

*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 *PTS11T* have been mapped to three reporting areas:

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

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 students are challenged.

## England

Aspects of the National Curriculum in England for KS2 relevant to *PTS11T*.

### Biology

*Animals including humans, evolution and inheritance, living things and their habitats, plants*

*Planning, concluding, reporting*

- Construct and interpret a variety of food chains, identifying producers, predators and prey
- Describe the changes that occur as humans develop to old age
- 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
- Describe the ways in which nutrients and water are transported within animals, including humans
- Describe the simple functions of the basic parts of the digestive system in humans
- Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution
- Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents
- Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago
- Give reasons for classifying plants and animals based on specific characteristics
- Describe the differences in the life cycle of a mammal, an amphibian, an insect and a bird
- Explore the requirements of plants for life and growth (air, light, water, nutrients from soil and room to grow) and how they vary from plant to plant
- Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal

- 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
- Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions

### Questions

1, 2, 3, 4, 5, 6, 19, 20, 21, 22, 23, 24, 25, 41, 42, 43, 44, 45, 46, 47, 48

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## Chemistry

### *Properties and changes of materials, rocks, states of matter*

#### *Measuring, recording*

- Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution
- Compare and group together everyday materials on the basis of their properties, including hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets
- Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating
- 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
- 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)
- Compare and group together materials according to whether they are solids, liquids or gases
- Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature
- Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate
- Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers
- Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs
- Gathering, recording, classifying and presenting data in a variety of ways to help in answering questions

### Questions

7, 8, 9, 10, 11, 12, 13, 26, 27, 28, 29, 30, 31, 49, 50, 51, 53, 54,

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## Physics

*Earth and space, electricity, forces, forces and magnets, light, sound*

### *Measuring, planning*

- Describe the Sun, Earth and Moon as approximately spherical bodies
- Describe the movement of the Earth, and other planets, relative to the Sun in the solar system
- Describe the movement of the Moon relative to the Earth
- Use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky
- Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit
- Identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery
- Compare and give reasons for variations in how components function, including brightness of bulbs, loudness of buzzers and on/off position of switches
- Use recognised symbols when representing a simple circuit in a diagram
- 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
- Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect
- Observe how magnets attract or repel each other and attract some materials but not others
- Recognise that light appears to travel in straight lines
- Identify how sounds are made, associating some of them with something vibrating
- 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*

14, 15, 16, 17, 18, 33, 32, 34, 35, 36, 37, 38, 39, 40, 55, 56, 57, 58, 59, 60

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## Wales

Aspects of the National Curriculum in Wales for KS2 and KS3 relevant to PTS11T.

### How things work

*Electricity, sound, forces, light*

*Collecting reliable data, carrying out a fair test, predicting*

- The uses of electricity and its control in simple circuits
- How different sounds are produced and the way that sound travels
- 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
- Check observations and measurements by repeating them in order to collect reliable data
- 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
- Predictions using some previous knowledge and understanding
- Linking the learning to similar situations within and outside school

### Questions

14, 15, 16, 17, 18, 32, 33, 34, 35, 36, 37, 38, 39, 40, 59

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### Interdependence of organisms

*Life cycles, human health, human organs, organ systems, environmental factors, identifying organisms, food chains, evolution and inheritance*

*Evaluating, concluding, linking learning, variables, 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 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
  - The basic structure and function of some cells, tissues, organs and organ systems and how they support vital life processes
  - The environmental factors that affect what grows and lives in those environments, e.g. sunlight, water availability, temperature
  - The interdependence of living organisms in environments and their representation as food chains
  - Suggesting how the approach/method could have been improved
  - 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
  - Linking the learning to similar situations, within and outside school
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- Use some prior knowledge to explain links between cause and effect when concluding
- Make comparisons and identify and describe trends or patterns in data and information

### Questions

1, 2, 3, 4, 5, 6, 19, 20, 21, 22, 23, 24, 25, 41, 42, 43, 44, 45, 46, 47, 48

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## The sustainable Earth

*States of matter, how materials are formed, Earth and space, features, properties and uses of materials*

*Separating techniques, drawing graphs, recording, measuring, success criteria, collecting reliable data*

- 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
- How some materials are formed or produced
- A comparison of the features and properties of some natural and made materials
- 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
- The properties of materials relating to their uses
- The observations or measurements that need to be made
- The choice of success criteria
- Communicate clearly by speech, writing, drawings, diagrams, charts, tables, bar charts, line graphs, videos, and ICT packages, using relevant scientific vocabulary
- Make careful observations and accurate measurements, using digital and ICT equipment at times
- Check observations and measurements by repeating them in order to collect reliable data

### Questions

7, 8, 9, 10, 11, 12, 13, 26, 27, 28, 29, 30, 31, 49, 50, 53, 54, 55, 56, 57, 58, 60

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In addition 'interpretations' is addressed: "consider different interpretations and distinguish between 'facts', beliefs and opinions, giving reasons and begin to recognise bias" in question 51.

## Scotland

Aspects of Curriculum for Excellence: Sciences experiences and outcomes for First, Second and Third levels relevant to PTS11T.

