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GCSE 2016 Science

Specification Structure, content, assessment and support

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New requirements for science

Structure and content

- Core/Additional Science replaced by Combined Science Double Award
- New specified content from DfE
- *Working scientifically* section
- At least 8 core practicals for each science (16 for Combined Science)
- Set list of 19 Physics equations to recall and apply in GCSE (9–1) Physics (plus 9 to just apply)

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New requirements for science

Assessment

- Assessment time 3.5 hours per GCSE (7 hours for Combined Science)
- Practical skills assessed in written papers (15%)
- Requirement for documentation of student experience of practical work
- Set percentages of maths within the papers
- Small changes to assessment objectives

Assessment objectives

Objective		Weighting
AO1	Demonstrate knowledge and understanding of: • scientific ideas • scientific techniques and procedures	40%
AO2	Apply knowledge and understanding of: • scientific ideas • scientific enquiry, techniques and procedures	40%
AO3	Analyse information and ideas to: • interpret and evaluate • make judgements and draw conclusions • develop and improve experimental procedures	20%

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GCSE 2016 Science

Our approach

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Our approach

Subject to Ofqual accreditation DRAFT

- The most inclusive GCSE Science (9-1) courses.
- Straightforward specifications and clear core practicals to give you confidence in our approach.
- Assessments to encourage all students to best show what they know and do.
- Free support that helps you plan, teach and assess the new qualifications with confidence.

An assessment model for all

Combined science

Biology 1 Paper 1 1hr 10 60 marks	**Chemistry 1** Paper 3 1hr 10 60 marks	**Physics 1** Paper 5 1hr 10 60 marks
Biology 2 Paper 2 1hr 10 60 marks	**Chemistry 2** Paper 4 1hr 10 60 marks	**Physics 2** Paper 6 1hr 10 60 marks

GCSE (9–1) Combined Science

- Foundation (1–5) and Higher (4–9) available
- Split according to topic

An assessment model for all

Separate sciences

GCSE (9–1) Biology	GCSE (9–1) Chemistry	GCSE (9–1) Physics
Biology 1 Paper 1 1hr 45 100 marks	**Chemistry 1** Paper 1 1hr 45 100 marks	**Physics 1** Paper 1 1hr 45 100 marks
Biology 2 Paper 2 1hr 45 100 marks	**Chemistry 2** Paper 2 1hr 45 100 marks	**Physics 2** Paper 2 1hr 45 100 marks

- Foundation (1–5) and Higher (4–9) available
- Split according to topic

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Our new specifications

Combined science and separate sciences

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Paper 1	Paper 2
Key concepts	Key concepts
First half of the content	Second half of the content

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Our new specifications

GCSE (9–1) Biology/Combined science

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Paper 1	Paper 2
Key Concepts in Biology	Key Concepts in Biology
Cells and control	Plant structures and their functions
Genetics	Animal coordination, control and homeostasis
Natural selection and genetic modification	Exchange and transport in animals
Health, disease and development of medicines	Ecosystems and material cycles

Our new specifications

GCSE (9–1) Chemistry/Combined science

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Paper 1	Paper 2
Key concepts in Chemistry	Key concepts in Chemistry
States of matter and mixtures	Groups in the periodic table
Chemical changes (acids and electrolytic processes)	Rates of reaction and energy changes
Extracting metals and equilibria	Fuels and Earth science
*Separate chemistry 1 (transition metals, quantitative analysis, dynamic equilibria, chemical cells and fuel cells)	*Separate chemistry 2 (Qualitative analysis, hydrocarbons, polymers, alcohols and carboxylic acids, bulk and surface properties of matter including nanoparticles)

* Chemistry GCSE only

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Our new specifications

GCSE (9–1) Physics/Combined science

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Paper 1	Paper 2
Key concepts in Physics	Key concepts in Physics
Motion and forces	Energy – forces doing work
Conservation of energy	Forces and their effects
Waves	Electricity and circuits
Light and electromagnetic spectrum	Static electricity*
Radioactivity	Magnetism and the motor effect
Astronomy*	Electromagnetic induction
	Particle model
	Forces and matter

