Stewards Academy

Science KS3:

Year 7

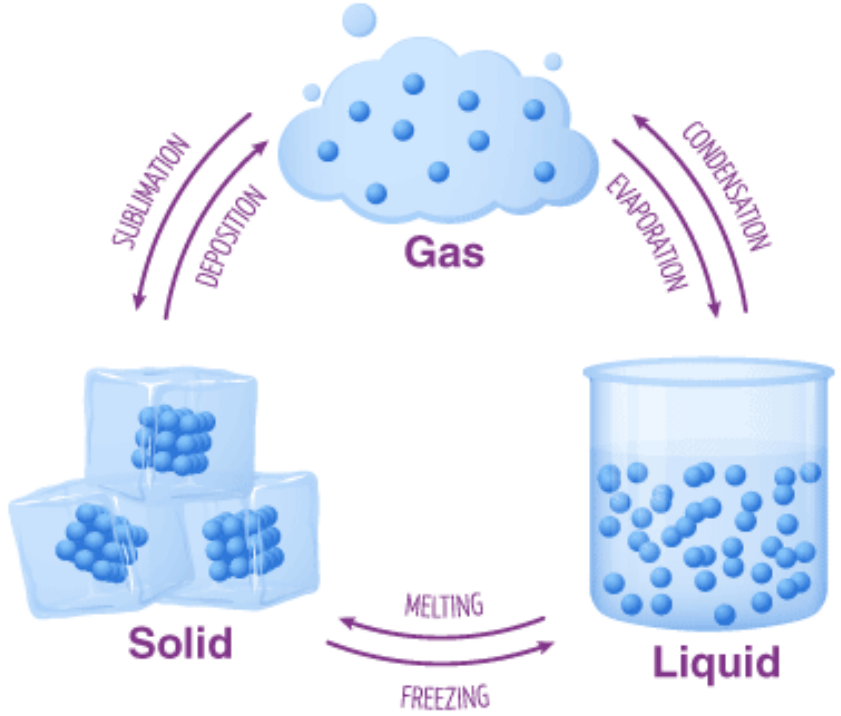
Blended Learning Booklet

Unit 4: Matter

Name:

Form:

- *Aim to complete three lessons each week.*
- *Use the online text book to help you*
- https://www.kerboodle.com/app
- *Login using your user name (1st initial followed by surname all lower case eg Joe Blogs = jblogs)*
- *Password (initially the same as your user name) should be reset to stewards lower case*
- *Institution code is fu0*
- *Complete the work described in the four part lesson*
- Use the mark schemes provided to self assess your work and make corrections in blue pen.



Big Picture – Year 7 Overview
Science

Next Year

End of Year Assess-ment

End of Unit Test

Energy transfer

Energy and temperature

Work energy and machines

Cost of energy

Energy and Power

Energy resources

I will be able to explain that there is energy in food and fuel and that it is measured in Joules. **I will be able to** explain how energy from non-renewable or renewable resources can be used to provide electricity. **I will be able to** use equations to link energy and power and to calculate the unit cost of energy. **I will be able to** state the Law of conservation of energy, describe 3 methods of heat transfer and how to prevent heat transfer using an insulator.

Energy

UNIT 6

End of Unit Test

Plant structure and function

Photo-synthesis

Microbial Bio-technology

Respiration

Flowers and pollination

Ecosystems

I will be able to explain that plants are able to make their own food by photosynthesis and that animals are consumers eating other organisms to take in energy. **I will be able to** explain that plants and animals are linked through food chains and webs which show the relationships between organisms in an ecosystem. **I will be able to** explain the processes and the importance of respiration and photosynthesis and how these are linked ,as well as how plants are uniquely adapted to carry out photosynthesis

Ecosystems and competition

Food chains and webs

UNIT 5

End of Unit Test

The periodic table. Groups 1, 7 & 0

Compounds and chemical formulae

Atoms and elements

Separation techniques

Matter

I will be able to use the particle model to explain how particles are arranged in solids, liquids and gases and how a substance can change between these states. **I will be able to** use the particle model to explain the process of diffusion and gas pressure. **I will be able to** recognize a pure substance and be able to describe methods for separating mixtures. **I will be able to** identify substances as elements or compounds and know that the periodic table shows how the elements are grouped together.

Pressure in solids, liquids and gases

End of Unit Test

UNIT 4

States of matter

Particle model

Pure substances and mixtures

Solutions and solubility

Forces

I will be able to explain that a forces are a push or a pull that can change the speed, direction or shape of an object. **I will be able to** explain how some forces such as gravity act at a distance (non-contact) and some such as friction and drag require objects to touch (contact). **I will be able to** use an equation to calculate speed and be able to represent changing speeds on a graph. Finally **I will be able to** use and equation to link force and pressure.

Squashing, stretching and turning

Friction and drag

Gravity

Speed

Introduction to forces

UNIT 3

End of Unit Test

Digestive system

Organisms

I will be able to explain How cells are the basic building blocks of life for both plants and animals. How some organisms can exist as simple single celled organisms and how in others cells are organized into tissues, organs and organ systems to create more complex multicellular organisms. **I will also be able to** explain the structure and function of some of these organ systems and how they are affected by different lifestyle choices

UNIT 2

Using a microscope & Plant and animal cells

Uni-cellular organisms

Drugs, alcohol and smoking

Breathing and gas exchange

Nutrients, healthy diet and food tests

End of Unit Test

I will be able to plan and carry out a scientific investigation. This procedure will include being able to write a hypothesis, design a method, collect and analyse data and finally be able to critically evaluate the whole process.

The Enquiry Process

Evaluating data and methods

Analysing patterns in data

Collecting, recording and presenting data

Planning scientific investigations

Asking scientific questions

UNIT 1

Year 7

ZOOM IN...

MY LEARNING JOURNEY:

Subject: Matter Year: 7 Unit: 4

In this unit students will learn what materials are made of and how they are classified according to their properties.
They will be able to use the particle model to identify and illustrate elements and compounds. They will be able to predict properties of substances using the periodic table which will help them understand
how substances behave in chemical reactions. They will be able to explain how the properties of substances can be used to separate them.

DEVELOPING COURAGE

C The laws of Chemistry are consistant

O To explore the chemical world

U Understanding how elements group together on the periodic table

R Learning to construct chemical equations

A The patterns in the properties of elements on the periodic table

G Share our knowledge

E Understanding how the chemical world works

UP NEXT

Ecosystems

- Food chains & webs
- Competition
- Pollination
- Respiration
- Photosynthesis

CAREERS

- Chemist
- Forensic Scientist
- Molecular modeller
- Cleaner

PREVIOUS LEARNING

Pupils should have some experience of the following: Different materials have different properties and can exist as solids, liquids and gases. Be able to name some of the changes of state and explain that this is reversible.
Know that some substances can dissolve and can be separated after dissolving by evaporation. A solid that does not dissolve can be separated by filtration.

WHAT WE KNOW/ REMEMBER

- .....
- .....
- .....
- .....
- .....

RECOMMENDED READING

1. The Elements: A Visual Exploration of Every Atom in the Universe by Nick Mann and Theodore Gray,
2. Elements & Compounds (Chemicals in Action) by Chris Oxlade,
3. Mixing and Separating (Working with Materials) by Chris Oxlade.

PERSONAL OBJECTIVES

- .....
- .....
- .....
- .....
- .....
- .....
- .....
- .....
- .....
- .....
- .....

Lesson 1: Book 1 – the particle model (5.1.1)

Connection

Have a look at the topic overview and the zoom in.

Populate what you know and your personal objectives.

Activation

LI: Describe simply, what the particle model of matter

1. Make a note of the date, title and the LI
2. Key words – Particle, Material, Mixture, Substance
3. Read pages 78-79
4. https://www.youtube.com/watch?v=2i0gv8btYBM
5. Answer Questions A, B, C, D

Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Single chemistry bottle question is for all students
Double chemistry bottle question are for students looking to extend their knowledge
Triple chemistry bottle question is for students looking to challenge themselves.

