

Pearson Level 3 AAQ BTEC National

Applied Science

Extended Certificate

Summer Transition Work - Essential Preparation

Name	
GCSE Science route	OCR Combined Science / GCSE Biology, Chemistry and Physics
Due date	First lesson in September

This booklet bridges OCR GCSE Combined Science into Applied Science AAQ Level 3 study. It should be completed before the course begins and brought to your first Applied Science lessons.

Contents

Section	Page
Welcome and expectations	3
What will you study?	3
Course structure at a glance	4
GCSE to AAQ links	5
Independent study plan	6
Science skills: units, prefixes and symbols	7
Biology section - Week 1	8
Chemistry section - Week 2	12
Physics section - Week 3	17
Research task and wider reading	21
Data sheet	21
Completion checklist	22

How to complete the booklet

Complete each week in order: Biology first, then Chemistry, then Physics. Use the GCSE links tables to revisit key OCR Combined Science knowledge before answering the Level 3 preparation tasks.

Welcome to Applied Science AAQ

Summer Transition Work - Essential Preparation

Congratulations on choosing Applied Science.

This bridging work must be completed before you start the course and will be assessed during the first few weeks of the Autumn term. The purpose of this booklet is to help you successfully transition from OCR GCSE Combined Science to the knowledge, skills and independent study required for Applied Science AAQ Level 3.

The jump from GCSE to Level 3 study is significant. At GCSE you were often required to recall scientific knowledge and apply it to familiar situations. At Level 3, you will be expected to explain biological, chemical and physical processes in greater depth, interpret scientific data, evaluate evidence and apply your knowledge to unfamiliar contexts.

Completing this booklet will give you a strong foundation for the start of the course and help develop the scientific knowledge and study skills needed for success.

What Will You Study?

The Applied Science AAQ qualification develops your understanding of biology, chemistry and physics through both theoretical and practical learning.

- Develop advanced scientific knowledge and understanding.
- Apply scientific concepts to real-world situations.
- Analyse and interpret scientific data.
- Evaluate scientific evidence.
- Develop practical laboratory skills.
- Communicate scientific ideas using appropriate terminology.
- Complete investigations and research activities.

The qualification has been designed to prepare students for progression into higher education, apprenticeships and careers within the scientific, healthcare and technical sectors.

Independent study expectation

Your GCSE knowledge is assumed knowledge. Level 3 lessons will build from this foundation rather than re-teach GCSE content. You should use free periods to consolidate notes, practise exam questions, complete coursework evidence, revise key terminology and read ahead.

Course Structure at a Glance

The Pearson Level 3 Alternative Academic Qualification BTEC National in Applied Science Extended Certificate is equivalent in size to one A Level. It contains externally assessed examination units and internally assessed applied practical units.

Unit	Title	GLH	Assessment	Why it matters
1	Principles and Applications of Biology	60	External exam	Cells, tissues, biological molecules, enzymes, transport, homeostasis and human physiology.
2	Principles and Applications of Chemistry	60	External exam	Atomic structure, bonding, periodicity, quantitative chemistry, energetics, rates and organic chemistry.
3	Principles and Applications of Physics	60	External exam	Waves, electricity, motion, forces, power, energy and change of state.
4	Practical Scientific Procedures and Techniques	120	Internal assignment	Core laboratory techniques, practical planning, data analysis, evaluation and reporting.
5	Science Investigation Skills	60	Internal assignment	Research, investigation planning, data handling and applied scientific conclusions.

Assessment Skills You Must Build

Skill	What it looks like in your work
A01	Recall accurate knowledge, terminology, definitions and scientific ideas.
A02	Apply scientific knowledge to unfamiliar contexts and practical scenarios.
A03	Analyse and interpret scientific information, graphs, diagrams and data.
A04	Evaluate evidence, methods, conclusions and reliability.

OCR GCSE Combined Science to Applied Science AAQ Links

The table below shows how your GCSE knowledge links directly to the new Level 3 course. RAG rate each row: Green = secure, Amber = revise, Red = priority revision.

