DOT POINT

VCE PHYSICS UNITS 1 AND 2

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Contents

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 Victorian Certificate of Education Study Design for each core topic in the Year 11 Physics syllabus:

Unit 1 What Ideas Explain the Physical World?

- Area of Study 1 How Can Thermal Effects Be Explained?
- Area of Study 2 How Do Electric Circuits Work?
- Area of Study 3 What Is Matter and How Is It Formed?

Unit 2 What Do Experiments Reveal About the Physical World?

- Area of Study 1 How Can Motion Be Described and Explained?

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 What Ideas Explain the Physical World?

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Area of Study 2 How Do Electric Circuits Work?

Unit 2 What Do Experiments Reveal About the Physical World?

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Area of Study 2 Options

Twelve options are available for selection in Area of Study 2. Each option is based on a different observation of the physical world. One option is to be selected from the following. Questions are not provided for the options.

- What are stars?
- Is there life beyond Earth's Solar System?
- How do forces act on the human body?
- How can AC electricity charge a DC device?
- How do heavy things fly?
- How do fusion and fission compare as viable nuclear energy power sources?
- How is radiation used to maintain human health?
- How do particle accelerators work?
- How can human vision be enhanced?
- How do instruments make music?
- How can performance in ball sports be improved?
- How does the human body use electricity?

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Unit 1

What Ideas Explain the Physical World?

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AREA OF STUDY 1

How Can Thermal Effects Be Explained?

1.1 Thermodynamic principles.

1.1.1 Convert temperature between degrees Celsius and kelvin.

1.1.1.1 Fahrenheit's first fixed point on his scale was the freezing point of water which was 32°F. What is this temperature in degrees Celsius and kelvins?

(a) Celsius = ...

(b) Kelvins = ...

1.1.1.2 The surface temperature of the Sun is about 5800°C. What is this temperature in kelvins?

....

1.1.1.3

(a) The average surface temperature on the side of Mercury facing the Sun is 430°C. What is the temperature in °F and kelvins?

Fahrenheit = ...

Kelvins = ...

(b) The average surface temperature on the side of Mercury away the Sun is –280°F. What is the temperature in °C and kelvins?

Celsius = ...

Kelvins = ...

1.1.1.4 Hydrogen has a boiling point of 20.1 K. What is the temperature in °C?

....

1.1.1.5 Pure zinc melts at 781.1°F. What is this temperature in Celsius and kelvins?

Celsius = ...

Kelvins = ...

1.1.1.6 Which temperature is hottest: 68°C or 168°F or 350 K? Justify your answer.

....

....

1.1.1.7 A general rule of thumb used by pilots is for every 330 m of altitude, the temperature falls 3.5°F. If the temperature at sea level is 78°F, what would you expect the temperature to be at 12 000 m in °C?

....

....

1.1.1.8 Complete the table.

	Fahrenheit temperature (°F)	Celsius temperature (°C)	Kelvin temperature (K)
(a)	10		
(b)		10	
(c)			10
(d)	60		
(e)		60	
(f)			60
(g)	105		
(h)		105	
(i)			105

1.1.2 **Describe temperature with reference to the average kinetic energy of the atoms and molecules within a system.**

1.1.2.1 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 (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.

1.1.2.2 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 (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.

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

....

....

....

....

....

....

....

1.1.2.4 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 state will the water particles have the most total energy? Justify your answer.

....

....

(d) In which state 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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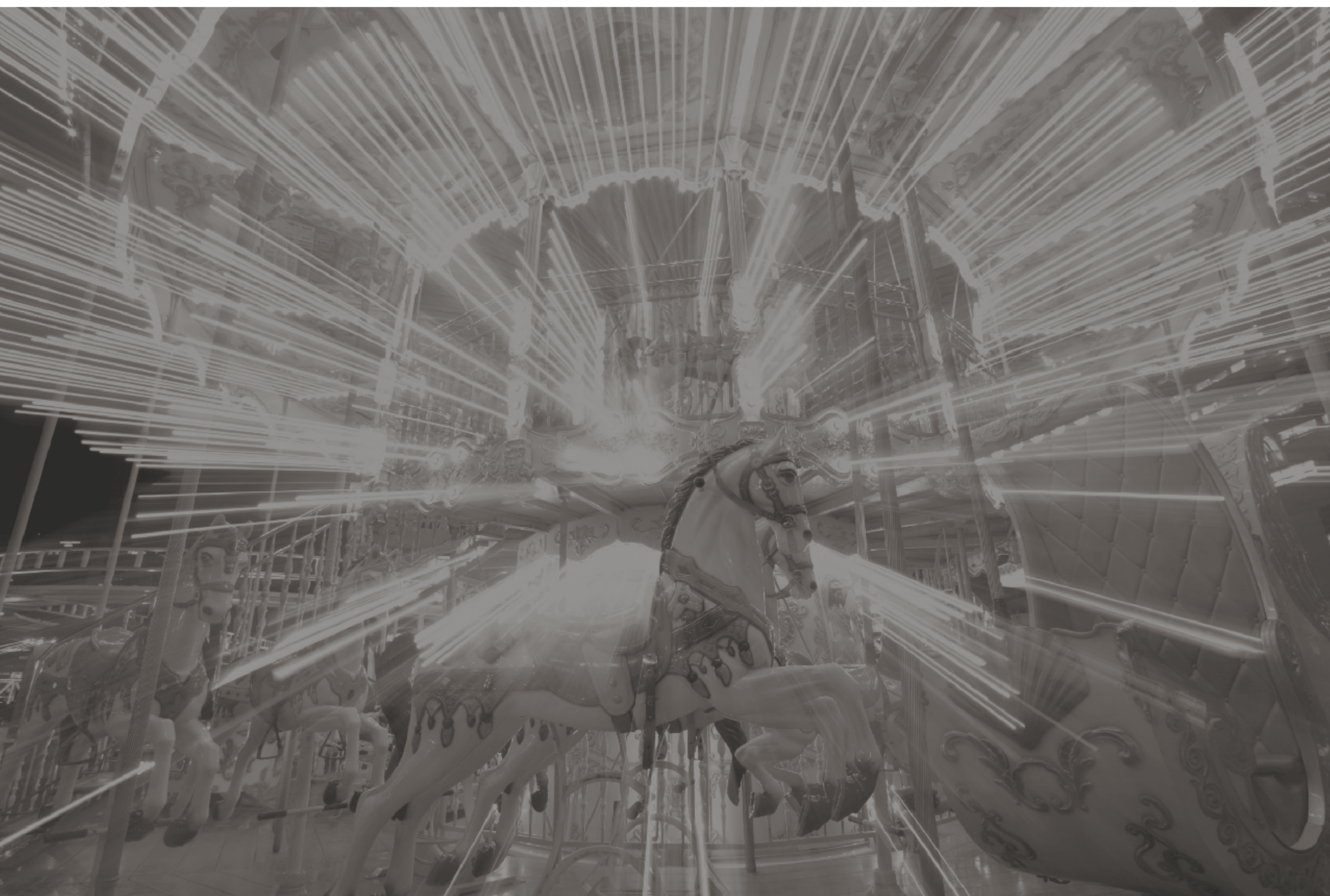
Answers