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 1: Answers **5.1.1 The Particle Model**

Connection

N/A

Activation & Demonstration

In-text questions	**A** tiny particles **B** A material that has the same properties all the way through. **C** What its particles are like, how its particles are arranged, and how its particles move. **D** The relative mass of a gold particle is greater than the relative mass of an aluminium particle, so gold has the higher density.
Summary questions	**1** millions, particles, the same, the same, different, behaviour (6 marks) **2** Mercury has the greater density because its particles have a greater mass. (2 marks) **3** The density of gold in the liquid state is slightly less than its density in the solid state. The difference results from the arrangement of particles – in the liquid state, the particles are a little less closely packed. The particles in the two states are identical, so the difference in density cannot be explained in terms of any difference in mass of the particles. (4 marks)

Lesson 2: Book 1 – States of matter (5.1.2)

Connection

1. What is a particle?
2. What is a substance?
3. What is a mixture?

Activation

LI: Describe the properties of solids liquids and gases using the particle model

1. Make a note of the date, title and the LI
2. Key words – Solid, Liquid, Gas, States of matter
3. Read pages 80-81
4. Draw and label 3 diagrams on page 81
5. https://www.youtube.com/watch?v=wclY8F-UoTE
6. Answer Questions A, B, C

Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Single chemistry bottle question is for all students
Double chemistry bottle question are for students looking to extend their knowledge
Triple chemistry bottle question is for students looking to challenge themselves.

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 2: Answers **5.1.2 States of Matter**

Connection answers

1. A very tiny object such as an atom or molecule, that materials are made from. They are also too small to be seen with a microscope

2. A material that is not a mixture. It has the same properties all the way through

3. A mixture is made up of two or more pure substances that are mixed(not chemically joined) together.

Activation & Demonstration

In-text questions	**A** solid, liquid, gas **B** Solids cannot flow, liquids can flow. A solid's shape is fixed; a liquid takes the shape of its container. A given substance exists as a solid at lower temperature than it exists as a liquid. **C** You cannot compress a liquid because its particles touch their neighbours.
Activity	**Express particle?** The train travels at 0.135 km/s. This (0.135 x 1000) = 135 m/s. So the oxygen particles travel faster.
Summary questions	**1** There are **three** states of matter. You **cannot** compress a substance in the solid state because the particles touch each other. In the liquid and gas states, a substance flows because the particles **can** move from place to place. You **can** compress a gas because the particles are spread out. (4 marks) **2** Extended response question (6 marks). Example answer: Water flows in the liquid and gas state, but it does not flow in the solid state. This is because the particles touch their neighbours in the solid and liquid state, but in the gas state the particles do not touch their neighbours. In the solid state the shape is fixed, in the liquid state water takes the shape of the bottom of its container, and in the gas state water takes the shape of the whole container. This is because in the solid shape the particles are in fixed positions but in the liquid and gas states the particles move around from place to place. **3** Examples answers (accept well-argued alternatives): **a** Toothpaste behaves as a liquid because it can flow, its shape is not fixed, and you cannot compress it. However, you can feel tiny 'grains' in it. You cannot compress these grains, and they appear to have a fixed shape, so the grains are in the solid state. This shows that toothpaste is a mixture of substances in the liquid and solid state. (6 marks) **b** A cake has bubbles of air in the gas state, but between the air bubbles the shape of the cake is fixed unless you apply a force. For these reasons Daisy is correct. (3 marks)

Lesson 3: Book 1 – melting and freezing (5.1.3)

Connection

1. What are the three states of matter?
2. Draw a diagram of a typical solid
3. Is it possible to compress a gas? Explain why

Activation

LI: Explain changes of state in terms of changes to the energy of the particles

1. Make a note of the date, title and the LI
2. Key words – Melt, change of state, freeze, melting point
3. Read pages 82-83
4. Draw and label diagram on page 82
5. https://www.youtube.com/watch?v=xYU7RSoOZ0U
6. Answer Questions A, B, C

Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Single chemistry bottle question is for all students
Double chemistry bottle question are for students looking to extend their knowledge
Triple chemistry bottle question is for students looking to challenge themselves.

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 3: Answers **5.1.3 Melting and Freezing**

Connection answers

1. Solid, liquid and gas

2. A diagram showing particles arranged in ordered pattern and touching each other

3. It is possible to compress a gas because the particles are widely spaced

Activation & Demonstration

In-text questions	**A** liquid and solid **B** The particles first gain more energy and vibrate more in their fixed positions. The particles then begin to break the bonds that hold them together and move about freely. **C** oxygen, water, gallium, gold
Activity	**Using melting points to identify substances** Since the painkiller must be one of the three listed, and the melting points are widely spaced, it is reasonable to be very confident that this answer is correct.
Summary questions	**1** melting, faster, around, liquid, temperature (5 marks) **2** Ben is correct. If the melting point is -7°C then the substance must be in either the liquid or gas state at 20°C. You cannot know which of these two states it is unless you also know its boiling point. (3 marks) **3** Extended response question (6 marks). Example answers: Melting is the change from the solid to the liquid state. On melting, energy is transferred from the surroundings to the particles as the particles vibrate faster and move away from their places in the pattern. More and more particles start moving around. When all the particles are moving around from place to place, the substance has melted. Freezing is the change from the liquid to the solid state. On freezing, energy is transferred from the substances to the surroundings as the particles start to move more slowly. Particles become arranged in a pattern, and vibrate on the spot. **4** In the solid the particles vibrate on the spot, but in the gas they move around randomly throughout the container. In the solid the particles are arranged in a regular pattern, but in the gas they are arranged randomly. The total energy stored by the particles in the solid is less than the total energy stored by the particles in the gas. (3 marks)

Lesson 4: Book 1 – Boiling(5.1.4)

Connection

1. What is a melting point?
2. Draw a diagram of a typical liquid
3. Describe the process of freezing

Activation

LI: Describe simply how temperature or state can be describe in terms of particles transferring energy

1. Make a note of the date, title and the LI
2. Key words –Boil, boiling point
3. Read pages 84-85
4. Draw and label diagram on page 84
5. https://www.youtube.com/watch?v=AW8v2Fx0Y8c
6. Answer Questions A, B, C, D

Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Single chemistry bottle question is for all students
Double chemistry bottle question are for students looking to extend their knowledge
Triple chemistry bottle question is for students looking to challenge themselves.

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 4: Answers **5.1.4 Boiling**

Connection answers

1. The temperature at which a solid turns into a liquid

2. A diagram showing particles arranged in disordered pattern but still touching each other

3. The particles in a liquid move more slowly as they transfer energy to the surroundings. The particles get into a pattern and vibrate on the spot

Activation & Demonstration

In-text questions	**A** Drawing of particles that are spread out, not touching each other, in a random arrangement. **B** steam OR water in the gas state OR water vapour **C** The temperature at which a substance boils. **D** Silver is in the liquid state at 1000°C.
Activity	The substance is likely to be ethanol.
Summary questions	**1** liquid, gas, all the way through, a certain (4 marks) **2** Copper is in the liquid state 2000°C (1 mark) **3** Answer to include (6 marks): Diagrams of particles in two substances in the liquid state indicating stronger forces of attraction between particles in one of the substances. Examples included, such as the boiling points of water and ethanol. The forces of attraction between water particles in the liquid state are stronger than those between ethanol particles in the liquid state, so water has the higher boiling point. Table or similar listing how the diagrams are like, and are not like, liquids in reality.

Lesson 5: Book 1 – More changes of state (5.1.5)

Connection

1. State what is meant by the term boiling point
2. Draw a diagram of a typical gas
3. At what temperature does water boil?

Activation

LI: describe one difference between boiling and evaporation

1. Make a note of the date, title and the LI
2. Key words –Evaporate, Condense, Sublime
3. Read pages 86-87
4. https://www.youtube.com/watch?v=ezjGJZRnDZg
5. Answer Questions A, B, C, D

Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Single chemistry bottle question is for all students
Double chemistry bottle question are for students looking to extend their knowledge
Triple chemistry bottle question is for students looking to challenge themselves.

