

# What are the key features of 'knowledge-rich' assessment for science?

Subject	Features
Science	<ul style="list-style-type: none"><li>❑ At both key stages the sticky knowledge takes full account of the national curriculum's main characteristics of:<ul style="list-style-type: none"><li>❑ Physics</li><li>❑ Chemistry</li><li>❑ Biology</li><li>❑ Working scientifically</li></ul></li></ul>
	<ul style="list-style-type: none"><li>❑ There are more assessments in science because the national curriculum specifies on a year-by-year basis what has to be taught. In addition, science is a core subject and should have more time devoted to it than non-core subjects</li></ul>
	<ul style="list-style-type: none"><li>❑ The working scientifically part does not conform with the knowledge-rich system as it is checking on pupils' ability to, amongst other things, carry out research, ask questions and carry out tests.</li></ul>
	<ul style="list-style-type: none"><li>❑ The working scientifically statements should be assessed as an on-going feature of the science lessons, whilst the scientific knowledge should be assessed away from the point of teaching.</li></ul>
	<ul style="list-style-type: none"><li>❑ When considering pupils' improvement in science specific vocabulary, see the identified subject specific vocabulary outlined in Focus Education's 'science knowledge mats'.</li></ul>

# Year 1

Year 1				
Biology			Chemistry	Physics
Animals, including Humans	Animals, including Humans	Plants	Everyday Materials	Seasonal Change
<ul style="list-style-type: none"> <li>• Name common animals</li> <li>• Carnivores, etc</li> </ul>	<ul style="list-style-type: none"> <li>• Human body and senses</li> </ul>	<ul style="list-style-type: none"> <li>• Common plants</li> <li>• Plant structure</li> </ul>	<ul style="list-style-type: none"> <li>• Properties of materials</li> <li>• Grouping materials</li> </ul>	<ul style="list-style-type: none"> <li>• The four seasons</li> <li>• Seasonal weather</li> </ul>
<ul style="list-style-type: none"> <li>• Know how to classify a range of animals by amphibian, reptile, mammal, fish and birds</li> <li>• Know and classify animals by what they eat (carnivore, herbivore and omnivore)</li> <li>• Know how to sort by living and non living things</li> </ul>	<ul style="list-style-type: none"> <li>• Know the name of parts of the human body that can be seen</li> <li>• Know which sense is associated with which part of the body</li> </ul>	<ul style="list-style-type: none"> <li>• Know and name a variety of common wild and garden plants</li> <li>• Know and name the petals, stem, leaves and root of a plant</li> <li>• Know and name the roots, trunk, branches and leaves of a tree</li> </ul>	<ul style="list-style-type: none"> <li>• Know the name of the materials an object is made from</li> <li>• Know about the properties of everyday materials</li> </ul>	<ul style="list-style-type: none"> <li>• Name the seasons and know about the type of weather in each season</li> </ul>

## Year 1

### Working Scientifically

- Ask questions such as:
  - Why are flowers different colours?
  - Why do some animals eat meat and others do not?
- Set up a test to see which materials keeps things warmest, know if the test has been successful and can say what has been learned
- Explain to someone what has been learned from an investigation they have been involved with and draw conclusions from the answers to the questions asked
- Measures (within Year 1 mathematical limits) to help find out more about the investigations undertaken

# Year 2

Biology			Chemistry	
All living things and their habitats	Animals, including Humans	Plants	Everyday Materials	
<ul style="list-style-type: none"> <li>• <i>Alive or dead</i></li> <li>• <i>Habitats</i></li> <li>• <i>Adaptations</i></li> <li>• <i>Food chains</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Animal reproduction</i></li> <li>• <i>Healthy living</i></li> <li>• <i>Basic needs</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Plant and seed growth</i></li> <li>• <i>Plant reproduction</i></li> <li>• <i>Keeping plants healthy</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Identify different materials</i></li> <li>• <i>Name everyday materials</i></li> <li>• <i>Properties of materials</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Compare the use of different materials</i></li> <li>• <i>Compare movement on different surfaces</i></li> </ul>
<ul style="list-style-type: none"> <li>• Classify things by living, dead or never lived</li> <li>• Know how a specific habitat provides for the basic needs of things living there (plants and animals)</li> <li>• Match living things to their habitat</li> <li>• Name some different sources of food for animals</li> <li>• Know about and explain a simple food chain</li> </ul>	<ul style="list-style-type: none"> <li>• Know the basic stages in a life cycle for animals, (including humans)</li> <li>• Know why exercise, a balanced diet and good hygiene are important for humans</li> </ul>	<ul style="list-style-type: none"> <li>• Know and explain how seeds and bulbs grow into plants</li> <li>• Know what plants need in order to grow and stay healthy (water, light &amp; suitable temperature)</li> </ul>	<ul style="list-style-type: none"> <li>• Know how materials can be changed by squashing, bending, twisting and stretching</li> </ul>	<ul style="list-style-type: none"> <li>• Know why a material might or might not be used for a specific job</li> </ul>