* Physics GCSE only

Our new specifications

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Topics for paper 2

Topic 6 – Plant structures and their functions

Students should:		Maths
6.1	Describe photosynthetic organisms as the main producers of food and therefore biomass	
6.2	Describe photosynthesis in plants and algae as an endothermic reaction that uses light energy to react carbon dioxide and water to produce glucose and oxygen	
6.3	Explain the effect of temperature, light intensity and carbon dioxide concentration as limiting factors on the rate of photosynthesis	2c 4a
6.4	**Explain the interactions of temperature, light intensity and carbon dioxide concentration in limiting the rate of photosynthesis**	4b, 4c, 4d
6.5	*Investigate the effect of light intensity on the rate of photosynthesis*	2c 4a
6.6	**Explain how the rate of photosynthesis is inversely proportional to light intensity, including the use of the inverse square law calculation**	2g 4b, 4c, 4d
6.7	Explain how the structure of the root hair cells is adapted to absorb water and mineral ions	
6.8	Explain how the structures of the xylem and phloem are adapted to their function in the plant, including: a lignified dead cells in xylem transporting water and minerals through the plant b living cells in phloem using energy to transport sucrose around the plant	
6.9	Describe how water and mineral ions are transported through the plant by transpiration, including the structure and function of the stomata	
6.10	Describe how sucrose is transported around the plant by translocation	
6.11B	Explain how the structure of a leaf is adapted for photosynthesis and gas exchange	

Clear command words

Higher tier marked in bold

Clear indication of separate science content

Maths opportunities highlighted

Core practicals embedded in content

Course Planners and Schemes of Work

Available now	
5 year Scheme of Work	2 year KS3 / 3 year GCSE
5 year Scheme of Work	2.5 year KS3 / 2.5 year GCSE
Scheme of Work for Lower Attainers	

For Spring Term	
5-year Scheme of Work	3 year KS3 / 2 year GCSE
Schemes of Work for Combined science followed by Separate Science content	

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GCSE 2016 Science

Assessing practical skills

Our specifications – assessing practical skills

A tried-and-trusted approach to core practicals and the assessment of practical skills

- We pioneered the use of core practicals in 2011.
- We've updated our core practicals for the new qualification, based on what you've told us works well
- We have 8 core practicals in each separate science GCSE, and 17 in Combined Science, based on the apparatus and techniques list in the DfE criteria
- Free Guide to Core Practicals with Teacher, Technician and Student worksheets for every core practical

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GCSE 2016 Science

Assessing maths skills

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Our specifications – assessing maths skills

- DfE set a list of required mathematical skills.
- For Foundation tier, this will be at the level of KS3 maths.
- For Higher tier, this will be at the level of Foundation tier maths.
- There are different weightings for maths within the exams:
  - Combined science 20%
  - Biology 10%
  - Chemistry 20%
  - Physics 30%
- Physics equations (recall and apply) are all clearly covered in our specification points for Combined Science and GCSE Physics.

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Free support to help you get started

- Free Guide to Maths for Scientists which maps the differences in teaching order and style of maths between GCSE (9–1) Sciences and GCSE (9–1) Maths

- Free poster on physics equations and command words

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GCSE 2016 Science

Our sample assessment materials

Our sample assessments

Designed to encourage all students to show what they know and understand about science to the best of their ability

- Gradual increase in difficulty *within* questions and *between* questions so students persevere to the end of the exam.
- Clear command words and accessible language ensures each student can understand and engage with what they're being asked to do.

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Our sample assessments

Retention of a similar structure to 2011.

- Around 10% will be Multiple Choice Questions
- Short answers
- Extended open response 6-mark questions (1 in each Combined science paper, 2 in each separate science paper)

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GCSE 2016 Science

Support to help you plan, teach and assess with confidence

Free support to help you get started

Plan	Teach	Assess	Develop
• Course Planner • Schemes of Work • Mapping Documents • Planning Guide for use with our free resources	• Transition Activities (Key Stage 3 – 4) • Guide to Maths for Scientists • Practical Guide including Teacher, Technician and Student Worksheets to support every Core Practical	• Transition Tests and Mark Schemes • Y10 Exam • Progression Service • Results Plus and Exam Wizard • Additional SAMs and marked exemplar materials • Mocks Service	• Getting Ready To Teach Events • Local Network Events every term

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Free resources for Combined Science

We're releasing advance material from our paid for publishing (60 lessons worth of content) to help you get started including:

- Online student book pages
- Videos and animations
- Worksheets
- Assessments
- differentiated lesson plans

Sign up here:

www.pearsonschools.co.uk/gcsescience2016

You don't have to purchase any resources to deliver our qualifications.

Paid for Published Resources

We are committed to helping teachers deliver our Edexcel qualifications and students to achieve their full potential.

To do this, we aim for our qualifications to be supported by a wide range of resources, produced by a range of publishers, including ourselves.

However, it is not necessary to purchase endorsed resources to deliver our qualifications.

Our Paid for Published Resources

Our simple, inclusive and inspiring teaching and learning resources will support you to deliver great science teaching for GCSE (9–1), creating confident, successful learners able to access the skills demanded by the new assessments.

