

## Topic 3: Organisms

### What's the science story?

Organisms, living and dead, are made up of cells. Cells are made of molecules organised into membranes and other structures. Most cells are too small to be seen with the naked eye but can be seen using a light microscope. There are many different types of cells with different shapes and sizes, but all cells are made up of common parts: all cells have a genome and cytoplasm contained by a cell membrane; all animal and plant cells store their genome within a nucleus, and they also have mitochondria; plant cells additionally have a cell wall and can have chloroplasts and a vacuole. These parts have common functions in all cells.

A single cell can carry out all the processes of life. An organism may be made up of a single cell or many cells working together. This is why scientists think of cells as the basic units of life. To stay alive, cells need a constant supply of energy and molecules for chemical reactions, and they need to get rid of waste. Molecules move through the cytoplasm by diffusion, and some molecules can enter and leave a cell by diffusing through the cell membrane.

In a multicellular organism the cells are organised into tissues, organs and organ systems that work together to support the life processes of cells to keep the organism alive. Humans and other animals have a skeleton and muscles, which are types of tissue made up of cells. Bones provide support and protection for organs. Bones and muscles work together to enable humans to move around, and muscles have vital roles in organs and organ systems.



### Previous knowledge:

#### KS2 – Yr 5/6

Living things and habitats  
Animals, including humans

### Next steps...

#### KS3

Yr8 - Body systems

Yr9 - Photosynthesis & Respiration

#### KS4

Yr 10 - B1 Cell Biology

Yr 10 - B2 Organisation



### Keywords

Cell  
Organism  
Nucleus  
Cytoplasm  
Cell membrane  
Mitochondria  
Cell wall

Chloroplast  
Vacuole  
Tissue  
Organ  
Organ system  
Magnification  
Specialised

Diffusion  
Unicellular  
Multicellular  
Hierarchy  
Antagonist  
Menstrual cycle  
Fertilisation

Gametes  
Gestation  
Pregnancy  
Pollination  
Dispersal  
Ecosystem  
Interdependence

Lesson No. and Title	Learning objectives	National Curriculum	Working scientifically skills	Practical equipment
1. Observing cells  <i>Possible exit ticket - microscopes</i>	ARE – To explain how to use a microscope and state the magnification. AGD – To calculate a range of magnifications.	<ul style="list-style-type: none"> <li>cells as the fundamental unit of living organisms, including how to observe, interpret and record cell structure using a light microscope</li> </ul>		<b>PRAC—Observe prepared slides under microscope</b> Microscopes and prepared slides  <b>WS8</b> – Reading and using a given method <b>WS10</b> – Selecting the correct equipment
2. Cells	ARE – To correctly draw and label a plant and animal cell. AGD – To explain the functions of the components of animal and plant cells.	<ul style="list-style-type: none"> <li>the functions of the cell wall, cell membrane, cytoplasm, nucleus, vacuole, mitochondria and chloroplasts</li> </ul>		
3. Plant and animal cells	ARE – To compare animal and plant cells. AGD – To decide whether a cell is an animal or plant cell using evidence.	<ul style="list-style-type: none"> <li>the similarities and differences between plant and animal cells</li> </ul>		<b>PRAC—Preparing own onion skin cell slide and cheek cells</b> Onion, slides, cover slips, microscopes, stain, tweezers, pointers, cotton buds  <b>WS11</b> - Hazards
4. Specialised cells	ARE – To describe the structural adaptations of cells. AGD – To link the structure to the function of specialised cells.	<ul style="list-style-type: none"> <li>the functions of the cell wall, cell membrane, cytoplasm, nucleus, vacuole, mitochondria and chloroplasts</li> <li>the similarities and differences between plant and animal cells</li> </ul>		
<b>Assessment 1: Animal and plant cells</b>				