## Year 2

### Working Scientifically

- Ask questions such as:
  - Why do some trees lose their leaves in Autumn and others do not?
  - How long are roots of tall trees?
  - Why do some animals have underground habitats?
- Use equipment such as thermometers and rain gauges to help observe changes to local environment as the year progresses
- Use microscopes to find out more about small creatures and plants
- Know how to set up a fair test and do so when finding out about how seeds grow best
- Classify or group things according to a given criteria, e.g. deciduous and coniferous trees
- Draw conclusions from fair tests and explain what has been found out
- Use measures (within Year 2 mathematical limits) to help find out more about the investigations they are engaged with

# Year 3

Year 3					
Biology			Chemistry	Physics	
Animals, including humans	Plants	Plants	Rocks	Forces	Light
<ul style="list-style-type: none"> <li>• <i>Skeleton and muscles</i></li> <li>• <i>Nutrition</i></li> <li>• <i>Exercise and health</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Plant life</i></li> <li>• <i>Basic structure and functions</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Life cycle</i></li> <li>• <i>Water transportation</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Fossil formation</i></li> <li>• <i>Compare and group rocks</i></li> <li>• <i>Soil</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Different Forces</i></li> <li>• <i>Magnets</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Reflections</i></li> <li>• <i>Shadows</i></li> </ul>
<ul style="list-style-type: none"> <li>• Know about the importance of a nutritious, balanced diet</li> <li>• Know how nutrients, water and oxygen are transported within animals and humans</li> <li>• Know about the skeletal and muscular system of a human</li> </ul>	<ul style="list-style-type: none"> <li>• Know the function of different parts of flowering plants and trees</li> </ul>	<ul style="list-style-type: none"> <li>• Know how water is transported within plants</li> <li>• Know the plant life cycle, especially the importance of flowers</li> </ul>	<ul style="list-style-type: none"> <li>• Compare and group rocks based on their appearance and physical properties, giving reasons</li> <li>• Know how soil is made and how fossils are formed</li> <li>• Know about and explain the difference between sedimentary, metamorphic and igneous rock</li> </ul>	<ul style="list-style-type: none"> <li>• Know about and describe how objects move on different surfaces</li> <li>• Know how a simple pulley works and use to on to lift an object</li> <li>• Know how some forces require contact and some do not, giving examples</li> <li>• Know about and explain how magnets attract and repel</li> <li>• Predict whether magnets will attract or repel and give a reason</li> </ul>	<ul style="list-style-type: none"> <li>• Know that dark is the absence of light</li> <li>• Know that light is needed in order to see and is reflected from a surface</li> <li>• Know and demonstrate how a shadow is formed and explain how a shadow changes shape</li> <li>• Know about the danger of direct sunlight and describe how to keep protected</li> </ul>

# Year 3

## Working Scientifically

<input type="checkbox"/> Ask questions such as: <ul style="list-style-type: none"> <li>• Why does the moon appear as different shapes in the night sky?</li> <li>• Why do shadows change during the day?</li> <li>• Where does a fossil come from?</li> </ul>	<input type="checkbox"/> Use a thermometer to measure temperature and know there are two main scales used to measure temperature
<input type="checkbox"/> Observe at what time of day a shadow is likely to be at its longest and shortest	<input type="checkbox"/> Gather and record information using a chart, matrix or tally chart, depending on what is most sensible
<input type="checkbox"/> Observe which type of plants grow in different places e.g. bluebells in woodland, roses in domestic gardens, etc.	<input type="checkbox"/> Group information according to common factors e.g. plants that grow in woodlands or plants that grow in gardens
<input type="checkbox"/> Use research to find out how reflection can help us see things that are around the corner	<input type="checkbox"/> Use bar charts and other statistical tables (in line with Year 3 mathematics statistics) to record findings
<input type="checkbox"/> Use research to find out what the main differences are between sedimentary and igneous rocks	<input type="checkbox"/> Know how to use a key to help understand information presented on a chart
<input type="checkbox"/> Test to see which type of soil is most suitable when growing two similar plants	<input type="checkbox"/> Be confident to stand in front of others and explain what has been found out, for example about how the moon changes shape
<input type="checkbox"/> Test to see if their right hand is as efficient as their left hand	<input type="checkbox"/> Present findings using written explanations and include diagrams when needed
<input type="checkbox"/> Set up a fair test with different variables e.g. the best conditions for a plant to grow	<input type="checkbox"/> Make sense of findings and draw conclusions which help them to understand more about scientific information
<input type="checkbox"/> Explain to a partner why a test is a fair one e.g. lifting weights with right and left hand, etc.	<input type="checkbox"/> Amend predictions according to findings
<input type="checkbox"/> Measure carefully (taking account of mathematical knowledge up to Year 3) and add to scientific learning	<input type="checkbox"/> Be prepared to change ideas as a result of what has been found out during a scientific enquiry