New resources include:

- **Student Books** (for Combined Science and Biology, Chemistry and Physics)

- **Active Learn Digital Service including:**
  - Teaching service
  - Homework, practice and support
  - Assessment and activity
  - Teacher and Technician Planning packs

Paid for Resources

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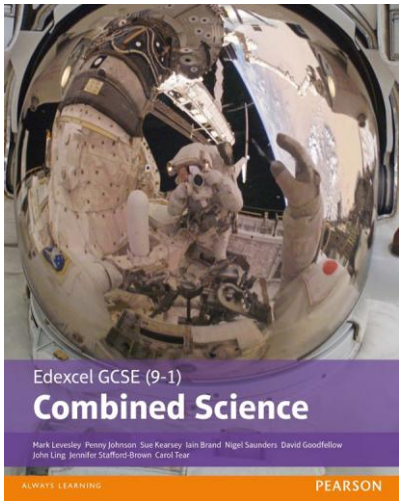
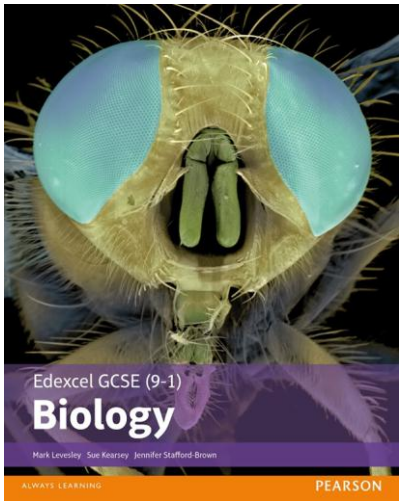
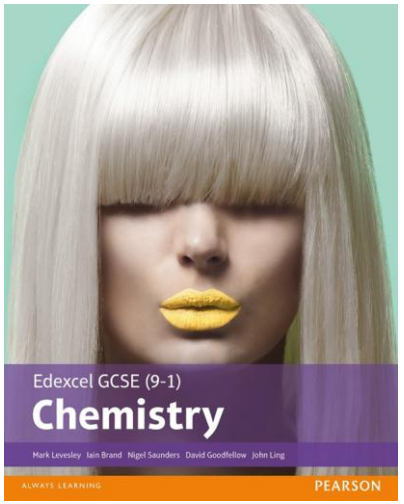
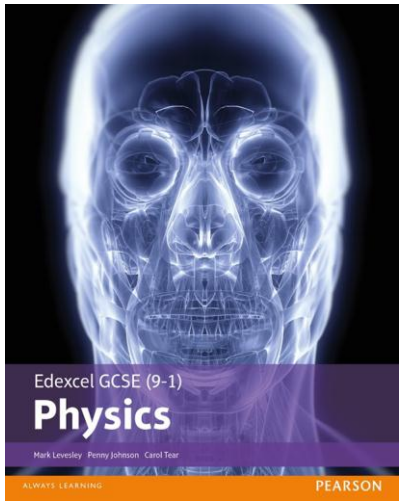
Edexcel GCSE (9-1) Sciences Teaching and Learning resources









Sign up for a free evaluation pack at: www.pearsonschools.co.uk/EPgcseSci

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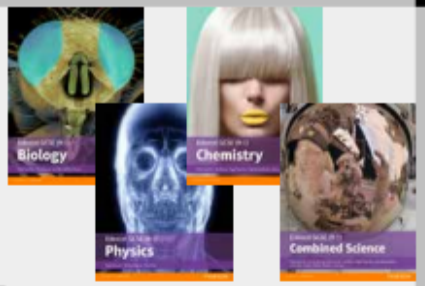
What's in the ActiveLearn Digital Service?

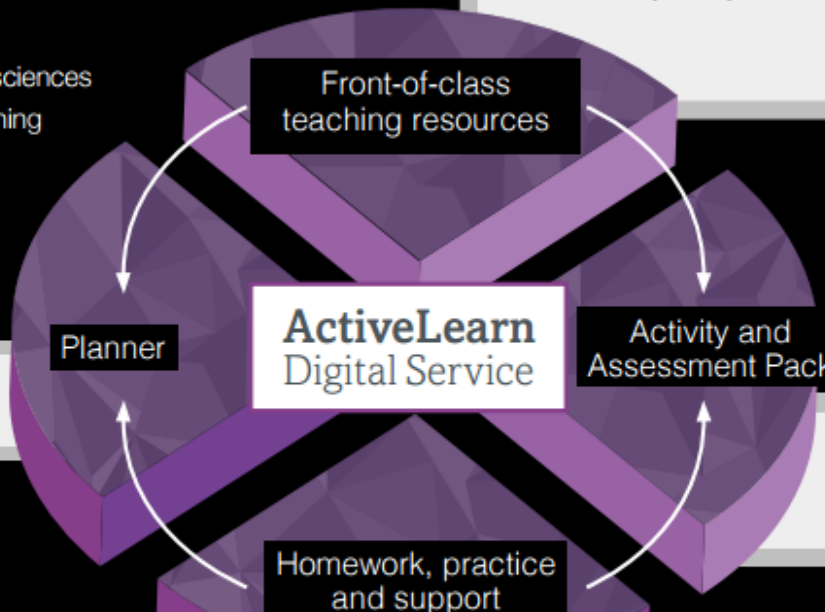
The subscription includes:

- access for all students in your school
- all content for Combined and Single sciences
- full support, including FREE initial training

100+ Videos
50+ Animations
50+ Interactive activities
500+ Powerpoint presentations



4 on-screen Student Books



250+ Lesson Plans
250+ Technician's notes

100+ End-of-unit assessments
500+ worksheets
250+ practical activities

450+ automarked activities
100+ Learning aids

Supporting great Science teaching

Sign up for two free terms' of teaching and learning materials

www.pearsonschools.co.uk/gcsescience2016

Paid for Resources

	Plan	Teach	Track and Assess	Develop
First two terms' resources available free of charge from Sept 2015	**ALDS** Teacher and Technician Pack	**ALDS** Presentations, videos, animations, Activity and Assessment Pack Student book pages on ActiveTeach	**ALDS** End of Unit tests (Pearson Steps) Quick Quizzes Progression Check	Online training for Active Learn Digital Service (from 2016)
Paid for resources from 2016	**ALDS Planner** Teacher and Technician Pack	**Student books** (print, ActiveTeach and ActiveBook) **ALDS** (Online homework, Presentations, worksheets)	**ALDS** End of Unit tests (Pearson Steps)	**CPD:** Developing Scientific Communicators at Key Stage 3 and 4 In-school product training

Endorsed resources*

We are working with a range of publishers who are looking towards getting their resources endorsed:

- **Pumpkin Interactive**: shot with leading international practitioners and theatre companies, our video content will captivate students and transform the way you teach. www.pumpkin-interactive.co.uk

- **ZigZag**: New spec resources for Science – learning, revision and exam practice! Spec-matched, technically checked and photocopiable.

*These resources have not yet been endorsed. This information is correct as of 25th August 2015, but may be subject to change

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Personal support

- **Stephen Nugus** and **Julius Edwards** – Science Subject Advisors
- Curriculum and **centre support** from our local Curriculum Development Managers and Curriculum Support Consultants
- **Science Team Updates** – email support giving regular news, past papers, information on training

  sciencesteamupdates@pearson.com

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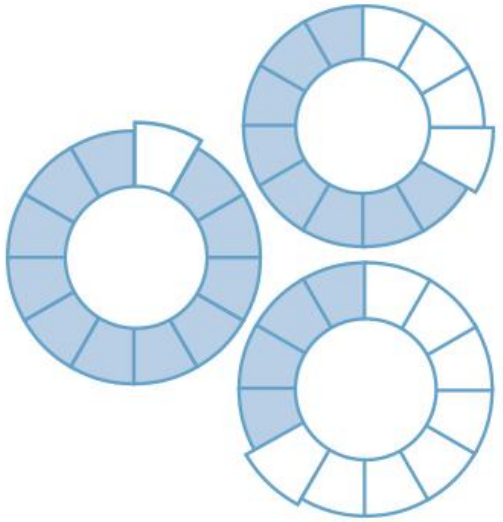
Pearson Progression Service



The need

- Removal of National Curriculum Levels
- Introduction of Progress 8

Key criteria

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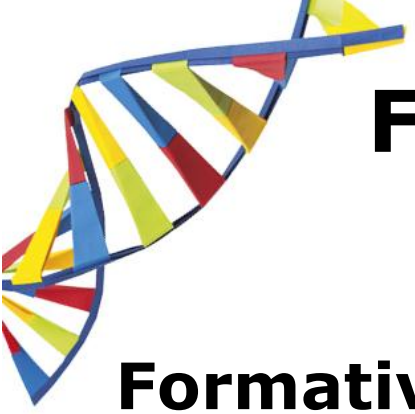
Any system of progress assessment must be:

- robust
- simple to administer
- transparent
- able to identify areas of weakness at an individual student level
- able to generate meaningful, understandable data.



