

Paper 1:

Topic 1 – Cell Biology Retrieval Starters

4.1.1.1 Eukaryotes and Prokaryotes

1. What type of cell is a bacterium?
2. Where is the genetic material found in a eukaryotic cell?
3. State two structures found in bacterial cells.
4. What is the name of the small rings of DNA found in some bacterial cells?
5. State two differences between prokaryotic cells and eukaryotic cells.
6. Explain why bacterial cells do not need a nucleus to contain their DNA.

4.1.1.2 Animal and Plant Cells

1. What organelle contains the genetic material in animal cells?
2. What is the function of mitochondria?
3. Name two structures found in plant cells but not animal cells.
4. What is the function of chloroplasts?
5. Explain the function of the permanent vacuole in plant cells.
6. Compare the structures found in plant cells and animal cells.

Sub-cellular Structures and Their Functions

1. What is the function of the nucleus?
2. What is the function of ribosomes?
3. What is the function of the cell membrane?
4. Why do muscle cells contain many mitochondria?
5. Why do cells contain different numbers of organelles?
6. Match the following structures to their functions: nucleus, mitochondria, ribosomes, chloroplasts.

Required Practical 1: Using a Light Microscope

1. What type of microscope is used to observe plant and animal cells in the required practical?
2. What is the purpose of using a stain when observing cells?
3. What two things should be included when drawing a biological specimen?
4. What is the purpose of including a magnification scale on a microscope drawing?
5. Describe the correct order of steps when preparing a microscope slide.
6. Calculate the magnification of an image that is 20 mm long if the real cell size is 0.02 mm.

Scale and Size of Cells

1. What unit is commonly used to measure cells?
2. What does the prefix micro- mean?
3. Convert 1 mm into micrometres.
4. Convert 5000 μm into millimetres.
5. Express 0.000005 m in standard form.
6. Explain why standard form is useful when measuring cells.

4.1.1.3 Cell Specialisation

1. What is a specialised cell?
2. Name a specialised animal cell.
3. Name a specialised plant cell.
4. State one adaptation of a sperm cell.
5. State one adaptation of a root hair cell.
6. Explain how the adaptations of specialised cells help them carry out their functions.

4.1.1.4 Cell Differentiation

1. What is differentiation?
2. Why do cells differentiate?
3. What does a cell become after differentiation?
4. When do most animal cells differentiate?
5. Why can many plant cells continue to differentiate throughout life?
6. Explain why differentiation is important in multicellular organisms.

4.1.1.5 Microscopy

1. What is magnification?
2. What is resolution?
3. Which type of microscope generally has the highest magnification and resolution?
4. What is the formula for calculating magnification?
5. What magnification does a microscope have if the image is 1000 times larger than the actual object?
6. Why are electron microscopes able to show smaller structures than light microscopes?

4.1.1.6 Culturing Microorganisms (Biology Only)

1. How do bacteria reproduce?
2. What is binary fission?
3. How quickly can bacteria divide when conditions are suitable?
4. Name two conditions needed for bacterial growth.
5. Calculate the number of bacteria produced after two divisions from one bacterium.
6. Why are bacteria grown on agar plates in laboratories?

Aseptic Technique

1. Why are Petri dishes sterilised before use?
2. Why are culture media sterilised before bacteria are added?
3. Why is an inoculating loop heated before transferring bacteria?
4. Why are Petri dish lids taped after bacteria are added?
5. Why are school cultures usually incubated at 25°C?
6. What is the purpose of aseptic technique?

Required Practical 2: Antibiotics and Antiseptics

1. What is measured to investigate the effect of antibiotics on bacteria?
2. What is a zone of inhibition?
3. What does a larger zone of inhibition show?
4. Why must the same volume of antibiotic be used on each agar plate?
5. Why are bacteria grown on agar before testing antibiotics?
6. How is the area of a circular zone of inhibition calculated?

4.1.2 Cell Division

4.1.2.1 Chromosomes

1. Where are chromosomes found?
2. What molecule are chromosomes made from?
3. What is a gene?
4. How many copies of each chromosome are normally found in body cells?
5. Explain the relationship between DNA, genes and chromosomes.
6. Why must chromosomes be copied before cell division?