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 5: Answers **5.1.5 More Changes of State**

Connection answers

1. The temperature at which a liquid boils and turns into a gas

2. A diagram showing particles arranged in disordered pattern, not touching and spaced far apart

3. 100 degrees Celsius

Activation & Demonstration

In-text questions	**A** In evaporation, particles escape from the surface of the liquid, but in boiling, bubbles of the substance in the gas state form throughout the liquid, rise to the surface, and escape. Evaporation happens at any temperature, but boiling happens only at the boiling point. **B** A hairdryer heats the substance in its liquid state, and supplies moving air to move evaporated particles away **C** On condensing, a substance in the liquid state is formed **D** subliming
Activity	**Evaluating evaporation** Make the test fair by soaking the same type of material in water and having equal-sized pieces of this material. It is not possible to know whether the evidence supports the conclusion because the investigation is not fair.
Summary questions	**1** In boiling, substances change from the liquid to the gas state. In boiling, particles leave from all parts of the liquid. In condensing, substances change from the gas state to the liquid state. In evaporating particles leave from the surface of the liquid. In evaporating, substances change from the liquid to the gas state. (5 marks) **2** On condensing, particles in the gas state move closely together until they touch each other. The particles stop moving around throughout the whole container, and instead they move around each other in the bottom part of the container. Answers include annotated diagrams to illustrate this process. (4 marks) **3** Extended response question (6 marks). Example answers: Before deposition the particles are moving from place to place. They are arranged randomly and are not touching each other. After deposition the particles are arranged in a regular pattern. They are touching each other. They are vibrating on the spot. During deposition, energy is transferred from the substance to the surroundings. Answer should include diagrams to show particle arrangements.

Lesson 6: Book 1 – Diffusion (5.1.6)

Connection

1. State what is meant by sublimation
2. Give an example where evaporation is useful
3. Name the change of state where gas turns into a liquid

Activation

LI: use the particle model to explain diffusion

1. Make a note of the date, title and the LI
2. Key words –Diffusion
3. Read pages 88-89
4. Draw and label diagrams on pages 88-89
5. https://www.youtube.com/watch?v=c_IYK8sy0QA
6. Answer Questions A, B

Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Single chemistry bottle question is for all students
Double chemistry bottle question are for students looking to extend their knowledge
Triple chemistry bottle question is for students looking to challenge themselves.

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 6: Answers **5.1.6 Diffusion**

Connection answers

1. Sublimation is where a substance turns from a solid to a gas without going through the liquid phase

2. Sweating cools you down by evaporation. Water from the sweat evaporates, the water particles need energy to move away as a gas. This takes energy from your skin

3. Condensation

Activation & Demonstration

In-text questions	**A** In the first diagram the particles of the diffusing substance are close together. In the second diagram they are spread out, randomly, to fill the whole container. **B** temperature, particle size and mass, state
Summary questions	**1** randomly, spread, many, diffusion (4 marks) **2** You might be able to see particles of a coloured substance moving through the air. You might be able to see particles of a coloured substances moving through a liquid. (2 marks) **3** Nitrogen particles diffuse faster because their particles have a smaller mass. (2 marks) **4** Extended response question (6 marks). Example answers: Diffusion (the movement of particles from a region where there are many particles, to a region where there are fewer) is evidence for the existence of particles. Further evidence for the existence of particles is that gases spread out to fill their containers, and that liquids and gases can flow.

Lesson 7: Book 1 – Gas pressure (5.1.7)

Connection

1. List three factors that affect the rate of diffusion
2. Describe one piece of evidence for particles
3. Explain why temperature increases the rate of diffusion

Activation

LI: Use words to explain gas pressure simply

1. Make a note of the date, title and the LI
2. Key words –Gas pressure
3. Read pages 90-91
4. Draw and label diagram on page 90
5. https://www.youtube.com/watch?v=BAnIW6EF0ls
6. Answer Questions A, B, C

Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Single chemistry bottle question is for all students
Double chemistry bottle question are for students looking to extend their knowledge
Triple chemistry bottle question is for students looking to challenge themselves.

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 7: Answers **5.1.7 Gas Pressure**

Connection answers

1. Temperature, particle size and the state of the diffusing substances

2. Robert brown looking at pollen grains in water and the pollen was moving around. They were moving due to colliding with particles of water that were fast moving

3. Particles have more energy and so move faster, therefore they diffuse more quickly

Activation & Demonstration

In-text questions	**A** The force per unit area caused by particles colliding with the walls of their container. **B** There are more particles causing more frequent collisions with the walls inside the container. **C** The air particles inside the bottle transfer energy to the freezer and the air cools down. The particles move more slowly. They collide with the plastic less often, so the pressure in the bottle decreases.
Activity	**Particle performance** Script to indicate that particles move faster as the air gets hotter, leading to more frequent collisions with the rubber tyres, and so increased pressure.
Summary questions	**1** Gas particle collide with the walls of their container. Colliding gas particles exert pressure on the inside of their container. The more particles in a container, the **higher** the pressure. The higher the temperature, the **higher** the pressure. (4 marks) **2** There are air particles in the closed can, above the baked beans. On heating, the gas particles move faster. They collide with the walls of the container more frequently, so the pressure increases. Eventually the pressure is so high that the container isn't strong enough to withstand this pressure, and the container explodes. (3 marks) **3** Example points. Students should also include before and after particle diagrams in their answer. (6 marks): In a warm room, the particles inside the balloon are moving more quickly. The particles collide with the walls of the rubber more often. The air pressure inside the balloon increases. The rubber will stretch and the balloon expand. In the freezer the particles inside the balloon transfer energy to the freezer, and the air cools down. The pressure inside the balloon decreases. The rubber stretches out less and the balloon shrinks.

Lesson 8: Book 1 – Inside particles (5.1.8)

Connection

1. State whether gas pressure is higher or lower at higher temperatures

2. Describe what happens to a sealed plastic bottle when placed in the freezer

Activation

LI: Describe what an atom is

1. Make a note of the date, title and the LI
2. Key words –Element, Atom, Molecule, Compound
3. Read pages 92-93
4. Draw and label diagrams on page 93
5. https://www.youtube.com/watch?v=CguFLlwZKoM
6. Answer Questions A, B, C

Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Single chemistry bottle question is for all students
Double chemistry bottle question are for students looking to extend their knowledge
Triple chemistry bottle question is for students looking to challenge themselves.

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Connection answers

1. Gas pressure is higher at higher temperatures as the particles have more energy and so collide with the outside of the container more often

2. The plastic bottle collapses as the air pressure inside the bottle decreases

Activation & Demonstration

In-text questions	**A** An element is a substance that contains just one type of atom. All materials are made up of one or more elements. **B** A molecule is a group of two or more atoms, strongly joined together. **C** A compound is a substance that is made up of atoms of two or more elements, strongly joined together.
Summary questions	**1** The smallest particle of an element that can exist. (1 mark) **2** Diagram showing two identical spheres touching each other. (2 marks) **3** Diagram showing one atom in one colour joined to two atoms in another colour. (2 marks) **4** Similarities – both include one or more oxygen atoms, and both are made up of atoms that are strongly joined together. Differences – an oxygen molecule is made up of two oxygen atoms only, but a water molecule is made up of one oxygen atom joined to two hydrogen atoms. (2 marks)

Lesson 9: Book 1 – Pure substances and mixtures (5.2.1)

Connection

1. State whether water is an element or a compound
2. Describe what a molecule is
3. Explain why carbon dioxide is described as a compound

Activation

LI: State the properties of a pure substance

1. Make a note of the date, title and the LI
2. Key words –Pure substance, Mixture
3. Read pages 94-95
4. Draw and label diagram & graphs on page 95
5. https://www.youtube.com/watch?v=1LtkK5UYe-o
6. Answer Questions A, B, C

Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Single chemistry bottle question is for all students
Double chemistry bottle question are for students looking to extend their knowledge
Triple chemistry bottle question is for students looking to challenge themselves.

