

Progress Test in Science (PTS) has been designed to sample the main science knowledge and skills set out in the national curricula for England, Wales, Scotland and Northern Ireland. While the intentions are similar, the science curricula vary between regions, for example in the terminology used. This document provides additional information on the test questions and their links to regional science skill sets.

Reporting areas

Learning in science comprises scientific knowledge as well as the skills and understanding needed to apply knowledge in different contexts.

To capture the different aspects of learning, the questions in *PTS11* have been mapped to three reporting areas:

Reporting area	Questions
<p>Knowledge and Understanding</p> <ul style="list-style-type: none"> Recognising, recalling and showing understanding of scientific knowledge 	3, 6, 9, 11, 13, 19, 21, 23, 24, 27, 28, 29, 30, 32, 33, 34, 35, 37, 42, 44, 46, 47, 53, 56, 57, 59, 60
<p>Application of Knowledge and Understanding</p> <ul style="list-style-type: none"> Application of scientific knowledge and understanding, including that related to issues, uses and implications Understanding of the nature, processes and methods of science through different types of science enquiries to help answer scientific questions about the world 	1, 2, 4, 5, 7, 8, 10, 12, 14, 15, 16, 17, 18, 20, 22, 25, 26, 31, 36, 38, 39, 40, 41, 43, 45, 48, 49, 50, 51, 52, 54, 55, 58
<p>Working scientifically</p> <ul style="list-style-type: none"> Key features of scientific enquiry, so that pupils learn to use a variety of approaches to answer relevant scientific questions <ul style="list-style-type: none"> Observing over time, pattern seeking, identifying, classifying and grouping, controlled investigations, researching using secondary sources Collecting, analysing and presenting data 	1, 10, 14, 15, 16, 18, 20, 22, 23, 31, 36, 40, 49, 58

The reporting areas shown above are based on the National Curriculum in England Science programmes of study for KS1 and KS2. The curricula for Wales, Scotland and Northern Ireland have similar requirements, although there is wide variation in the way they are defined.

Knowledge and skills

The question by question analysis in *PTS* reports provides detailed information on how students perform in the scientific disciplines of biology, chemistry and physics. The following tables map the test questions to the different regional curriculum content categories.

Some test questions may reflect content from previous years to ensure that knowledge has been embedded and progress is made across the range of scientific knowledge and skills. There are also some advanced questions to ensure that the more able pupils are challenged.

England

Aspects of the National Curriculum in England for KS1 and KS2 relevant to *PTS11*.

Biology

Evolution and inheritance, living things and their habitats, animals including humans

Carrying out, concluding, recording, measuring

- Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago
- Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution
- Describe the differences in the life cycle of a mammal, an amphibian, an insect and a bird
- Recognise that environments can change and that this can sometimes pose dangers to living things
- Give reasons for classifying plants and animals based on specific characteristics
- Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function
- Identify that humans and some other animals have skeletons and muscles for support, protection and movement
- Identify the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood
- Describe the changes that occur as humans develop to old age
- Describe the life process of reproduction in some plants and animals
- Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment
- Identifying scientific evidence that has been used to support or refute ideas or arguments
- Setting up simple practical enquiries, and comparative and fair tests
- Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs

- Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment – including thermometers and data loggers

Questions

1, 2, 3, 4, 5, 6, 17, 18, 19, 20, 21, 22, 23, 35, 36, 37, 50, 52, 53, 54

Chemistry

Properties and changes of materials, rocks, states of matter

Concluding, carrying out

- Compare and group together everyday materials on the basis of their properties, including hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets
- Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties
- Describe in simple terms how fossils are formed when things that have lived are trapped within rock
- Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature
- Observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C)
- Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution
- Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating
- Compare and group together materials according to whether they are solids, liquids or gases
- Explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda
- Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials including metals, wood and plastic
- Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions
- Setting up simple practical enquiries, and comparative and fair tests

