

Biology Paper 1

Model Exam Question Booklet

Essential Content for
the Higher Separate
Science Exam
(PBT/FKI)

This booklet is split into 3 parts.

Biology Paper 1	
Topics in the Paper:	
B1	Cell Structure and Transport
B3	Organisation and the Digestive System
B4	Organising Animals and Plants
B5	Communicable Disease
B6	Preventing and Treating Disease
B7	Non-Communicable Disease
RP1	Using a Light Microscope
RP3	Investigating Osmosis
RP4	Qualitative Reagents

Part 1

The first part is a selection of short response questions and answers that are likely to come in your Biology exams this summer. Spend time learning the answers to these questions, for example you could produce flash cards. You should self quiz yourself on these questions regularly!

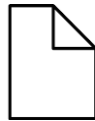
Part 2

Selection of extended response questions (4 to 6 marks) that are likely to be on your paper this year, either because they have not been assessed in the last couple of years, or because they come up most years in exams. Prepare and practice your responses to these questions.

Part 3

Required practical section. In this section you will find step by step guidance for each practical. This is followed by a page of short response questions and answers to learn for each of the practicals. There are also some extended response questions (4 to 6 marks) that are very likely to be on the exam paper this year.

B1: Cell Structure

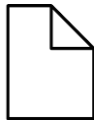


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1. What is a eukaryotic cell?
2. What is a prokaryotic cell?
3. What is a plasmid?
4. What type of cell is a bacterial cell?
5. How does the size of a prokaryotic cell compare to a eukaryotic cell?
6. What is the function of the nucleus?
7. What is the function of the cytoplasm?
8. What is the function of the cell membrane?
9. What is the function of the mitochondria?
10. What is the function of ribosomes?
11. What is the function of chloroplasts?
12. What is the permanent vacuole's function?
13. How is the cell wall strengthened?
14. What are the common parts of an animal cell?
15. What are the common parts of a plant cell?
16. What is the function of a sperm cell?
17. How is a sperm cell adapted?
18. What is the function of a nerve cell?
19. How is a nerve cell adapted?
20. What is the function of a muscle cell?
21. How is a muscle cell adapted?
22. What is the function of the root hair cells?
23. How is a root hair cell adapted?
24. What is the function of the xylem?
25. How are the xylem adapted for their function?
26. What are the function of phloem cells?
27. How are phloem cells adapted for their function?
28. What are the advantages of electron microscopes?
29. What have been the benefits of electron microscopes?
30. What is the formula for magnification?
31. How do bacteria multiply?
32. How often do bacteria multiply?
33. How can bacteria be grown in a lab?

1. A plant or animal cell that has a cell membrane, cytoplasm and its genetic material enclosed in a nucleus.
2. A cell in which the genetic material is not enclosed in a nucleus. Its DNA is found as a loop in the cell and there may be one or more plasmids.
3. A small ring of DNA.
4. Prokaryotic cell.
5. Much smaller.
6. Control the cell.
7. Site of chemical reactions.
8. Controls what enters and leaves the cell.
9. Site of respiration.
10. Site of protein synthesis.
11. Site of photosynthesis.
12. Supports the cell and contains cell sap.
13. Cellulose.
14. Nucleus, cell membrane, cytoplasm, mitochondria and ribosomes.
15. Nucleus, cell membrane, cytoplasm, mitochondria, ribosomes, chloroplasts, cell wall and vacuole.
16. Carry father's genetic information and fertilise the egg.
17. Streamlined shape, nucleus contains 1 set of chromosomes, lots of mitochondria for respiration, contains digestive enzymes.
18. Transmit electrical impulses around the body.
19. Long, and lots of dendrites to make connections with lots of other cells.
20. Contract and relax to bring about movement.
21. Lots of mitochondria for respiration.
22. Absorb mineral ions and water from soil.
23. Large surface area and lots of mitochondria for respiration.
24. Transport water around the plant.
25. Few cell structures and so they are dead for more space and supported by lignin.
26. Transport sugars around the plant.
27. Few cell structures and supported by companion cells.
28. Higher magnification and higher resolution.
29. Can be used to examine a cell in much finer detail and has led to a better understanding of sub cellular structures.
30. Magnification = Size of Image /Size of Real Object
31. Binary fission.
32. Often as once every 20 minutes.
33. In a nutrient broth or as colonies on an agar gel plate.

B1: Cell Transport

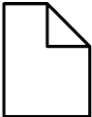


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1. What is diffusion?
2. What substances in animals and plants are transported in and out of cells by diffusion?
3. How does the difference in concentration affect the rate of diffusion?
4. How does the temperature affect the rate of diffusion?
5. How does the surface area of the membrane affect the rate of diffusion?
6. How are single-cells organisms adapted for diffusion?
7. How is the small intestine adapted for exchange?
8. How are the lungs adapted for exchange?
9. How are the gills in a fish adapted for exchange?
10. How are the roots adapted for exchange?
11. How are the leaves adapted for exchange?
12. What is osmosis?
13. What is active transport?
14. What is an example of active transport in animals?
15. What is an example of active transport in plants?

1. The spreading out of the particles of any substance in solution, or particles of a gas, causing a net movement from an area of higher concentration to an area of lower concentration.
2. Oxygen, carbon dioxide and urea.
3. Increased concentration gradient increases the rate of diffusion.
4. Increased temperature increases in the rate of diffusion because particles have more kinetic energy and are moving faster.
5. Increased surface area increases the rate of diffusion.
6. It has a large surface area to volume ratio.
7. It is long and has villi for a large surface area, the cell membranes are thin for a short diffusion pathway, there is a rich blood supply to maintain a steep concentration gradient and lots of mitochondria.
8. Lots of alveoli for a large surface area, thin membrane for a short diffusion pathway and good ventilation and blood supply to maintain a steep concentration gradient.
9. Large surface area, thin membrane for a short diffusion pathway and good ventilation and blood supply to maintain a steep concentration gradient.
10. Large surface area, thin surface membrane for a short diffusion pathway and lots of mitochondria for active transport.
11. Large surface area and thin for short diffusion pathway.
12. The movement of water from a dilute to concentrated solution through a partially permeable membrane.
13. The movement of substances from a more dilute solution to a more concentrated solution (against the concentration gradient). It requires energy.
14. Absorption of sugar in the gut from a low to high concentration.
15. Absorption of mineral ions into plant root hairs.

