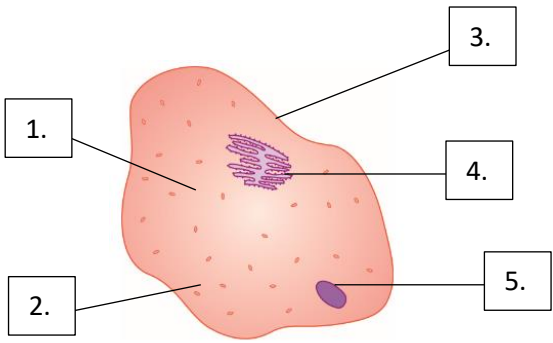
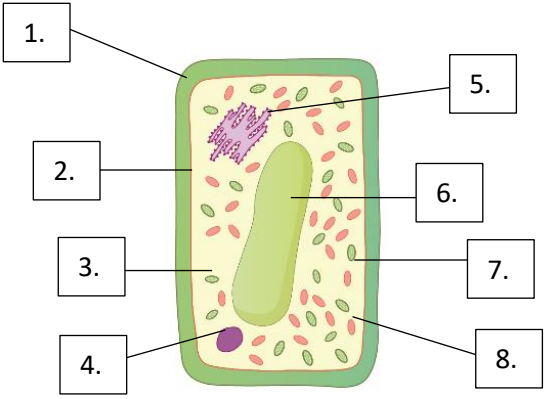
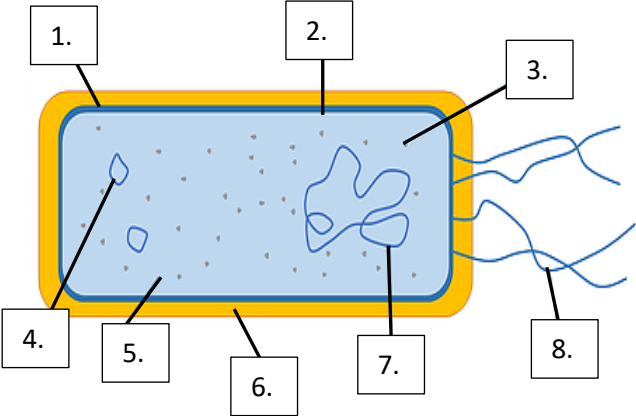


# Knowledge organiser: cell biology

	Question	Answer
1	How much can a light microscope magnify by	X2000
2	How much can an electron microscope magnify by?	X2,000,000
3	What is 'resolving power'	How much detail an image has
4	What resolving power can a light microscope have?	200nm
5	What resolving power can an electron microscope have?	0.2nm
6	How do you calculate magnification?	$\text{Magnification} = \frac{\text{size of image}}{\text{size of real object}}$
7		<ol style="list-style-type: none"> <li>1. cytoplasm</li> <li>2. mitochondria</li> <li>3. cell membrane</li> <li>4. ribosome</li> <li>5. nucleus</li> </ol>
8		<ol style="list-style-type: none"> <li>1. cell wall</li> <li>2. cell membrane</li> <li>3. chloroplast</li> <li>4. nucleus</li> <li>5. ribosome</li> <li>6. vacuole</li> <li>7. cytoplasm</li> <li>8. mitochondria</li> </ol>
9	What sub-cellular do all animal cells contain?	A nucleus, cytoplasm, cell membrane, mitochondria and ribosomes
10	What do ALL plant and algae cells contain as well as the features of animal cells?	A cellulose cell wall
11	What do many (but not all) plant cells contain that animal cells do not?	chloroplasts and a permanent vacuole
12	What is the job of the nucleus?	To control the activity of the cell and contain genetic information
13	What is the job of the cytoplasm?	Where chemical reactions take place
14	What is the job of the cell membrane?	Control substances that move in and out