KS3 – Year 7

5. Diffusion	<p>ARE – To describe the process of diffusion.            AGD – To apply diffusion to a range of examples in cells.</p>	<ul style="list-style-type: none"> <li>the role of diffusion in the movement of materials in and between cells</li> </ul>		<p><b>PRAC—Investigating diffusion using water and food colouring</b>            Petri dishes, food colouring, pipettes, stop watches, 250ml beakers, kettles</p> <p><b>WS11 - Hazards</b></p>
6. Unicellular organisms	<p>ARE – To describe the structure of an amoeba and euglena.            AGD – To explain what a unicellular organism is and give detailed examples.</p>	<ul style="list-style-type: none"> <li>the structural adaptations of some unicellular organisms</li> </ul>		<p><b>PRAC—Observing unicellular organisms under the microscope</b>            Microscopes and prepared slides</p> <p><b>WS8 – Reading and using a given method</b></p>
7. Levels of organisation	<p>ARE – To explain the hierarchy of organisation in a multicellular organism.            AGD – To interpret information to explain the functions of organ systems.</p>	<ul style="list-style-type: none"> <li>the hierarchical organisation of multicellular organisms: from cells to tissues to organs to systems to organisms</li> </ul>		
<b>Assessment 2: Unicellular</b>				
8. The skeletal system	<p>ARE – To describe the functions of the muscular skeletal system.            AGD – To explain the relationship between bones and joints in the skeleton.</p>	<ul style="list-style-type: none"> <li>the structure and functions of the human skeleton, to include support, protection, movement and making blood cells</li> <li>biomechanics – the interaction between skeleton and muscles, including the measurement of force exerted by different muscles</li> </ul>		<p><b>PRAC—Dissection of chicken wing</b>            Chicken wings, scalpels, scissors, tiles, disinfectant, bin bag</p> <p><b>WS11 - Hazards</b></p>
9. The muscular system	<p>ARE – To observe how muscles work together in a chicken wing.            AGD – To explain how muscles interact with tissues to cause movement.</p>	<ul style="list-style-type: none"> <li>the function of muscles and examples of antagonistic muscles</li> </ul>		

**KS3 – Year 7**

10. The reproductive system	<p>ARE – Describe the functions of the main structures of the male and female reproductive system.            AGD – Link adaptations of structures to function.</p>	<ul style="list-style-type: none"> <li>reproduction in humans (as an example of a mammal), including the structure and function of the male and female reproductive systems</li> </ul>		
11. Fertilisation	<p>ARE – To describe the process of fertilisation and implantation.            AGD – To discuss some possible causes of infertility.</p>	<ul style="list-style-type: none"> <li>naming the gametes of both male and female and the process of fertilisation</li> </ul>		
12. Menstrual cycle	<p>ARE – Identify key events in the menstrual cycle.            AGD – Present information in a scaled timeline or pie chart.</p>	<ul style="list-style-type: none"> <li>menstrual cycle (without details of hormones)</li> </ul>		
13. Gestation and birth	<p>ARE – To describe what happens during pregnancy.            AGD – To compare the gestation periods of a range of organism.</p>	<ul style="list-style-type: none"> <li>gestation and birth, to include the effect of maternal lifestyle on the foetus through the placenta</li> </ul>		
<b>Assessment 3: Fertilisation</b>				
14. Plant reproduction	<p>ARE – To explain how plants reproduce.            AGD – To justify the importance of plant reproduction through insect pollination.</p>	<ul style="list-style-type: none"> <li>reproduction in plants, including flower structure, wind and insect pollination, fertilisation, seed and fruit formation and dispersal, including quantitative investigation of some dispersal mechanisms</li> <li>the importance of plant reproduction through insect pollination in human food security</li> </ul>		<p><b>PRAC: Seed dispersal by Wind</b>            Some fruit with seeds, metre ruler, masking tape, electric fans</p> <p><b>PRAC: Flower dissection</b>            Range of flowers (rose, lilly), white tiles, scalpels, tweezers</p> <p><b>WS11 - Hazards</b></p>
<b>Assessment 4: Flower fertilisation</b>				

