



1. Getting started with Blueprint

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GCSE is a Universe of marks

**40% is Visible matter.
It's the content
statements (AO1)**

**60% is Dark Matter.
It's beyond content
statements (AO2/3)**

GCSE is a Universe of marks

Many schemes, textbooks and PowerPoints focus on AO1

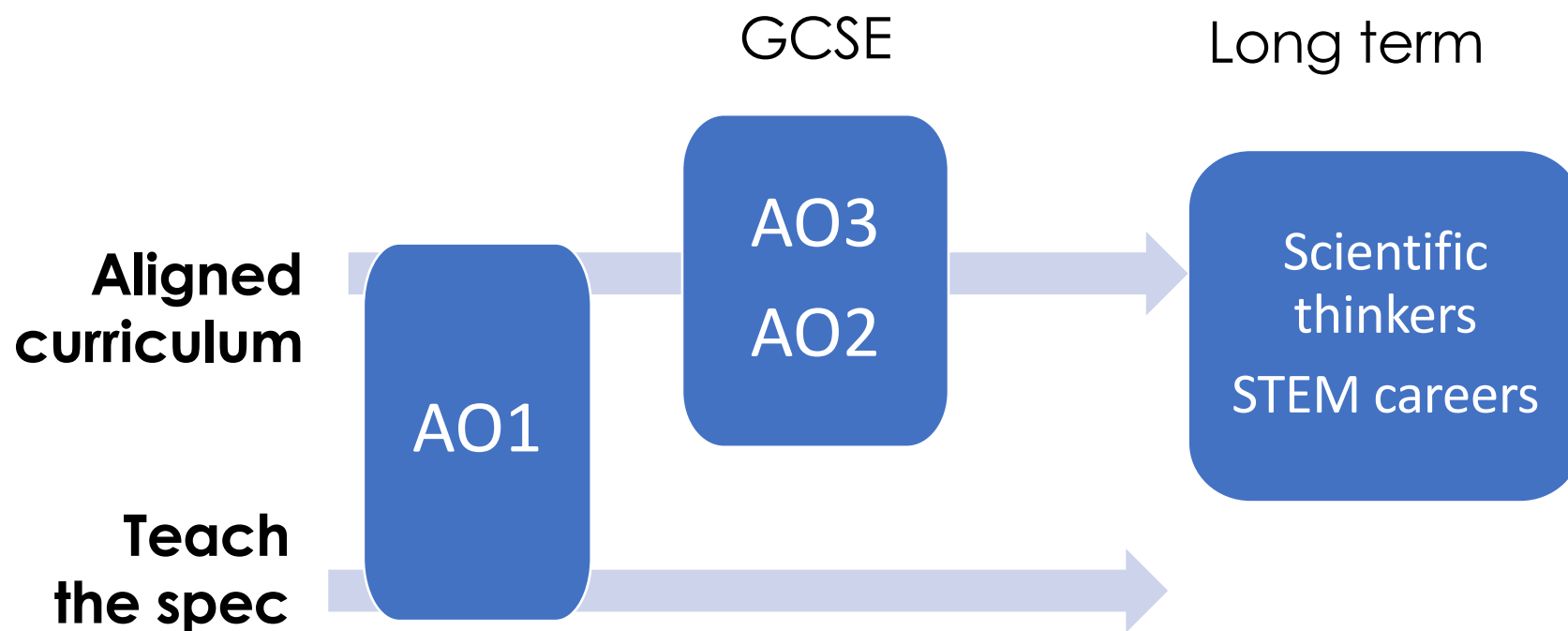
For AO2/3, students need to

- ✓ Apply knowledge
- ✓ Analyse knowledge
- ✓ Use enquiry skills
- ✓ Use cognitive strategies