		of the cell
15	What is the job of the mitochondria?	Release / transfer energy through aerobic respiration
16	What is the job of the ribosomes?	Where proteins are made
17	What is the job of the cell wall?	Strength and support
18	What is the job of the chloroplasts?	Contain chlorophyll, that absorbs light for photosynthesis to make glucose
19	What is the job of the permanent vacuole?	Filled with sap to keep the cell rigid for support.
20	What do all eukaryotic cells have?	A nucleus with genetic material inside (except red blood cells), a cell membrane and cytoplasm
21	What do all prokaryotic cells have?	Genetic material loose inside the cell, no nucleus
22	Are bacteria eukaryotes or prokaryotes?	Prokaryotes
23	Which are larger, eukaryotic cells or prokaryotic cells?	Eukaryotic cells
24		<ol style="list-style-type: none"> <li>1. cell wall</li> <li>2. cell membrane</li> <li>3. ribosome</li> <li>4. plasmid</li> <li>5. cytoplasm</li> <li>6. slime capsule</li> <li>7. genetic information</li> <li>8. flagella</li> </ol>
25	What is cell differentiation?	When cells change to become specialised
26	Which cell is specialised to carry electrical impulses?	Nerve cells
27	How is it specialised?	Lots of dendrites to connect to other cells, a long axon, synapses at the ends to pass messages on
28	Which cell is specialised to contract and relax?	Muscle cells
29	How is it specialised?	Contains special proteins that can slide over each other, lots of mitochondria and can store glycogen to release energy
30	Which cell is specialised to fertilise an egg?	Sperm cell
31	How is it specialised?	tail for swimming, mitochondria for releasing energy, acrosome to break down outer layers of the egg cell

32	Which cell is specialised to absorb water & mineral ions	Root hair cell
33	How is it specialised?	Large surface area, large vacuole and many mitochondria
34	What cells are specialised to transport water?	Xylem cells
35	How are they specialised?	Cells die, ends break down to form long, hollow tube. Spirals of lignin (waterproof) mean they can take high pressure.
36	What cell is specialised to transport food in plants?	Phloem cells
37	How are they specialised?	Cell walls between cells form sieve plates, very little internal structure so supported by a companion cell
38	Where in the cell are chromosomes found?	The nucleus
39	How many chromosomes do humans have?	46 (23 pairs)
40	What happens in the first stage of the cell cycle?	The cell grows. DNA is replicated and new subcellular structures are made
41	What happens in the second stage of the cell cycle?	chromosomes line up and one set is pulled to each end of the cell.
42	What happens in the third stage of the cell cycle?	Cell membrane and the cytoplasm divides to form two identical cells
43	What is cell division by mitosis used for?	Growth, repair and development of multicellular organisms.
44	Where does mitosis take place in a plant?	The meristem
45	What is a stem cell?	An unspecialised cell that can differentiate into many types of cell
46	How are adult stem cells different?	They can only differentiate into a few types of cells
47	When can most plant cells differentiate	Throughout their lives
48	How can stem cells be used in medicine?	To replace damaged cells
49	What conditions could be helped using stem cells?	Paralysis and diabetes
50	What are the risks with using stem cell therapy?	They could cause cancer through rapid growth; they could carry viruses, or they could be rejected by the patient's body
51	Why are some people against the use of stem cell therapy?	Too much money is being spent on it and they object to the use of embryos for ethical or religious reasons.