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 9: Answers **5.2.1 Pure Substances and Mixtures**

Connection answers

1. A compound

2. A molecule is a group of two or more atoms strongly joined together

3. Carbon dioxide is a compound because it is a substance that is made of up of atoms of two elements strongly joined together

Activation & Demonstration

In-text questions	**A** Two or more different substances not chemically joined together. **B** Any four examples of mixtures. **C** Substances with clearly-defined melting (or boiling) points are pure. If the melting or boiling point of a substance occurs over a temperature range then it is impure.
Activity	**Toothpaste tales** Ingredients list and uses should include hydrated silica (removes plaque), sodium fluoride (prevents cavities), sodium lauryl sulfate (makes foam), carrageenan (thickens toothpaste), and titanium oxide (whitener).
Summary questions	**1a** A mixture is made up of different substances that are **not** joined together. **b** You **can** change the amounts of substances in a mixture. **c** A pure substance has no other substances mixed with it. (3 marks) **2** Substances is pure because the change of state takes place at a clearly-defined temperature. (2 marks) **3** Extended response question (6 marks). Example answers: A pure substance contains one substance only, but a mixture contains more than one substance. In a pure substance, all the particles are the same. A mixture contains different types of particles, which are not joined together.

Lesson 10: Book 1 – Solutions (5.2.2)

Connection

1. State whether saltwater is a pure substance
2. Describe how to identify a pure substance
3. What is meant by the term mixture

Activation

LI: Describe solutions using key words

1. Make a note of the date, title and the LI
2. Key words –Dissolve, Solvent, Solute, Solution
3. Read pages 96-97
4. Draw and label diagram on page 96
5. https://www.youtube.com/watch?v=HHMuxploYEY
6. Answer Questions A, B, C

Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Single chemistry bottle question is for all students
Double chemistry bottle question are for students looking to extend their knowledge
Triple chemistry bottle question is for students looking to challenge themselves.

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 10: Answers **5.2.2 Solutions**

Connection answers

1. Saltwater is not a pure substance, it is a mixture

2. A pure substance can be identified by identifying its melting point

3. A mixture contains two or more substances which may be elements or compounds

Activation & Demonstration

In-text questions	**A** A mixture of a liquid with a solid or gas dissolved in it. **B** coffee powder **C** Solvent particles surround solute particles. The particles are arranged randomly and can move around.
Activity	**Solution masses** mass of solution = 3 g + 100 g = 103 g **Modelling dissolving** Credit sensible suggestions for how a model for dissolving can be set up. For example, small handfuls of beans can be placed carefully at different intervals throughout a container of rice. The rice represents solvent particles and the beans represent solute particles. When mixed, the content is shaken until the beans are scattered throughout the rice.
Summary questions	**1** solution, solute, solvent, water, salt, completely (6 marks) **2** Since pure water has a density of 1 g/cm^3, Laura should find the masses of each liquid on a mass balance. The liquid with a mass of 200 g will be pure water and the other two liquids will be solutions. (3 marks) **3** Visual summary example answers (6 marks): Definitions of the key words solute, solvent, and solution. How dissolving requires solvent particles to surround the solute particles. All particles are freely moving in a solution. Use a mass to identify solvents from solutions. Examples of different solutions, stating the solutes and solvents used. Particle diagrams to illustrate the points above.

Lesson 11: Book 1 – Solubility (5.2.3)

Connection

1. Identify the solute in saltwater solution
2. Identify the solvent in saltwater solution
3. Can gases dissolve? If so, give an example

Activation

LI: Explain the meaning of solubility

1. Make a note of the date, title and the LI
2. Key words –Saturated solution, Solubility, Soluble, Solubility curve
3. Read pages 98-99
4. Sketch graph top of page 99
4. https://www.youtube.com/watch?v=_KFhFi1jMn0
5. Answer Questions A, B

Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Single chemistry bottle question is for all students
Double chemistry bottle question are for students looking to extend their knowledge
Triple chemistry bottle question is for students looking to challenge themselves.

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 11: Answers **5.2.3 Solubility**

Connection answers

1. Salt
2. Water
3. Gases can dissolve in solvents. Carbon dioxide dissolves in liquid to make fizzy drinks

Activation & Demonstration

In-text questions	**A** A solution where no more solute will dissolve. **B** lithium chloride (most), sodium chloride (least)
Activity	**Solubility curves** Solubility increases with temperature for each straight-line graph (sodium nitrate, lead nitrate, potassium chloride, and sodium chloride). Lead nitrate has the steepest gradient (solubility increases the most for each degree of temperature increase) while sodium chloride has the smallest gradient. Curve for calcium chloride, potassium nitrate, and potassium chlorate (VII) show a slow increase in solubility with temperature at first, before a rapid increase after a certain temperature, Credit inclusion of correct temperature values. The curve for cerium (III) sulfate is the only one to show a decrease in solubility with temperature, to a constant solubility of 3 g/100 g of water from 30°C onwards.
Summary questions	**1** A saturated solution is a solution that contains the greatest mass of solid that can dissolve. A saturated solution contains undissolved solid. An insoluble substance does not dissolve. Solubility is the mass of substance that dissolves in 100 g of water. (4 marks) **2** Graph should show an upward curve of decreasing gradient. This shows that solubility increases with temperature but up to a limit of approximately 700 g per 100 g of water. (4 marks) **3a** When the student adds 20 g of potassium chloride to 100 g of water, he would see that all the solid dissolved to make a solution. (3 marks) **b** When the student adds 200 g of cerium (III) sulfate to 100 g of water, he would see that some of the solid would dissolve, but most would remain undissolved at the bottom of the container. (3 marks)

Lesson 12: Book 1 – Filtration (5.2.4)

Connection

1. State what happens when you try to add more solute to a saturated solution
2. Describe how temperature affects solubility
3. Describe how you could best show data about solubility

Activation

LI: State why it is possible to separate mixtures

1. Make a note of the date, title and the LI
2. Key words –Filtration, Filtrate, Residue
3. Read pages 100-101
4. Draw and label diagram on page 100
5. https://www.youtube.com/watch?v=WSdGxQBnhZU
6. Answer Questions A, B, C, D

Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Single chemistry bottle question is for all students
Double chemistry bottle question are for students looking to extend their knowledge
Triple chemistry bottle question is for students looking to challenge themselves.

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Connection answers

1. No more solute would dissolve. The solute would simply rest at the bottom of the container

2. Solutes dissolve more quickly at higher temperatures

3. Data about solubility can best be shown graphically on a solubility curve

Activation & Demonstration

In-text questions	**A** A liquid from insoluble solid, or solution from an insoluble solid. **B** glitter = residue, water = filtrate **C** Removing coffee from ground-up coffee beans, removing solid impurities from oil, making water safe to drink. **D** Salt is soluble in water and sand is not.
Activity	**Solubility puzzle** Remove undissolved solid solute by filtering the solution into a pre-weighed beaker. Find the mass of the filtrate by: final mass of beaker – initial mass of beaker Pour the filtrate into a measuring cylinder to measure volume; volume of solution = volume of solvent Convert volume of solvent to mass by using 1 cm^3 of water = 1 g Solubility of zinc sulfate in the volume of solvent used can be found by: mass of solution – mass of solvent Scale up or down to give solubility in g per 100 g of water
Summary questions	**1** insoluble residue (top), liquid filtrate (bottom) (2 marks) **2** Amount of solute dissolved in 100 g of water: calcium chloride = 100 – 25 = 75 g calcium hydrogencarbonate = 100 – 84 = 16 g (least soluble) calcium bromide = 100 g (most soluble) calcium iodide = 100 – 33 = 67 g (4 marks) **3** Students design a suitable model and identify at least one advantage and one disadvantage or their model. They also include relevant diagrams that help describe their model. (6 marks)

Lesson 13: Book 1 – Evaporation and distillation (5.2.5)

Connection

1. State whether saltwater can be separated by filtration
2. Describe two uses of filtration
3. Describe what is meant by residue

Activation

LI: State why evaporation works to separate a particular mixture

1. Make a note of the date, title and the LI
2. Key words –Distillation
3. Read pages 102-103
4. Draw and label diagram on page 103
5. https://www.youtube.com/watch?v=CK1KVYLIGRE
6. Answer Questions A, B, C

Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Single chemistry bottle question is for all students
Double chemistry bottle question are for students looking to extend their knowledge
Triple chemistry bottle question is for students looking to challenge themselves.

