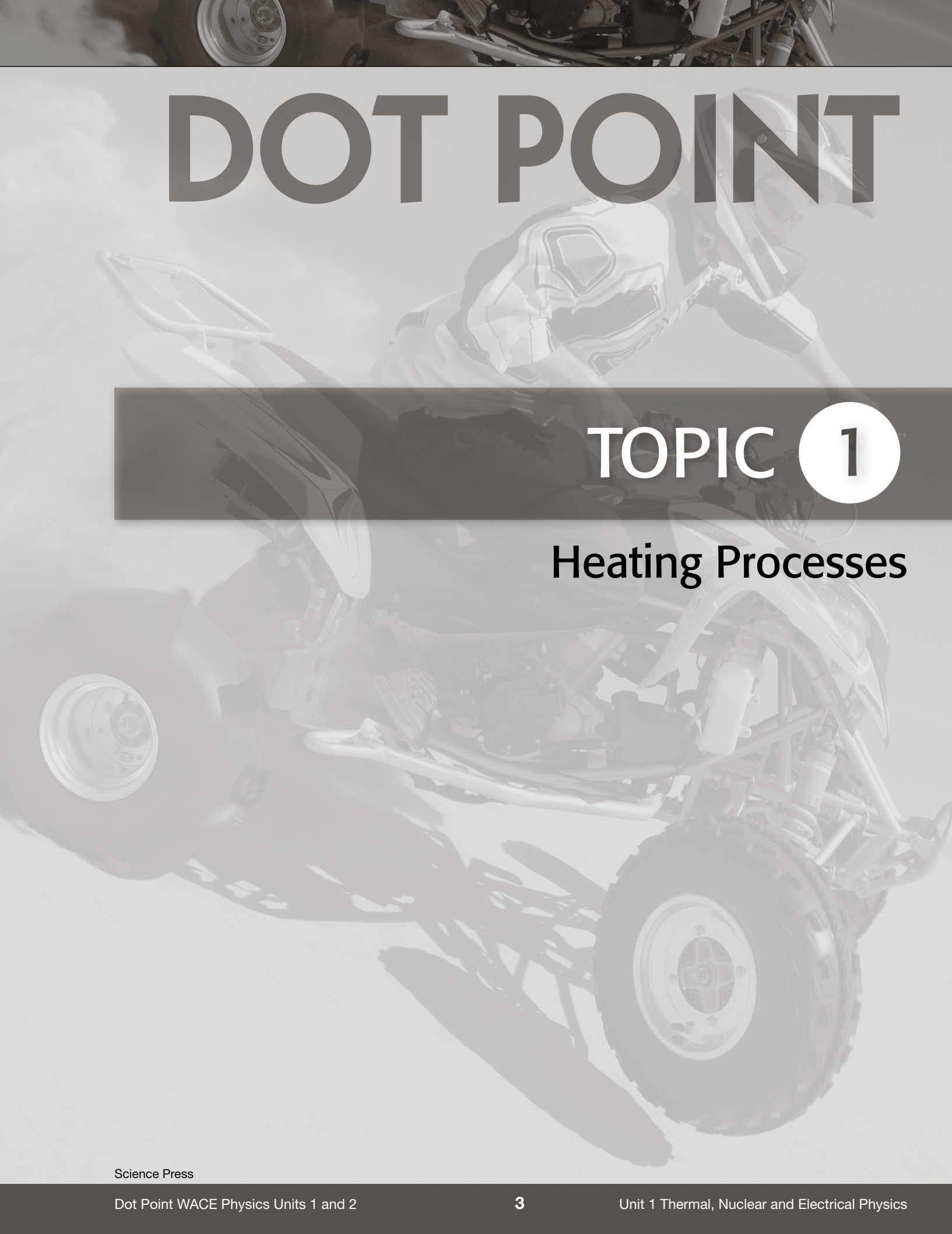




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## Unit 1 Thermal, Nuclear and Electrical Physics





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## TOPIC 1

### Heating Processes

## 1.1 The kinetic particle model, internal thermal energy and temperature.

### 1.1.1 The kinetic theory of matter.

1.1.1.1 The last column in the table gives the second halves of the sentences. Choose the correct second half for each sentence and write it in the first column of the table to summarise the kinetic theory of matter.