### Biological systems

#### *Inheritance, body systems and cells*

##### *Carrying out a fair test*

- By investigating the lifecycles of plants and animals, I can recognise the different stages of their development
- 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

##### *Questions*

1, 2, 3, 4, 5, 6, 41, 45, 46

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### Forces, electricity and waves

#### *Electricity, vibrations and waves, forces*

##### *Evaluating, carrying out a fair test, scientific questioning*

- 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 collaborating in experiments on different ways of producing sound from vibrations, I can demonstrate how to change the pitch of the sound
- 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 exploring the forces exerted by magnets on other magnets and magnetic materials, I can contribute to the design of a game
- 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 contributing to investigations of energy loss due to friction, I can suggest ways of improving the efficiency of moving systems
- 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*

14, 15, 16, 17, 18, 32, 33, 34, 35, 36, 37, 38, 39, 40, 59

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## Materials

### *Properties and uses of substances, Earth's materials*

#### *Measuring*

- I can make and test predictions about solids dissolving in water and can relate my findings to the world around me
- 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
- 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
- Having explored the substances that make up Earth's surface, I can compare some of their characteristics and uses
- Through evaluation of a range of data, I can describe the formation, characteristics and uses of soils, minerals and basic types of rocks

#### *Questions*

9, 10, 11, 12, 13, 49, 50, 53, 54

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## Planet Earth

### *Processes of the planet, biodiversity and interdependence, space*

#### *Evaluating, concluding, variables*

- 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
- 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 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
- 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
- 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

### Questions

7, 8, 19, 20, 21, 22, 23, 24, 25, 28, 29, 31, 42, 43, 44, 47, 48, 55, 56, 57, 58, 60

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### Topical science

- Through research and discussion I have an appreciation of the contribution that individuals are making to scientific discovery and invention and the impact this has made on society

### Questions

51

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## Northern Ireland

Aspects of National Curriculum in Northern Ireland for KS1, KS2 and KS3 relevant to PTS11T.

### Biology

#### *Developing a line of reasoning*

- Interpret results by identifying patterns and relate their conclusions to their scientific knowledge and understanding

#### *Questions*

25

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### Change over time

#### *Change in the natural world, ways in which change occurs*

#### *Making decisions and solving problems, questioning and planning*

- About the life cycles of some plants and animals
- How properties of materials relate to how they are used
- That some substances dissolve and others do not
- About the relevance of the water cycle
- That some things decay naturally while others do not
- Explain and justify methods, choices and actions
- Make suggestions about what, when and how to measure

#### *Questions*

1, 8, 9, 11, 12, 13, 26, 30, 31, 45, 46, 54

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### Earth and universe

#### *The solar system: the solar system and universe*

#### *Questions*

57

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### Forces and energy

#### *Electricity: sound and light*

#### *Questions*

14, 17, 18

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### Interdependence

#### *Interaction in the world, how place influences the nature of life, living things in the natural world*

#### *Making decisions and solving problems, memory and understanding*

- How lifestyle choices can affect the health
  - About the position of the major organs in the body and their importance for life
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- About the variety of living things and the conditions necessary for their growth and survival
- To understand the interdependency that exists in simple food chains and webs
- Suggest how to make a test fair, identifying what should be changed, measured and kept the same
- Investigate similarities and differences, for example, comparing how things work, differences among animals and plants or properties of materials

### Questions

2, 4, 5, 24, 41, 44, 47

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## Movement and energy

*The causes and effects of energy, the causes and effects of forces and movement, changes in movement and energy over time, our place in the universe*

*Making decisions and solving problems*

- That when an object vibrates, sound is produced
- That some materials do not allow electricity to pass and these are called insulators
- Push and pull forces can make things start and stop moving
- That different surfaces affect how easily things move over them
- That light travels through some materials and not others
- The direction the sun appears to rise and set
- Design and carry out fair tests, examine the quality of the evidence and make links between possible causes and effects
- Make predictions and give reasons based on scientific knowledge and understanding
- To recognise how models and machines allow movement and how this has changed over time
- Suggest how to make a test fair identifying what should be changed, measured and kept the same

### Questions

15, 16, 32, 33, 34, 35, 36, 37, 38, 39, 40, 59, 60

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## Organisms and health

*Animals including humans: healthy body and mind*

### Questions

6

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## Place

*Change over time in places, features of the immediate world, how place influences the nature of life, adaptation to the environment, our place in the universe, memory and understanding*

*Using information, exploration, developing a line of reasoning, making decisions and solving problems*

- How changes in state can be brought about
- About the properties of everyday materials and their uses
- How place affects the plant and animal life there
- 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
- About the position of the major organs in the body and their importance for life
- That the Earth orbits the Sun
- That the Earth's rotation produces day and night
- Suggest and design ways of recording and presenting observations, for example, block graphs, labelled pictures, drawings, bar charts, pictograms, diagrams, databases, spreadsheets etc.
- Make predictions and give reasons based on scientific knowledge and understanding
- 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
- 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

## Questions

3, 7, 10, 19, 20, 21, 22, 23, 27, 28, 29, 42, 43, 48, 49, 50, 53, 55, 56, 58

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## Feedback to parents and carers

A report on the individual student 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 student 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 student in order to understand and maximise their potential.
- Explain that testing with *PTS11T* is part of the school's regular assessment regime and that all students in the year group(s) have been tested.
- As part of the test, students were tested on their science knowledge and skills.
- You may wish to summarise the specific outcomes and recommendations from the test for that individual student (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 *PTS11T*.

Figure 1: Sample parent/carer feedback letter

Dear Parent or Carer,

In school, we wish to assess all our students 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 11T*, 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.