YEAR 8 WORK PACK: SCIENCE
**SCIENCE**

**MESSAGE FROM THE HEAD OF DEPARTMENT**

Hi. In the next four weeks you will be exploring unicellular organisms. You will discover what they are and the different types; also the scientist who showed resilience in discovering them.

**USEFUL WEBSITES**

1. [https://www.bbc.co.uk/bitesize/topics/znyvcdm/articles/z4f26yc](https://www.bbc.co.uk/bitesize/topics/znyvcdm/articles/z4f26yc)
2. [https://www.bbc.co.uk/bitesize/guides/z9hyvcw/revision/5](https://www.bbc.co.uk/bitesize/guides/z9hyvcw/revision/5)
3. [https://www.bbc.co.uk/bitesize/guides/ztpw4j6/revision/2](https://www.bbc.co.uk/bitesize/guides/ztpw4j6/revision/2)

<table>
<thead>
<tr>
<th>Week beginning</th>
<th>Lesson Title</th>
<th>Tasks</th>
<th>Resources</th>
</tr>
</thead>
</table>
| 15.06.20       | Lesson 1 Unicellular organisms | Task 1 - find the meaning of the key words cells / microorganism / multicellular / unicellular  
Task 2 - read page 54-55 on ‘Unicellular organisms’ answer all questions  
Extension - Draw and label a diagram of a Cell | Exploring science 2  
Read page 54-55 on ‘Unicellular organisms’ |
| 22.06.20       | Lesson 2 Microscopic fungi    | Task 1 find the meaning of the key words aerobic / anaerobic  
Task 2 - read page 56-57 on ‘Microscopic fungi’ answer all questions and draw a labelled diagram of a fungi  
Extension - Research and make a list of different types of fungi | Exploring science 2 -  
Read page 56-57 on ‘Microscopic fungi’ |
| 29.06.20       | Lesson 3 Modal verbs in science | Task 1 - Read page 58-59 on modal verbs. Answer all questions  
Extension - Write a summary of who Louis Pasteur was and what he discovered. | Exploring science 2 -  
Read page 58-59 on modal verbs |
| 06.07.20       | Lesson 4 Bacteria             | Task 1 - find the meanings of the keywords enzymes / binary fission / chromosomes  
Task 2 Read page 60-61. Answer all questions  
Extension - can you create a 3D model of a bacteria | Exploring science 2 -  
Read page 60-61 |

Also see the key words list and summary sheets at the end of this section.
UNICELLULAR OR MULTICELLULAR

HOW DO DIFFERENT SPECIES OF UNICELLULAR ORGANISM VARY?

An organism is a living thing. All organisms carry out seven life processes: movement, reproduction, sensitivity, growth, respiration, excretion, nutrition.

Organisms are all based on cells. Organisms made of many cells are said to be multicellular. An adult human is made up of about 37 million million cells!

Cells of the same type are grouped together as tissues. Different tissues form organs and organs work together in organ systems. Large multicellular organisms use organ systems to help them carry out the life processes.

1. Name one organ system that helps humans carry out each life process.


Some organisms are made of just one cell but this cell still carries out all seven life processes. One-celled organisms are described as being unicellular. They are also called microorganisms because they are very small. You usually need a microscope to see them.

Diffusion

All matter is made of particles that are constantly moving. So particles can travel from one place to another without anything moving them. This is diffusion. Materials, such as oxygen, that a unicellular organism needs can diffuse into the cell and diffuse around inside the cell. There is a limit, though, because if a cell were too big, it might not be able to fill up with all the materials it needs quickly enough.

The tissues in multicellular organisms need to have raw materials transported to them because diffusion would be too slow.

3. Why might a unicellular organism need oxygen?

4. How does oxygen get into a unicellular organism?

5. a] Which organ system transports materials to all the cells in a human's body?
b] Why do multicellular organisms need efficient transport systems?

A This animal is a type of sea cucumber. The tissue that covers it is transparent so you can see the different organs in its digestive system.

D Diffusion fills this cell with enough of the materials.

B Diffusion may not be fast enough to allow a larger cell to get enough of the materials it needs.

FACT

Most unicellular organisms are microscopic but a bubble alga consists of one cell that can grow up to 5 cm in diameter.

Microorganisms and kingdoms

Organisms are classified into five kingdoms based on what their cells look like.

Yersinia pestis, which causes plague, is a bacterium. All bacteria are in the prokaryote kingdom. Unicellular protocists are larger than bacteria. Unicellular fungi (e.g. yeasts) are usually smaller than protocists but bigger than bacteria.