4.1.2.2 Mitosis and the Cell Cycle

1. What type of cell division produces genetically identical cells?
2. What happens to DNA before a cell divides?
3. What are the two cells produced by mitosis like?
4. Name two situations where mitosis occurs.
5. Put these stages of the cell cycle in order: cell growth, DNA replication, cell division.
6. Why is mitosis important for growth and repair?

4.1.2.3 Stem Cells

1. What is a stem cell?
2. Where are embryonic stem cells found?
3. What can stem cells differentiate into?
4. Where are adult stem cells found in humans?
5. What are meristem cells found in plants able to produce?
6. Give one medical use of stem cells.

4.1.3 Transport in Cells

4.1.3.1 Diffusion

1. What is diffusion?
2. In which direction do particles move during diffusion?
3. Name one substance that moves by diffusion.

4. State three factors that affect the rate of diffusion.
5. Why does increasing surface area increase the rate of diffusion?
6. Why do single-celled organisms have a high surface area to volume ratio?

Surface Area to Volume Ratio

1. What does surface area to volume ratio compare?
2. What happens to surface area to volume ratio as a cell gets bigger?
3. Calculate the surface area of a cube with sides of 2 cm.
4. Calculate the volume of a cube with sides of 2 cm.
5. Explain why large organisms need exchange surfaces.
6. Explain why cells remain small.

Exchange Surfaces

1. Name one exchange surface in humans.
2. Name one exchange surface in plants.
3. State one feature of an efficient exchange surface.
4. How are alveoli adapted for gas exchange?
5. How are fish gills adapted for gas exchange?
6. How are leaves adapted for gas exchange?

4.1.3.2 Osmosis

1. What is osmosis?
2. What substance moves during osmosis?
3. What type of membrane is needed for osmosis?
4. In which direction does water move during osmosis?
5. What happens to a plant cell placed in a dilute solution?
6. What happens to a plant cell placed in a concentrated solution?

Required Practical 3: Osmosis in Plant Tissue

1. What type of plant tissue is commonly used in the osmosis required practical?
2. Why are potato cylinders placed into different concentrations of solution?
3. Why is the mass of potato cylinders measured before and after the experiment?

4. Calculate the percentage change in mass if a potato cylinder changes from 5 g to 6 g.
5. Why should potato cylinders be the same size at the start?
6. Why are repeats carried out in the osmosis investigation?

4.1.3.3 Active Transport

1. What is active transport?
2. Does active transport require energy?
3. In which direction does active transport move substances?
4. Where does the energy for active transport come from?
5. Why do root hair cells use active transport?
6. Give one difference between diffusion and active transport.

Topic 1 Review

1. What is the difference between a prokaryotic cell and a eukaryotic cell?
2. Name the organelle where aerobic respiration occurs.
3. Explain why specialised cells have different structures.
4. State the three ways substances move across cell membranes.
5. What type of cell division produces identical cells?
6. Explain why cells need transport systems.

Topic 2 – Organisation Retrieval Starters (AQA 8461)

4.2.1 Principles of Organisation

1. What are the basic building blocks of all living organisms?
2. What is a tissue?
3. What is an organ?
4. What is an organ system?
5. Put these levels of organisation in order: organ, cell, organism, tissue.
6. Explain how tissues work together to form an organ.

4.2.2.1 The Human Digestive System

1. What is the main function of the digestive system?
2. Where does digestion begin in the human body?
3. Name the organ where most absorption of digested food occurs.
4. State the role of the small intestine in digestion and absorption.
5. Explain why digestion produces small soluble molecules.
6. Explain how the digestive system and circulatory system work together.

Enzymes and Metabolism

1. What type of biological molecule are enzymes?
2. What is the function of enzymes?
3. What is the active site of an enzyme?
4. Explain why enzymes are specific to their substrates.
5. Describe the lock and key model of enzyme action.
6. Explain why changes in temperature can affect enzyme activity.