B3: Digestion

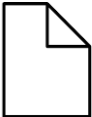


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1. What is a tissue?
2. What is an organ?
3. What is an organ system?
4. What is the function of the digestive system?
5. What are enzymes?
6. How do enzymes work?
7. What effect does temperature have on enzyme activity?
8. How are enzymes are denatured by temperature?
9. Why do enzymes have an optimum pH?
10. Where is amylase made in the body?
11. What is the function of amylase?
12. Where is protease made in the body?
13. What is the function of protease?
14. Where is lipase made in the body?
15. What is the function of lipase?
16. What is the function of digestive enzymes?
17. What are the products of digestion used for?
18. Where is starch digested in the body?
19. Where is protein digested in the body?
20. Where are fats digested in the body?
21. Why is starch not digested in the stomach?
22. How can the mouth break down starchy foods?
23. Where is bile made?
24. Where is bile stored?
25. What is the function of bile?

1. A group of cells with a similar structure and function.
2. A group of different tissues that perform a specific function together.
3. A group of organs that work together to carry out a process in the body.
4. An organ system in which several organs work together to digest and absorb food.
5. Biological catalysts with a specific active site that speed up reactions.
6. The substrate fits into the active site of the enzyme and the enzyme and substrate binds together. The reaction happens quickly, and the products are released.
7. At temperature increase the rate of reaction increases. At the optimum temperature, the reaction works as fast as possible. After the optimum temperature, the enzyme begins to be denatured and so the enzyme stops working.
8. The high temperature causes the protein chains to unravel changing the shape of the active site.
9. The forces holding the protein chains in position are affected by pH. A change in pH can change the shape of the active site.
10. Salivary glands, small intestine and pancreas.
11. Break down starch into glucose.
12. Stomach, small intestine and pancreas.
13. Break down proteins into amino acids.
14. Pancreas and small intestine.
15. Break down lipids into fatty acids and glycerol.
16. Convert food into small soluble molecules that can be absorbed into the bloodstream.
17. Build new carbohydrates, lipids and proteins. Some glucose is used in respiration.
18. Mouth and small intestine.
19. Stomach and small intestine.
20. Small intestine
21. The stomach doesn't produce amylase and the conditions in the stomach are too acidic for the amylase to work.
22. The teeth break down the food and the saliva contains amylase.
23. Liver
24. Gall Bladder
25. It is alkaline to neutralise hydrochloric acid from the stomach. It also emulsifies fat to form small droplets which increases the surface area. This increases the breakdown of fat by lipase.

B4: Organisation: Heart

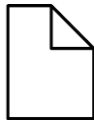


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1. What is the heart?
2. Why is the heart known as a double pump?
3. What is the route of a blood cell through the heart?
4. What is the function of the right ventricle?
5. What is the function of the left ventricle?
6. What is the function of the aorta?
7. What is the function of the vena cava?
8. What is the function of the pulmonary artery?
9. What is the function of the pulmonary vein?
10. How is resting heart rate controlled?
11. Where is the natural pacemaker found?
12. What are artificial pacemakers?
13. What is the function of the arteries?
14. How are the arteries adapted for the function?
15. What is the function of capillaries?
16. How are capillaries adapted for their function?
17. What is the function of veins?
18. How are the veins adapted for their function?
19. How can we calculate rate of blood flow?

1. An organ that pumps blood around the body in a double circulatory pump.
2. Blood enters the heart twice for one circuit around the body.
3. Body → Vena Cava → Right Atrium → Right Ventricle → Pulmonary Artery → Lungs → Pulmonary Vein → Left Atrium → Left Ventricle → Aorta → Body
4. Pumps blood to the lungs where gas exchange takes place.
5. Pumps blood around the rest of the body.
6. Transport oxygenated blood under high pressure away from the left ventricle of the heart.
7. Return deoxygenated blood from the body to the right atrium of the heart.
8. Transport deoxygenated blood from the heart to the lungs.
9. Transport oxygenated blood from the lungs to the heart.
10. Group of cells known as a pacemaker.
11. Right atrium.
12. Electrical devices used to correct irregularities in the heart rate.
13. Transport oxygenated blood under high pressure from the heart to the body.
14. Narrow lumen, thick elastic walls to withstand pressure.
15. Transport blood to cells.
16. Narrow so that blood cells pass through them one by one and have thin walls for a short diffusion pathway.
17. Transport deoxygenated blood under high pressure from the body to the heart.
18. Thin walls and large lumen due to low pressure. They have valves to prevent backflow.
19. $\text{Rate of Blood Flow} = \frac{\text{Volume of Blood}}{\text{Number of Minutes}}$

B4: Organisation: Plants

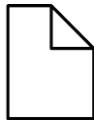


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1. What is the function of the epidermal tissue?
2. What is the function of the palisade tissue?
3. How is the palisade tissue adapted for its function?
4. What is the function of the spongy mesophyll?
5. How is the spongy mesophyll adapted for its function?
6. What is the function of the xylem?
7. How is the xylem adapted for its function?
8. What is the function of the phloem?
9. How is the phloem adapted for its function?
10. What is the function of meristems?
11. Where are meristems found in the plant?
12. What are stomata?
13. What is the function of the guard cells?
14. What is the function of the roots?
15. How are root hair cells adapted for their function?
16. What is absorbed by osmosis by the roots?
17. What is absorbed by active transport by the roots?
18. What is transpiration?
19. What is translocation?
20. What happens to the rate of transpiration if temperature is increased and why?
21. What happens to rate of transpiration if humidity decreases and why?
22. What happens to the rate of transpiration if air movement increases and why?
23. What happens to the rate of transpiration if light intensity increases and why?
24. How are plant leaves adapted for gas exchange?

1. Cover the leaf.
2. Absorb light for photosynthesis.
3. They are close towards the upper surface of the leaf; they are packed with chloroplasts and are arranged closely together.
4. Gas exchange
5. Cells packed loosely to allow gaps between cells and cells are covered by a thin layer of water which gases dissolve in
6. Transport water and dissolved minerals around the plant.
7. They are a dead hollow tube strengthened by lignin.
8. Transport sugars around the plant.
9. The cells do not contain a nucleus and it is supported by companion cells. The end of each cell has a sieve plate to allow free movement of substances from cell to cell.
10. Plant stem cells that differentiate into specialised cells throughout the life of the plant.
11. Shoots and roots
12. Small pores on the underside of the leaf that allow gases such as oxygen, carbon dioxide and water vapour to diffuse through.
13. Open and close the stomata to control water loss.
14. Anchorage and absorption of water and mineral ions.
15. Large surface area, thin surface membrane for a short diffusion pathway and lots of mitochondria.
16. Water
17. Mineral ions
18. The transport of water through the xylem from the roots to the leaf. It does not require energy.
19. The transport of sugar through the phloem both upwards and downwards. It required energy.
20. It increases because there is increased evaporation from cell surfaces and the rate of diffusion of water molecules from the leaf is increased.
21. It decreases. The increased humidity decreases the concentration gradient between water in the leaf and water in the air and so rate of diffusion of water from the leaf decreases.
22. It increases. The air flow removes water vapour from leaf surfaces and so more water diffuses from the leaf.
23. It increases. The light intensity increases the rate of photosynthesis and so stomata open so there is increased diffusion of water out of the leaf.
24. Large surface area, a thin surface for a short diffusion pathway and air spaces between cells.