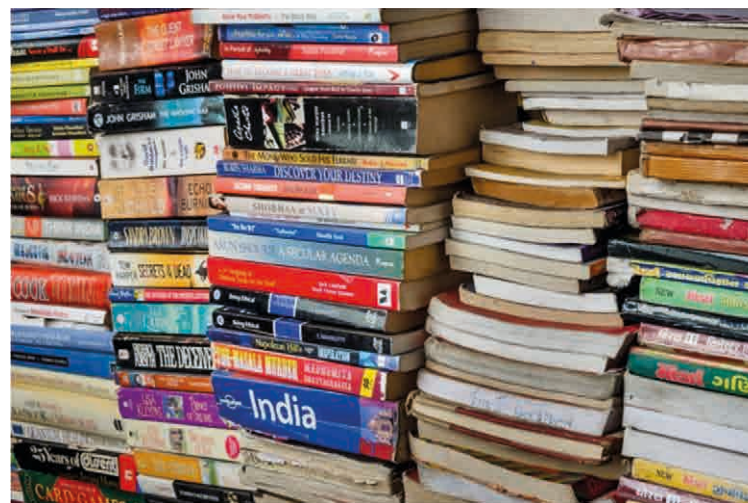
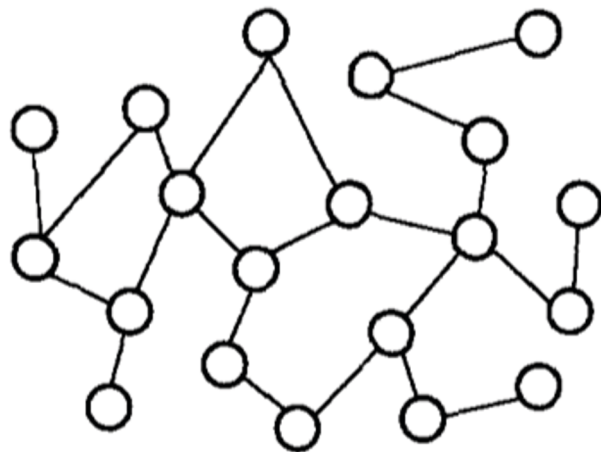
Aligned curriculum

- **Goals:** what student need to be able to do for AO1-3
- ■ **Assessment:** measure progress on AO1-3
- ■ ■ **Align teaching:** equip students with understanding for AO1-3

Aligned curriculum

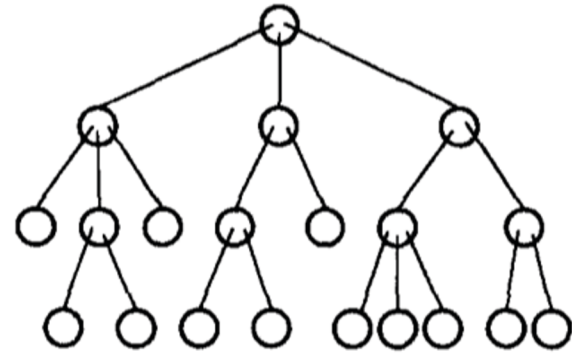


Novice knowledge



Disorganised knowledge or books are hard to find

Expert knowledge



Hierarchically organised knowledge is easy to find

Progression

Big Idea	Year 7	Year 8	Year 9	Year 10
BI-Forces predict motion	7U-Contact forces 7KC-Balanced & unbalanced 7KC-Friction 7KC-Density	8U-Movement 8KC-Speed 8KC-Motion graphs	9U-Force & direction 9KC-Force vectors 9KC-Equilibrium & interactions	10U-Newton's laws 10KC-Acceleration 10KC-Newton's 2nd law 10KC-Momentum

Order based on research

Later concepts:

- Rely on understanding earlier ones
- Integrate earlier ones
- Are more theoretical or quantitative

Units

7U-Substances & particles

7KC-Particle model

7KC-Mixtures

7KC-Solutions

← Year 7 chemistry unit

Three related key concepts
Arranged in teaching order

Each concept takes 1-2 weeks
(dependent on how many main ideas it
contains)

Coverage

Blueprint covers all:

- English NC KS3 and GCSE Combined Science criteria.
- AQA Trilogy specification statements.

Any GCSE content taught in year 7-8 is applied in year 9-11, providing several opportunities to revisit.