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 13: Answers **5.2.5 Evaporation and Distillation**

Connection answers

1. Saltwater cannot be separated by filtration as the salt is dissolved in water

2. Separating coffee solution from ground coffee beans
   Oil filters in cars
   Sand filters to help make water safe to drink

3. Residue is a solid that collects in the filter paper during filtration

Activation & Demonstration

In-text questions	**A** Pour some seawater into an evaporating dish. Heat over a water bath until some of the water has evaporated. Leave in a warm place for the rest of the water to evaporate. **B** making copper sulfate crystals, drying of glue, obtaining lithium compounds from solution **C** Salt has a much higher boiling point than water.
Activity	**Ancient distillation** Credit sensible suggestions for how the alembic might work. Answers should include evaporation of the mixture and condensation once vapours reach the curved lid.
Summary questions	**1** differences, physical, properties (3 marks) **2a** Evaporation because water has a lower boiling point than copper chloride, so on heating the water evaporates, leaving copper chloride in the container. (1 mark) **b** Distillation because propanone has a lower boiling point than water, so on heating the propanone evaporates first. It then condenses and is collected as a liquid. (1 mark) **c** Distillation (same reasoning as **b**). (1 mark) **d** Evaporation because water has a lower boiling point than potassium chloride, so on heating the water evaporates, leaving potassium chloride in the container. (1 mark) **3** Extended response question (6 marks). Example answers: Evaporation separates solute from a solution. The solvent evaporates and enters the atmosphere. The solvent cannot be obtained from evaporation. Distillation uses evaporation and condensation to obtain a solvent from a solution. Solids (mainly solute and other soluble impurities) remain. Only distillation can be used to obtain a solvent from solution. Both distillation and evaporation can be used to obtain solutes from solution, but evaporation uses much simpler apparatus and is therefore easier to set up, and to carry out.

Lesson 14: Book 1 – Chromatography (5.2.6)

Connection

1. State the name of the piece of equipment which cools down steam during distillation of saltwater

2. Describe how to separate a mixture of two liquids of different boiling points

3. Describe a use of evaporation

Activation

LI: Describe how chromatography separates substances

1. Make a note of the date, title and the LI
2. Key words –Chromatography, Chromatogram
3. Read pages 104-105
4. Draw and label diagram on page 104
5. https://www.youtube.com/watch?v=PvHvx7k7UPU
6. Answer Questions A, B

Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Single chemistry bottle question is for all students
Double chemistry bottle question are for students looking to extend their knowledge
Triple chemistry bottle question is for students looking to challenge themselves.

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 14: Answers **5.2.6 Chromatography**

Connection answers

1. A condenser

2. Heat up the mixture to the boiling point of the substance with the lower boiling point. The substance with the higher boiling will remain in the flask

3. Extraction of salt from salt pans, evaporation of the solvent to make glue dry,

Activation & Demonstration

In-text questions	**A** Chromatography separates substance in a mixture that are soluble in the same solvent. **B** The result from a chromatography experiment, where different colours have travelled up the chromatography paper by different amounts.
Activity	**Clever chromatography** Answers must include three uses of chromatography, for example, separating mixtures in solution, identifying coloured dyes, identifying the presence of vitamins and minerals, matching an unknown sample to a known specimen, and checking the progress of a reaction against a known product. Credit detailed descriptions of how chromatography is used, and check that scientific terminology has been used correctly.
Summary questions	**1** a mixture, solvent, chromatogram (3 marks) **2** Some substances are more soluble than others, some stick to the chromatography paper more/better than others. (3 marks) **3** Plant C – all the pigments in the unknown plant match all the constituent pigments in plant C. The pattern of spots for plant C is exactly the same as that for the unknown sample, so it is reasonable to be fairly confident that the answer is correct. However, there could be more than one plant producing identical chromatograms, so it is not possible to be 100% certain. (4 marks) **4** Examples answers (6 marks): Place a sample of the unknown ink into chromatography paper. Obtain samples from the three possible pens. Place dots of sample inks along a line with the unknown sample on the same piece of chromatography paper. Carry out the chromatography procedure to obtain a chromatogram. Compare chromatograms obtained and one of the samples will match the unknown link. Possible issues: Obtaining the sample of the unknown ink from the note. If more than one person uses the same ink (same brand) then their chromatograms will look the same. Chromatography tests the ink for the soluble substances inside it, not the pen itself.

Lesson 16: Book 2 – Elements (5.3.1)

Connection

1. What is chromatography used for?
2. How does chromatography work?
3. Describe a use of chromatography

Activation

LI: State what an element is

1. Make a note of the date, title and the LI
2. Key words –Element, Chemical symbol
3. Read pages 68-69
4. Use a periodic table to copy the name and the symbol for the 1st 20 elements
4. https://www.youtube.com/watch?v=p90Ug56GkcE
5. Answer Questions A, B

Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Single chemistry bottle question is for all students
Double chemistry bottle question are for students looking to extend their knowledge
Triple chemistry bottle question is for students looking to challenge themselves.

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 14: Answers **5.3.1 Elements**

Connection answers

1. Chromatography is used to separate dyes

2. Dyes are separated due to their how much they dissolve in water or are attracted to the paper

3. Chromatography can be used to identify nutrients in food

Activation & Demonstration

In-text questions	**A** Any three elements that are shown as smartphone elements **B** H, Al, Mg, Na
Activity	**Golden smartphones** 40 phones 1300 phones
Summary questions	**1** Any six elements that are shown as smartphone elements, and their correct symbols. (6 marks) **2** Elements cannot be broken down into other substances. Since the substance breaks down when electricity passes through it, it cannot be an element. (2 marks) **3** Chemists can communicate about elements, whatever language they normally use. Chemical symbols avoid possible confusion resulting from an element having different names in different languages. (2 marks)

Lesson 17: Book 2 – Atoms (5.3.2)

Connection

1. State the symbols of the elements Oxygen, Carbon and Sodium

2. How many naturally occurring elements are there?

3. Explain why it is useful to use the same chemical symbols in every language

Activation

LI: Represent atoms using particle diagrams

1. Make a note of the date, title and the LI
2. Key words –atom
3. Read pages 70-71
4. Draw and label table on page 71
5. https://www.youtube.com/watch?v=c9uB6VVJxGE
6. Answer Questions A, B

Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Single chemistry bottle question is for all students
Double chemistry bottle question are for students looking to extend their knowledge
Triple chemistry bottle question is for students looking to challenge themselves.

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 17: Answers **5.3.2 Atoms**

Connection answers

1. O, C , Na

2. There are 98 naturally occurring elements

3. It is useful to have the same chemical symbols in every language so that scientists around the world can easily communicate with other and avoid confusion.

Activation & Demonstration

In-text questions	**A** An atom is the smallest particle of an element that can exist. **B** Gold atoms are bigger and heavier than silicon atoms.
Activity	**Going for gold** In 1000 g of gold there are about 3×10^{24} atoms. So in 10 g there are about $(3 \times 10^{24})/100 = 3 \times 10^{22}$ atoms.
Summary questions	**1** atom, same, different (3 marks) **2** There are three types of atoms in the medal, since there are three different elements, and each element has a different type of atom from every other element. (2 marks) **3** Credit sensible visual summaries. Key points to include – key words, meanings of key words, examples to illustrate key words. Visual summary should be logically organised. (6 marks)

Lesson 18: Book 2 – Compounds (5.3.3)

Connection

1. What is an atom?
2. State the number of types of atom in water
3. Draw a particle diagram showing gold atoms in the solid form

Activation

LI: State what a compound is

1. Make a note of the date, title and the LI
2. Key words –Compound, Molecule
3. Read pages 72-73
4. Draw and label diagram on page 72
5. https://www.youtube.com/watch?v=DZ6Ap8Zyb9w
6. Answer Questions A, B, C

Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Single chemistry bottle question is for all students
Double chemistry bottle question are for students looking to extend their knowledge
Triple chemistry bottle question is for students looking to challenge themselves.

