PT SCIENCE 10

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 *PTS*10 have been mapped to three reporting areas:

Reporting area	Questions
Knowledge and Understanding • Recognising, recalling and showing understanding of scientific knowledge	1, 2, 3, 5, 9, 10, 11, 12, 13, 14, 18, 19, 21, 24, 26, 29, 30, 35, 36, 38, 41, 43, 45, 46, 47, 48, 49
Application of Knowledge and Understanding • 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	4, 6, 7, 8, 15, 16, 17, 20, 22, 23, 25, 27, 28, 31, 32, 33, 34, 37, 39, 40, 42, 44
Working scientifically • Key features of scientific enquiry, so that pupils learn to use a variety of approaches to answer relevant scientific questions o Observing over time, pattern seeking, identifying, classifying and grouping, controlled investigations, researching using secondary sources o Collecting, analysing and presenting data	4, 6, 7, 8, 9, 11, 17, 22, 31, 34, 37, 40

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 *PTS*10.

Biology

Animals including humans, living things and their habitats

Concluding, measuring, planning, reporting

- Construct and interpret a variety of food chains, identifying producers, predators and prey
- Describe the differences in the life cycle of a mammal, an amphibian, an insect and a bird
- Describe the life process of reproduction in some plants and animals
- Identify that humans and some other animals have skeletons and muscles for support, protection and movement
- Identify the different types of teeth in humans and their simple functions
- Describe the changes that occur as humans develop to old age
- Recognise that environments can change and that this can sometimes pose dangers to living things
- Recognise that living things can be grouped in a variety of ways
- Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment
- Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment – including thermometers and data loggers
- Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary
- Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations

- Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate
- Using straightforward scientific evidence to answer questions, or to support their findings

Questions

1, 2, 3, 4, 5, 7, 14, 15, 16, 17, 18, 19, 20, 34, 35, 36, 37

Chemistry

Properties and changes of materials

Measuring , planning, recording

- Compare and group together everyday materials on the basis of their properties, including hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets
- Demonstrate that dissolving, mixing and change of state are reversible changes
- 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
- 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
- Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment – including thermometers and data loggers
- 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
- Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables

Questions

6, 8, 9, 21, 22, 23, 24, 25, 26, 27, 38, 39, 40, 41, 42, 43, 44

Physics

Earth and space, electricity, forces, light, sound

Recording

- Describe the movement of the Earth, and other planets, relative to the Sun in the solar system
- 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
- Describe the Sun, Earth and Moon as approximately spherical bodies
- Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object
- Identify how sounds are made, associating some of them with something vibrating
- Identify the effects of air resistance, water resistance and friction, that act between moving surfaces
- Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit
- Recognise that shadows are formed when the light from a light source is blocked by an opaque object
- Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect
- Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs

Questions

10, 12, 13, 28, 29, 30, 31, 32, 33, 45, 46, 47, 48, 49

Wales

Aspects of the National Curriculum in Wales for KS2 and KS3 relevant to *PTS*10.

Interdependence of organisms

Human organs, organisms in their environment, life cycles, human health, environmental factors, food chains, identifying organisms

Concluding, recording, measuring, collecting reliable data, carrying out a fair test

- Identifying 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 those two environments, e.g. sunlight, water availability, temperature
- The interdependence of living organisms in their environments and their representation as food chains
- The need for a variety of foods and exercise for human good health
- The names, positions, functions and relative sizes of a human's main organs
- 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
- Check observations and measurements by repeating them in order to collect reliable data
- Make comparisons and identify and describe trends or patterns in data and information
- The equipment and techniques required for the enquiry
- The observations or measurements that need to be made
- 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, 8, 9, 14, 15, 16, 17, 18, 19, 20, 34, 35, 36, 37

How things work

Sound, light, electricity, forces

Drawing graphs, variables

- How light travels and how this can be used
- How different sounds are produced and the way that sound travels
- The uses of electricity and its control in simple circuits
- 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

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

Questions
10, 12, 13, 28, 29, 30, 31, 32, 33

The sustainable Earth

How materials are formed, physical and chemical changes, properties and uses of materials, the solar system, movements of the Earth
Comparing materials, separating techniques, variables

- A comparison of the features and properties of some natural and made materials
- How some materials are formed or produced
- The differences between physical and chemical changes using some common examples
- 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 relative positions and key features of the Sun and planets in the solar system
- 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

Questions
21, 22, 23, 24, 25, 26, 27, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49

In addition 'make comparisons and identify and describe trends or patterns in data and information', and 'use apparatus and equipment correctly and safely' are addressed in questions 6 and 7.

Scotland

Aspects of Curriculum for Excellence: Sciences experiences and outcomes for First and Second levels relevant to *PTS*10.