## Knowledge organiser: cell transport

1	Define 'diffusion'	The spreading out of particles, resulting in a net movement from an area of higher concentration to an area of lower concentration.
2	Name four factors that affect the rate of diffusion.	Concentration gradient, temperature and surface area, diffusion distance
3	Name three substances transported in and out of cells by diffusion.	Oxygen and carbon dioxide (gas exchange) and urea.
4	The waste product urea is produced in cells. Where is it moved to?	the kidney
5	Diffusion is a passive process. What is meant by the term 'passive'?	no energy is required
6	Give four ways the effectiveness of an exchange surface in a multicellular organism is increased.	<ul style="list-style-type: none"> <li>• having a large surface area</li> <li>• a membrane that is thin, to provide a short diffusion path</li> <li>• having an efficient blood supply</li> <li>• gaseous exchange - ventilation.</li> </ul>
7	How is the small intestine adapted for taking up nutrients?	<p>Very large surface area due to:</p> <ul style="list-style-type: none"> <li>• finger like projections called villi &amp; microvilli</li> <li>• large network of capillaries</li> </ul> <p>Steep concentration gradient maintained by good blood supply.</p>
8	How are the lungs in mammals adapted for gas exchange?	<p>Very large surface area due to:</p> <ul style="list-style-type: none"> <li>• millions of alveoli</li> <li>• large network of capillaries</li> </ul> <p>Steep concentration gradient maintained by:</p> <ul style="list-style-type: none"> <li>• ventilation</li> <li>• good blood supply</li> <li>• Walls of alveoli one cell thick so short diffusion pathway.</li> </ul>
9	How are the gills in fish adapted for gas exchange?	<p>Very large surface area due to:</p> <ul style="list-style-type: none"> <li>• gills</li> <li>• blood capillaries in each gill filament</li> </ul> <p>Steep concentration gradient maintained by efficient ventilation of the gills with water - there is a counter current flow of water and blood</p> <p>Short diffusion pathway as the outer layer of the gill filaments and the capillary walls are just one cell thick.</p>
10	How are leaves adapted for exchange of materials?	<ul style="list-style-type: none"> <li>• Flat &amp; thin – large surface area</li> <li>• Air spaces – large surface area</li> <li>• Stomata &amp; guard cells – control gas exchange</li> </ul>
11	How are plant roots adapted for exchange of materials?	<ul style="list-style-type: none"> <li>• Large surface area</li> </ul>

		<ul style="list-style-type: none"> <li>• Mitochondria to release energy for active transport</li> </ul>
12	Define 'osmosis'	Diffusion of water across a partially permeable membrane from a dilute solution to a concentrated solution.
13	What is 'turgor' in a plant cell?	When the pressure of water inside the cell makes the cell hard and rigid
14	Give the formula to calculate percentage change.	$\% \text{ gain or loss} = \frac{\text{change in mass}}{\text{initial mass}} \times 100$
15	What is 'active transport'?	The movement of substances from low to high concentrations, requiring energy released from respiration
16	Give an example of active transport in plants	Mineral ions being taken in from the soil
17	Give an example of active transport in humans	Absorption of sugar molecules from the gut to the blood

## Knowledge organiser: organisation & digestion

14	What do carbohydrase's break down?	carbohydrates
15	What are carbohydrates broken down into?	simple sugars
16	What are lipids (fats and oils) broken down into?	fatty acids and glycerol

17	What are proteins broken down into?	amino acids
22	What is an enzyme?	A protein that is a biological catalyst (speeds up reactions in living organisms)
23	How does an enzyme work?	A substrate binds to the active site of the enzyme
24	Why are enzymes specific to certain reactions?	The active site is a specific shape
25	What is metabolism?	The sum of all biological reactions
26	Why do high temperatures stop enzymes working?	The active site is denatured (changes shape)
27	What substance does the enzyme amylase work on?	starch
29	What enzymes break down proteins and what does it break them into?	proteases and amino acids
31	What enzymes break down lipids?	lipases