Science	GCSE knowledge	OCR GCSE Combined Science link	Applied Science AAQ link	RAG/notes
Biology	Cell structure and microscopy	B1.1 Cells and microscopy; magnification	Unit 1: cell structure, tissues and biological molecules	
Biology	Enzymes and digestion	B2 biological molecules and enzymes	Unit 1: enzymes as biological catalysts; digestion and metabolism	
Biology	Transport across membranes	B1.3 diffusion, osmosis and active transport	Unit 1: transport, exchange surfaces and homeostasis	
Biology	Circulatory, respiratory and nervous systems	B4/B5 transport, gas exchange and coordination	Unit 1: human physiology and homeostatic control	
Chemistry	Atomic structure and periodic table	C1 atomic structure and C2 periodic table	Unit 2: atomic and electronic structure, periodicity	
Chemistry	Bonding and formulae	C3 bonding, structure, formulae and conservation of mass	Unit 2: bonding, structure, formulae and quantitative chemistry	
Chemistry	Rates and energetics	C5 rates, exothermic and endothermic reactions	Unit 2: chemical energetics, rates and equilibria	
Chemistry	Organic chemistry and fuels	C6 carbon chemistry and crude oil	Unit 2: organic chemistry, hydrocarbons and green chemistry	
Physics	Waves and electromagnetic spectrum	P4 waves, EM spectrum and uses	Unit 3: progressive waves, EM radiation and applications	
Physics	Electricity and circuits	P3 current, voltage, resistance and circuits	Unit 3: electricity, circuits, power and energy transfer	
Physics	Forces and motion	P5 motion, speed, acceleration and forces	Unit 3: motion, vectors, forces and Newtonian mechanics	
Physics	Energy and change of state	P1/P2 energy stores, SHC, latent heat	Unit 3: power, internal energy, heating and change of state	
Working scientifically	Variables, risk, accuracy, precision, graphs and evaluation	Required practical skills across OCR GCSE Science	Unit 4: practical procedures, techniques, data analysis and evaluation	

Revision action

For every Amber or Red row, write one specific action in the notes column. Examples: revise keywords, make flashcards, complete 10 GCSE questions, create a labelled diagram, practise calculations, or rewatch a GCSE lesson video.

Independent Study Plan

Use this plan to organise your summer preparation. Each week should take approximately 3-4 hours if completed properly.

When	Focus	Key knowledge	Evidence to complete
Week 1	Biology	Cells, organs, transport systems, practical vocabulary	Complete Biology activities and make 20 flashcards.
Week 2	Chemistry	Atomic structure, formulae, bonding, equations	Complete Chemistry activities and practise calculations.
Week 3	Physics	Units, standard form, rearranging equations, circuits	Complete Physics activities and practise showing working.
Extension	Research	Scientific poster and wider reading	Create the scientific poster and complete the reading log.

Personal Learning Goals

Goal 1:

Goal 2:

Goal 3:

Science Skills: Units, Prefixes and Symbols

Why this matters

Applied Science requires accurate use of units, symbols, standard form, significant figures and practical vocabulary. Marks are often lost when students give answers without units, use incorrect prefixes, or do not show working.

Core SI Units

Quantity	Unit	Symbol
length	metre	m
mass	kilogram	kg
time	second	s
temperature	kelvin	K
amount of substance	mole	mol
current	ampere	A
luminous intensity	candela	cd

Common Prefixes

Prefix	Symbol	Multiplier
Giga	G	10^9
Mega	M	10^6
Kilo	k	10^3
Centi	c	10^{-2}
Milli	m	10^{-3}
Micro	μ	10^{-6}
Nano	n	10^{-9}

Key Practical Vocabulary

Term	Definition
Accurate	A measurement close to the true value.
Precise	Repeated measurements with very little spread.
Repeatable	Same experimenter and method gives similar results.
Reproducible	Different person or equipment gives similar results.
Resolution	Smallest change an instrument can detect.
Uncertainty	Interval in which the true value is expected to lie.
control variable	A variable kept constant.
dependent variable	The variable measured as the outcome.