Digestive Enzymes

1. Which enzyme breaks down starch?
2. Which enzyme breaks down proteins?
3. Which enzyme breaks down lipids?
4. What are the products of protein digestion?
5. What are the products of lipid digestion?
6. Explain why the products of digestion can be absorbed into the bloodstream.

Bile

1. Where is bile produced?
2. Where is bile stored?
3. What is the role of bile in digestion?
4. Why does bile neutralise stomach acid?
5. Explain how bile increases the rate of fat digestion.
6. Explain why lipase works more effectively after bile has acted on fats.

Required Practical 4: Testing for Biological Molecules

1. Which food test is used to test for starch?

2. Which food test is used to test for protein?
3. Which food test is used to test for sugars?
4. What colour change shows a positive Benedict's test result?
5. Explain why different reagents are used to test different food molecules.
6. Describe how to test a food sample for starch, protein and sugar.

Required Practical 5: Effect of pH on Amylase

1. Which enzyme is investigated in the pH practical?
2. Which substance is broken down by amylase?
3. Which reagent is used to test for starch?
4. Explain why pH is controlled during an enzyme investigation.
5. Explain why temperature must be controlled when investigating enzyme activity.
6. Explain how the time taken for starch to disappear can be used to measure enzyme activity.

4.2.2.2 The Heart and Blood Vessels

1. What is the main function of the heart?
2. What type of circulatory system do humans have?
3. Which side of the heart pumps blood to the lungs?
4. Which side of the heart pumps blood around the body?
5. Name the five main blood vessels associated with the heart.
6. Explain why the heart is described as a double circulatory system.

Structure of the Heart

1. Which organ pumps blood around the body?
2. What is the function of the ventricles?
3. What is the function of the atria?
4. Why is the left ventricle thicker than the right ventricle?
5. Explain why the heart muscle needs its own blood supply.
6. Explain the role of the natural pacemaker and state where it is found.

The Lungs and Gas Exchange

1. What gas enters the blood in the lungs?
2. What gas leaves the blood in the lungs?

3. What structure in the lungs is adapted for gas exchange?
4. Name the blood vessels surrounding alveoli.
5. Explain how alveoli are adapted for gas exchange.
6. Explain why a good blood supply increases the efficiency of gas exchange.

Blood Vessels

1. Name the three types of blood vessel.
2. Which blood vessel carries blood away from the heart?
3. Which blood vessel carries blood towards the heart?
4. Explain why arteries have thick muscular walls.
5. Explain why capillaries have thin walls.
6. Compare the structures of arteries, veins and capillaries.

4.2.2.3 Blood

1. What type of tissue is blood?
2. What is the liquid part of blood called?
3. Name the four main components of blood.
4. What is the function of red blood cells?
5. What is the function of white blood cells?
6. Explain how red blood cells are adapted to transport oxygen.

4.2.2.4 Coronary Heart Disease: A Non-Communicable Disease

1. What type of disease is coronary heart disease?
2. What builds up inside coronary arteries during coronary heart disease?
3. What does the narrowing of coronary arteries reduce?
4. What is the purpose of a stent?
5. How do statins reduce the risk of coronary heart disease?
6. Explain why reduced oxygen supply damages heart muscle.

Treatments for Cardiovascular Disease

1. What is a stent used for?
2. What are statins used for?
3. What is a mechanical heart valve used to replace?
4. What may a patient receive during heart failure?
5. State one artificial device used to support the heart.
6. Explain why different treatments have different risks and benefits.

4.2.2.5 Health Issues

1. What is meant by health?
2. Name two types of disease.
3. State one factor that can affect physical health.
4. Explain how diseases can interact with each other.
5. Explain how defects in the immune system can affect health.
6. Explain how lifestyle factors can affect disease risk.

4.2.2.6 The Effect of Lifestyle on Some Non-Communicable Diseases

1. What is a risk factor?
2. Name one lifestyle risk factor for disease.
3. How can smoking increase the risk of lung disease?
4. How can diet affect cardiovascular disease?
5. Explain why obesity increases the risk of Type 2 diabetes.
6. Explain how alcohol can affect the liver and brain.