Unit 1 What Ideas Explain the Physical World?

1.1.1.1 (a) 0°C

(b) 273 K

1.1.1.2 6073 K

1.1.1.3 (a) 806°F

703 K

(b) –173°C

99.7 K

1.1.1.4 – 252.9°C

1.1.1.5 (a) 416.17°C

(b) 689.17 K

1.1.1.6 168°F is equal to 75.56°C, 350 K = 77°C, so 350 K is the hottest.

1.1.1.7 –45.15°C

1.1.1.8

	Fahrenheit temperature (°F)	Celsius temperature (°C)	Kelvin temperature (K)
(a)	10	–12.2	260.8
(b)	50	10	283
(c)	–391.4	–263	10
(d)	60	15.6	288.6
(e)	140	60	333
(f)	–211.4	–213	60
(g)	105	40.6	313.6
(h)	221	105	378
(i)	–49.4	–168	105

1.1.2.1

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.

1.1.2.2

	Completed sentences
(a)	Temperature is a measure of how fast the particles of matter are moving.
(b)	Temperature is a measure of the average kinetic energy of the particles of matter.
(c)	The higher the temperature, the faster the particles are moving.
(d)	When matter is heated its particles absorb energy and move faster.
(e)	When matter is cooled its particles lose energy and slow down.
(f)	Gas particles have more energy due to their state than liquid particles at the same temperature.
(g)	Similarly, liquid particles have more energy than solid particles at the same temperature.
(h)	In both cases (f) and (g), this is due to the extra energy they have because the particles move more freely.

1.1.2.3 Our theory is that temperature is a measure of the average kinetic energy of the particles of matter and kinetic energy depends on mass and speed (squared). The particles will always have mass, so the kinetic energy can only be zero if their motion is zero. Because motion cannot be less than zero, this means there is a temperature (absolute zero) which is the lowest possible temperature. Absolute zero is 0 K (or 0 kelvins) = –173.14°C.

1.1.2.4
(a) D = E faster than B faster than C = A. The hottest (both at 100ºC) have particles moving equally fast, and the others are in order of decreasing temperature.
(b) Taking temperature as a measure of average kinetic energy, then the order for kinetic energy will be the same as the order for temperature and rate of movement, so, answer is same as (a) = D = E more than B more than C = A
(c) D. Being a vapour, the steam has more degrees of freedom of movement than the particles in water at the same temperature, so the steam particles will have the most total energy.
(d) The particles in the ice at 0ºC will have least total energy as their freedom of movement is less than that of water at the same temperature.
(e) Steam particles move more freely than water particles and are not held to other steam particles, so they can penetrate pores in our skin much more effectively and give a deeper burn.

1.1.3.1 B
1.1.3.2 D
1.1.3.3 C
1.1.3.4 A
1.1.3.5 C
1.1.3.6 B
1.1.3.7 C
1.1.3.8 A
1.1.3.9 A
1.1.3.10 B
1.1.3.11 D
1.1.3.12 D
1.1.3.13 C
1.1.3.14 C
1.1.3.15 B
1.1.3.16 C
1.1.3.17 B
1.1.3.18 1200 kJ or 1.2×10^6 J
1.1.3.19
(a) The work done by the gas against the piston.
(b) 1.8 kJ or 1800 J
(c) 1.8 kJ or 1800 J
(d) As it expands the temperature will fall as the gas will do work on the piston and therefore its internal heat energy will decrease. As it is compressed back to its initial volume, the temperature will rise to its initial level as the piston does work on the gas to compress it.