B5: Communicable Disease

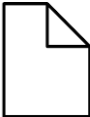


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1. What is a communicable disease?
2. What is a non-communicable disease?
3. What is a pathogen?
4. How can pathogens be spread?
5. How can we prevent the spread of communicable diseases?
6. Why do bacterial infections cause us feel ill?
7. Why do viral infections cause us to feel ill?
8. What is measles?
9. What is HIV?
10. What is AIDS?
11. What is tobacco mosaic virus?
12. What is salmonella?
13. What is gonorrhoea?
14. What is rose black spot?
15. What pathogen causes malaria?
16. What is malaria?
17. How can the spread of malaria be prevented?
18. How does the skin defend the body from pathogens?
19. How does the nose defend the body from pathogens?
20. How does the trachea and bronchi defend the body from pathogens?
21. How does the stomach defend the body from pathogens?
22. How do white blood cells help to defend against pathogens?

1. A disease caused by a pathogen that can be spread from one person to another.
2. A disease that cannot be passed from one person to another.
3. Microorganisms that cause infectious disease.
4. Direct contact, by water or by air.
5. Good hygiene such as handwashing and use of disinfectants. By isolating infected people, by destroying the vectors that transmit the disease and by vaccination.
6. The bacteria produce poisons that damage tissues and make us feel ill.
7. The viruses live and reproduce inside living cells which causes cell damage.
8. A viral disease that causes fever and a red skin rash. It can be fatal. It is spread by droplets in coughs and sneezes.
9. A viral disease that initially causes flu-like symptoms that then attacks the body's immune cells. It is spread by sexual contact or exchange of body fluids.
10. Late stage HIV. It occurs when the body's immune system is so damaged it can no longer deal with infections or cancers.
11. A plant pathogen that causes a discolouration of leaves which affects growth as it causes less photosynthesis. It affects lots of plants including tomatoes.
12. A bacterial disease spread in food that causes food poisoning. It can cause fever, cramps, vomiting and diarrhoea.
13. A sexually transmitted bacterial disease which can cause a thick yellow discharge as well as pain when urinating.
14. A fungal disease in plants that causes purple or black spots on leaves. It is spread by wind and water.
15. Protists
16. A disease caused by protists that can cause fever and death.
17. Preventing the mosquito from breeding and by using mosquito nets to avoid being bitten.
18. Acts as a barrier and makes antimicrobial secretions.
19. Full of hairs and makes a sticky mucus. These trap particles that may contain pathogens.
20. Secrete mucus that traps pathogens. The lining is also covered in cilia that waft the mucus to the back of the throat to be swallowed.
21. The stomach produces acids that destroy microorganism.
22. Phagocytosis, antibody production and antitoxin production.

B6: Preventing and Treating Disease

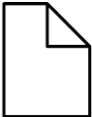


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1. What does vaccination involve?
2. Why does a vaccination protect someone from a disease?
3. What produces monoclonal antibodies?
4. Why are monoclonal antibodies able to target a specific chemical or cell?
5. How are monoclonal antibodies produced?
6. What are combined to make a hybridoma?
7. What are some uses for monoclonal antibodies?
8. How could monoclonal antibodies be used to treat cancer?
9. Why are monoclonal antibodies not used as widely as expected?

1. A small quantity of dead or inactive forms of a pathogen are introduced into the body. The white blood cells are stimulated to make white blood cells.
2. If the same pathogen re-enters the body the white blood cells respond quickly to produce the correct antibodies, preventing infection.
3. A single clone of cells.
4. They are specific to one binding site on one protein antigen.
5. A mouse lymphocyte is stimulated to make a particular antibody. The lymphocytes are combined with a tumour cell to make a hybridoma which can divide and make an antibody. The hybridoma are cloned to make the same antibody. The antibodies are collected and purified.
6. Lymphocyte and a tumour cell.
7. Pregnancy tests, detecting pathogens, measuring levels of hormones, to treat cancer.
8. The monoclonal antibody is bound to a radioactive substance, a toxic drug or a chemical which stops cells growing and dividing.
9. They create more side effects than expected.

B7: Non-Communicable Disease



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1. What is a non-communicable disease?
2. What is a casual mechanism?
3. What are the risk factors of cardiovascular disease?
4. What are the risk factors of type 2 diabetes?
5. What risk factors can affect an unborn baby?
6. What is meant by obesity?
7. What diseases are linked to obesity?
8. Why can smoking increase the risk of heart disease?
9. Why can smoking increase the risk of lung cancer?
10. Why can smoking increase the risk of emphysema?
11. Why can smoking increase the risk of lung infections?

1. A non-infectious disease that can't be caught from another person.
2. Something that explains how one factor influences another
3. Poor diet, smoking and lack of exercise
4. Obesity
5. Smoking and alcohol
6. Being overweight with a BMI over 25
7. Arthritis, diabetes, high blood pressure, strokes
8. It raises blood pressure, increases cholesterol and leads to thickening of the artery walls.
9. The chemicals in smoke can cause mutations leading to uncontrolled growth of cells.
10. Smoking damages the alveoli causing the surface area to decrease. This causes shortness of breath.
11. Chemicals in the smoke damage the cilia which causes mucus production to increase, this causes shortness of breath and increased risk of infection.