OCR/Edexcel/IGCSE

- Blueprint describes ideas and skills – not spec statements.
- Therefore easily adapted to match other GCSE exam boards.
- We supply the links to AQA GCSE so you can adapt to yours.

Curriculum links

AQA KS3 syllabus: AQA GCSE Combined Science Trilogy:

Cells 3.8.2

Cell structure 4.1.1.2 Animal and plant cells, Specialised cells, 4.1.1.3 Cell specialisation

Separate sciences

- Not specifically included.
- Extra topics will need to be added.



Modelling

- Compare a model with observations
- Use a model's features
- Represent with a model
- Evaluate a model's limitations
- Make a reasoned prediction

Interpreting

- Recognise uncertainties
- Review a hypothesis against evidence
- Identify experimental limitations
- Draw a reasoned conclusion

Argument

- Consider a range of perspectives
- Make reasoned arguments

Hypothesising

- Invent a scientific hypothesis
- Think up an experiment

Investigating

- Collect sufficient data
- Choose appropriate method
- Identify hazards
- Determine variables

Literacy

- Judge reliability
- Interpret complex texts
- Write with coherence

Mathematics

- Determine relationships from graphs
- Solve equations
- Use fractions and percentages
- Use proportions and ratios
- Use tables
- Construct charts & graphs
- Estimate true value



Enquiry skills

Each acquire has a linked foreground skill.

Acquire

Building blocks

Level 3 Building blocks: Studying living organisms with microscopes revealed that they are made of one or more cells - the smallest living units.

Level 2 N/A

Level 1 Multicellular, Microscope, Single-celled organism, Scale of cells, Calculate total magnification

Skill Argue for a claim by explaining how each piece of evidence supports it or not

Technique Use a light microscope

Goal To check a claim that an unknown specimen is alive by using a microscope to examine plant and animal cells and identifying common structures.

Planners: knowledge and goals



Novice

7KC-Energy

Mastery planner: 7U-Energy unit

Activate

Prior: Everyday ideas about energy

Goal: To show understanding of prior ideas that are prerequisite for new learning

Acquire

Kinetic energy

Level 3: Kinetic energy: Energy can be quantified. The energy of a moving object depends on its mass and its speed.

Level 2: Energy store, Energy shift

Level 1: Thermal energy store, Unit of energy

Skill: Make prediction from a model.

Technique: Measure length, Measure mass

Goal: To determine how the energy of a moving object depends on its mass and its speed.

Potential energy

Level 3: Potential energy: An object can store energy because of its position. When released, potential energy can be transferred to kinetic energy.

Level 2: Gravitational energy, Elastic energy

Level 1: Magnetic potential energy, Chemical potential energy, Chemical energy store

Knowledge structure



Goals for each stage



Learning stages

activate

Activate prerequisite concepts and repair faulty knowledge

acquire

Build a well-organised schema around the key concept

assess

Check understanding and application of key concept

apply

Teach strategies to use the schema in unfamiliar situations

analyse

Teach strategies to interpret and organise information

Knowledge structure

Three main
(level 3) ideas

Acquire

Kinetic energy

Level 3 Kinetic energy: Energy can be quantified. The energy of a moving object depends on its mass and its speed.

Level 2 Energy store, Energy shift

Level 1 Thermal energy store, Unit of energy

Skill Make prediction from a model.

Technique Measure length, Measure mass

Goal To determine how the energy of a moving object depends on its mass and its speed.

Potential energy

Level 3 Potential energy: An object can store energy because of its position. When released, potential energy can be transferred to kinetic energy.

Level 2 Gravitational energy, Elastic energy

Level 1 Magnetic potential energy, Chemical potential energy, Chemical energy store

Skill Compare actual & predicted results.

Technique Measure length

Goal To determine what factors affect the potential energy of a raised or stretched object.

Conservation of energy

Level 3 This law says that the total amount of energy of the objects in a closed system is the same before and after an event. Energy is not gained or lost.

Level 2 Closed system, Energy pathways

Level 1 N/A

Skill Represent a real world event, process or system using a model.