Biology Section - Week 1

GCSE knowledge to revise first

Cells and microscopy; specialised cells; organs and organ systems; respiratory system; circulatory system; nervous system; transport across membranes; enzymes and biological molecules.

Activity 1: Link the practical vocabulary to the correct definition

Word	Definition - write the matching letter/number
Accurate	A statement suggesting what may happen in the future.
Data	Information, in any form, that has been collected.
Precise	A measurement close to the true value.
Prediction	Measurements where repeated measurements show very little spread.
Range	The spread of data, showing the maximum and minimum values.
Repeatable	Same experimenter, method and equipment gives similar results.
Reproducible	Different person, equipment or technique gives similar results.
Resolution	The smallest change in quantity that an instrument can detect.
Uncertainty	The interval in which the true value is expected to lie.
Variable	Physical, chemical or biological quantities that can change.
Control variable	A variable kept constant during an experiment.
Dependent variable	A variable measured as the outcome of an experiment.

Activity 2: Cell structures and functions

Structure	Function
Cell surface membrane	
Chloroplast	
Cell vacuole	
Mitochondria	
Nucleus	
Cell wall	
Chromosomes	
Ribosomes	

Activity 3: Draw and label cells

Draw one plant cell and one animal cell. Add labels for all structures that are present. Include a short note explaining two similarities and two differences.

Plant cell drawing space	Animal cell drawing space

Similarities and differences:

Activity 4: Organs and organ systems

1. Name the organ that takes oxygen into the bloodstream.

2. Name the organ that breaks down food using enzymes and acid.

3. Name the organs that produce urine.

4. Name the organ that controls body functions.

5. Name the organ system containing arteries, veins and capillaries.

6. Explain how an organ is different from a tissue.

Activity 5: Respiratory system structure and function

Structure	Description	Adaptation for function
Rib		
Alveoli		
Bronchus		
Trachea		
Larynx		
Diaphragm		
Bronchiole		

Activity 6: Blood vessels

State the three blood vessels that make up the circulatory system and complete the comparison table.

Blood vessel	Size of lumen	Thickness of wall	Valves?
Arteries			
Veins			
Capillaries			

Compare the function of arteries and veins.

Match each neurone to its function: sensory neurone, relay neurone, motor neurone.

Activity 8: Level 3 challenge: biological application

A patient has damaged alveoli due to a long-term respiratory condition. Explain how this could affect gas exchange and oxygen delivery to tissues. Use the terms diffusion, surface area, concentration gradient, capillary and respiration in your answer.

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There are approximately 20 lines visible. The paper has a slight shadow on the right side, suggesting it's resting on a surface.

Chemistry Section - Week 2

GCSE knowledge to revise first

Atomic structure; periodic table; ions; formulae; bonding; relative atomic mass; relative formula mass; conservation of mass; balancing symbol equations.

Activity 1: Using the periodic table

1. Find the atomic number of osmium, sodium, lead and chlorine.
2. Find the relative atomic mass of helium, barium and oxygen.
3. State the number of protons in mercury, iodine and calcium.
4. Give the symbols for gold, lead, copper and iron.
5. Give the names of Sr, Na, Ag and Hg.

Activity 2: Relative atomic mass from isotopes

Show your working for each calculation.

1. Bromine contains equal amounts of Br-79 and Br-81. Calculate the relative atomic mass.
2. Neon has isotopes: Ne-20 = 90.9%, Ne-21 = 0.3%, Ne-22 = 8.8%. Calculate Ar.
3. Magnesium has isotopes: Mg-24 = 79%, Mg-25 = 10%, Mg-26 = 11%. Calculate Ar.
4. Boron has B-10 and B-11. Its relative atomic mass is 10.8. Calculate the percentage abundance of each isotope.

5. Copper has Cu-63 and Cu-65. Its relative atomic mass is 63.5. Calculate the relative abundance of each isotope.

Activity 3: Relative formula mass

Calculate the relative formula masses of the compounds below. Use the periodic table and show all working.