## Knowledge organiser – infection & response

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	<b>Question</b>	<b>Answer</b>
1	What is a communicable disease?	A disease caused by a pathogen
2	What is a pathogen?	A microorganism that causes an infectious disease
3	What types of microorganism can cause disease?	Virus, bacteria, fungi or protists
4	What is a main cause of allergies?	Immune responses caused by a pathogen
5	How do bacteria make us ill?	They reproduce rapidly in our bodies and produce toxins (poisons) that damage tissue and make us feel ill
6	How can the spread of disease be prevented?	Simple hygiene (wash hands after toilet etc), destroying vectors, isolation of infected individuals and vaccination
7	How does the skin defend us from pathogens?	Acts as a barrier, produces antimicrobial chemicals and is covered with healthy microbes
8	How does our nose defend us from pathogens?	Full of hairs and mucus to trap particles in the air that could have pathogens
9	How does our trachea and bronchi defend us from pathogens?	Produces sticky mucus to trap particles in air, cilia waft mucus up so we can swallow it
10	How does our stomachs defend us from pathogens?	Contains hydrochloric acid to kill pathogens in food and drink
11	How do white blood cells defend against pathogens that enter our body?	Engulfing them (phagocytosis), producing antibodies or producing antitoxins
12	How do viruses make us ill?	The replicate rapidly inside cells causing damage
13	What ways can viruses be spread?	Air (including droplet), contact and water
14	What type of pathogen causes measles?	Virus
15	What are the symptoms of measles?	Fever and rash, can be fatal in children
16	How is measles spread?	Air (droplet inhalation)
17	How is measles prevented?	Vaccination
18	What type of pathogen causes HIV/AIDS?	Virus
19	What are the symptoms of HIV?	Flu like symptoms initially followed by damage to the immune system (AIDS) causing other illnesses
20	How is HIV spread	Sexual contact or exchange of body fluids e.g., blood or sharing needles
21	How is HIV treated?	Antiretroviral drugs
22	What type of pathogen causes TMV?	Virus (affects plants)
23	What are the symptoms of TMV?	Mosaic pattern of discolouration on the leaf which affects photosynthesis
24	How is TMV spread?	Contact, including by vectors
25	How is TMV treated?	Destroy infected plants



26	What type of pathogen is salmonella?	Bacteria
27	What are the symptoms of salmonella?	Fever, abdominal cramps, vomiting and diarrhoea
28	How is salmonella spread?	contaminated food
29	How is salmonella prevented?	Good food hygiene
30	What type of pathogen causes gonorrhoea?	Bacteria
31	What are the symptoms of gonorrhoea?	A thick yellow or green discharge from the vagina or penis and pain when urinating
32	How is gonorrhoea spread?	Sexual contact
33	How is gonorrhoea controlled?	Treatment with antibiotics and the use of barrier contraception (e.g., condoms)
34	What type of pathogen causes rose black spot?	Fungus
35	What are the symptoms of rose black spot?	Purple or black spots on leaves which turn yellow and drop early, reducing photosynthesis
36	How is rose black spot spread?	Air (wind) or water
37	How is rose black spot controlled?	Using fungicides and/or removing and destroying affected leaves
38	What type of pathogen causes malaria?	Protist
39	What are the symptoms of malaria?	Recurring fever which can be fatal
40	How is malaria spread?	By mosquito vectors (being bitten)
41	How is malaria controlled?	Preventing mosquitos from breeding and avoiding being bitten, vaccination
41	What system tries to destroy pathogens if they get in the body?	The immune system
42	What is contained inside a vaccine?	dead or inactive form of a pathogen
43	How does a vaccine work?	It stimulates white blood cells to produce antibodies and memory cells for that pathogen so if an active form enters the body, antibodies are produced much more quickly
44	What is 'herd immunity'	When a large enough proportion of the population are immune to a disease, its spread is reduced
45	What do painkillers do?	relieve symptoms of disease
46	What do antibiotics do?	Kill bacterial pathogens
47	What was the first antibiotic called?	Penicillin
48	Why can antibiotics not be used for viral infections?	They do not kill viruses, only bacteria
49	Why is it difficult to develop drugs to kill viruses?	Because they live inside your cells, so the drugs would also damage your cells
50	Why do antibiotics not work on some bacteria?	Antibiotic resistant strains of bacteria are evolving
51	What plant is the drug digitalis (digoxin) extracted from?	Foxglove
52	What is digitalis (digoxin) used to treat?	Heart problems