Biological systems

Body systems and cells, inheritance

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 comparing generations of families of humans, plants and animals, I can begin to understand how characteristics are inherited
- By investigating the lifecycles of plants and animals, I can recognise the different stages of their development

Questions

1, 2, 3, 4, 5, 19

Forces, electricity and waves

Vibrations and waves, electricity, forces

Recording

- I can describe an electrical circuit as a continuous loop of conducting materials. I can combine simple components in a series circuit to make a game or model
- 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
- Through research on how animals communicate, I can explain how sound vibrations are carried by waves through air, water and other media
- 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

10, 12, 13, 28, 29, 30, 31, 32, 33

Materials

Chemical changes, properties and uses of substances, Earth's materials, properties and uses of materials

- 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 have participated in practical activities to separate simple mixtures of substances and can relate my findings to my everyday experience
- I can make and test predictions about solids dissolving in water and can relate my findings to the world around me

Questions

23, 24, 25, 26, 38, 39, 41, 42, 43, 44

Planet Earth

Energy sources and sustainability, biodiversity and interdependence, space, processes of the planet, variables

Evaluating, measuring, carrying out a fair test, recording

- I can distinguish between living and non-living things. I can sort living things into groups and explain my decisions
- I can explore examples of food chains and show an appreciation of how animals and plants depend on each other for food
- I can use my knowledge of the interactions and energy flow between plants and animals in ecosystems, food chains and webs.
- I can help to design experiments to find out what plants need in order to grow and develop. I can observe and record my findings and from what I have learned I can grow healthy plants in school
- I am aware of different types of energy around me and can show their importance to everyday life and my survival
- By investigating how water can change from one form to another, I can relate my findings to everyday experiences
- By observing and researching features of our solar system, I can use simple models to communicate my understanding of size, scale, time and relative motion within it
- 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

8, 9, 14, 15, 16, 17, 18, 20, 21, 22, 27, 34, 35, 36, 37, 45, 46, 47, 48, 49

Northern Ireland

Aspects of National Curriculum in Northern Ireland for KS1, KS2 and KS3 relevant to *PTS*10.

Change over time

Change in the natural world, ways in which change occurs

Developing a line of reasoning, memory and understanding

- About the life cycles of some plants and animals
- How properties of materials relate to how they are used
- About the effects of heating and cooling
- That some substances dissolve and others do not
- Interpret results by identifying patterns and relate their conclusions to their scientific knowledge and understanding
- Make observations, use the senses and appropriate instruments to describe objects and events using relevant scientific terminology, for example, flexible, opaque or decay

Questions

2, 3, 6, 7, 18, 19, 23, 24, 25, 34, 35, 38, 39, 41, 42, 44

Chemical and material behaviour

Chemical changes: atoms and chemical changes

Questions

26

Earth and universe

The solar system and universe

Questions

49

Interdependence

Interaction in the world, living things in the natural world

Memory and understanding, developing a line of reasoning

- How lifestyle choices can affect their own and others health
- About the variety of living things and the conditions necessary for their growth and survival
- Investigate similarities and differences, for example, comparing how things work, differences among animals and plants or properties of materials
- Interpret results by identifying patterns, and relate their conclusions to their scientific knowledge and understanding

Questions

4, 5, 14, 16

Movement and energy

The causes and effects of energy, the causes and effects of forces and movement, changes in movement and energy over time

Using information, developing a line of reasoning

- To recognise how models and machines allow movement and how this has changed over time
- That when an object vibrates, sound is produced
- How shadows are formed and can be changed
- That a complete circuit is needed for a device to work
- That push and pull forces can make things start and stop moving
- That different surfaces affect how easily things move over them
- Interpret results by identifying patterns and relate their conclusions to their scientific knowledge and understanding
- Suggest and design ways of recording and presenting observations, for example, block graphs, labelled pictures, drawings, bar charts, pictograms, diagrams, databases, spreadsheets etc.

Questions

10, 12, 13, 28, 29, 30, 31, 32, 33

Place

How place influences the nature of life, features of the immediate world, change over time in places, our place in the universe

Using information, memory and understanding, making decisions and solving problems

- How changes in state can be brought about
- About the properties of everyday materials and their uses
- About the position of the major organs in the body and their importance for life
- How place affects the plant and animal life there
- About simple food chains in different places
- About some of the plants and animals in a chosen habitat locally or elsewhere
- That the Earth orbits the sun
- That the Earth's rotation produces day and night
- Suggest how to make a test fair, identifying what should be changed, measured and kept the same
- Suggest and design ways of recording and presenting observations, for example, block graphs, labeled pictures, drawings, bar charts, pictograms, diagrams, databases, spreadsheets etc.
- Make observations, use the senses and appropriate instruments to describe objects and events using relevant scientific terminology, for example, flexible, opaque or decay

Questions

1, 8, 9, 15, 20, 21, 22, 27, 36, 37, 40, 43, 45, 46, 47, 48

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 *PTS*10 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 *PTS*10.

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* 10, 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.