Formative vs Summative

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Formative

- day-to-day interaction of teacher and student
- assesses a small amount of topic material
- is not scored or recorded

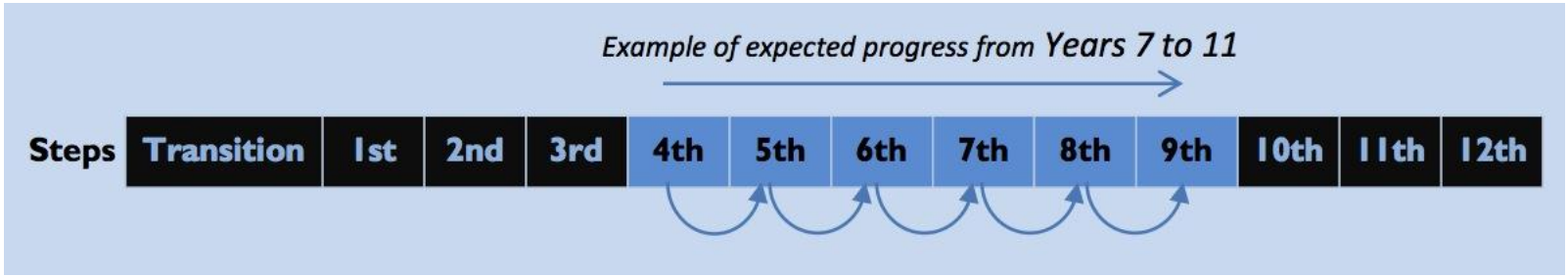
Summative

- infrequent appraisal of a student's progress
- assesses a large amount of topic material
- scored and recorded to track progress

Progression from 11 - 16

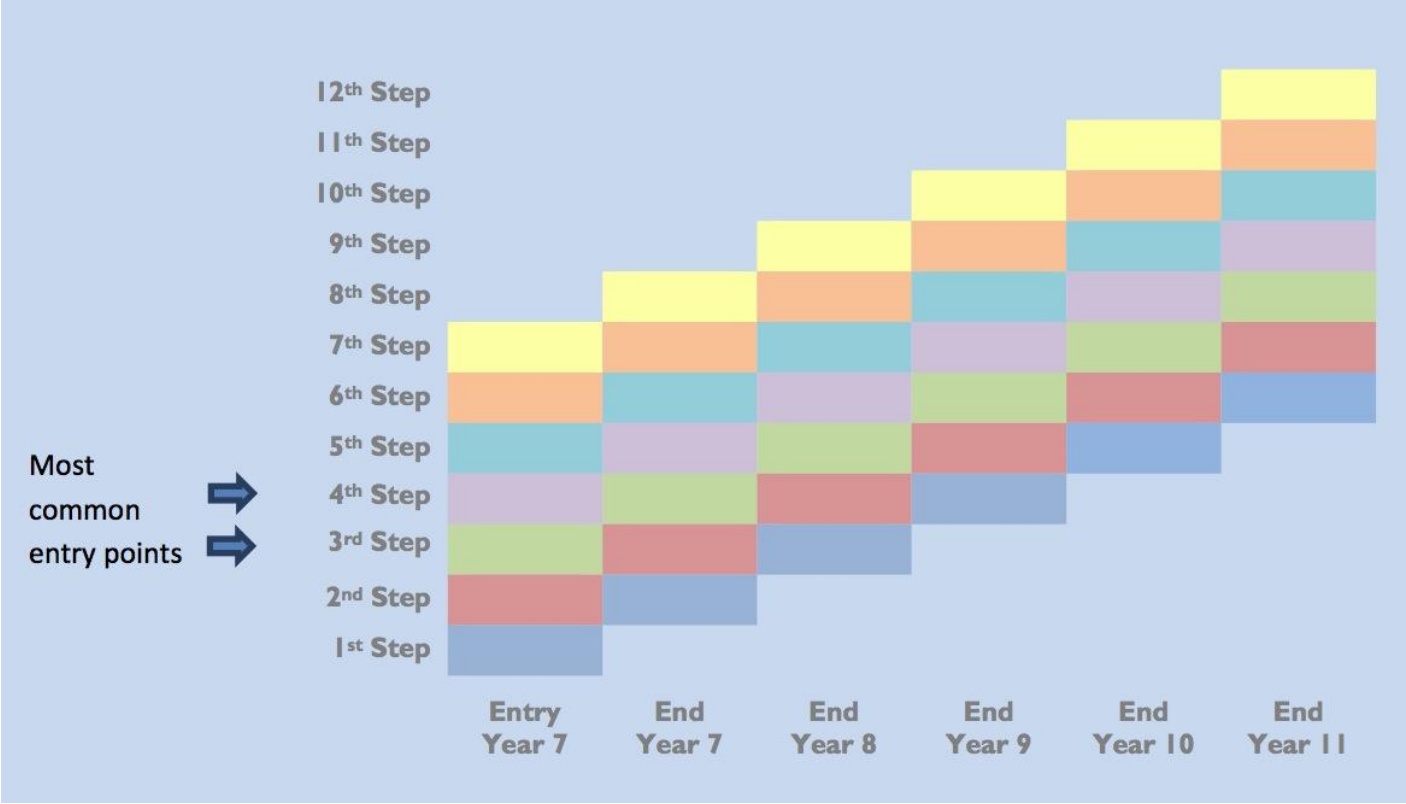
Progression Scale

- divided into 12 Steps (from low to high challenge)