# Year 4

Biology		Chemistry	Physics	
Animals, including humans	All living things and their habitats	States of Matter	Electricity	Sound
<ul style="list-style-type: none"> <li>• Digestive system</li> <li>• Teeth</li> <li>• Food chains</li> </ul>	<ul style="list-style-type: none"> <li>• Grouping living things</li> <li>• Classification keys</li> <li>• Adaptation of living things</li> </ul>	<ul style="list-style-type: none"> <li>• Compare and group materials</li> <li>• Solids, liquids and gases</li> <li>• Changing state</li> <li>• Water cycle</li> </ul>	<ul style="list-style-type: none"> <li>• Uses of electricity</li> <li>• Simple circuits and switches</li> <li>• Conductors and insulators</li> </ul>	<ul style="list-style-type: none"> <li>• How sounds are made</li> <li>• Sound vibrations</li> <li>• Pitch and Volume</li> </ul>
<ul style="list-style-type: none"> <li>• Identify and name the parts of the human digestive system</li> <li>• Know the functions of the organs in the human digestive system</li> <li>• Identify and know the different types of human teeth</li> <li>• Know the functions of different human teeth</li> <li>• Use and construct food chains to identify producers, predators and prey</li> </ul>	<ul style="list-style-type: none"> <li>• Use classification keys to group, identify and name living things</li> <li>• Know how changes to an environment could endanger living things</li> </ul>	<ul style="list-style-type: none"> <li>• Know the temperature at which materials change state</li> <li>• Know about and explore how some materials can change state</li> <li>• Know the part played by evaporation and condensation in the water cycle</li> <li>• Group materials based on their state of matter (solid, liquid or gas)</li> </ul>	<ul style="list-style-type: none"> <li>• Identify and name appliances that require electricity to function</li> <li>• Construct a series circuit</li> <li>• Identify and name the components in a series circuit (including cells, wires, bulbs, switches and buzzers)</li> <li>• Predict and test whether a lamp will light within a circuit</li> <li>• Know the function of a switch</li> <li>• Know the difference between a conductor and an insulator; giving examples of each</li> </ul>	<ul style="list-style-type: none"> <li>• Know how sound is made, associating some of them with vibrating</li> <li>• Know how sound travels from a source to our ears</li> <li>• Know the correlation between pitch and the object producing a sound</li> <li>• Know the correlation between the volume of a sound and the strength of the vibrations that produced it</li> <li>• Know what happens to a sound as it travels away from its source</li> </ul>

# Year 4

## Working Scientifically

<input type="checkbox"/> Ask questions such as: <ul style="list-style-type: none"> <li>• Why are steam and ice the same thing?</li> <li>• Why is the liver important in the digestive systems?</li> <li>• What do we mean by 'pitch' when it comes to sound?</li> </ul>	<input type="checkbox"/> Gather and record information using a chart, matrix or tally chart, depending on what is most sensible
<input type="checkbox"/> Use research to find out how much time it takes to digest most of our food	<input type="checkbox"/> Group information according to common factors e.g. materials that make good conductors or insulators  <input type="checkbox"/> Use bar charts and other statistical tables (in line with Year 4 mathematics statistics) to record findings
<input type="checkbox"/> Use research to find out which materials make effective conductors and insulators of electricity	<input type="checkbox"/> Present findings using written explanations and include diagrams, when needed
<input type="checkbox"/> Carry out tests to see, for example, which of two instruments make the highest or lowest sounds and to see if a glass of ice weighs the same as a glass of water	<input type="checkbox"/> Write up findings using a planning, doing and evaluating process
<input type="checkbox"/> Set up a fair test with more than one variable e.g. using different materials to cut out sound	<input type="checkbox"/> Make sense of findings and draw conclusions which helps them understand more about the scientific information that has been learned
<input type="checkbox"/> Explain to others why a test that has been set up is a fair one e.g. discover how fast ice melts in different temperatures	<input type="checkbox"/> When making predictions there are plausible reasons as to why they have done so
<input type="checkbox"/> Measure carefully (taking account of mathematical knowledge up to Year 4) and add to scientific learning	<input type="checkbox"/> Able to amend predictions according to findings
<input type="checkbox"/> Use a data logger to check on the time it takes ice to melt to water in different temperatures	<input type="checkbox"/> Prepared to change ideas as a result of what has been found out during a scientific enquiry
<input type="checkbox"/> Use a thermometer to measure temperature and know there are two main scales used to measure temperature	