Questions

12, 13, 14, 15, 16, 30, 31, 32, 33, 34, 40, 44, 45, 46, 47, 48, 49, 59

Physics

Forces, light, Earth and space, electricity

Measuring, planning

- Recognise that some mechanisms, including levers, pulleys and gears allow a smaller force to have a greater effect
- Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object
- Identify the effects of air resistance, water resistance and friction, that act between moving surfaces
- Use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye
- Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them
- Notice that light is reflected from surfaces
- Use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky
- Describe the movement of the Moon relative to the Earth
- Use recognised symbols when representing a simple circuit in a diagram
- Compare and give reasons for variations in how components function, including brightness of bulbs, loudness of buzzers and on/off position of switches
- Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate
- Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary

Questions

7, 8, 9, 10, 11, 24, 25, 26, 27, 28, 29, 38, 39, 41, 42, 43, 51, 55, 56, 57, 58, 60

Wales

Aspects of the National Curriculum in Wales for KS2 and KS3 relevant to PTS11.

How things work

Forces, electricity, Earth and space, light

Evaluating

- The daily and annual movements of the Earth and their effect on day and year length
- Forces of different kinds, e.g. gravity, magnetic and friction, including air resistance
- The ways in which forces can affect movement and how forces can be compared
- How light travels and how this can be used
- The uses of electricity and its control in simple circuits
- Suggesting how the approach/method could have been improved

Questions

7, 8, 9, 10, 11, 24, 25, 26, 27, 28, 38, 39, 41, 42, 43, 51, 55, 56, 57, 58, 60

Interdependence of organisms

Patterns, environmental factors, evolution and inheritance, life cycles, interdependence, identifying organisms, human health, human organs, function of organs

Concluding, drawing graphs, measuring

- Identify through fieldwork the plants and animals found in two contrasting local environments, e.g. identification, nutrition, life cycles, place in environment
- The environmental factors that affect what grows and lives in different environments, e.g. sunlight, water availability, temperature
- The interdependence of living organisms in their environments and their representation as food chains
- The basic structure and function of some cells, tissues, organs and organ systems and how they support vital life processes
- The need for a variety of foods and exercise for human good health
- Identify that humans and some other animals have skeletons and muscles for support, protection and movement
- The observations or measurements that need to be made
- The equipment and techniques required for the enquiry
- Make comparisons and identify and describe trends or patterns in data and information
- Use some prior knowledge to explain links between cause and effect when concluding

- Communicate clearly by speech, writing, drawings, diagrams, charts, tables, bar charts, line graphs, videos, and ICT packages, using relevant scientific vocabulary

Questions

1, 2, 3, 4, 5, 6, 17, 18, 19, 20, 21, 22, 23, 35, 36, 37, 50, 52, 53, 54

The sustainable Earth

Comparing materials, how materials are formed, properties and uses of materials, states of matter, physical and chemical changes, Earth and space

Carrying out a fair test, concluding, separating techniques

- How some materials are formed or produced
- A comparison of the features and properties of some natural and made materials
- The properties of materials relating to their uses
- The physical and chemical properties of some elements, compounds and mixtures and how mixtures can be separated by simple techniques
- The properties of solids, liquids and gases and how the particle model can be used to explain these properties
- The differences between physical and chemical changes using some common examples
- The daily and annual movements of the Earth and their effect on day and year length
- When carrying out a fair test, the key variables that need to be controlled and how to change the independent variable whilst keeping other key variables the same
- Make comparisons and identify and describe trends or patterns in data and information

Questions

12, 13, 14, 15, 16, 29, 30, 31, 32, 33, 34, 44, 45, 46, 47, 48, 59

Scotland

Aspects of Curriculum for Excellence: Sciences experiences and outcomes for First and Second levels relevant to PTS11.