Progression from 11 - 16

Progression Scale



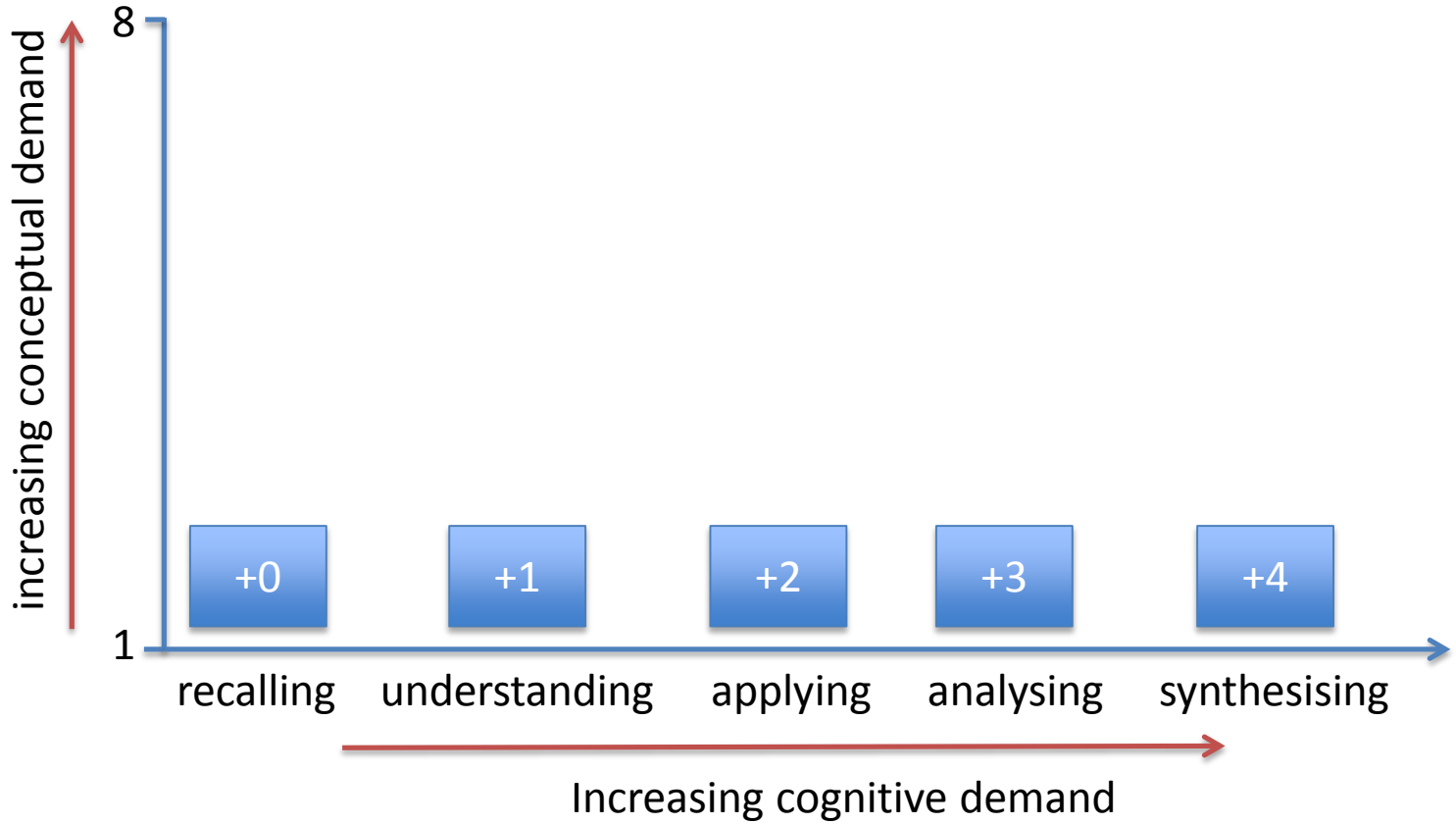
Progression from 11 - 16

Progression Map

Strand	Sub-strand	Topic	Progress descriptor	Step
Biology	Muscles and bones	Muscles and breathing	Correctly use the terms: breathing, breathing rate, ventilation, inhalation, exhalation.	4th
Biology	Muscles and bones	Muscles and breathing	Describe what happens when muscles contract and relax.	4th
Biology	Muscles and bones	Muscles and breathing	Identify the main organs of the human gaseous exchange system.	4th
Biology	Muscles and bones	Muscles and breathing	Describe how gases are carried around the body (in the blood).	5th
Biology	Muscles and bones	Muscles and breathing	Describe the functions of the organs in the human gaseous exchange system and how breathing movements occur.	5th
Biology	Muscles and bones	Muscles and breathing	Describe what happens during gas exchange.	5th
Biology	Muscles and bones	Muscles and breathing	Identify muscle cells as being adapted to their function.	5th
Biology	Muscles and bones	Muscles and breathing	Recall what happens in respiration.	5th

Progression from 11 - 16

Working out Steps



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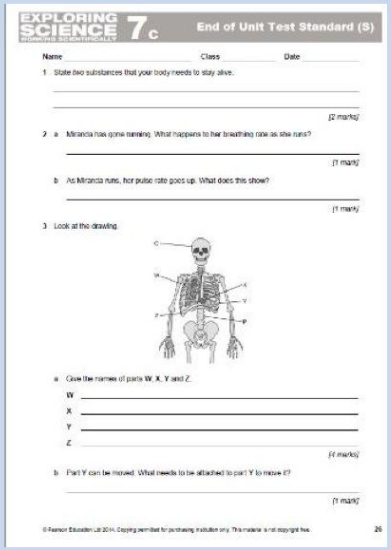
Progression from 11 - 16

Progression Tests

Sample of a progression test



EXPLORING SCIENCE 7c — End of Unit Test Standard (S)

Name _____ Class _____ Date _____

1 State two substances that your body needs to stay alive.

_____

_____

[2 marks]

2 a Miranda has gone running. What happens to her breathing rate as she runs?

_____

[1 mark]

b As Miranda runs, her pulse rate goes up. What does this show?

_____

[1 mark]

3 Look at the drawing.