# Year 5

<b>Biology</b>		<b>Chemistry</b>	<b>Physics</b>	
<b>All living things and their habitats</b>	<b>Animals, including humans</b>	<b>Properties and changes in materials</b>	<b>Forces</b>	<b>Earth and Space</b>
<ul style="list-style-type: none"> <li>• <i>Life cycles – plants and animals</i></li> <li>• <i>Reproductive processes</i></li> <li>• <i>Famous naturalists</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Changes as humans develop from birth to old age</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Compare properties of everyday materials</i></li> <li>• <i>Soluble/ dissolving</i></li> <li>• <i>Reversible and irreversible substances</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Gravity</i></li> <li>• <i>Friction</i></li> <li>• <i>Forces and motion of mechanical devices</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Movement of the Earth and the planets</i></li> <li>• <i>Movement of the Moon</i></li> <li>• <i>Night and day</i></li> </ul>
<ul style="list-style-type: none"> <li>• Know the life cycle of different living things e.g. mammal, amphibian, insect and bird</li> <li>• Know the differences between different life cycles</li> <li>• Know the process of reproduction in plants</li> <li>• Know the process of reproduction in animals</li> </ul>	<ul style="list-style-type: none"> <li>• Create a timeline to indicate stages of growth in humans</li> </ul>	<ul style="list-style-type: none"> <li>• Compare and group materials based on their properties (e.g. hardness, solubility, transparency, conductivity, [electrical &amp; thermal], and response to magnets</li> <li>• Know and explain how a material dissolves to form a solution</li> <li>• Know and show how to recover a substance from a solution</li> <li>• Know and demonstrate how some materials can be separated (e.g. through filtering, sieving and evaporating)</li> <li>• Know and demonstrate that some changes are reversible and some are not</li> <li>• Know how some changes result in the formation of a new material and that this is usually irreversible</li> </ul>	<ul style="list-style-type: none"> <li>• Know what gravity is and its impact on our lives</li> <li>• Identify and know the effect of air and water resistance</li> <li>• Identify and know the effect of friction</li> <li>• Explain how levers, pulleys and gears allow a smaller force to have a greater effect</li> </ul>	<ul style="list-style-type: none"> <li>• Know about and explain the movement of the Earth and other planets relative to the Sun</li> <li>• Know about and explain the movement of the Moon relative to the Earth</li> <li>• Know and demonstrate how night and day are created</li> <li>• Describe the Sun, Earth and Moon (using the term spherical)</li> </ul>

## Year 5

### Working Scientifically

<input type="checkbox"/> Set up an investigation when it is appropriate e.g. finding out which materials dissolve or not	<input type="checkbox"/> Able to present information related to scientific enquiries in a range of ways including using IT such as power-point and iMovie
<input type="checkbox"/> Set up a fair test when needed e.g. which surfaces create most friction?	<input type="checkbox"/> Use diagrams, as and when necessary, to support writing
<input type="checkbox"/> Set up an enquiry based investigation e.g. find out what adults / children can do now that they couldn't when a baby	<input type="checkbox"/> Is evaluative when explaining findings from scientific enquiry
<input type="checkbox"/> Know what the variables are in a given enquiry and can isolate each one when investigating e.g. finding out how effective parachutes are when made with different materials	<input type="checkbox"/> Clear about what has been found out from recent enquiry and can relate this to other enquiries, where appropriate
<input type="checkbox"/> Use all measurements as set out in Year 5 mathematics (measurement), including capacity and mass	<input type="checkbox"/> Their explanations set out clearly why something has happened and its possible impact on other things
<input type="checkbox"/> Use other scientific instruments as needed e.g. thermometer, rain gauge, spring scales (for measuring Newtons)	<input type="checkbox"/> Able to give an example of something focused on when supporting a scientific theory e.g. how much easier it is to lift a heavy object using pulleys
<input type="checkbox"/> Able to record data and present them in a range of ways including diagrams, labels, classification keys, tables, scatter graphs and bar and line graphs	<input type="checkbox"/> Keep an on-going record of new scientific words that they have come across for the first time
<input type="checkbox"/> Make predictions based on information gleaned from investigations	<input type="checkbox"/> Able to relate causal relationships when, for example, studying life cycles
<input type="checkbox"/> Create new investigations which take account of what has been learned previously	<input type="checkbox"/> Frequently carry out research when investigating a scientific principle or theory