Topic	B1 Cell Structure and Transport
Qu	Explain how a _____ cell is adapted for its function.
Info	You could be asked this question for any of the following specialised cells: • Sperm Cell • Nerve Cell • Muscle Cell • Red Blood Cell • Root Hair Cell • Xylem • Phloem To answer this question you will need to do the following: 1. Identify the function (job) of the specialised cell. 2. Describe an adaptation that the cell has. 3. Explain how this adaptation helps the cell complete its function. 4. Continue to describe another adaptation the cell has and explain how this helps complete its function until you can think of no more adaptations.
Top Tip	If you are explaining why a cell has lots of mitochondria use the following phrase: “The cell has lots of mitochondria, for respiration, to release more energy”
Model Answer	Explain how a sperm cell is adapted for its function. <i>The function of the sperm cell is to carry the father’s genetic information and fertilise the egg. Adaptations the sperm cell have include that it is streamlined to reduce the cells energy requirements to travel to the egg. Another adaptation is that the nucleus contains 1 set of chromosomes, this preserves the chromosome number when the egg is fertilised. A third adaptation is that the sperm cell has an acrosome that contains digestive enzymes that enables the sperm cell to penetrate the egg. Finally, the sperm cell has lots of mitochondria, for respiration, to release more energy for the cell.</i>
Practice	1. Learn and practice the model answer above. 2. Prepare and learn model answers to explain how the following cells are adapted for their function: nerve cell, muscle cell, red blood cell, root hair cell, xylem and phloem

Topic	B1 Cell Structure and Transport
Qu	Explain how _____ is adapted for efficient exchange of _____.
Info	You could be asked this question for any of the following exchange surfaces: • The lungs and the exchange of gases. • Gills of a fish and the exchange of gases. • The leaf and the exchange of gases. • The small intestine and absorption of nutrients. • Roots and absorption of substances from the soil. To answer this question you will need to do the following: 1. Identify an adaptation. 2. Explain how it increases the exchange of substances 3. Identify the cell transport involved. 4. Repeat steps 1-3 for as many adaptations that you can
Top Tip	If active transport is involved, then use the phrase: “Cells will have lots of mitochondria, for respiration, to release energy for active transport.”
Model Answer	Explain how the lungs are adapted for the exchange of gases by diffusion. <i>The lungs have lots of alveoli which increase the surface area for diffusion to take place. The alveoli walls are also very thin which provides a short diffusion pathway. The process of breathing keeps the lungs ventilated with the removal of carbon dioxide and the entry of oxygen which provides a steep concentration. Finally, the lungs have a good blood supply, which removes oxygen and so there is a steep concentration gradient.</i>
Practice	1. Learn and practice the model answer above. 2. Prepare and learn model answers to explain how the following exchange surfaces are adapted for exchange: gills, leaf, roots, small intestine.

Topic	B3 Digestion
Qu	Describe how _____ is digested
Info	You could be asked this question to test for: • Protein • Starch • Fat • A combination of some/all of them To answer this question you will need to do the following: 1. Describe mechanical digestion in the mouth. 2. Identify the enzyme that helps digest it. 3. Identify where in the body this enzyme digests the molecule. 4. Identify what the food substance is broken down into.
Top Tip	Be careful with your enzyme names and sites of digestion. It is easy to mix up where the enzyme is made and where the enzyme acts. For examples enzymes made by the pancreas digest food in the small intestine.
Model Answer	Explain how protein is digested. <i>The protein is firstly broken down mechanically into smaller pieces by chewing in the mouth before the food is swallowed. Protease enzymes break down the protein in the stomach and small intestine. The protein is broken down into amino acids.</i>
Practice	1. Learn and practice the model answer above. 2. Prepare and learn model answers to explain how starch, fat and a combination of all three are broken down.

Topic	B3 Digestion
Qu	Explain how bile helps the digestion of fats. Describe the roles of the liver and the pancreas in digestion. Explain the 'lock and key theory' of enzyme action.
Info	At least one of these questions is likely to come up. The examiner is going to be looking for a clear answer written in a logical sequence.
Top Tip	Be careful that you use key words/phrases accurately (these are in bold in your model answers below).
Model Answer	Explain how bile helps the digestion of fats. <i>Bile is alkaline and so neutralises the digestive juices in the small intestine. It also emulsifies fats which gives them a larger surface area. This means that enzymes work more efficiently.</i>
Model Answer	Describe the roles of the liver and the pancreas in digestion. The liver produces bile which is alkaline and neutralises digestive juices. It also emulsifies fats which increases its surface area. The pancreas produces digestive enzymes such as protease, lipase and amylase.
Model Answer	Explain the 'lock and key theory' of enzyme action • <i>The enzyme binds to the substrate because they are complimentary shapes. The substrate is broken down and the products are released. The enzyme remains unchanged.</i>
Practice	1. Learn and practice the model answers above.

Topic	B4 Organising Animals and Plants
Qu	Compare the structure of arteries and veins. Describe what coronary heart disease is and the problems it causes. Describe and explain some of the treatments for coronary heart disease.
Info	At least one of these questions is likely to come up. The examiner is going to be looking for a clear answer written in a logical sequence.
Top Tip	Be careful that you use key words/phrases accurately (these are in bold in your model answers below).
Model Answer	Compare the structure of arteries and veins. <i>Arteries do not have valves, while veins do. The arteries also have a thicker wall when compared to the vein. Finally, the artery has a narrower lumen when compared to veins.</i>
Model Answer	Describe what coronary heart disease is and the problems it causes <i>Coronary heart disease is when layers of fat build up inside the coronary arteries. This reduces the flow of blood through the arteries and can result in a lack of oxygen for the heart muscle.</i>
Model Answer	Describe and explain some of the treatments for coronary heart disease. <i>Stents can be used to keep the coronary artery open and statins can be used to lower cholesterol levels which slows down the deposit of fatty material. In the event that the heart fails the patient may be able to have a heart transplant.</i>
Practice	1. Learn and practice the model answers above.

Topic	B4 Organising Animals and Plants
Qu	Explain how the plants ____ is adapted for its function
Info	You could be asked in this question to explain the adaptations of: • The leaf • The roots • The xylem • The phloem To answer this question you will need to do the following: 1. Identify the overall function (job) of the plant organ. 2. Describe an adaptation that the organ has. 3. Explain how this adaptation helps the organ complete its function. 4. Continue to describe another adaptation the organ has and explain how this helps complete its function until you can think of no more adaptations.
Top Tip	If you are explaining why a cell has lots of mitochondria use the following phrase: “The cell has lots of mitochondria, for respiration, to release more energy”
Model Answer	Explain how the plants leaf is adapted for its function <i>The function of the leaf is to carry out photosynthesis. Adaptations the leaf has include a large surface area to increase the absorption of light. Another adaptation the leaf has is that it has a layer of palisade cells, they are close towards the upper surface of the leaf; they are packed with chloroplasts and are arranged closely together. This means that there is increased absorption of light for photosynthesis. Another adaptation the leaf has is spongy mesophyll with gaps between the spaces, this maximises the diffusion of gases. These spongy mesophyll have a layer of water covering them so that gases can diffuse in and out of this. Finally, the leaf is very thin to produce a short diffusion pathway.</i>
Practice	1. Learn and practice the model answer above. 2. Prepare and learn model answers to explain how the xylem, phloem and roots are adapted for their function.