1. MgO

2. NaOH

3. CuSO₄

4. NH₄Cl

5. (NH₄)₂SO₄

6. CaCO₃

7. Al₂(SO₄)₃

Activity 4: Formulae of ionic compounds

Work out the formulae for each ionic compound.

1. Barium oxide
2. Zinc chloride
3. Aluminium chloride
4. Aluminium bromide
5. Iron(II) sulfate
6. Iron(III) sulfate
7. Magnesium nitrate
8. Calcium hydroxide

Substance	Formula
Methane	
Ammonia	
Hydrochloric acid	
Sulfuric acid	
Sodium hydroxide	
Water	
Carbon dioxide	
Calcium carbonate	

Draw dot-and-cross diagrams for: lithium fluoride, sodium fluoride, potassium fluoride, lithium chloride, sodium chloride and magnesium oxide.

LiF	NaF	KF

LiCl	NaCl	MgO

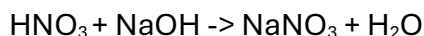
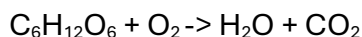
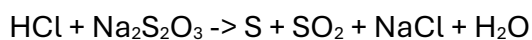
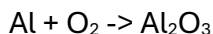
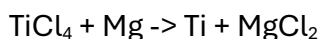
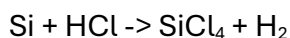
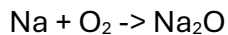
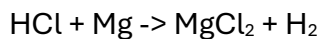
Activity 7: Covalent bonding diagrams

Draw dot-and-cross diagrams for hydrogen gas, water, carbon dioxide and hydrogen chloride.

H₂	H₂O
CO₂	HCl

Activity 8: Balancing equations

Balance the equations by adding numbers in front of formulae. Do not change the formulae.



Activity 9: Level 3 challenge: chemical application

A student reacts magnesium with hydrochloric acid and measures the volume of hydrogen gas produced. Identify the independent, dependent and control variables. Explain how the method could be improved to increase accuracy and reliability.

Physics Section - Week 3

GCSE knowledge to revise first

Standard form; unit conversions; equations and rearranging; efficiency; circuits; current and potential difference; motion graphs; wave speed; energy calculations.

Activity 1: Unit conversions

1. 1502 kilometres into metres

2. 45 milligrams into grams

3. 104 millimetres into metres

4. 30 minutes into seconds

5. 1 hour 20 minutes into seconds

6. 3.5 megawatts into watts

7. 0.25 kilojoules into joules

Activity 2: Standard form

1. Write 379.4 in standard form.

2. Write 0.0712 in standard form.

3. Write the speed of light as an ordinary number using the data sheet.

4. Write the charge on an electron as an ordinary number using the data sheet.

5. Write one quarter of a million in standard form.

Activity 3: Calculation practice

1. How many rockets are needed to deliver 30 tonnes of material if each rocket can hold 7 tonnes?

2. A power station has an output of 3.5 MW. The coal used had a potential output of 9.8 MW. Work out the efficiency to one decimal place and as a percentage.

3. A radioactive source produces 17,804 beta particles in 1 hour. Calculate the mean number produced in 1 minute. Give your answer to 1 significant figure.