53	What plant is the drug aspirin from?	Willow
54	What is aspirin used to treat?	Pain
	<b>Question</b>	<b>Answer</b>
55	Where is the antibiotic penicillin from?	The <i>Penicillium</i> mould
56	What are all new drugs tested for in clinical trials?	Toxicity, efficacy (if they work) and dose
57	Who are clinical trials tested on?	Healthy volunteers & patients
58	How are drugs tested before being tested on humans?	In the lab using cells, tissues and live animals
59	What is a 'double blind' trial?	Test where neither patient nor doctor know if the patient is being given the drug or a placebo
60	What is a 'placebo'?	A dummy drug that does not contain any of the medicine being tested
61	Why are placebos used?	As a control

## Knowledge organiser: bioenergetics

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16	What is the word equation for aerobic respiration?	Glucose + oxygen → carbon dioxide + water
17	What is the balanced symbol equation for respiration?	$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$
18	Where in a cell does aerobic respiration happen?	Mitochondria
19	What type of reaction is respiration?	Exothermic – it releases energy
20	Why do living things need to respire?	To release energy from glucose to carry out life functions
21	What specific processes is energy required for?	<ul style="list-style-type: none"> <li>• chemical reactions to build larger molecules</li> <li>• movement</li> <li>• keeping warm</li> </ul>
22	How is glucose stored in muscle cells?	Glycogen
23	What happens to your heart rate and breathing rate when you exercise?	They increase
24	Why does your heart rate and breathing rate change during exercise?	To provide working muscles with more oxygen and remove waste carbon dioxide
25	What is anaerobic respiration?	Respiration without oxygen
26	When there is not enough oxygen, where does anaerobic respiration take place?	In muscles
27	What is the word equation for anaerobic respiration in animals?	Glucose → Lactic acid
28	What does a build-up of lactic acid lead to?	<ul style="list-style-type: none"> <li>• Muscle fatigue (cramp)</li> </ul>
29	<b>What is 'oxygen debt'?</b>	<b>The amount of extra oxygen the body needs after exercise to react with and remove lactic acid</b>
30	<b>How is lactic acid removed from the muscles?</b>	<b>It is transported in the blood to the liver and converted back into glucose</b>
31	What is the word equation for anaerobic respiration in plants and yeast?	Glucose → ethanol + carbon dioxide
32	Where does anaerobic respiration take place?	Cytoplasm of cells
33	Which type of respiration transfers less energy per glucose molecule?	Anaerobic
34	What is anaerobic respiration in yeast called and why is it useful?	Fermentation – the products are used in the manufacture of bread & alcoholic drinks
35	What is 'metabolism'?	The sum of all the body's chemical reactions