Technique N/A

Acquire

Kinetic energy

Level 3	Kinetic energy: Energy can be quantified. The energy of a moving object depends on its mass and its speed.	— Main (level 3) idea
Level 2	Energy store, Energy shift	} Level 2 and 1 ideas (less time)
Level 1	Thermal energy store, Unit of energy	
Skill	Make prediction from a model.	} Enquiry skill and practical techniques
Technique	Measure length, Measure mass	
Goal	To determine how the energy of a moving object depends on its mass and its speed.	— Goal is an activity idea

Goals for each stage

acquire

Goal

To use information about individual feeding relationships to construct a visual model of an ecosystem, and account for population changes.

EXPLORE

Krill and killer whales are part of more complicated system.

Leopard seals eat penguins, but they also eat cod.



Can a change in one organism affect another?

Activity: Show the feeding relationships in a system SS1

- Show complete food chains.
- Link food chains together.
- Make sure arrows do not cross (you can redraw).
- You could cut out the pictures.

Show the feeding relationships in a system SS1



zooplankton



emperor penguin



cod



leopard seal



killer whale

Organisms in the Antarctic

Krill forms huge swarms at the ocean's surface for protection against animals that eat them, such as penguins and cod, but also because their food, small **producers** called phytoplankton, live in huge numbers there.

Cod have a varied diet – they are **predators** of zooplankton and krill but also eat phytoplankton. Zooplankton eat phytoplankton and are eaten by cod and squid.

The life of an emperor penguin is hard. Not only do they have to survive freezing temperatures but they are also **prey** for killer whales and leopard seals. Leopard seals also prey on cod.

Killer whales are **top predators** – they eat leopard seals, penguins and squid but are not eaten by any animals.



squid



krill



phytoplankton

Pathway to expertise

activate

Goal
To show understanding of prior ideas that are prerequisite for new learning
PS: food chain



novice

acquire

Goal
To use information about individual feeding relationships to construct a visual model of an ecosystem, and account for population changes.

assess

Goal
To show accurate understanding of the ideas and rectify gaps and misconceptions before problem-solving.

apply

Goal
To use a food web model to describe how energy is transferred between organisms.

To determine how changing one population affects another in a food web.

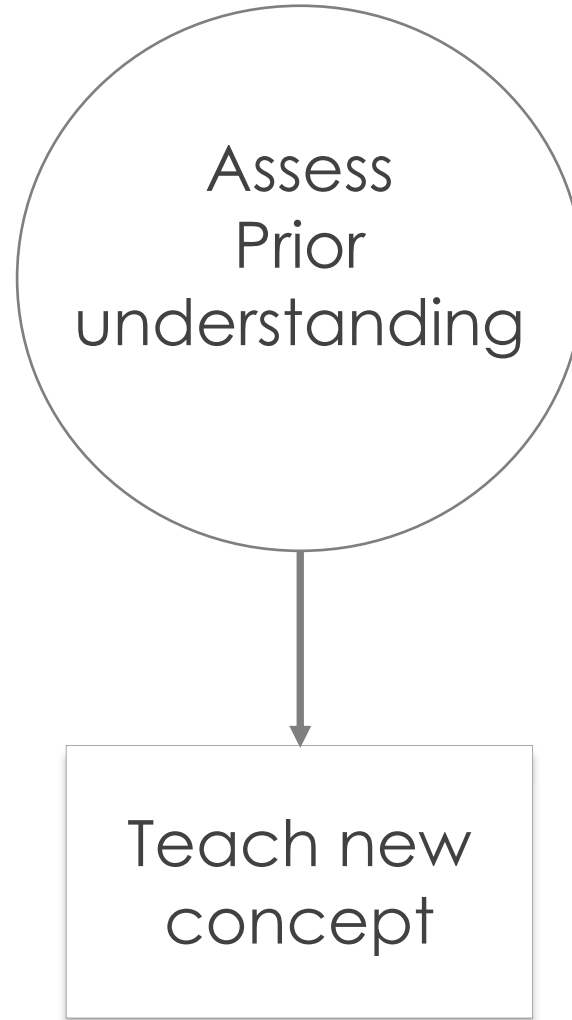
expert



analyse

Goal
To study evidence and make a logical argument to support a claim about energy in food chains.