| Completed sentences                                   | Second halves<br>(not in order)                              |
|-------------------------------------------------------|--------------------------------------------------------------|
| All matter is                                         | at absolute zero.                                            |
| The particles of matter are always moving except      | they are held together by strong forces.                     |
| Particles in matter are held                          | in any direction so that gases always fill their containers. |
| The particles in solids cannot move freely because    | are weaker than those holding particles together in solids.  |
| Particles in solids simply vibrate                    | studying the properties of matter.                           |
| In liquids particles can                              | made up of particles which are in continuous motion.         |
| The forces holding particles together in liquids      | together by forces which vary in strength.                   |
| Particles in gases are free to move                   | roll over one another.                                       |
| Particles in gases are                                | to explain and predict the behaviour of matter.              |
| Particles of matter are far too                       | in their fixed positions.                                    |
| We deduce the behaviour of the particles of matter by | small to be seen even under a microscope.                    |
| We use the kinetic theory of matter                   | not held together.                                           |





### 1.1.2 Kinetic theory and properties of matter.

1.1.2.1 Why can't we compress liquids and solids?

- (A) They are too dense.
- (B) Their particles are held together too tightly.
- (C) Their particles are further apart.
- (D) Their particles are already as close together as they can be.

1.1.2.2 Why can liquids be poured?

- (A) Their particles are held together loosely.
- (B) Their particles are not held together.
- (C) Their particles can roll over one another.
- (D) Their particles are held together tightly.

1.1.2.3 What will cause the particles of matter to move more slowly?

- (A) Weaker forces between them.
- (B) Cooling the matter.
- (C) Heating the matter.
- (D) Shaking the matter.

1.1.2.4 What happens to the particles of matter when it contracts?

- (A) They get smaller and occupy less space.
- (B) They get smaller and decrease in volume.
- (C) They break the forces holding them together and spread out into a larger volume.
- (D) They move more slowly, collide less violently, and move closer together.

1.1.2.5 Which is an example of diffusion?

- (A) Spilt water spreading over the floor.
- (B) Noticing the perfume your friend is wearing.
- (C) Molten lava flowing out of an active volcano.
- (D) Writing with a felt pen.

1.1.2.6 Between which particles would you expect the forces to be weakest?

- (A) Between air particles.
- (B) Between water particles.
- (C) Between ice particles.
- (D) Between lemonade particles.

1.1.2.7 Considering what you know about roll on deodorants, which statement is correct?

- (A) Forces between deodorant particles and skin particles are stronger than those between deodorant particles.
- (B) Forces between deodorant particles are stronger than those between deodorant and skin particles.
- (C) Forces between deodorant particles are equal to those between deodorant and skin particles.
- (D) Forces between deodorant particles are equal to those between skin particles.

1.1.2.8 Which particles will have the least energy?

- (A) Water liquid particles at 60°C.
- (B) Water vapour particles at 60°C.
- (C) Water liquid particles at 50°C.
- (D) Water vapour particles at 50°C.

1.1.2.9 Why do liquids diffuse more slowly than gases?

- (A) Their particles are held together more firmly.
- (B) Their particles are not held together.
- (C) Their particles are larger.
- (D) Their particles move more quickly.

1.1.2.10 Why can't solids be poured?

- (A) Their particles are held together more strongly than in liquids.
- (B) Their particles are not held together.
- (C) Their particles are held together in fixed positions.
- (D) Their particles are as close together as they can be.

**1.1.2.11** Complete the following table.

|     | <b>Fact</b>                                                       | <b>Kinetic theory explanation</b> |
|-----|-------------------------------------------------------------------|-----------------------------------|
| (a) | Air can be compressed.                                            |                                   |
| (b) | Liquids diffuse into each other.                                  |                                   |
| (c) | Cooking odours spread throughout the house.                       |                                   |
| (d) | You can dry yourself with a towel.                                |                                   |
| (e) | Liquids do not fill their containers.                             |                                   |
| (f) | Glass objects shatter when dropped onto a hard floor.             |                                   |
| (g) | Concrete footpaths have black rubber strips every few metres.     |                                   |
| (h) | Gases expand quickly when heated.                                 |                                   |
| (i) | Solids have a constant shape.                                     |                                   |
| (j) | Liquids expand when heated.                                       |                                   |
| (k) | If a soccer ball gets a hole in it, the air leaks out.            |                                   |
| (l) | Large bridges sit on, and are free to move on rollers at one end. |                                   |
| (m) | Your breath is 'foggy' on a very cold day.                        |                                   |
| (n) | A balloon expands on a hot day.                                   |                                   |





1.1.3      **Temperature and the kinetic theory.**

1.1.3.1      Complete the sentences in the first column of the table by matching the phrase provided with the correct alternative from the second column.