Viruses cause diseases like chicken pox, influenza (flu) and measles. However, they are not living things because they cannot live without being inside a living cell; they do not carry out the life processes for themselves.

C

<table>
<thead>
<tr>
<th>Prokaryotes</th>
<th>Protocists</th>
<th>Fungi</th>
<th>Plants</th>
<th>Animals</th>
</tr>
</thead>
<tbody>
<tr>
<td>(all unicellular)</td>
<td>(mainly unicellular)</td>
<td>(mainly multicellular)</td>
<td>(all multicellular)</td>
<td>(all multicellular)</td>
</tr>
</tbody>
</table>

Cytosol ✓ ✓ ✓ ✓ ✓
cell membrane ✓ ✓ ✓ ✓ ✓
nucleus X ✓ ✓ ✓ ✓
mitochondria X ✓ ✓ ✓ X
cell wall ✓ X/N (some only) ✓ ✓ X
chloroplasts X ✓ ✓ ✓ X

FACT

There are two members of the same kingdom in figure D. Which kingdom?

One cell from an organism has a cell wall but no mitochondria. Will this organism be unicellular or multicellular? Explain your reasoning.

Which kingdoms contain organisms that can make their own food?

a] Suggest why viruses are not microorganisms.
b] Why is there no virus kingdom?

I can ...

- use cell features to identify members of different kingdoms
- explain differences between unicellular and multicellular organisms.
Microscopic Fungi

How do we use microscopic fungi?

Ringworm is a common skin disease. It was thought to be caused by worms until the 1840s, when David Gruby (1810–1898) used a microscope to discover a fungus in the 'ring'. This was evidence that a microorganism caused the disease.

Advances in microscopes in the 19th century allowed more discoveries of microscopic fungi. Unicellular yeasts were discovered and were seen to use budding to reproduce. Budding is a type of asexual reproduction in which a daughter cell grows out of a parent cell.

Baking

We now know that, compared with anaerobic respiration, aerobic respiration releases more energy for yeast cells and also produces much more carbon dioxide:

\[
\text{glucose + oxygen} \rightarrow \text{carbon dioxide} + \text{water} \\
\text{(a sugar)}
\]

Bread dough is stretched and folded to get air into it. The yeast cells respire aerobically and bubbles of gas make the dough rise.

Brewing

The anaerobic respiration of microorganisms is called fermentation. When wine and beer are being made, air is kept out of the juice mixture to make sure it ferments.

\[
\text{glucose} \rightarrow \text{carbon dioxide} + \text{ethanol} \\
\text{(a sugar)}
\]

**What liquid is produced when yeast cells ferment?**

**Why do wine-makers stop air getting into a fermenting mixture?**

**If bread dough is made so that it contains very little air; the dough still rises a bit. What process allows this to happen?**

Growth curves

For yeast cells to grow and reproduce they need resources such as moisture, sugar and warmth. This is why bread dough is left in a warm place for it to rise. A few yeast cells soon become millions but the population of cells will not keep growing forever. Eventually the sugar runs out and the population stops growing. Something that slows down or stops a process is called a limiting factor.

**How a yeast population changes with time**

As the glucose starts to run out (becomes a limiting factor), the growth of the population slows down. Soon the population stops growing and the line becomes level.

**Facts**

To make champagne, wine is put into bottles with sugar and yeast. Fermentation occurs but the carbon dioxide cannot escape and makes the wine fizzy. Champagne bottles are very thick to withstand the pressure of the gas inside them.

The famous champagne-making monk, Dom Pérignon (1638–1715), started out by trying to prevent wines going fizzy and breaking the bottles. It was an English scientist, Christopher Merrett (1614–1695), who first began making fizzy wines.

**I can...**

* explain how yeasts are used in brewing and baking
* describe how yeasts reproduce and the factors that limit this.
**MODAL VERBS**

**HOW DO SCIENTISTS USE MODAL VERBS TO SHOW DEGREES OF CERTAINTY?**

Modal verbs are used to change the meanings of other verbs. Scientists often use them to express how sure they are about something. Modal verbs are shown on the right.

- can
- could
- may
- might
- must
- ought to
- shall
- should
- will
- would

The theory of spontaneous generation might be wrong.

The theory could be wrong.

The theory must be proved wrong.

These things are swimming so must be living things. I will call them animals.

Spontaneous generation could still be correct for microorganisms.

However, many scientists still thought that microorganisms could be created by spontaneous generation, even if larger animals were not.