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 18: Answers **5.3.3 Compounds**

Connection answers

1. An atom is the smallest part of an element that can exist

2. There 2 types of atom in water

3. A diagram showing equally sized particles arranged in neat rows

Activation & Demonstration

<table>
<tr><td>In-text questions</td><td>A A pure substance made up of atoms of two or more elements strongly joined together.
B The boiling point of water is higher than the boiling point of hydrogen.
C For example, sodium is silver-coloured and shiny; sodium chloride is white and not shiny.</td></tr>
<tr><td>Activity</td><td>Organising ideas
<table>
<tr><th>Name of substance</th><th>State at room temperature</th><th>Colour</th><th>Other properties</th></tr>
<tr><td>sodium</td><td>solid</td><td>silver</td><td>fizzes in water</td></tr>
<tr><td>chlorine</td><td>gas</td><td>green</td><td>poisonous and smelly</td></tr>
<tr><td>sodium chloride</td><td>solid</td><td>white</td><td>no smell, not poisonous, does not fizz in water</td></tr>
</table>
Sodium is made up of sodium atoms only, and chlorine is made up of chlorine atoms only. The compound – sodium chloride – is made up of atoms of sodium and chlorine that are joined together to make one substance. This explains why the compound has different properties from the elements it is made from.</td></tr>
<tr><td>Summary questions</td><td>1 two, different to, two, strongly (4 marks)
2 A mixture of elements. The diagram shows two types of particle, each made up of two atoms of the same element. (2 marks)
3 The boiling point of water is higher than the boiling point of oxygen. This is because weak forces hold molecules close to each other in liquid oxygen. Stronger forces hold molecules close together in liquid water. You need to transfer more energy to water to separate the molecules from each other than to oxygen to separate oxygen molecules from each other. (3 marks)
4 Example answers (6 marks):
Water is liquid at room temperature but hydrogen and oxygen are gases. There are weaker forces holding molecules close to each other in liquid hydrogen and liquid oxygen than there are in liquid water. You need to transfer more energy to water to separate the molecules from each other than to hydrogen to separate hydrogen molecules from each other. You cannot see oxygen and hydrogen at room temperature but you can see water. Oxygen and hydrogen are bonded differently to water. Oxygen is only two oxygen atoms bonded together, hydrogen is only two hydrogen atoms bonded together, but water is made from oxygen and hydrogen bonded to each other. Oxygen and hydrogen are elements, water is a compound.</td></tr>
</table>

Lesson 19: Book 2 – Chemical formulae (5.3.4)

Connection

1. State why water is classified as a compound
2. State why oxygen is classified as an element
3. Explain why the properties of salt are different to the properties of sodium and chlorine

Activation

LI: name compounds using their chemical formulae

1. Make a note of the date, title and the LI
2. Key words –Chemical formula Hydroxide, Nitrate, Sulfate, Carbonate
3. Read pages 74-75
4. Draw and label diagrams of molecules on pages 74 & 75
5. https://www.youtube.com/watch?v=r5QwiagXc3c
6. Answer Questions A, B, C

Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Single chemistry bottle question is for all students
Double chemistry bottle question are for students looking to extend their knowledge
Triple chemistry bottle question is for students looking to challenge themselves.

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 19: Answers **5.3.4 Chemical Formulae**

Connection answers

1. Water is classified as a compound as it is made up of two types of atom

2. Oxygen is classified as an element as it is made up of one type of atom

3. In salt, the atoms of sodium and chlorine are not mixed up. They are joined together to make one substance. Therefore it will have different properties to its constituent elements

Activation & Demonstration

In-text questions	**A** One carbon atom and two oxygen atoms **B** sodium chloride **C** sulfur, copper, oxygen
Activity	**What's water?** Water has 2 g of hydrogen to every 16 g of oxygen. The ratio is mass of hydrogen : mass of oxygen 2 g : 16 g The ratio in nitrogen dioxide is mass of nitrogen : mass of oxygen 14 g : 32 g This is 7 g : 16 g So water has the higher proportion of oxygen.
Summary questions	**1** CO_2, one, two, oxygen (4 marks) **2a** nitrogen monoxide **b** nitrogen dioxide **c** hydrogen chloride **d** potassium hydroxide **e** zinc sulfate **f** copper carbonate (6 marks) **3a** Two hydrogen atoms and one oxygen atom. **b** Two nitrogen atoms and four oxygen atoms. **c** One carbon atom and four hydrogen atoms. (6 marks) **4a** A diagram of an oxygen molecule, made up of two identical circles joined together. **b** A diagram of one argon atom, consisting of one single circle. **c** A diagram of four nitrogen molecules, each made up of two identical circles joined together. **d** A diagram of one carbon dioxide molecule, made up of one circle in the centre joined to two circles that are different from the central circle, but identical to each other. **e** A diagram showing all the atoms and molecules above. (5 marks) **5** LiOH. The formulae of compounds shows a pattern, and this formula fits the pattern. (2 marks)

Lesson 20: Book 2 – Polymers (5.3.5)

Connection

1. State the formula for carbon dioxide
2. State the name of the compound which has the formula NaOH
3. Write down the name of the of the elements that make up sodium nitrate

Activation

LI: Describe the structure of a polymer

1. Make a note of the date, title and the LI
2. Key words –Polymer, natural polymer, Synthetic polymer
3. Read pages 76-77
4. Draw and label diagram on page 76
5. https://www.youtube.com/watch?v=FD4dncoxXRY
6. Answer Questions A, B, C, D

Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Single chemistry bottle question is for all students
Double chemistry bottle question are for students looking to extend their knowledge
Triple chemistry bottle question is for students looking to challenge themselves.

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 20: Answers **5.3.5 Polymers**

Connection answers

1. CO_2
2. Sodium hydroxide
3. Sodium, Nitrogen, Oxygen

Activation & Demonstration

In-text questions	**A** A substance with very long molecules that is made from thousands of smaller molecules that are joined together in a repeating pattern. **B** Methane melts at a lower temperature than poly(ethene) because poly(ethene) has bigger and heavier molecules. **C** Any one from: wool for jumpers and socks, cotton for summer clothing like T-shirts, rubber for tyres. **D** They are flexible but strong.
Activity	**Plotting polymers** Bar charts should have names of the five polymers along the x-axis and density (g/cm3) on the y-axis. Axes should be labelled with values at regular intervals. Bars should decrease in height from PVC, soft rubber, HDPE, LDPE, to poly(propene).
Summary questions	**1** long, atoms, natural, synthetic, PVC, flexible (6 marks) **2 a** low density **b** poor conductor of heat (2 marks) **3** B has the higher melting point because its particles are bigger. (2 marks)

Lesson 21: Book 2 – The periodic table (5.4.1)

Connection

1. What is a polymer?
2. State two examples of natural polymers
3. Explain why poly(ethene) bags can be bad for the environment

Activation

LI: State what the groups and periods of the periodic table tell you about the elements

1. Make a note of the date, title and the LI
2. Key words –Physical properties, Periodic table, Group, Period, Trend
3. Read pages 78-79
4. Highlight a copy of the periodic table to indicate key groups
4. https://www.youtube.com/watch?v=OfoGeyWGLgI
5. Answer Questions A, B

Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Single chemistry bottle question is for all students
Double chemistry bottle question are for students looking to extend their knowledge
Triple chemistry bottle question is for students looking to challenge themselves.

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 21: Answers **5.4.1 The Periodic Table**

Connection answers

1. A polymer is a substance with very long molecules. A polymer molecule has identical groups of atoms, repeated many times

2. Wool, Cotton, Starch and Rubber

3. Poly(ethene) does not break down or wear away. Theefore it does not biodegrade when disposed of in landfill sites. It can also be harmful to wildlife if it is ingested

Activation & Demonstration

In-text questions	**A** groups **B** periods
Activity	**Predictable patterns?** Credit bar charts to show atomic radii of elements in Period 2 and Period 3. For both periods, atomic radii are larger at the start of the period (Li and Na) than at the end (F and Cl). Atomic radii decrease more rapidly at the start of a period than at the end. Atomic radii for Period 3 are larger than those of Period 2.
Summary questions	**1** groups, periods, down, across left, right (6 marks) **2** Credit suitable bar charts for density data (one for cobalt, rhodium, and iridium, and another for nickel and platinum). Credit a predicted palladium density of 9–15 g/cm^3. The actual density of palladium is 10.4 g/cm^3. (3 marks) **3** Example answers (6 marks): Vertical columns are called groups. Horizontal rows are called periods. Numerical data for one element can be predicted given data of surrounding elements. These elements can be neighbouring elements in periods or groups. Melting points increase down a group. Atomic radii decrease across a period. The density of elements increases down a group.