<p>15. Interdependence</p>	<p>ARE – To construct a food web. AGD – To explain the importance of all the organisms in an ecosystem.</p>	<ul style="list-style-type: none"> <li>the interdependence of organisms in an ecosystem, including food webs and insect pollinated crops</li> </ul>		
<p>16. Our environment</p>	<p>ARE – To explain how organisms can affect their environment. AGD – To explain the process of bioaccumulation and the problems it can cause.</p>	<ul style="list-style-type: none"> <li>how organisms affect, and are affected by, their environment, including the accumulation of toxic materials</li> </ul>		
<p><b>Assessment 4: Feeding relationships</b></p>				



**Assessment Criteria (part 1)**



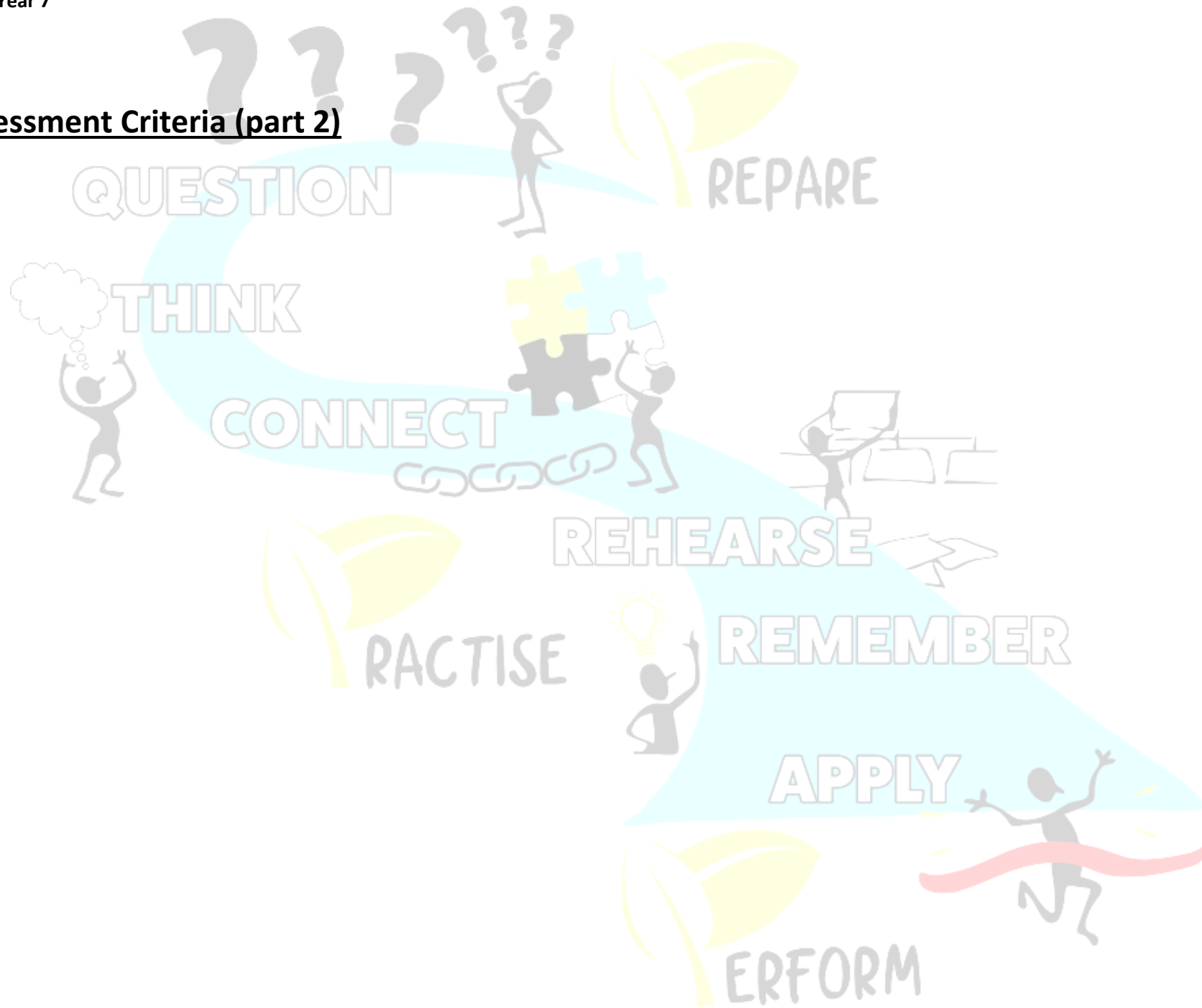
QUESTION

PREPARE

Assessment No. & Title	Working Towards	Age Related Expectations	At Greater Depth
n/a	Describe how to use a microscope to observe a cell	Explain how to use a microscope to observe a cell	Explain what each part of the microscope does and how it is used
1. Animal and plant cells	Identify one similarity and one difference between a plant and an animal cell.	Describe the similarities and differences between plant and animal cells	Explain the functions of the components of a cell by linking them to life processes
	Match some components of a cell to their functions	Describe the functions of the components of a cell	
	Name some examples of specialised animal and plant cells.	Describe examples of specialised animal and plant cells	Describe examples of specialised animal and plant cells, linking structure and function
n/a	Identify substances that move into or out of cells.	Describe the process of diffusion	Explain the process of diffusion
2. Unicellular	Define unicellular.	Describe what a unicellular organism is	Explain what a unicellular organism is and give detailed examples
	State the sequence of the hierarchy of organisation in a multicellular organism	Describe the structure of an amoeba	Describe the structure and function of an amoeba
	Name an example of a unicellular organism	Describe the structure of a euglena	Describe the structure and function of a euglena.
	Identify some structures in an amoeba and a euglena	Explain the hierarchy of organisation in a multicellular organism	Explain the hierarchy of organisation in a multicellular organism