The argument was settled by Louis Pasteur (1822–1895).

Antoni Van Leeuwenhoek (1632–1723) first saw microorganisms, using a simple microscope. He was certain they were living.

**Pasteur**

The last two scenes in cartoon A show the work of Louis Pasteur. Pasteur put the same volume of broth (soup made by boiling meat and bones) into two flasks. One flask had a straight neck and the other an S-shaped neck. Pasteur thought that microorganisms in the air would fall into the broth in the flask with a straight neck but would get trapped in the S-shaped neck in the other flask. Pasteur then boiled the broth in both flasks to kill any microorganisms.

After a few weeks, the broth in the straight-necked flask was cloudy and full of microorganisms but the broth in the other flask was clear.

**1.** Write a conclusion that Pasteur might have made from his experiment. Use a modal verb to express certainty.

**2.** Write a comment from the scientist in scene 4 of cartoon A about Pasteur’s result. Use a modal verb to express certainty.

**3.** Pasteur and other scientists started to wonder whether microorganisms cause some diseases. Write one sentence to say that:

a) you are sure this is true
b) you are not very sure this is true.

**A** | Can you find the modal verbs?
BACTERIA
WHAT ARE THE FEATURES OF BACTERIA?

In 1856, a French brewing company was having problems fermenting sugar beet juice. Instead of ethanol (alcohol), some fermentation vats contained a very sour substance. The owner called in Louis Pasteur to solve the mystery.

Pasteur found that the sour substance was lactic acid (also found in sour milk). He examined samples from different vats under a microscope. In the vats that contained ethanol, Pasteur found yeast cells. However, in the vats that had gone sour he found much smaller cells — bacteria.

A | yeast and lactic acid bacteria, shown in different colours (× 4000)

Bacteria are prokaryotes. Members of this kingdom do not have nuclei, and the information needed to control a cell is found in a circular chromosome.

Some bacteria swim using flagella (pronounced 'fla-jel-la'). Each flagellum spins to move a cell forward, similar to the movement of a boat's propeller.

Different species of bacteria have different shapes and sizes. They can be identified using a statement key, such as the one shown in figure B.

Yoghurt and cheese
Lactic acid bacteria are used to turn milk into yoghurt. The lactic acid they produce turns the milk sour and thickens it, which is why unsweetened yoghurt tastes sour. These bacteria are often used to make the sour milk needed to make cheese.

When a cell has grown big enough, it can divide into two.

When a cell has grown big enough, it can divide into two.

A | This bacterium causes cholera, a disease that causes terrible diarrhoea and vomiting. It often kills people.

B | binary fission in a species of bacterium that causes food poisoning (× 8000)

E | These bacteria cause sore throats. They cannot swim.

C

1. shaped like a straight rod
2. not shaped like a straight rod

GO TO 2
GO TO 5

GO TO 2
GO TO 5

2. can swim
cannot swim

GO TO 3
GO TO 4

Pseudomonas aeruginosa
Salmonella typhimurium

GO TO 4

3. one flagellum
many flagella

Lactobacillus delbrueckii
Yersinia pestis

GO TO 6

4. long, thin, with smooth outer layer
short, with rough outer layer

Vibrio cholerae
Staphylococcus aureus
Streptococcus pyogenes

GO TO 6

5. round shape
comma-shaped

3. long, thin, with smooth outer layer
short, with rough outer layer

Vibrio cholerae
Staphylococcus aureus
Streptococcus pyogenes

GO TO 6

6. in groups, like bunches of grapes
in a chain

I CAN ...
- explain why anaerobic bacteria are used to make yoghurt and cheese
- describe the functions of the parts of a bacterial cell
- describe how bacteria reproduce
- use a statement key.

F | At the top, choose the description that matches your bacterium. Follow the 'GO TO' instruction to find the next pair of sentences. Keep choosing sentences until you get to a name.
Protoctists

There are many different types of protoctist and some can photosynthesise:

\[
\text{carbon dioxide + water} \rightarrow \text{glucose + oxygen}
\]

Photosynthesising protoctists are therefore producers in a food chain, for example:

\[
\text{algae} \rightarrow \text{pond snail} \rightarrow \text{minnow} \rightarrow \text{grey heron}
\]

(producer) (consumer, herbivore) (consumers, carnivores, predators)

Some protoctists move using pseudopods, while others use cilia and others use flagella.