Activate stage



Activate stage

7KC-Feeding relationships

Mastery planner 7U-Interdependence unit

blueprint
secondary science

Activate

Prior PS-Food chain: A food chain shows how animals obtain their food from plants and other animals.

Goal To show understanding of prior ideas that are prerequisite for new learning.

Typical activity

Something to think about...

Think of an order to put these organisms in.

Why have you put them in this order?



Feeding definitions (5 min)

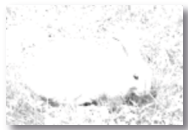
Prepare a set of cards, each with a key word or a definition. Students match the words with their definitions. Cards should include: food chain, carnivore, herbivore, omnivore, producer, consumer, predator, and prey.

Students use what they have learnt from the key words to make simple food chains.

Pre-assessment

Here is a list of what eats what in a habitat.

1. Write down as many food chains as you can.
2. Label each organism as producer, predator or prey.
3. Which organisms are both predator and prey?



Field

Hedgehogs eat frogs

Foxes eat rabbits

Frogs eat slugs

Rabbits eat grass

Slugs eat grass

Foxes eat hedgehogs

Grass snakes eat frogs

Hawks eat thrushes

Thrushes eat slugs

The 'tell and practice' unit

Contact forces unit

Lesson 1: What is a force

Lesson 2: Balanced forces

Lesson 3: Friction

Lesson 4: Practical



Introduction

What happens when there is more than 1 force?

What happens when you win a tug-of-war?

Can you explain why? Forces are **unbalanced**.

What happens if the teams are well matched?

How do the forces compare? Forces are **balanced**.

Activity

How do forces interact?

- 1) Match the pictures to the force diagrams
- 2) Look at the force diagrams. Find the balanced force pairs
- 3) Write a sentence to explain what happens to each object

The Blueprint approach

7KC-Balanced & unbalanced



Mastery planner 7U-Contact forces unit

Activate

Prior PS-Forces: Some forces need contact between two objects.

Goal To show understanding of prior ideas that are prerequisite for new learning.

Acquire

Types of force

Level 3 Types of force: There are many ways that objects can interact: gravity, friction, air resistance, reaction, tension and compression. Interactions produces a force on each object, with magnitude and direction.

Level 2 Reaction, Tension & Compression, Friction, Gravity, Air resistance, Sketch force diagrams

Level 1 Newton

Skill Draw or represent a real world event, process or system using a scientifically accepted model.

Technique N/A

Goal To explain a force phenomenon, by considering what interactions affect the object, and representing them with a force diagram.

Balanced forces

Level 3 Balanced forces: If there is zero net force on an object, it continues moving at constant speed, or standing still. A net force causes the object's motion to change.

Level 2 Net force, Calculate net force

Level 1 N/A

Skill Provide relevant evidence from the data, to support a conclusion.

Technique N/A

Goal To explain a force phenomenon, by investigating how different combinations of forces affect whether the motion of an object changes.

7KC-Friction



Mastery planner 7U-Contact forces unit

Activate

Prior PS-Moving surfaces: Air resistance, water resistance and friction act between moving surfaces, 7KC-Balanced & unbalanced

Goal To show understanding of prior ideas that are prerequisite for new learning.

Acquire

Surface friction

Level 3 Surface friction: The force always acts in a direction to resist relative motion between two surfaces. Its magnitude depends on their roughness and the force pushing them together.

Level 2 N/A

Level 1 Lubrication

Skill Consider limitations of data as evidence and suggest ways of improving accuracy.

Technique Measure force

Goal To choose a suitable material for an application, by investigating what variables affect the frictional force between surfaces.

Air resistance

Level 3 Air resistance: When an object moves across the surface a fluid, it causes friction. The resistive force increases with the object's speed.