n/a	List the functions of the skeletal system	Describe the functions of the skeletal system	Describe the functions of the skeletal system
	State how a muscle exerts force during movement.	Explain how to measure the force exerted by different muscles	Explain how to measure the force exerted by different muscles

ERFORM

Assessment Criteria (part 2)



Assessment No. & Title	Working Towards	Age Related Expectations	At Greater Depth
n/a	State the changes of the bodies of boys and girls during puberty	Describe the main changes which take place during puberty	Explain the main changes that take place during puberty
	Name the main structures of the male and female reproductive structures	Describe the function of the main structures in the male and female reproductive systems	
3. Fertilisation	State the definitions of gametes and fertilisation	Describe the process of fertilisation	Explain the sequence of fertilisation and implantation
	State the definition of gestation	Describe what happens during gestation and child birth	Explain in detail how contractions bring about birth
n/a	State the main stages in the menstrual cycle	Describe the main stages of the menstrual cycle	Explain the role of the menstrual cycle in reproduction
n/a	Name the parts of a flower	Describe the differences between wind pollinated and insect pollinated plants	Explain how the structures of the flower are adapted to their function
4. Flower fertilisation	Name two methods of pollination	Describe the process of fertilisation in plants	Explain the process of fertilisation in plants, explaining the role of each of the parts involved in the process.
	State what is meant by fertilisation in plants	Describe how seeds and fruits are formed	Explain how the adaptations of seeds aid dispersal
	Name the methods of seed dispersal	Describe how a seed is adapted to its method of dispersal.	
5. Feeding relationships	State the definition of a food chain and a food web.	Describe what food webs and food chains show	Explain why a food web gives a more accurate representation of feeding relationships than a food chain.
	State that one population can affect another.	Describe the interdependence of organisms.	
			Describe how toxic materials can accumulate in a food web.