Growth

All microorganisms need warmth, food and moisture to grow well. Some need light for photosynthesis. Some need oxygen for aerobic respiration. The increase in a population can be shown on a growth curve. Something that stops a population from increasing further is called a limiting factor.

The carbon cycle

Many unicellular microorganisms are decomposers and play an important part in the carbon cycle.

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Kingdoms

Organisms are classified into five kingdoms. Viruses are not living and so are not in a kingdom.

<table>
<thead>
<tr>
<th>Cell part</th>
<th>prokaryotes (all unicellular)</th>
<th>protists (mainly unicellular)</th>
<th>fungi (mainly multicellular)</th>
<th>plants (all multicellular)</th>
<th>animals (all multicellular)</th>
</tr>
</thead>
<tbody>
<tr>
<td>cytoplasm</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>cell membrane</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>nucleus</td>
<td>x</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>mitochondria</td>
<td>X</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>cell wall</td>
<td>✓</td>
<td>x/✓</td>
<td>✓</td>
<td>✓</td>
<td>x</td>
</tr>
<tr>
<td>chloroplasts</td>
<td>x</td>
<td>x/✓</td>
<td>x</td>
<td>✓</td>
<td>x</td>
</tr>
</tbody>
</table>

Unicellular organisms can only grow to a certain size. If the organism is too big, it cannot get enough of the substances it needs throughout the cell because diffusion is too slow.

The tissues in multicellular organisms need to have raw materials transported to them because diffusion would be too slow.

Microscopic fungi

These include, for example, yeast. They:
- reproduce asexually by budding
- can use aerobic respiration, which is important in baking
- can use anaerobic respiration (fermentation), which is important in alcoholic drink manufacture.

\[
glucose \rightarrow \text{carbon dioxide + ethanol (alcohol)}
\]

Bacteria

Some bacteria are important in making yoghurt and cheese. These bacteria use a type of anaerobic respiration to ferment milk:

\[
glucose \rightarrow \text{lactic acid}
\]

Feeding

Bacteria and fungi feed by releasing enzymes into their surroundings to digest large organic molecules. The digested molecules are then absorbed.
### 8Da – Unicellular or multicellular

<table>
<thead>
<tr>
<th>Word</th>
<th>Pronunciation</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>animal</td>
<td></td>
<td>A member of the animal kingdom. Animals are multicellular and have cells without cell walls.</td>
</tr>
<tr>
<td>bacterium</td>
<td>bac-teer-ee-um</td>
<td>A type of prokaryote organism. Plural is bacteria.</td>
</tr>
<tr>
<td>cell (biology)</td>
<td>sell</td>
<td>The basic unit of all life. All organisms are made of cells.</td>
</tr>
<tr>
<td>diffusion</td>
<td>diff-you-zshun</td>
<td>When particles spread and mix with each other without anything moving them.</td>
</tr>
<tr>
<td>fungus</td>
<td></td>
<td>A member of the fungus kingdom. A fungus can be multicellular or unicellular but does not make its own food. Plural is fungi.</td>
</tr>
<tr>
<td>kingdom</td>
<td></td>
<td>There are five kingdoms into which organisms are divided: plants, animals, fungi, protocists and prokaryotes.</td>
</tr>
<tr>
<td>microorganism</td>
<td></td>
<td>An organism too small to be seen with the naked eye.</td>
</tr>
<tr>
<td>multicellular</td>
<td></td>
<td>An organism made of many cells.</td>
</tr>
<tr>
<td>plant</td>
<td></td>
<td>A member of the plant kingdom. Plants have chloroplasts and so can photosynthesize.</td>
</tr>
<tr>
<td>prokaryote</td>
<td>prO-ka-re-oat</td>
<td>A member of the prokaryote kingdom. Prokaryotes are all unicellular and have cells that lack nuclei.</td>
</tr>
<tr>
<td>protocist</td>
<td>prO-tock-tist</td>
<td>A member of the protocist kingdom. Many protocists are unicellular.</td>
</tr>
<tr>
<td>unicellular</td>
<td></td>
<td>An organism made of one cell.</td>
</tr>
<tr>
<td>virus</td>
<td></td>
<td>A non-living particle that can change how a living cell functions when it enters a cell. Inside a cell, a virus often causes the cell to make copies of the virus.</td>
</tr>
</tbody>
</table>