a Give the names of parts W, X, Y and Z.

W _____

X _____

Y _____

Z _____

[4 marks]

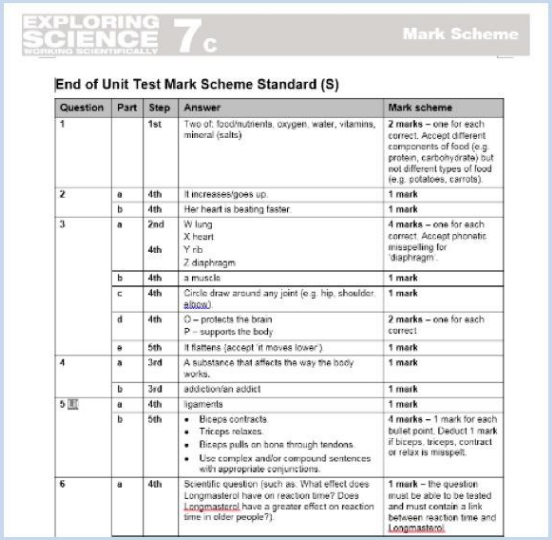
b Part Y can be moved. What needs to be attached to part Y to move it?

_____

[1 mark]

 26

Mark scheme



EXPLORING SCIENCE 7c — Mark Scheme

End of Unit Test Mark Scheme Standard (S)

Question	Part	Step	Answer	Mark scheme
1		1st	Two of: food/nutrients, oxygen, water, vitamins, mineral (salts)	**2 marks** – one for each correct. Accept different components of food (e.g. protein, carbohydrate) but not different types of food (e.g. potatoes, carrots).
2	a	4th	It increases/goes up.	**1 mark**
	b	4th	Her heart is beating faster.	**1 mark**
3	a	2nd 4th	W lung X heart Y rib Z diaphragm	**4 marks** – one for each correct. Accept phonetic misspelling for 'diaphragm'.
	b	4th	a muscle	**1 mark**
	c	4th	Circle drawn around any joint (e.g. hip, shoulder, elbow)	**1 mark**
	d	4th	O – protects the brain P – supports the body	**2 marks** – one for each correct
	e	5th	It flattens (accept 'it moves lower')	**1 mark**
4	a	3rd	A substance that affects the way the body works.	**1 mark**
	b	3rd	addiction/an addict	**1 mark**
5	a	4th	ligaments	**1 mark**
	b	5th	• Biceps contracts. • Triceps relaxes. • Biceps pulls on bone through tendons. • Use complex and/or compound sentences with appropriate conjunctions.	**4 marks** – 1 mark for each bullet point. Deduct 1 mark if biceps, triceps, contract or relax is misspelt.
6	a	4th	Scientific question (such as: What effect does Longmasterol have on reaction time? Does Longmasterol have a greater effect on reaction time in older people?)	**1 mark** – the question must be able to be tested and must contain a link between reaction time and Longmasterol.