Topic	B5 Communicable Diseases
Qu	Describe what the disease _____ is and how its spread can be prevented.
Info	You could be asked about the following diseases: • Measles • HIV • Tobacco Mosaic Virus • Salmonella • Gonorrhoea • Rose Black Spot • Malaria To answer this question you will need to do the following: 1. Identify the type of microbe that causes the disease 2. Describe the symptoms 3. Describe how the disease is spread 4. Identify at least 2 appropriate ways of preventing the spread of the disease.
Top Tip	For plant diseases you could also be asked to explain how the symptoms affect growth. Use the following phrase to explain this: “The symptoms of the plant disease lead to less absorption of light, which leads to less photosynthesis and so there is less glucose produced by the plant for respiration and growth.”
Model Answer	Describe what the disease salmonella is and how its spread can be prevented. <i>Salmonella is a bacterial infection that causes symptoms including stomach cramps, vomiting and diarrhoea. People usually become infected from Salmonella by eating contaminated/undercooked food. To prevent the spread of Salmonella chickens are vaccinated. At home raw chicken should also be kept away from uncooked food, surfaces and hands should also be washed.</i>
Practice	1. Learn and practice the model answer above. 2. Prepare and learn model answers to describe what measles, HIV, tobacco mosaic virus, gonorrhoea, rose black spot and malaria are and how their spread can be reduced.

Topic	B5 Communicable Diseases
Qu	Explain how the human body defends itself from microorganisms. Explain how white blood cells protect us from disease. Explain how a bacterial infection makes us feel ill.
Info	At least one of these questions is likely to come up. The examiner is going to be looking for a clear answer written in a logical sequence.
Top Tip	Be careful that you use key words/phrases accurately (these are in bold in your model answers below).
Model Answer	Explain how the human body defends itself from microorganisms. <i>To prevent microbes from entering the body we have skin which is a dead layer that is difficult to penetrate. In the nose we have hairs which trap dust and microbes and, in the trachea, there is mucus that traps microbes that is produced, and cilia move the mucus up to the throat. The stomach also contains acid which kills bacteria.</i> <i>To defend the body against microbes that have entered the body we have white blood cells which produce antibodies which help destroy pathogens and they produce antitoxins which neutralise toxins the microbes produces.</i>
Model Answer	Explain how white blood cells protect us from disease. <i>The white blood cells which carry out phagocytosis and ingest the microbes, they also produce antibodies which destroys pathogens, and produce antitoxins which counteract poisons released by the microbes.</i>
Model Answer	Explain how a bacterial infection makes us feel ill. <i>The bacteria reproduce rapidly and produce poisons.</i>
Practice	1. Learn and practice the model answers above.

Topic	B6 Preventing and Treating Disease
Qu	Describe what a vaccination is and explain how they protect from infection. Describe the steps in the procedure to produce monoclonal antibodies. Explain how monoclonal antibodies works to treat cancer.
Info	At least one of these questions is likely to come up. The examiner is going to be looking for a clear answer written in a logical sequence.
Top Tip	Be careful that you use key words/phrases accurately (these are in bold in your model answers below).
Model Answer	Describe what a vaccination is and explain how they protect from infection. <i>A vaccination involves a dead or inactive pathogen being injected into the person. This produces an immune response. The antigen on the vaccine stimulates the white blood cells to start making antibodies. The white blood cells destroy the pathogen without risk of getting the disease. When a person is re-infected the white blood cells produce antibodies more rapidly which leads to the pathogen being destroyed.</i>
Model Answer	Describe the steps in the procedure to produce monoclonal antibodies. <i>The virus is injected into a mouse which stimulates its lymphocytes to produce antibodies. The lymphocyte is combined with a tumour cell to form a hybridoma. The hybridoma is then cloned and produces the required antibodies.</i>
Model Answer	Explain how monoclonal antibodies works to treat cancer. <i>The monoclonal antibody is attached to a toxin or radioactive substance. The monoclonal antibody will only attach to cancer cells and so the toxin or radioactive substance will bind to the tumour and stop its dividing and destroy the tumour.</i>
Practice	1. Learn and practice the model answers above.

Topic	B7 Non-Communicable Disease
Qu	Explain how a foetus may be affected if a mother smokes during pregnancy. Identify conditions linked to obesity. Describe how smoking can affect health.
Info	At least one of these questions is likely to come up. The examiner is going to be looking for a clear answer written in a logical sequence.
Top Tip	Be careful that you use key words/phrases accurately (these are in bold in your model answers below).
Model Answer	Explain how a foetus may be affected if a mother smokes during pregnancy. <i>The cigarette smoke will contain carbon monoxide which occupies the mothers red blood cells and so reduces the amount of oxygen that the mothers blood contains. This means that the foetus receives less oxygen which reduces the rate of respiration in the foetus which causes the birth mass of the baby to be less.</i>
Model Answer	Identify conditions linked to obesity. <i>There are several diseases linked to obesity including heart disease, arthritis, strokes, diabetes, high blood pressure and breathing difficulties.</i>
Model Answer	Describe how smoking can affect health. <i>Firstly smoking raises blood pressure, increases cholesterol and leads to thickening of the artery walls. This leads to increased risk of heart disease. The chemicals in smoke can also cause mutations leading to uncontrolled growth of cells which can cause cancer. Smoking can also damage the alveoli causing the surface area to decrease. This causes shortness of breath and leads to a disease called emphysema. Finally the chemicals in the smoke damage the cilia which causes mucus production to increase, this causes shortness of breath and causes the person to be at an increased risk of infection.</i>
Practice	1. Learn and practice the model answers above.

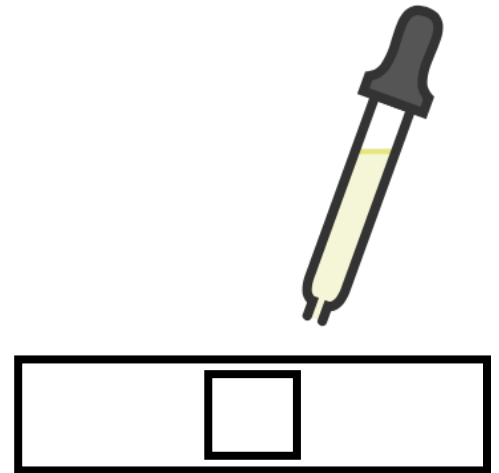
Preparing a Slide:

Add a drop of water to the microscope slide.