Risk Factors and Data

1. What does correlation mean?
2. What type of graph can show a correlation between two variables?
3. What is a risk factor?
4. Explain why correlation does not always prove causation.
5. Describe how scientists use data to investigate disease risk factors.
6. Explain why large samples are useful when studying disease patterns.

4.2.2.7 Cancer

1. What is cancer?
2. What is a tumour?
3. What is the difference between benign and malignant tumours?
4. Why are malignant tumours more dangerous than benign tumours?
5. State one lifestyle risk factor linked to cancer.
6. Explain how cancer can spread to other parts of the body.

4.2.3 Plant Tissues, Organs and Systems

4.2.3.1 Plant Tissues

1. What type of organ is a leaf?
2. Name the tissue where photosynthesis mainly occurs.
3. What is the function of xylem tissue?
4. What is the function of phloem tissue?
5. Explain how palisade mesophyll cells are adapted for photosynthesis.
6. Explain how different plant tissues allow the plant to survive.

Leaf Structure

1. What tissue covers the outside of a leaf?
2. What is the function of guard cells?
3. What are stomata?
4. Explain why leaves contain spongy mesophyll.
5. Explain how stomata control water loss.
6. Explain how the structure of a leaf allows efficient photosynthesis.

4.2.3.2 Plant Organ System

1. Name the three main organs in a plant transport system.
2. What substance does xylem transport?
3. What substance does phloem transport?
4. What process moves water through a plant?
5. Explain how root hair cells are adapted to absorb water and minerals.
6. Explain the difference between transpiration and translocation.

Root Hair Cells, Xylem and Phloem

1. What process allows root hair cells to absorb water?
2. What process allows root hair cells to absorb mineral ions?
3. What strengthens xylem vessels?
4. What do phloem tubes transport?
5. Explain why root hair cells have a large surface area.
6. Explain how xylem structure is adapted for transporting water.

Transpiration and Stomata

1. What is transpiration?
2. Through which structures does water leave a leaf?
3. What is the function of guard cells?
4. Name four factors that affect transpiration rate.
5. Explain how increased temperature affects transpiration.
6. Explain how light intensity affects transpiration.

Measuring Transpiration

1. What is measured when investigating transpiration rate?
2. What apparatus can be used to measure water uptake by a plant?
3. Why are experiments repeated when measuring transpiration?
4. Calculate the rate of water uptake if 10 cm³ of water is taken up in 5 hours.
5. Explain why environmental conditions must be controlled during a transpiration investigation.
6. Explain why changing one factor at a time improves an investigation.

Topic 2 Review

1. State the order of organisation from cell to organism.
2. Explain the role of enzymes in digestion.
3. Explain how the heart transports blood around the body.
4. State the functions of the four components of blood.
5. Explain how lifestyle factors increase disease risk.
6. Explain how plant tissues are adapted for transport and photosynthesis.

Topic 3 – Infection and Response Retrieval Starters (AQA 8461)

4.3.1.1 Communicable (Infectious) Diseases

1. What is a pathogen?
2. Name the four types of pathogen.
3. What is an infectious disease?
4. State three ways pathogens can be spread.

5. Explain why viruses can cause damage to body cells.
6. Explain why bacteria can make humans feel ill.

4.3.1.2 Viral Diseases

1. What type of pathogen causes measles?
2. How is measles spread?
3. State one symptom of measles.
4. How does HIV affect the immune system?
5. How is HIV transmitted between people?
6. Explain how Tobacco Mosaic Virus affects plant growth.

Measles

1. What type of microorganism causes measles?
2. How is the measles virus spread?
3. State two symptoms of measles.
4. Why are most young children vaccinated against measles?
5. Explain why measles can sometimes be fatal.
6. Explain how vaccination reduces the spread of measles.

HIV

1. What type of pathogen causes HIV?
2. What does HIV attack in the human body?
3. State one way HIV can be transmitted.
4. What condition can develop when HIV damages the immune system severely?
5. Why can people with AIDS become ill from other infections?
6. How can antiretroviral drugs help people with HIV?