With Step analysis

Marks/30	Step
21 – 30 marks	5th
15 – 20 marks	4th
9 – 14 marks	3rd
5 – 8 marks	2nd
2 – 4 marks	1st
0 – 1 marks	U

Progression from 11 - 16

Markbooks and reports

Year 9 GCSE Baseline Test 1		Use calculator	Round answer to 2 d.p.	Find missing angle	Find mean from frequency table	Solve number problem in words	Write ratio in simplest form	Solve measure problem	Solve linear equation	Solve linear equation with brackets	Solve fraction/number problem in words	Read data to solve percentages problem	Find area of compound shape	Divide quantity in given ratio	Find quantity after percentage increase	Use line of best fit	Use line of best fit	Round number to 3 s.f.	Estimate value of calculation	Complete two-way table	Find probability from two-way table	Use 1 - ر	Use probability to estimate frequency	Enlarge shape by positive scale factor	Interpret distance on map given scale factor	Use BIDMAS	Interpret distance-time graph	Interpret distance-time graph	Find speed from distance-time graph	Use circumference and perimter	Substitute numbers into a formula	Factorise expression	Total	Percentage	Step student is working at
	Q #	Q1a	Q1b	Q2	Q3	Q4	Q5	Q6	Q7a	Q7b	Q8	Q9	Q10	Q11	Q12	Q13a	Q13b	Q14a	Q14b	Q15a	Q15b	Q16a	Q16b	Q17	Q18	Q19	Q20a	Q20b	Q20c	Q21	Q22	Q23a			
	Step	4th	4th	5th	4th	5th	5th	5th	5th	5th	5th	5th	5th	5th	5th	5th	5th	5th	5th	5th	5th	6th	6th	6th	6th	6th	6th	6th	6th	7th	7th	7th			
	Strand	N	N	GM	SP	N	R	N	A	A	N	R	GM	R	N	SP	SP	N	N	SP	SP	SP	SP	GM	R	N	A	A	A	GM	A	A			
Students	Marks	1	1	3	3	4	2	3	2	3	3	4	4	3	3	1	1	1	3	2	2	1	2	2	2	3	1	1	3	4	3	1	80	%	
Albert Grayson		1	1	2	2	3	1	2	2	1	3	3	3	2	2	1	1	1	2	2	2	1	1	1	1	3	1	1	2	3	3	1	61	76.3	7th
Julie Hindle		1	1	3	2	4	1	3	2	1	1	2	4	2	2	1	1	1	3	2	1	1	1	1	1	3	0	1	2	3	2	1	62	77.5	7th
Shahid Khalik		1	1	2	3	3	2	1	2	2	3	3	1	3	1	1	1	1	2	2	2	0	2	1	2	0	1	1	3	3	2	0	59	73.8	6th
Brian Liminton		1	1	1	3	4	2	2	2	1	1	4	1	2	2	1	0	1	3	2	2	1	2	1	2	0	1	0	2	3	2	1	58	72.5	6th
Mary Malone		1	1	3	1	3	1	2	2	2	2	3	1	2	2	1	1	0	2	2	2	1	2	2	2	3	1	0	3	3	3	1	59	73.8	6th
Ajay Neelesh		1	1	1	0	4	0	2	2	1	1	4	1	0	0	1	1	1	3	2	1	1	2	2	1	3	1	1	2	4	2	1	53	66.3	6th

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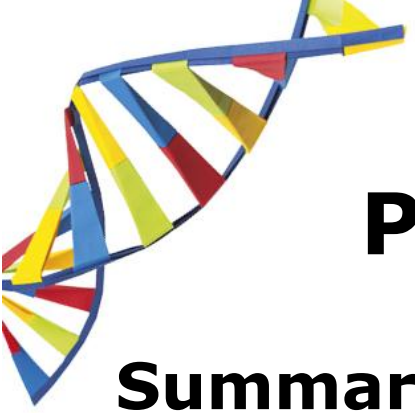
Progression from 11 - 16

6 **6** Name the substrate of amylase, and the products of the reaction it catalyses.

6 **7** Give two examples of processes that are controlled by enzymes in the human body.

7 **8** Suggest what will happen in the cells of someone who does not make phenylalanine hydroxylase. Explain your answer.



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Progression from 11 - 16

Summary of suggested approach

- use baseline tests
- set expected and aspirational targets (using the Progression Scale)
- use Progression Tests (and other evaluation) to monitor progress
- support, intervene or extend with reference to the Progression Map
- For more information go to: www.pearsonschools.co.uk/progression