Level 2 N/A

Level 1 Terminal velocity

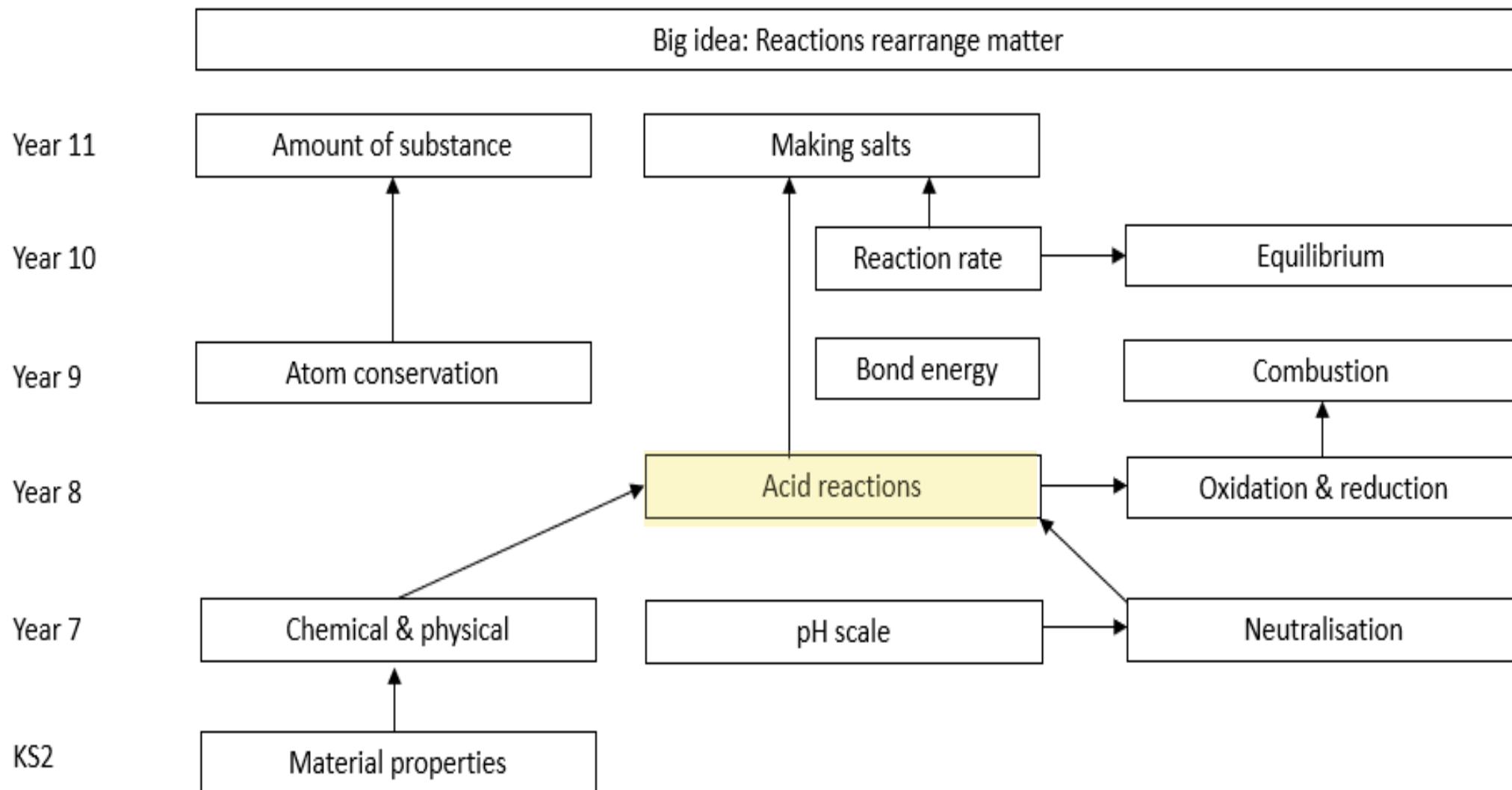
Skill N/A

Technique Measure time

Goal To explain a phenomena about a falling object, by investigating how the balance of forces affects its speed.