Biological systems

Inheritance, body systems and cells

Concluding

- By researching, I can describe the position and function of the skeleton and major organs of the human body and discuss what I need to do to keep them healthy
- By investigating some body systems and potential problems which they may develop, I can make informed decisions to help me to maintain my health and wellbeing
- By investigating the lifecycles of plants and animals, I can recognise the different stages of their development

Questions

5, 20, 35, 36, 37, 52, 53, 54

Forces, electricity and waves

Electricity, forces, vibrations and waves

Evaluating

- I have used a range of electrical components to help to make a variety of circuits for differing purposes. I can represent my circuit using symbols and describe the transfer of energy around the circuit
- By investigating forces on toys and other objects, I can predict the effect on the shape or motion of objects
- I have collaborated in investigations to compare magnetic, electrostatic and gravitational forces and have explored their practical applications
- By investigating how friction, including air resistance, affects motion, I can suggest ways to improve efficiency in moving objects
- By exploring reflections, the formation of shadows and the mixing of coloured lights, I can use my knowledge of the properties of light to show how it can be used in a creative way

Questions

7, 8, 9, 10, 11, 24, 25, 26, 27, 38, 39, 41, 42, 43, 51, 56, 58, 60

Materials

Properties and uses of substances, Earth's material, chemical changes

Concluding

- I have collaborated in activities which safely demonstrate simple chemical reactions using everyday chemicals. I can show an appreciation of a chemical reaction as being a change in which different materials are made

- Having explored the substances that make up Earth's surface, I can compare some of their characteristics and uses
- Through exploring properties and sources of materials, I can choose appropriate materials to solve practical challenges
- I can make and test predictions about solids dissolving in water and can relate my findings to the world around me
- I have participated in practical activities to separate simple mixtures of substances and can relate my findings to my everyday experience

Questions

12, 13, 14, 15, 16, 44, 45, 46, 47, 48, 59

Planet Earth

Biodiversity and interdependence, space, processes of the planet

Carrying out a fair test, concluding, measuring, planning, recording

- I can identify and classify examples of living things, past and present, to help me appreciate their diversity. I can relate physical and behavioural characteristics to their survival or extinction
- I can distinguish between living and non-living things. I can sort living things into groups and explain my decisions
- I can use my knowledge of the interactions and energy flow between plants and animals in ecosystems, food chains and webs. I have contributed to the design or conservation of a wildlife area
- I have collaborated in the design of an investigation into the effects of fertilisers on the growth of plants. I can express an informed view of the risks and benefits of their use
- I can apply my knowledge of how water changes state to help me understand the processes involved in the water cycle in nature over time
- By contributing to experiments and investigations, I can develop my understanding of models of matter and can apply this to changes of state and the energy involved as they occur in nature
- By investigating how water can change from one form to another, I can relate my findings to everyday experiences
- By safely observing and recording the sun and moon at various times, I can describe their patterns of movement and changes over time. I can relate these to the length of a day, a month and a year

Questions

1, 2, 3, 4, 6, 17, 18, 19, 21, 22, 23, 28, 29, 30, 31, 32, 33, 34, 40, 49, 50, 55, 57

Northern Ireland

Aspects of National Curriculum in Northern Ireland for KS1, KS2 and KS3 relevant to PTS11.

Change over time

Change in the natural world, ways in which change occurs

Developing a line of reasoning, questioning and planning

- About the life cycles of some plants and animals
- About the relevance of the water cycle
- How properties of materials relate to how they are used
- That some things decay naturally while others do not
- That some substances dissolve and others do not
- Interpret results by identifying patterns and relate their conclusions to their scientific knowledge and understanding
- Make suggestions about what, when and how to measure

Questions

5, 15, 16, 20, 34, 40, 44, 49, 53

Chemical and material behaviour

States of matter, chemical changes

- Atoms and chemical changes

Questions

47, 48

Earth and Universe

The solar system and universe

Questions

29

Forces and energy

Electricity, light

- Using electricity
- Sound and light

Questions

24, 26, 27, 39, 41, 43

Interdependence

Living things in the natural world, interaction in the world

Developing a line of reasoning, memory and understanding

- How lifestyle choices can affect the health of themselves and others
- About the variety of living things and the conditions necessary for their growth and survival
- About the interrelationships between animals and plants in a habitat
- Interpret results by identifying patterns and relate their conclusions to their scientific knowledge and understanding
- Note similarities and differences and sort into groups, for example, different types of animals, properties of everyday materials or existing solutions to technological designs