Place a thin layer of tissue on the slide.

Stain the tissue with a couple of drops of iodine solution.

Place the coverslip on top.

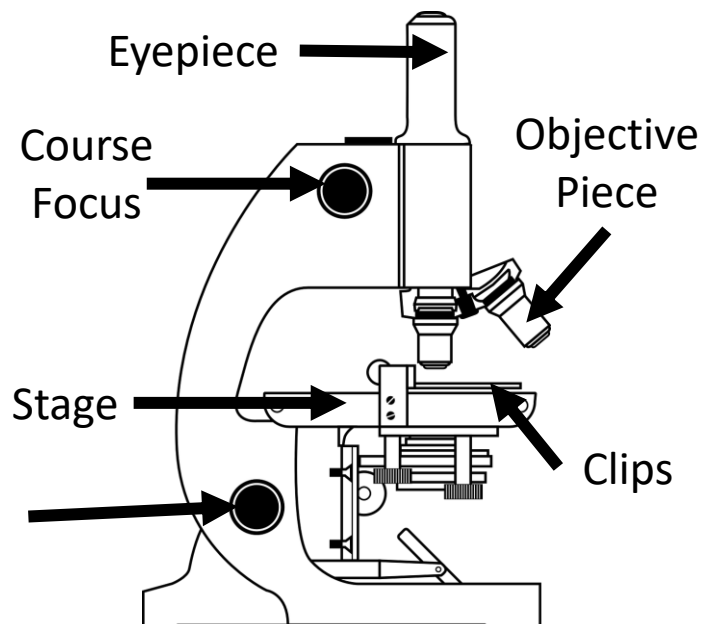
**Observing a Slide:**

Place the slide on the stage and use the lowest power objective lens.

Turn the course focus wheel to bring the image into focus.

Increase the power of the objective lens to increase magnification.

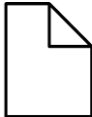
Turn the fine focus wheel to bring the image into clearer focus.



Practical Video



Required Practical: Using a Light Microscope

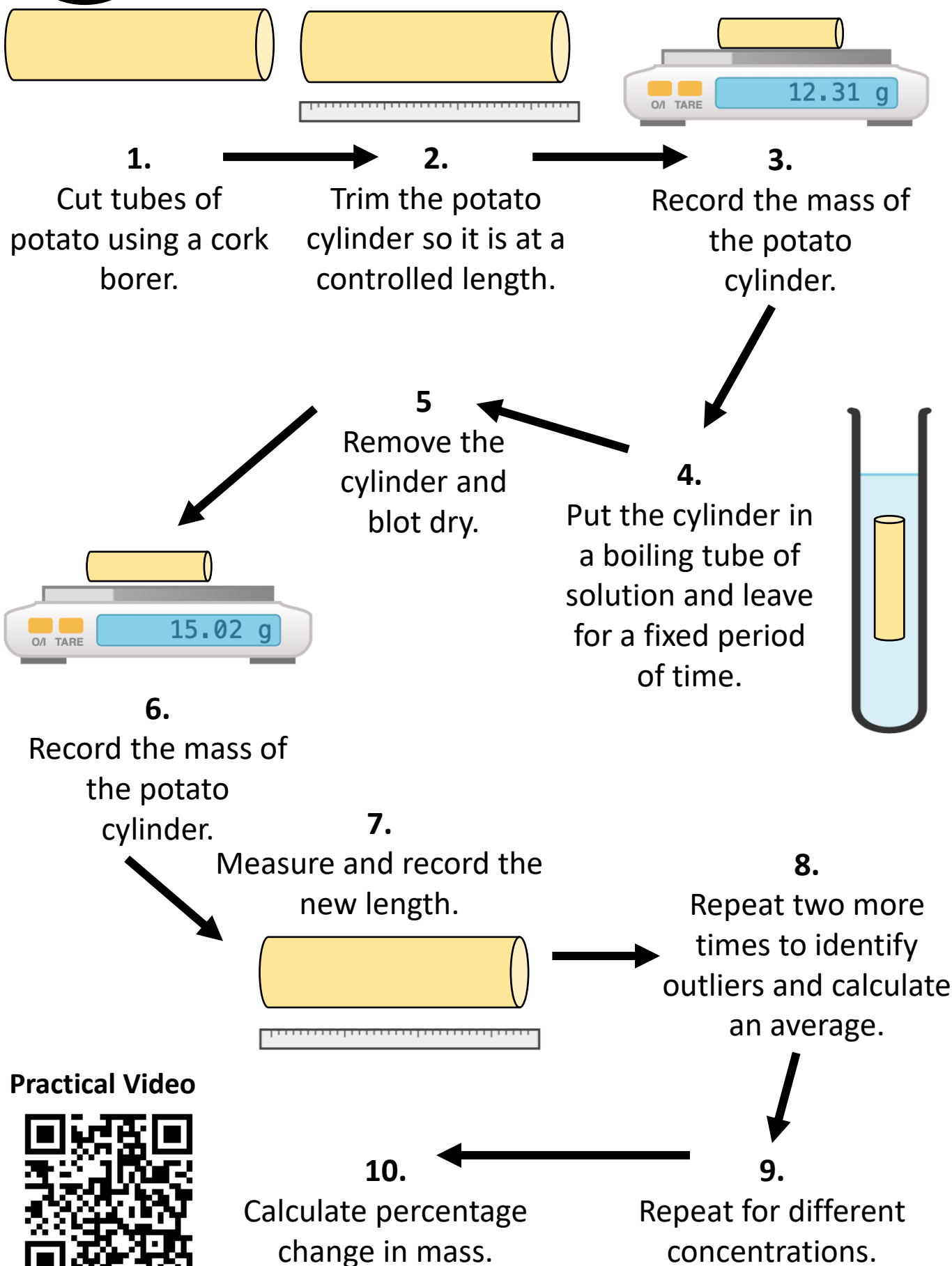


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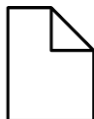
1. What could you use to stain the sample cells?
2. Why do you stain the sample cells?
3. Which lens do you use first when viewing a cell under a microscope?
4. How do you increase the magnification of the image?
5. How do you bring the image into a clearer focus?
6. What is the formula to calculate the real size of a cell?
7. What are the advantages of using an electron microscope rather than a light microscope?
8. Suggest why ribosomes cant be seen through a light microscope.
9. When measuring the length of a cell from an image what unit should you use?
10. How many μm are in a mm?
11. How do you convert from mm into μm ?
12. You have increased the magnification and the image you can see is fuzzy. What should you do?