Acid reactions

Progression



Acid reactions

Levels

Acquire

Chemical reaction

Level 3	Chemical reaction: Atoms in the reactants rearrange to form the products. A word equation summarises the change.
Level 2	Gas tests, Acid-carbonate reaction, Write a word equation
Level 1	Reactant , Product, Salt type, Carbonate

Time priority

more

less



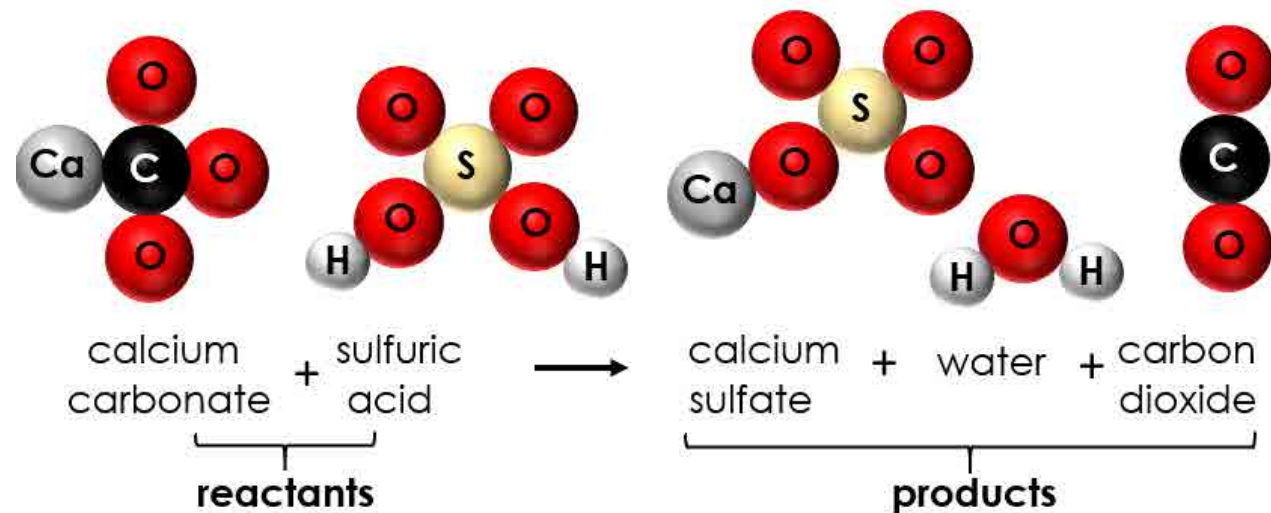
Acid reactions

Level 3 idea

Acquire

Chemical reaction

Level 3 Chemical reaction: Atoms in the reactants rearrange to form the products. A word equation summarises the change.



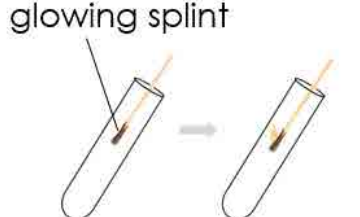
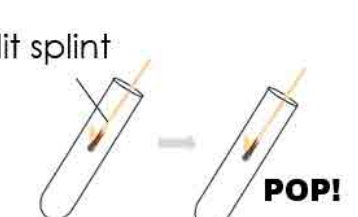
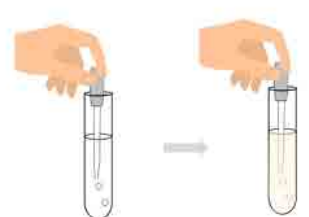
Acquire

Chemical reaction

Level 2

Gas tests, Acid-carbonate reaction, Write a word equation

You carried out tests to identify the gas:

		
observation the flame reappears	observation there is a popping noise POP!	observation limewater goes from clear to cloudy
deduction gas is oxygen	deduction gas is hydrogen	deduction gas is carbon dioxide

Acquire

Chemical reaction

Level 1 Reactant , Product, Salt type, Carbonate,

Think of a reaction like this:

starting substances turn into new substances
reactants \rightarrow **products**

Acid reactions

Skills

Skill Use relevant features and behaviours of a model to account for aspects of a real phenomenon.