# Knowledge organiser: reproduction

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20	What is an allele?	Different forms of a gene									
21	Define 'homozygous'	Two copies of the same allele									
22	What is sexual reproduction? Define heterozygous	Reproduction that involves the joining (fusion) of male and female gametes Two different alleles for a characteristic									
23	What is meant by a 'dominant' allele?	An allele that is always expressed, even if only one copy is present									
24	What is meant by a 'recessive' allele?	An allele that is only expressed if there are two copies present									
25	What type of cell division forms gametes? Define 'genotype'	Meiosis Describes the alleles present for a particular characteristic of an individual									
26	What causes variation in the offspring from sexual reproduction? Define 'phenotype'	The mixing of genetic information This describes the physical characteristics of an individual									
27	What is asexual reproduction? What is polydactyly?	Reproduction involving only one parent and no fusion of gametes. There is no mixing of genetic information A genetic disorder resulting in extra toes or fingers									
28	What type of allele causes polydactyly? What type of cell division is involved in asexual reproduction?	A dominant one Mitosis									
29	How many chromosomes are there in cells produced by meiosis?	A genetic condition that affects cell wall that of the parent cell ( $n$ ) one set membranes									
30	What type of allele causes cystic fibrosis? Where does meiosis take place?	A recessive one in reproductive organs									
30	Construct a Punnett square for two parents who are heterozygous for the cystic fibrosis allele	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td>C</td> <td>c</td> </tr> <tr> <td>C</td> <td>CC</td> <td>Cc</td> </tr> <tr> <td>c</td> <td>Cc</td> <td>cc</td> </tr> </table>		C	c	C	CC	Cc	c	Cc	cc
	C	c									
C	CC	Cc									
c	Cc	cc									
31	How do the gametes produced by										
32	What is the chance that their child will have cystic fibrosis?	25% / 0.25 / $\frac{1}{4}$ / 1 in 4 / 1:3 / a quarter									
33	How is the number of chromosomes restored to the full amount (2n)?	It is restored to the full amount (2n)									
34	How can couples find out if their embryos have a genetic condition?	Looking at pedigree charts (family tree)									
35	Describe the structure of DNA	Embryo screening									
36	Define 'genome'	The differentiate into specialised cells									
37	How many chromosomes does a human cell contain?	46 / 23 pairs									
38	Which chromosomes are responsible for determining sex?	X and Y chromosome that codes for a sequence of amino acids, to make a specific protein									
39	What sex chromosomes do females have?	XX									
40	What sex chromosomes do males have?	XY									
41	Why is it important to understand the probability of a child being a boy or a girl?	<ul style="list-style-type: none"> <li>To search for genes linked to disease</li> <li>To understand and treat inherited disorders</li> <li>To trace past human migration patterns</li> </ul>									

# **Knowledge Organiser - ecology part 1**

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	<b>Question</b>	<b>Answer</b>
1	What is an ecosystem?	The interaction of a community of living organisms (biotic) with the non-living (abiotic) parts of the environment
2	Define the term biodiversity.	The variety of all the different species of organisms on earth, or within an ecosystem
3	What do organisms require to survive and reproduce?	A supply of materials from their surroundings and from the other living organisms there
4	Define the term biotic factor.	Living factors in an ecosystem
5	Define the term abiotic factor.	Non-living parts of an environment
6	What do plants compete for in a community?	Light, space, water and mineral ions
7	What do animals compete for in a community?	Food, mates and territory
8	What is 'interdependence'?	Species depending on each other, where the removal of one species can affect the whole community
9	What is a 'stable' community?	One where the species and environmental factors are in balance so that population sizes remain fairly constant
10	Name the 7 abiotic factors that can affect a community.	<ul style="list-style-type: none"> <li>• light intensity</li> <li>• temperature</li> <li>• moisture levels</li> <li>• soil pH and mineral content</li> <li>• wind intensity and direction</li> <li>• carbon dioxide levels for plants</li> <li>• oxygen levels for aquatic animals</li> </ul>
11	Name the 4 biotic factors that can affect a community.	<ul style="list-style-type: none"> <li>• availability of food</li> <li>• new predators arriving</li> <li>• new pathogens</li> <li>• one species outcompeting another</li> </ul>
12	What are 'adaptations'?	Features that enable them to survive in the conditions in which they normally live
13	What types of adaptations are there?	Structural, behavioural or functional
14	What are 'extremophiles'?	Organisms adapted to live in extreme environments such as high temperature, pressure or salt concentrations
15	Give an example of an extremophile	Bacteria living in deep sea vents
16	How can feeding relationships within a community be represented?	With food chains
17	What is a producer?	Begins a food chain



18	What is a primary consumer?	An animal that eats producers
19	What is a secondary consumer?	An animal that eats primary consumers
20	What is a tertiary consumer?	An animal that eats secondary consumers
21	What is a predator?	consumers that kill and eat other animals
22	What is a prey animal?	animals eaten by predators
23	What is meant by 'abundance' of a species?	How many of that species there are (population)
24	What is meant by 'distribution' of a species?	Where in an ecosystem that species lives
25	What experimental methods are used by ecologists to measure abundance and distribution of a species in an ecosystem?	Quadrats and transects