Lesson 22: Book 2 – The elements of group 1 (5.4.2)

Connection

1. What is the periodic table?
2. What is a group?
3. What is a period?

Activation

LI: State the properties and reactivity of the group 1 elements

1. Make a note of the date, title and the LI
2. Key words – Group 1, Alkali metals, Chemical properties
3. Read pages 80-81
4. List 6x group 1 elements
4. https://www.youtube.com/watch?v=JAPWCJEo9Iw
5. Answer Questions A, B, C

Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Single chemistry bottle question is for all students
Double chemistry bottle question are for students looking to extend their knowledge
Triple chemistry bottle question is for students looking to challenge themselves.

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 22: Answers **5.4.2 The elements of Group 1**

Connection answers

1. The periodic table groups together all the chemical elements with similar properties

2. A group on the periodic table refers to the vertical columns of the periodic table

3. A period on the periodic table refers to the horizontal rows of the periodic table

Activation & Demonstration

In-text questions	**A** Group 1 metals have lower melting points than other metals. **B** The boiling point decreases as you move down Group 1. **C** hydrogen
Activity	**Which conclusion?** Credit reasonable explanations that support either Sam's or Ben's theory. A more detailed description of the pattern may be: The density of Group 1 metals increases down the group in a roughly linear fashion. Potassium is an anomaly because it has a smaller density than that of sodium. Densities of caesium and francium are required to understand the trend in Group 1 metal densities better.
Summary questions	**1** Any five of the following, for one mark each: From top to bottom of Group 1, boiling point decreases (1). From top to bottom of Group 1, the vigour of the reaction with water increases (1). From bottom to top of Group 1, melting point increases (1). All Group 1 elements have low densities (1). All Group 1 elements conduct electricity (1). All Group 1 elements react with water to make hydrogen and an alkaline solution (1). **2a** Credit appropriate bar chart, with hardness decreasing from Li to Cs. (6 marks) **b** Hardness decreases down Group 1. (2 marks) **c** 0.4, because hardness decreases by 0.1 for each element down Group 1. (2 marks) **3** Very vigorous reaction, which is more violent than that of potassium with water. Rubidium is below potassium in Group 1. Bright flame, bubbles of hydrogen produced as for potassium. Products are hydrogen and rubidium hydroxide. The other elements in the group also react with water to make hydrogen and a solution of a hydroxide. (6 marks) **4** Example answers (6 marks): Physical properties down Group 1: decreasing hardness, decreasing melting point, decreasing boiling point. Chemical properties down Group 1: increased reactivity with water.

Lesson 23: Book 2 – The elements of group 7 (5.4.3)

Connection

1. State what gas is released when group 1 metals react with water

2. Describe what happens when lithium reacts with water

3. Describe the trend in melting point as you move down group 1

Activation

LI: State the properties and reactivity of the group 7 elements

1. Make a note of the date, title and the LI
2. Key words – Group 7, Halogens
3. Read pages 82-83
4. List 5x group 7 elements
4. https://www.youtube.com/watch?v=J7b2aBKa6-U
5. Answer Questions A, B, C, D

Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Single chemistry bottle question is for all students
Double chemistry bottle question are for students looking to extend their knowledge
Triple chemistry bottle question is for students looking to challenge themselves.

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 23: Answers **5.4.3 The elements of Group 7**

Connection answers

1. Hydrogen

2. Reacts vigorously with water. The gas produced moves the reacting element around the water. If indicator is added then it will turn purple

3. Melting point decreases down the group

Activation & Demonstration

In-text questions	**A** Destroy bacteria to make water safe to drink or swim in. **B** fluorine, chlorine, bromine, iodine, astatine **C** Boiling points increase down Group 7. **D** Reactions become less vigorous down the group.
Activity	**Better bar charts** Credit correctly drawn bar charts where boiling points increase down Group 7 (from F to At). Students should offer suggestions on how to improve each other's bar charts.
Summary questions	**1** halogens, increase, less (3 marks) **2** Reactions a, c, and d will happen. In each case the Group 7 element on its own is more reactive/higher up in Group 7 than the Group 7 element in the compound. A displacement reaction occurs. (3 marks) **3** The product is iron fluoride. Products of other Group 7 elements with iron are iron chloride, iron bromide, iron iodide, so this fits the pattern. The reaction would be very vigorous, with a flame and the production of brown fumes. It is like the reaction of iron with chlorine, but more vigorous. (4 marks) **4** The halogen is below chlorine in Group 7. If it were above chlorine, it would displace chlorine from its compound, potassium chloride, so a reaction would occur. (3 marks)

Lesson 24: Book 2 – The elements of group 0 (5.4.4)

Connection

1. What is the state of matter of bromine at room temperature?

2. State the name of the compound produced when chlorine reacts with Iron

3. Describe the trend in reactivity as you go down group 7

Activation

LI: State the properties and reactivity of the group 0 elements

1. Make a note of the date, title and the LI
2. Key words – Group 0, Noble gases, Unreactive
3. Read pages 84-85
4. List 6x noble gases
4. https://www.youtube.com/watch?v=Lid8BsbqTDQ
5. Answer Questions A, B, C

Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Single chemistry bottle question is for all students
Double chemistry bottle question are for students looking to extend their knowledge
Triple chemistry bottle question is for students looking to challenge themselves.

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 24: Answers **5.4.4 The elements of Group 0**

Connection answers

1. Liquid

2. Iron chloride

3. As you go down the group reactivity tends to decrease

Activation & Demonstration

In-text questions	**A** helium, neon, argon, krypton, xenon, radon **B** Boiling points increase down the group. **C** Unreactive means that the elements take part in very few reactions.
Activity	**Using Group 0** Credit suitable eye-catching and persuasive adverts about the merits of using Group 0 elements or compounds in the correct product. For example, neon in advertising signs, helium in balloons, argon as insulating gas between the layers in double glazing, or krypton in lasers.
Summary questions	**1** The noble gases are all in Group **0** of the Periodic Table. The element at the top of the group is **helium**. The noble gases are **non-metals**. They have **very few** reactions. From bottom to top of the group, boiling point **decreases**. (5 marks) **2** Melting point increases down Group 0. Credit predictions for the melting point of argon between −180 and −220 °C. (The melting point of argon is −189.4 °C.) (2 marks) **3** In Group 7 the boiling points increase from top to bottom of the group. This is the same as for Group 0, in which the boiling points also increase from top to bottom of the group. The highest boiling point for a Group 7 element is greater than the highest boiling point for a Group 0 element. (4 marks)

Lesson 25 & 26: Book 1 & 2 – Revision

Connection

Q1. What is the group number of noble gases?

Q2. Why are they called noble gases?

Q3. Where do noble gases come from?

Activation

LI: Practice some Big Idea questions about Electromagnets

1. Make a note of the date, title and the LI
2. Read page 39 for Book 1 questions and page 43 for Book 2 questions
3. Use the previous pages of the book and your notes to help you answer the questions

Demonstration

Work with others on your table to answer as many of the questions as you can.