4. A heater transfers 12,000 J of energy in 60 s. Calculate the power.

5. A wave has frequency 25 Hz and wavelength 0.40 m. Calculate wave speed.

Activity 4: Rearranging equations

1. Rearrange $y = 2x + 3$ to make x the subject.

2. Rearrange $C = 2\pi r$ to make r the subject.

3. Rearrange $E = \frac{1}{2}mv^2$ to make v the subject.

4. Rearrange $s = ut + \frac{1}{2}at^2$ to make u the subject.

5. Rearrange $v = f\lambda$ to make f the subject.

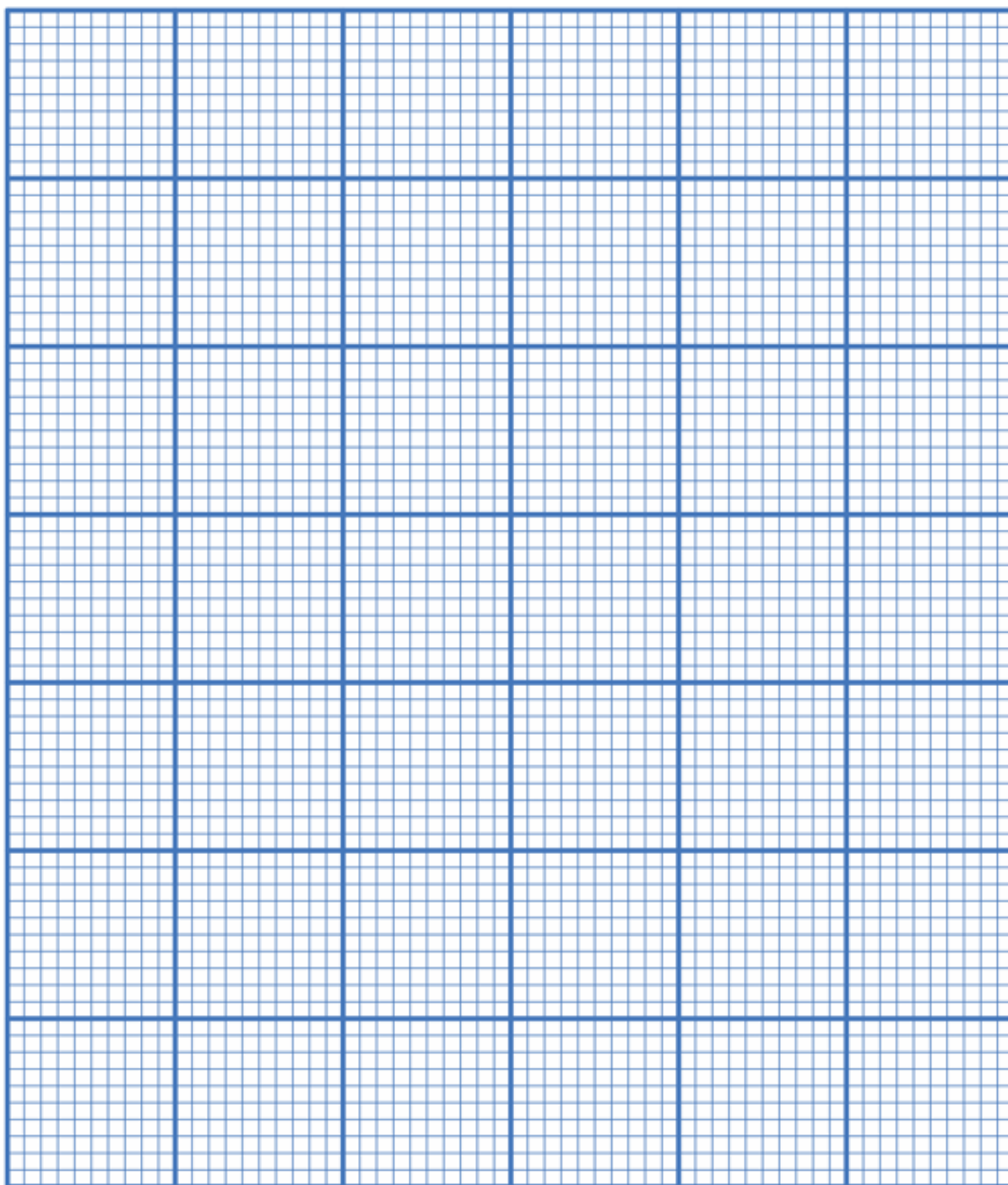
6. Rearrange $V = IR$ to make R the subject.

Activity 5: Graph skills

A student records the current through a resistor at different potential differences.

Potential difference / V	0	1	2	3	4	5
Current / A	0.00	0.20	0.40	0.60	0.80	1.00

Plot the graph on graph paper or in the space below. Describe the relationship and calculate the resistance.