### 8Db – Microscopic fungi

<table>
<thead>
<tr>
<th>Word</th>
<th>Pronunciation</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>aerobic respiration</td>
<td>air-O-bick</td>
<td>A type of respiration in which oxygen is used to release energy from substances such as glucose.</td>
</tr>
<tr>
<td>anaerobic respiration</td>
<td>an-air-O-bick</td>
<td>A type of respiration that does not need oxygen.</td>
</tr>
<tr>
<td>asexual reproduction</td>
<td></td>
<td>Producing new organisms from one parent only.</td>
</tr>
<tr>
<td>budding</td>
<td></td>
<td>A type of asexual reproduction in which a new small cell, a bud, grows out from a parent cell.</td>
</tr>
<tr>
<td>fermentation</td>
<td>fer-ment-ay-shun</td>
<td>Anaerobic respiration occurring in microorganisms.</td>
</tr>
<tr>
<td>limiting factor</td>
<td></td>
<td>Something that stops a population growing.</td>
</tr>
<tr>
<td>population</td>
<td>pop-U-lay-shun</td>
<td>The number of a certain organism found in a certain area.</td>
</tr>
</tbody>
</table>
### 8Dc – Bacteria

<table>
<thead>
<tr>
<th>Word</th>
<th>Pronunciation</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>binary fission</td>
<td></td>
<td>When a cell splits in two.</td>
</tr>
<tr>
<td>chromosome</td>
<td><em>krow</em>-mO-sOwm</td>
<td>A long molecule that contains instructions for organisms and their cells.</td>
</tr>
<tr>
<td>enzyme</td>
<td></td>
<td>A substance that can speed up some processes in living things (e.g. by breaking down food molecules).</td>
</tr>
<tr>
<td>flagellum</td>
<td></td>
<td>A tail-like structure that rotates, allowing a unicellular organism to move. Plural is flagella.</td>
</tr>
<tr>
<td>statement key</td>
<td></td>
<td>A series of descriptive statements used to work out what something is.</td>
</tr>
</tbody>
</table>

### 8Dd – Prototists

<table>
<thead>
<tr>
<th>Word</th>
<th>Pronunciation</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>chlorophyll</td>
<td><em>klor</em>-O-fill</td>
<td>The green substance found inside chloroplasts.</td>
</tr>
<tr>
<td>cillum</td>
<td><em>sill</em>-ee-um</td>
<td>A small hair-like structures on the surface of some cells. Plural is cilia.</td>
</tr>
<tr>
<td>food chain</td>
<td></td>
<td>A way of showing what eats what in a habitat.</td>
</tr>
<tr>
<td>organic molecule</td>
<td></td>
<td>A molecule that is built using a chain of carbon atoms.</td>
</tr>
<tr>
<td>photosynthesis</td>
<td><em>fo-tow-sinth</em>-e-sis</td>
<td>A process that plants use to make their own food. It needs light to work.</td>
</tr>
<tr>
<td>producer</td>
<td></td>
<td>An organism that is able to produce its own food (e.g. by photosynthesis).</td>
</tr>
<tr>
<td>pseudopod</td>
<td><em>syoo</em>-dO-pod</td>
<td>An extension from a cell that can extend and contract and so pull a cell in a certain direction.</td>
</tr>
<tr>
<td>pyramid of numbers</td>
<td></td>
<td>A way of showing the numbers of different organisms in a food chain.</td>
</tr>
<tr>
<td>vacuole</td>
<td><em>vack</em>-you-oll</td>
<td>A storage space in cells.</td>
</tr>
</tbody>
</table>

### 8De – Decomposers and carbon

<table>
<thead>
<tr>
<th>Word</th>
<th>Pronunciation</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>carbohydrate</td>
<td><em>car-bO-high-drate</em></td>
<td>A nutrient that is used as the main source of energy.</td>
</tr>
<tr>
<td>carbon cycle</td>
<td></td>
<td>A model used to show how carbon compounds are recycled in an ecosystem.</td>
</tr>
<tr>
<td>decay</td>
<td></td>
<td>The breakdown of dead organisms or animal wastes, which allows the substances they contain to be recycled.</td>
</tr>
<tr>
<td>decomposer</td>
<td></td>
<td>An organism that feeds on dead organisms or animal wastes, causing them to decay.</td>
</tr>
<tr>
<td>ecosystem</td>
<td></td>
<td>All the physical environmental factors and all the organisms that are found in a habitat.</td>
</tr>
<tr>
<td>fat</td>
<td></td>
<td>A nutrient that is stored to be used for energy in the future. It also acts as a thermal insulator.</td>
</tr>
<tr>
<td>protein</td>
<td><em>prO-teen</em></td>
<td>A nutrient used for growth and repair.</td>
</tr>
</tbody>
</table>