In 45 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Connection

1. helium, neon, argon, krypton, xenon

2. Because they are unreactive they won't react with and set themselves apart from other elements

3. They are found in trace amounts in the atmosphere.

Activation & Demonstration

End-of-Big Idea questions	**1** The particles are identical, touching each other, and arranged in a regular pattern. (2 marks) **2a** Before and after particle diagrams as follows: Before: particles touching each other and randomly arranged. After: particles separate from each other and randomly arranged. The particles in both diagrams should be identical, and there should be the same number of particles in each diagram. (2 marks) **b** Energy transferred from the surroundings is needed to separate the particles from each other, and to make them move faster. (2 marks) **3a** Filtration – Set up a filter paper cone in a funnel with a flask underneath. Pour the mixture into the filter paper cone. Sand remains in the filter paper cone and water foes through the filter paper to the flask beneath. (2 marks) **b** Evaporation – Heat the salty water with a Bunsen burner in an evaporating basin until its volume halves. Then leave the remaining mixture in a warm, dry place for a day or so. Salt crystals form in the evaporating basin. Water evaporates and mixes with the air. (2 marks) **c** Chromatography – Draw a pencil line 1 cm from the bottom of a strip of chromatography paper. Draw and colour in a circle (0.5 cm diameter) with the felt tip pen at the centre of the pencil line. Place the filter paper in a beaker containing water to a depth of 0.5 cm, with the pencil line near the bottom. Allow water to move up the chromatography paper until it is near the top. The different coloured dyes of the pen will have travelled different distances up the filter paper. (2 marks) **4a** C (1 mark) **b** Credit a sensible explanation of why statements A, B, or D do not explain why solids cannot be poured. (1 mark) **5a** Distillation. (1 mark) **b** The technique makes use if the different boiling points of the two substances. The substance with the lower boiling point (propanone) is collected first, and that with the higher boiling point is collected next. (1 mark) **6a** Use a magnet to remove iron filings from the mixture. Add water to the remaining mixture or of potassium chloride and sand. The potassium chloride dissolves. Filter the mixture of sand and potassium chloride solution. The sand remains in the filter paper. Then heat the potassium chloride solution in an evaporating basin until its volume halves. Leave the remaining mixture in a warm, dry place for a day or so. Potassium chloride crystals form in the evaporating basin. (4 marks) **b** Magnet – the iron filings are attracted to the magnet, none of the other substances in the mixture is. Adding water – sand is insoluble in water, but potassium chloride is soluble in water. Filtration – separates the insoluble solid (sand) from the solution it is mixed with. Evaporation – water boils and evaporates but potassium chloride does not. (2 marks) **7a** Sophie's evidence – fast-moving air particles collide with the dust particles at random times and from different directions. This cases the random movement of the dust particles. Amie's evidence – as you blow in more air, you are adding more air particles. These collide with the rubber of the balloon. Eventually, the increased frequency of collisions resulting from the increased number of particles makes the balloon burst. Javier's evidence – the blackcurrant juice particles mix with the water particles. (6 marks) **b** Any one piece of evidence, with clear justification given. (2 marks)

Activation & Demonstration

End-of-Big Idea questions	**1a** A substance that cannot be broken down into simpler substances, and contains just one type of atom. (1 mark) **b** one (1 mark) **c** oxygen (1 mark) **d** two (1 mark) **e** one, oxygen (2 marks) **2a** three (1 mark) **b** two (1 mark) **c** Compound because it includes atoms of two elements. (2 marks) **d** sulfur – 1, oxygen – 2 (2 marks) **e** SO2 (2 marks) **3** Example answers (6 marks): The Group 1 elements include lithium, sodium, and potassium. The melting point decreases from top to bottom of Group 1. The Group 0 elements include neon, argon, and krypton. The melting point increases from top to bottom of Group 0. The pattern is different for the two groups – in one group, melting point increases, in the other it decreases. **4 a** B (1 mark) **b** E (1 mark) **c** C (1 mark) **d** A (1 mark) **e** D (1 mark)

Lesson 27: Revision

Connection

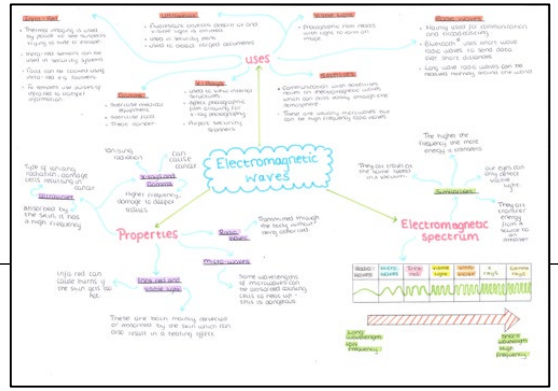
N/A

Activation

LI: Complete a piece of revision work

1. Make a summary sheet OR
2. Make flash cards OR
3. Complete the revision questions from book 1 (page 197) and 2 (page 161)

mind map



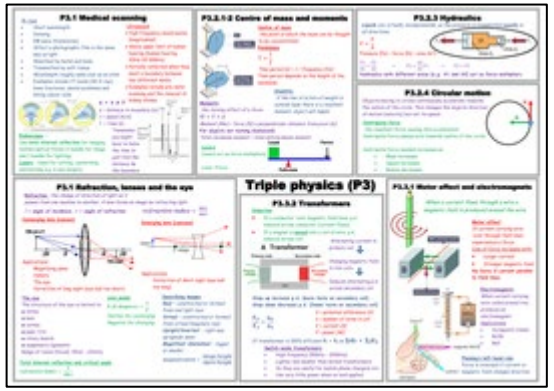
Demonstration

Use your revision work to quiz the person sat next to you OR work in a group to quiz each other.

flash cards

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher



Summary sheet

Attainment Band	Matter & The Periodic Table Knowledge and Understanding
Yellow/Yellow +	• Use particle diagrams to explain the differences in energy and the forces on the particles in different states of matter • Use the particle model to explain latent heat • Make predictions, using ideas about particles, relating to factors affecting the rate of diffusion • Use ideas about particles to explain differences in concentration and in pressure • Use the particle model to explain factors relating to density • Explain the difference between pure and chemically pure substances • Consistently use the correct terms to explain factors that affect dissolving • Use data to draw conclusions about solubility • Clearly explain the choice and method of separation using the correct terms • Use a simple model to explain dissolving and separation • Identify the advantages of distillation • Explain the effectiveness of different models in explaining chemical changes • Use evidence from chromatography to explain the composition of mixtures • Identify similarities and differences between chromatography and DNA analysis • Explain and exemplify trends and patterns in the Periodic Table • Use the Periodic Table to calculate the mass of elements and compounds • Accurately describe compounds including the ratio of atoms via chemical formulas • Make links between simple circle models and chemical formulas
Blue	• Draw circle diagrams and other models to demonstrate the differences between the arrangement of particles in solids, liquids and gases • Interpret and explain data relating to melting and boiling points • Explain observations relating to diffusion in terms of particles • Apply ideas of pressure and concentration to explain different applications • Calculate the densities of solids and liquids • Use the particle model to explain differences in the densities of gases • Interpret the names and symbols of common elements and compounds • Explain the differences between types of water such as tap, bottled and seawater • Use the correct terms to describe dissolving • Describe methods for producing crystals • Choose and explain appropriate separation techniques • Use a simple model to explain what happens to mass during dissolving • Explain the physical processes involved in distillation • Use particle models to explain how the solubilities of solids and gases change with temperature • Describe how to separate a mixture using chromatography • Interpret chromatograms and draw conclusions • Explain how the Periodic Table is organised using the correct terms • Use the Periodic Table to identify and provide information about elements • Explain how and why compounds may be formed • Explore the value of a simple circle model for representing compounds

Stewards Academy
Science Department
ASSESSMENT FEEDBACK
Year 7 – 4

Green	• Use accurate observations to draw inferences about the properties of solids, liquids and gases • Describe and recognise changes of state, using correct terminology and the particle model • Describe how diffusion occurs in liquids and gases • Make liquids of known concentrations • Make predictions about floating and sinking using ideas about density • Link the density of a gas with its uses – e.g. helium, carbon dioxide, argon • Classify substances as materials, pure substances, compounds or elements • Give simple differences between tap water and other water sources, e.g. seawater • Describe what happens when substances dissolve • Describe the effect of temperature on dissolving • Describe how to separate simple mixtures • Recognise pure substances and mixtures • Describe distillation • Use particle models to explain separation processes • Identify mixtures using chromatography • Give examples of common elements • Identify an element from its symbol and atomic number • Describe substances using the terms atom, element and compound • Correctly classify elements and compounds, describe and give an example of a compound • Represent atoms and diatomic molecules using a simple circle model
White	• Some of the above elements have been achieved.