Imagine you could look at atoms with a microscope. During a reaction, the atoms rearrange.



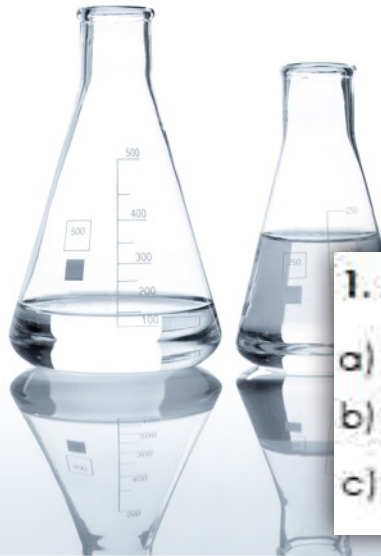
This model helps you to predict what the products are

Acid reactions

Technique

Technique

Observe chemical reactions, Conduct chemical reactions, Use chemicals safely



1. Find out how a carbonate reacts

- Combine each solid with each liquid. Record your observations in a table:
- Which combination(s) reacted? How can you tell?
- What liquid did the carbonates react with?



Acid reactions

Goal

Goal To react acids with carbonates to spot patterns in the products and model how atoms rearrange during reactions.

EXPLORE

Unfortunately we can't tell if the meteorite contains a metal carbonate by looking.



But maybe we can detect it with a chemical reaction.

How does a carbonate react?

Activity: Explore a carbonate reaction

SS1-2

1. Find out how a carbonate reacts
2. Identify a product of the reaction
3. Model the reaction using atoms

3. Model the reaction using particle diagrams

a) Copy the boxes below. Draw the particles of the reactants

b) Name the gas product and draw its particles.

liquid HCl hydrochloric acid	liquid H ₂ SO ₄ sulfuric acid	liquid H ₂ O water
solid CaCO ₃ calcium carbonate	solid MgCO ₃ magnesium carbonate	solid ZnCO ₃ zinc carbonate

+

→

reactants
gas product

Next steps

Get the Y7/8 planners now



Novice

7KC-Cell structure



Mastery planner 7U-Cells unit

Activate

Prior PS-Life processes: There are differences between things that are living, dead, and things that have never been alive.

Goal To show understanding of prior ideas that are prerequisite for new learning.

Acquire

Building blocks

Level 3 Building blocks: Studying living organisms with microscopes revealed that they are made of one or more cells - the smallest living units.

Level 2 N/A

Level 1 Multicellular, Microscope, Single-celled organism, Scale of cells, Calculate total magnification

Skill Argue for a claim by explaining how each piece of evidence supports it or not.

Technique Use a microscope

Goal To check a claim that an unknown specimen is alive by using a microscope to examine plant and animal cells and identifying common structures.

Life functions

Level 3 Life functions: Cells use energy to carry out life processes like growth and reproduction and have specific parts for these jobs.

Level 2 Plant cell, Bacterial cells

Level 1 Ribosome, Cell membrane, Nucleus, Cytoplasm, Mitochondrion, Chloroplast, Cell wall, Permanent vacuole, Flagella

Skill Represent a real world event, process or system using a model.

Technique ...

Goal To examine diagrams of real animal, plant and bacteria cells, identify similarities and differences, and explain how those parts keep the cells alive.

Level 3 N/A

Level 2 N/A

Level 1 N/A

Skill N/A

Technique N/A

Goal

Assess

Goal To show accurate understanding of the ideas and rectify gaps and misconceptions before problem-solving.

Apply

Goal To identify what type an unfamiliar cell is with reasons, by comparing its structures to those of plant and animals, To work out an explanation for how a given change in a cell will affect the whole organism.

Analyse

Goal To interpret experimental results about cells and make an argument that cells carry out life processes.



Expert

U = unit, KC = Key Concept, PS=Primary Science, Level 3 = main idea, Level 2 = other ideas, Level 1 = terms/facts

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