# Year 6

Biology			Physics	
Animals, including humans	All living things and their habitats	Evolution and Inheritance	Electricity	Light
<ul style="list-style-type: none"> <li>• The circulatory system</li> <li>• Water transportation</li> <li>• Impact of exercise on body</li> </ul>	<ul style="list-style-type: none"> <li>• Classification of living things and the reasons for it</li> </ul>	<ul style="list-style-type: none"> <li>• Identical and non identical off-spring</li> <li>• Fossil evidence and evolution</li> <li>• Adaptation and evolution</li> </ul>	<ul style="list-style-type: none"> <li>• Electrical components</li> <li>• Simple circuits</li> <li>• Fuses and voltage</li> </ul>	<ul style="list-style-type: none"> <li>• How light travels</li> <li>• Reflection</li> <li>• Ray models of light</li> </ul>
<ul style="list-style-type: none"> <li>• Identify and name the main parts of the human circulatory system</li> <li>• Know the function of the heart, blood vessels and blood</li> <li>• Know the impact of diet, exercise, drugs and lifestyle on health</li> <li>• Know the ways in which nutrients and water are transported in animals, including humans</li> </ul>	<ul style="list-style-type: none"> <li>• Classify living things into broad groups according to observable characteristics and based on similarities and differences</li> <li>• Know how living things have been classified</li> <li>• Give reasons for classifying plants and animals in a specific way</li> </ul>	<ul style="list-style-type: none"> <li>• Know how the Earth and living things have changed over time</li> <li>• Know how fossils can be used to find out about the past</li> <li>• Know about reproduction and offspring (recognising that offspring normally vary and are not identical to their parents)</li> <li>• Know how animals and plants are adapted to suit their environment</li> <li>• Link adaptation over time to evolution</li> <li>• Know about evolution and can explain what it is</li> </ul>	<ul style="list-style-type: none"> <li>• Compare and give reasons for why components work and do not work in a circuit</li> <li>• Draw circuit diagrams using correct symbols</li> <li>• Know how the number and voltage of cells in a circuit links to the brightness of a lamp or the volume of a buzzer</li> </ul>	<ul style="list-style-type: none"> <li>• Know how light travels</li> <li>• Know and demonstrate how we see objects</li> <li>• Know why shadows have the same shape as the object that casts them</li> <li>• Know how simple optical instruments work e.g. periscope, telescope, binoculars, mirror, magnifying glass etc.</li> </ul>

## Year 6

### Working Scientifically

<input type="checkbox"/> Know which type of investigation is needed to suit particular scientific enquiry e.g. looking at the relationship between pulse and exercise	<input type="checkbox"/> Use a range of written methods to report findings, including focusing on the planning, doing and evaluating phases
<input type="checkbox"/> Set up a fair test when needed e.g. does light travel in straight lines?	<input type="checkbox"/> Clear about what has been found out from their enquiry and can relate this to others in class
<input type="checkbox"/> Know how to set up an enquiry based investigation e.g. what is the relationship between oxygen and blood?	<input type="checkbox"/> Explanations set out clearly why something has happened and its possible impact on other things
<input type="checkbox"/> Know what the variables are in a given enquiry and can isolate each one when investigating	<input type="checkbox"/> Aware of the need to support conclusions with evidence
<input type="checkbox"/> Justify which variable has been isolated in scientific investigation	<input type="checkbox"/> Keep an on-going record of new scientific words that they have come across for the first time and use these regularly in future scientific write ups
<input type="checkbox"/> Use all measurements as set out in Year 6 mathematics (measurement), including capacity, mass, ratio and proportion	<input type="checkbox"/> Use diagrams, as and when necessary, to support writing and be confident enough to present findings orally in front of the class
<input type="checkbox"/> Able to record data and present them in a range of ways including diagrams, labels, classification keys, tables, scatter graphs and bar and line graphs	<input type="checkbox"/> Able to give an example of something they have focused on when supporting a scientific theory e.g. classifying vertebrate and invertebrate creatures or why certain creatures choose their unique habitats
<input type="checkbox"/> Make accurate predictions based on information gleaned from their investigations and create new investigations as a result	<input type="checkbox"/> Frequently carry out research when investigating a scientific principle or theory
<input type="checkbox"/> Able to present information related to scientific enquiries in a range of ways including using IT such as power-point, animoto and iMovie	