Activity 6: Circuit symbols and components

Component	Symbol	Function
Lamp		Lights up when current flows through it.
Open switch		Breaks the circuit.
Diode		Allows current to flow in one direction only.
Thermistor		Resistance changes with temperature.
LED		Emits light when current flows in the forward direction.
Closed switch		Completes the circuit.
Ammeter		Measures current in amps.
Variable resistor		Resistance can be changed to vary current.

Activity 7: Series circuits

A cell, resistor, lamp and ammeter are connected in series. Complete each sentence using greater than, less than or the same as.

- The current through the battery is _____ the current through the ammeter.
- The potential difference across the battery is _____ the potential difference across the resistor.
- The current through the lamp is _____ the current through the resistor.
- The potential difference across the lamp is _____ the potential difference across the battery.

Activity 8: Level 3 challenge: physics application

A hospital uses electrical equipment that must transfer energy safely and efficiently. Explain why current, potential difference, power and resistance are important when designing safe circuits. Include at least two equations in your answer.

Research Task and Wider Reading

Extension expectation

All students should complete one scientific poster and one wider reading log. This task develops the research, reporting and communication skills needed for the AAQ course.

Activity 1: Scientific poster

Create one scientific poster on ONE of the following topics. Your poster may be digital or hand produced, but it must be clear, accurate and suitable for a Level 3 Applied Science display.

- Cardiovascular diseases
- The Periodic Table
- Electromagnetic waves and their uses

Your poster should include: title, introduction, key scientific explanations, labelled diagrams, data or examples, real-world applications, glossary of at least 10 key terms, and a reference list.

Activity 2: Wider reading log

Prompt	Your notes
Article/video title	
Source / URL	
Date accessed	
Main science idea	
Three key facts	
One question I still have	
How this links to Applied Science AAQ	

Useful Resources

- Pearson BTEC Nationals Applied Science AAQ specification and support materials
- Royal Society of Biology: <https://www.rsb.org.uk/>

- Royal Society of Chemistry: <https://www.rsc.org/>
- Institute of Physics: <https://www.iop.org/>
- BBC Bitesize GCSE Combined Science: <https://www.bbc.co.uk/bitesize>
- Free Science Lessons on YouTube

Data Sheet

Quantity	Symbol	Value	Units
speed of light in vacuo	c	3.00×10^8	m s^{-1}
magnitude of charge of electron	e	1.60×10^{-19}	C
Planck constant	h	6.63×10^{-34}	J s
Avogadro constant	NA	6.02×10^{23}	mol^{-1}
electron rest mass	m_e	9.11×10^{-31}	kg
proton rest mass	m_p	1.67×10^{-27}	kg
neutron rest mass	m_n	1.67×10^{-27}	kg
gravitational field strength	g	9.81	N kg^{-1}
acceleration due to gravity	g	9.81	m s^{-2}
atomic mass unit	u	1.661×10^{-27}	kg
mass of the Sun		1.99×10^{30}	kg
mean radius of the Sun		6.96×10^8	m
mass of the Earth		5.98×10^{24}	kg
mean radius of the Earth		6.37×10^6	m

Useful GCSE and AAQ Equations to Revise

Topic	Equation
speed	speed = distance / time
acceleration	acceleration = change in velocity / time
weight	weight = mass x gravitational field strength
wave speed	wave speed = frequency x wavelength
potential difference	potential difference = current x resistance
power	power = energy transferred / time
efficiency	efficiency = useful output / total input x 100
magnification	magnification = image size / actual size

Completion Checklist

Completed?	Task	Teacher comment
[]	Read the welcome and expectations section.	
[]	Complete the GCSE to AAQ links RAG audit.	
[]	Complete the independent study plan and personal goals.	
[]	Complete the science skills pages on units, prefixes and vocabulary.	
[]	Complete all Biology Week 1 activities.	
[]	Complete all Chemistry Week 2 activities.	
[]	Complete all Physics Week 3 activities.	
[]	Create the scientific poster.	
[]	Complete the wider reading log.	
[]	Bring the completed booklet to your first Applied Science lesson.	

Final reminder

This transition work is not optional. It will be assessed in the first few weeks of the Autumn term and used to identify any GCSE knowledge gaps before the Level 3 course begins.