1. Iodine
2. So that you can see them.
3. Lowest power lens.
4. Increase the power of the objective lens.
5. Turn the fine focus wheel to adjust the height of the stage.
6. Magnification = length of drawing/actual length of cell.
7. Higher resolution and magnification.
8. They are too small.
9. mm
10. 1000
11. Multiply by 1000
12. Turn the fine focus wheel to bring the image into focus.

Topic	Required Practical 1: Microscopes	
Qu	Calculate the real length of the cell.	
Info	This is a common calculation question on a Biology exam paper and is often worth 3 marks. It may require you to use a ruler and measure the size of the image. Be careful with this and measure as accurately as you can in mm.	
Top Tip	Watch out for units. You may be working in mm and be asked to convert into μm . There are 1000 μm in a mm.	
Model Answer	The image of a cell is 30mm in length and the magnification is x200. Calculate the actual size of the cell in μm.	
	$30 \times 1000 = 30,000\mu\text{m}$ <i>Magnification = Image length/actual length</i> <i>Actual Length = Image Length/Magnification</i> <i>Actual Length = 30,000 / 200</i> <i>Actual Length = 150μm</i>	<i>Convert mm into μm</i> <i>Write in the formula</i> <i>Rearrange the formula</i> <i>Substitute numbers</i> <i>Show answer, round if required, then add units</i>
Practice	Complete the following calculations. Remember to show full working. - The image of a cell is 32mm in length and the magnification is x400. Calculate the actual size of the cell in μm. - The image of a cell is 12mm in length and the magnification is x1000. Calculate the actual size of the cell in μm. - The real length of a cell is 0.06mm while the image length is 24mm. Calculate the magnification. - An image has a length of 40mm and has been magnified x500. Calculate the actual size of the image. - The average diameter of a real red blood cell is 0.008 millimetres. On the photograph, the diameter of the red blood cell is 100 millimetres. Calculate the magnification of the photograph. - The image width of the cell was 40 mm. The real width of the cell was 0.1 mm. Calculate the magnification of the cell. - An image has a length of 45mm and has been magnified x400. Calculate the actual size of the image. - An image has a length of 12mm and has been magnified x150. Calculate the actual size of the image. - An image has a length of 22mm and has been magnified x1000. Calculate the actual size of the image. - The image of a cell is 52mm in length and the magnification is x400. Calculate the actual size of the cell in μm.	



Required Practical 3: Osmosis



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1. What piece of apparatus is used to measure mass?
2. What piece of equipment is used to measure time?
3. What is osmosis?
4. Why would you dry the potato piece before weighing it again?
5. Why do you calculate the percentage change in mass?
6. What are some of the potential sources of error when investigating osmosis?
7. When would a potato piece left in solution increase in mass?
8. When would a potato piece left in solution decrease in mass?
9. When would a potato piece left in solution not have a change in mass?
10. What are the control variables when determining the concentration of a potato piece?
11. How could you increase the reliability of investigative data.
12. How do you calculate percentage change in mass?
13. What does it mean if you get a negative percentage change in mass?
14. What does it mean if you get a positive percentage change in mass?

1. Balance
2. Stopwatch
3. The movement of water through a selectively permeable membrane from an area of high water concentration to a lower concentration of water.
4. So that the excess water does not contribute to the mass.
5. The samples would have been different masses.
6. Concentration of solutions, drying of pieces before weighing, accuracy of balance, evaporation from tubes.
7. The solution would be more dilute than the potato piece and so water has entered the potato by osmosis.
8. The solution would be more concentrated than the potato piece and so water has left the potato by osmosis.
9. When the concentration of the solution is the same as the concentration of the potato.
10. Time in solution, surface area of potato piece, volume of solution, amount of blotting dry
11. Do repeats.
12. Divide the change in mass by the start mass and multiply by 100.
13. There has been a loss in mass.
14. There has been a gain in mass.

Topic	Required Practical 3: Osmosis
Qu	Construct a method to determine the concentration of a piece of _____
Info	You could be asked this question to determine the concentration of lots of different things. Some examples from the past include: • A piece of potato • A piece of carrot • A chip • An egg To answer this question, you will need to do the following: 1. Construct a clear method. 2. Identify what you will measure. 3. Identify control variables 4. Explain how you will use the results to determine the concentration.
Top Tip	Make sure you include 5 different concentrations with regular intervals between them.
Model Answer	Construct a method to determine the concentration of a potato. 1. Cut a tube of potato using a cork borer. 2. Trim the potato to 5cm in length. 3. Weigh the potato piece. 4. Place the potato in 25cm³ of 0M solution and leave for 1 hour. 5. Remove the potato and blot dry. 6. Reweigh the potato. 7. Calculate the change in mass. 8. Calculate the percentage change in mass. 9. Repeat for 0.2, 0.4, 0.6, 0.8 and 1M solutions 10. Plot a graph to show the percentage change in mass for each concentration and draw a line of best fit. 11. To determine the concentration, find the point that the line crosses the x axis and there is no change in mass
Practice	1. Learn and practice the model answer above. 2. Prepare and learn model answers to explain how to determine the concentration of a piece of carrot, a chip and a piece of egg.

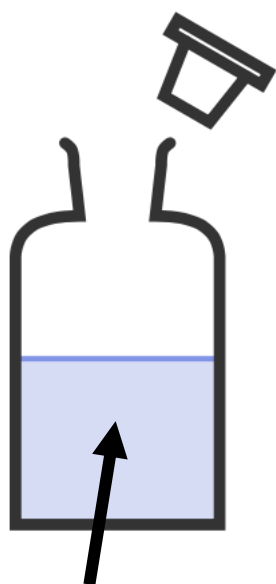
Topic	Required Practical 3: Osmosis
Qu	Explain why _____ changed in mass when placed in a _____ solution
Info	You could be asked this question to explain the change in mass of different substances when placed in dilute or concentration solutions. To answer this question, you will need to do the following: 1. Compare the concentration inside and outside the cells of the substance that was given in the question. 2. Identify the direction of the movement of water by osmosis. 3. Identify what this will do to the mass.
Top Tip	Remember a concentrated solution has little water while a dilute solution has lots of water. Water will move from a dilute solution to a concentrated solution.
Model Answer	Explain why a peeled potato changed in mass when placed in a dilute solution. The potato piece is more concentrated than the surrounding solution. This means that water will move into the potato piece by osmosis and so the potato piece will increase in mass.
Practice	1. Learn and practice the model answer above. 2. Prepare and learn a model answer to explain what will happen to a potato piece when placed in a concentrated solution. 3. Prepare and learn a model answer to explain what you predict would happen to a potato piece with a concentration of 0.55M when placed in the following solutions; 0M, 0.2M, 0.4M and 0.6M

Testing for Proteins

Preparation

If the food is already in solution (such as milk) no further preparation is needed. If the food is solid it needs to be ground up using a pestle and mortar and added to water to make a solution.