Tobacco Mosaic Virus (TMV)

1. What type of pathogen causes TMV?
2. Which type of organism is affected by TMV?
3. What appearance does TMV cause on plant leaves?
4. Why does TMV reduce plant growth?
5. Explain how TMV affects photosynthesis.
6. Explain why a plant infected with TMV may produce a lower yield.

4.3.1.3 Bacterial Diseases

1. What type of pathogen causes Salmonella food poisoning?
2. How is Salmonella usually spread?
3. State two symptoms of Salmonella infection.
4. Why do bacteria produce toxins?
5. How is gonorrhoea spread?
6. Why are some strains of gonorrhoea difficult to treat?

Salmonella

1. What type of pathogen causes Salmonella food poisoning?
2. How can Salmonella bacteria enter the human body?
3. State two symptoms caused by Salmonella.
4. How can Salmonella in poultry be controlled?
5. Explain why good hygiene reduces the spread of Salmonella.
6. Explain how bacterial toxins cause illness.

Gonorrhoea

1. What type of pathogen causes gonorrhoea?
2. How is gonorrhoea transmitted?
3. State one symptom of gonorrhoea.
4. Which antibiotic was previously used to treat gonorrhoea?
5. Why have some strains of gonorrhoea become resistant to antibiotics?
6. State two ways the spread of gonorrhoea can be reduced.

4.3.1.4 Fungal Diseases

1. What type of pathogen causes rose black spot?
2. Which organism is affected by rose black spot?
3. State one symptom of rose black spot.
4. How is rose black spot spread?
5. Why does rose black spot reduce plant growth?
6. State two methods used to control rose black spot.

4.3.1.5 Protist Diseases

1. What type of pathogen causes malaria?
2. Which organism acts as the vector for malaria?
3. What disease is caused by the malarial protist?

4. State one symptom of malaria.
5. Explain why mosquitoes are important in the spread of malaria.
6. State two ways the spread of malaria can be reduced.

4.3.1.6 Human Defence Systems

1. What is the first barrier against pathogens entering the body?
2. What substance in the stomach destroys many pathogens?
3. How do hairs and mucus in the nose help defend the body?
4. What is the role of white blood cells?
5. Name the three ways white blood cells defend against pathogens.
6. Explain how phagocytosis helps remove pathogens.

White Blood Cells

1. What type of cell helps defend the body against pathogens?
2. What process involves white blood cells engulfing pathogens?
3. What do antibodies bind to on pathogens?
4. What do antitoxins neutralise?
5. Explain why antibodies are specific to particular pathogens.
6. Explain how white blood cells help the body recover from infection.

4.3.1.7 Vaccination

1. What is introduced into the body during vaccination?
2. Are the pathogens used in vaccines usually alive or dead/inactive?
3. Which cells produce antibodies after vaccination?
4. What happens if the same pathogen enters the body again?
5. Explain why vaccination prevents illness.
6. Explain how high vaccination rates reduce the spread of disease.

4.3.1.8 Antibiotics and Painkillers

1. What type of pathogen can antibiotics kill?
2. Name one antibiotic.
3. Why do antibiotics not kill viruses?
4. What is the purpose of painkillers?
5. Why are antibiotics becoming less effective?
6. Explain how antibiotic resistance develops in bacteria.

4.3.1.9 Discovery and Development of Drugs

1. Where did the drug digitalis originally come from?
2. Which plant does aspirin originate from?
3. Who discovered penicillin?
4. What is the purpose of preclinical testing?
5. What is tested during clinical trials?
6. Explain why new medicines must be tested before use.

Drug Testing

1. What does toxicity testing investigate?
2. What does efficacy testing investigate?
3. What is meant by the optimum dose?
4. Why are very low doses used at the start of clinical trials?
5. What is a placebo?
6. Why are double blind trials used?

4.3.2.1 Producing Monoclonal Antibodies

1. What are monoclonal antibodies?
2. What cells produce antibodies?
3. What type of cell is produced when lymphocytes are combined with tumour cells?
4. What is a hybridoma cell able to do?
5. Why are hybridoma cells cloned?
6. Explain why monoclonal antibodies are specific.