Questions

1, 6, 17, 19, 36, 50

Movement and energy

Changes in movement and energy over time, the causes and effects of forces and movement, the causes and effects of energy, our place in the universe

Making decisions and solving problems

- To recognise how models and machines allow movement and how this has changed over time
- That the earth orbits the sun
- That a complete circuit is needed for a device to work
- How shadows are formed and can be changed
- That light travels through some materials and not others
- That dark is the absence of light
- Push and pull forces can make things start and stop moving
- That different surfaces affect how easily things move over them
- Explain and justify their methods, choices and actions

Questions

7, 8, 9, 10, 11, 25, 28, 38, 42, 51, 56, 58, 59, 60

Organisms and health

Organ systems

- Healthy body and mind

Questions

52

Place

Adaptation to the environment, features of the immediate world, exploration, how place influences the nature of life, change over time in places, our place in the universe

Exploration, using information, memory and understanding, questioning and planning, making decisions and solving problems

- How some living things can change in order to adapt and survive in their environment, and that there are places where living things cannot survive
- How changes in state can be brought about
- How place affects the plant and animal life there
- About the position of the major organs in the body and their importance for life
- About the properties of everyday materials and their uses
- That the Earth's rotation produces day and night
- Take time to consider ways in which they can explore their own and others' questions and invent different methods for investigation
- Suggest how to make a test fair, identifying what should be changed, measured and kept the same
- Make observations using the senses to describe a range of characteristics about objects or events, such as, soft, hard, rough, smooth or in models, fast, slow, loud or quiet
- Suggest and design ways of recording and presenting observations, for example, block graphs, labelled pictures, drawings, bar charts, pictograms, diagrams, databases, spreadsheets etc.
- Make suggestions about what, when and how to measure

Questions

2, 3, 4, 12, 13, 14, 18, 21, 22, 23, 30, 31, 32, 33, 35, 37, 45, 46, 54, 55, 57

Feedback to parents and carers

A report on the individual pupil is available to support feedback to parents or carers. This *Individual report for parents* strips away much of the technical detail that is included in the *Group report for teachers*. A series of statements, tailored for parents, is included to explain what the results mean and how learning may be affected. Recommendations focus on how the parent or carer can work with the school to support the pupil at home.

In addition to the *Individual report for parents*, you may wish to provide supporting information, either orally or in writing, explaining the process and outcomes. The following list provides you with guidelines to assist with this communication.

- Stress the school's commitment to identifying and addressing the needs of each individual pupil in order to understand and maximise their potential.
- Explain that testing with *PTS11* is part of the school's regular assessment regime and that all pupils in the year group(s) have been tested.
- As part of the test, pupils were tested on their science knowledge and skills.
- You may wish to summarise the specific outcomes and recommendations from the test for that individual pupil (which are also shown on the *Individual report for parents*).
- Parents or carers should be reassured that if they have any questions or concerns or would like any further advice on how best to support their child, then they should contact the school.

A sample letter is provided (Figure 1) to support your communications with parents/carers after testing with *PTS11*.

Figure 1: Sample parent/carer feedback letter

Dear Parent or Carer,

In school, we wish to assess all our pupils to see what their needs are and how we can best help them learn and achieve.

As part of this process, your child has completed the *Progress Test in Science 11*, which assesses key aspects of science knowledge and skills.

A copy of the *Individual report for parents* is included*. This shows your child's results and describes what these mean in terms of the ways in which he/she will learn best and how you can support him/her at home.

[If the report is not included a relevant short extract can be included instead.]

If you have any queries or concerns please contact us.

Yours faithfully,

[School/Establishment name]

*If possible, it is helpful to parents to discuss the report with them on a suitable occasion before sending it out.