Add Biuret Reagent to the food sample.



Biuret Reagent



Food Sample



If there is no protein the sample remains blue.



If there is protein the sample turns purple.

Practical Video

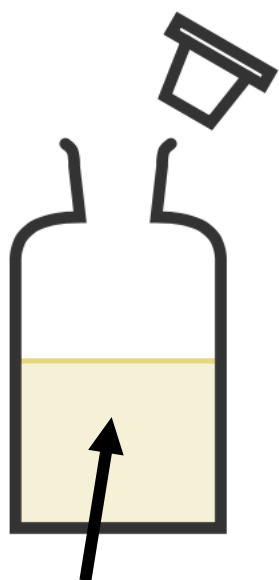


Testing for Starch

Preparation

If the food is already in solution (such as milk) no further preparation is needed. If the food is solid it needs to be ground up using a pestle and mortar and added to water to make a solution.

Add iodine to
the food
sample.



Iodine
Solution



Food
Sample

If there is no
starch the
sample
remains
yellow.



If there is
starch the
sample turns
blue/black.



Practical Video

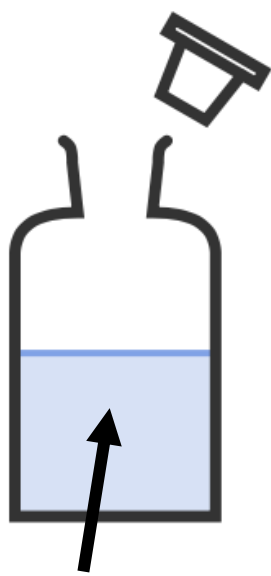


Testing for Glucose

Preparation

If the food is already in solution (such as milk) no further preparation is needed. If the food is solid it needs to be ground up using a pestle and mortar and added to water to make a solution.

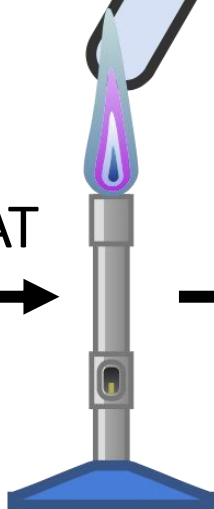
Add Benedict's Reagent to the food sample.



Benedict's Reagent

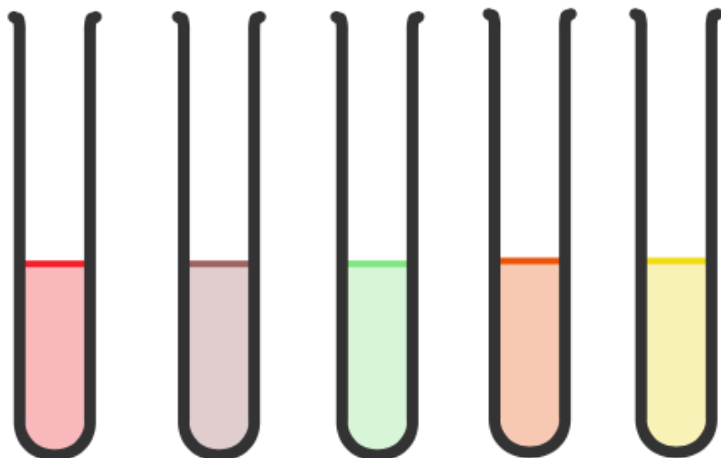
Food Sample

HEAT



If there is no glucose the sample remains blue.

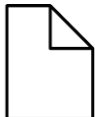
If there is glucose the sample turns red, orange, yellow, brown or green.



Practical Video



Required Practical 4: Testing Foods



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1. How do you prepare a solid food sample to test for nutrients?
2. What reagent is used to test for proteins?
3. What colour change indicates a positive result for protein?
4. How do you test for protein?
5. What reagent is used to test for starch?
6. What colour change indicates a positive result for starch?
7. How do you test for starch?
8. What reagent is used to test for glucose?
9. What colour change indicates a positive result for glucose?
10. How do you test for glucose?
11. What are examples of carbohydrates?
12. Which reagents would you use to test for carbohydrates?

1. Grind up using a pestle and mortar and then add water to form a solution.
2. Biuret solution
3. Colour change to purple.
4. Add biuret solution and look for a colour change to purple.
5. Iodine
6. Colour changes to blue/black
7. Add iodine and look for a colour change to blue/black.
8. Benedicts
9. A colour change to red/green/orange/yellow
10. Add Benedicts, heat and look for colour change to red/green/orange/yellow.
11. Starch and glucose
12. Amylase for starch and Benedicts for glucose

Topic	Required Practical 4: Testing Foods
Qu	Explain how to test a substance for the presence of _____
Info	You could be asked this question to test for: • Starch • Glucose • Proteins • A combination of some/all of them To answer this question, you will need to do the following: 1. Identify the chemical you would use to test for the food substance. 2. Describe what you would do. 3. Identify the positive result 4. Repeat steps 1-3 for another food substance if the exam question is asking about more than one substance in the food.
Top Tip	Be careful with your colour changes. Marks will be awarded for identifying the colour that shows a positive result, not for the start colour. If you don't know the start colour, don't include it as it could lose you marks.
Model Answer	Explain how to test a substance for the presence of glucose. <i>Add Benedict's solution to your sample of food in solution and heat it. A positive test for glucose would be the solution turning red. If the solution does not change colour no glucose is present.</i>
Practice	1. Learn and practice the model answer above. 2. Prepare and learn model answers to explain how to test for starch, lipids and proteins. 3. Prepare and learn a model answer to explain how to test 1 food for the presence of glucose, starch and proteins