| Completed sentences |                                                   | Second halves<br>(not in order)                                    |
|---------------------|---------------------------------------------------|--------------------------------------------------------------------|
| (a)                 | Temperature is a measure of how fast              | the faster the particles are moving.                               |
| (b)                 | Temperature is a measure of                       | solid particles at the same temperature.                           |
| (c)                 | The higher the temperature,                       | the average kinetic energy of the particles of matter.             |
| (d)                 | When matter is heated its                         | its particles lose energy and slow down.                           |
| (e)                 | When matter is cooled                             | the extra energy they have because the particles move more freely. |
| (f)                 | Gas particles have more energy due to             | the particles of matter are moving.                                |
| (g)                 | Similarly, liquid particles have more energy than | their state than liquid particles at the same temperature.         |
| (h)                 | In both cases (f) and (g), this is due to         | particles absorb energy and move faster.                           |

1.1.3.2      In terms of the kinetic theory, identify the values of and justify the concept of an absolute zero temperature.

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**1.1.3.3** Consider the following five pictures of water.



A: Ice at 0°C



B: Water at room temperature



C: Water at 0°C

- (a) Rank the speed of the particles of water/ice/steam in order of moving fastest to slowest. Justify your answer.

.....  
.....  
.....  
.....



D: Steam at 100°C

- (b) Rank the kinetic energy of the particles of water/ice/steam in order most to least. Justify your answer.

.....  
.....  
.....  
.....



E: Water at 100°C

- (c) In which will the water particles have the most total energy? Justify your answer.

.....  
.....

- (d) In which will the water particles have the least total energy? Justify your answer.

.....  
.....

- (e) Steam at 100°C will actually cause more severe burns to a person than water at 100°C. Hypothesise why this is so.

.....  
.....

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Answers



## Unit 1 Thermal, Nuclear and Electrical Physics

1.1.1.1

| Completed sentences                                                                                          |
|--------------------------------------------------------------------------------------------------------------|
| All matter is made up of particles which are in continuous motion.                                           |
| The particles of matter are always moving except at absolute zero.                                           |
| Particles in matter are held together by forces which vary in strength.                                      |
| The particles in solids cannot move freely because they are held together by strong forces.                  |
| Particles in solids simply vibrate in their fixed positions.                                                 |
| In liquids particles can roll over one another.                                                              |
| The forces holding particles together in liquids are weaker than those holding particles together in solids. |
| Particles in gases are free to move in any direction so that gases always fill their containers.             |
| Particles in gases are not held together.                                                                    |
| Particles of matter are far too small to be seen even under a microscope.                                    |
| We deduce the behaviour of the particles of matter by studying the properties of matter.                     |
| We use the kinetic theory of matter to explain and predict the behaviour of matter.                          |

1.1.2.1

D

1.1.2.2

C

1.1.2.3

B

1.1.2.4

D

1.1.2.5

B

1.1.2.6

A

1.1.2.7

A

1.1.2.8

C

1.1.2.9

A

1.1.2.10

C

1.1.2.11

|     | Fact                                                          | Kinetic theory explanation                                                                                                                                                                                               |
|-----|---------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (a) | Air can be compressed.                                        | Air is a gas and its particles are not close together, therefore they can be pushed closer together.                                                                                                                     |
| (b) | Liquids diffuse into each other.                              | Particles in a liquid are free to roll over one another and as they do so they gradually mix or diffuse together.                                                                                                        |
| (c) | Cooking odours spread throughout the house.                   | Gas particles from the cooking food are free to move and diffuse relatively quickly through the house.                                                                                                                   |
| (d) | You can dry yourself with a towel.                            | Water particles are not held together by strong forces and they bond to the particles in the towel with stronger forces.                                                                                                 |
| (e) | Liquids do not fill their containers.                         | The forces between the liquid particles hold them together and prevent them from breaking free from each other (evaporating) to fill the container.                                                                      |
| (f) | Glass objects shatter when dropped onto a hard floor.         | The forces involved in the collision between the glass and the floor are stronger than the forces holding glass particles together.                                                                                      |
| (g) | Concrete footpaths have black rubber strips every few metres. | These are soft expansion joints so that in hot weather, when the concrete blocks expand they squash the rubber rather than pushing against each other and breaking.                                                      |
| (h) | Gases expand quickly when heated.                             | Gas particles are not held together and are free to move when the gas is heated. They move faster and collide with each other more violently and take up more space if it is available (if not, the pressure increases). |
| (i) | Solids have a constant shape.                                 | Particles in a solid are held together by relatively strong forces.                                                                                                                                                      |
| (j) | Liquids expand when heated.                                   | Liquid particles roll over one another faster when heated and need more room to move about.                                                                                                                              |