4.3.2.2 Uses of Monoclonal Antibodies

1. Give one use of monoclonal antibodies.
2. How can monoclonal antibodies be used in pregnancy tests?
3. How can monoclonal antibodies identify pathogens?
4. How can monoclonal antibodies be used to locate molecules in cells?
5. How can monoclonal antibodies target cancer cells?
6. Explain why monoclonal antibodies can be useful in medical treatments.

4.3.3 Plant Disease (Biology Only)

4.3.3.1 Detection and Identification of Plant Diseases

1. State one sign that a plant may be diseased.
2. Name one type of pathogen that can infect plants.
3. What does stunted growth suggest about a plant?
4. How can plant diseases be identified using testing kits?
5. What nutrient deficiency causes chlorosis?
6. Why are magnesium ions needed by plants?

Plant Ion Deficiencies

1. Which ion is needed to make chlorophyll?
2. Which ion is needed for protein synthesis?
3. What symptom is caused by nitrate deficiency?
4. What symptom is caused by magnesium deficiency?
5. Explain why nitrate deficiency affects plant growth.
6. Explain why magnesium deficiency reduces photosynthesis.

4.3.3.2 Plant Defence Responses

1. State one physical defence response in plants.
2. What substance are plant cell walls made from?
3. What is the function of the waxy cuticle on leaves?
4. State one chemical defence response in plants.
5. State one mechanical defence response in plants.
6. Explain how plant defence responses reduce infection or damage.

Topic 3 Review

1. Name the four types of pathogen.
2. State how viruses reproduce inside the body.
3. Explain how vaccines protect against disease.
4. Explain why antibiotics do not work against viruses.
5. State the function of antibodies.
6. Explain how plants defend themselves against pathogens.

Topic 4 – Bioenergetics Retrieval Starters (AQA 8461)

4.4.1.1 Photosynthetic Reaction

1. What process do plants use to make glucose?
2. What two substances are needed for photosynthesis?
3. What gas is produced during photosynthesis?
4. Write the word equation for photosynthesis.
5. State the chemical formula for carbon dioxide, water, oxygen and glucose.
6. Explain why photosynthesis is described as an endothermic reaction.

Photosynthesis and Chloroplasts

1. Where in a plant cell does photosynthesis occur?
2. What pigment absorbs light energy for photosynthesis?
3. What organelle contains chlorophyll?
4. Explain why chloroplasts are important for photosynthesis.
5. Explain how light energy is used during photosynthesis.
6. Explain why plants need carbon dioxide to make glucose.

4.4.1.2 Rate of Photosynthesis

1. State one factor that affects the rate of photosynthesis.
2. What is meant by a limiting factor?
3. How does increasing light intensity affect photosynthesis rate?
4. How does carbon dioxide concentration affect the rate of photosynthesis?
5. Explain why increasing temperature does not always increase the rate of photosynthesis.
6. Explain how two limiting factors can interact to affect photosynthesis rate.

Required Practical 6: Investigating Light Intensity and Photosynthesis

1. Which organism can be used to investigate the effect of light intensity on photosynthesis?
2. What is measured to calculate the rate of photosynthesis in this practical?
3. Why is the distance from the lamp changed during the investigation?
4. Why must variables such as temperature be controlled?

5. Calculate the rate of photosynthesis if 60 bubbles are produced in 5 minutes.
6. Explain why repeats are carried out in the photosynthesis investigation.

Graphs and Limiting Factors (HT)

1. What is shown on the x-axis of a graph showing the effect of light intensity?
2. What is shown on the y-axis of a graph showing the rate of photosynthesis?
3. Why does the rate of photosynthesis eventually stop increasing when light intensity increases?
4. Identify the limiting factor when increasing one factor no longer increases photosynthesis rate.
5. Explain how greenhouse growers use knowledge of limiting factors.
6. Explain why increasing carbon dioxide, light or temperature has a cost for greenhouse growers.

4.4.1.3 Uses of Glucose from Photosynthesis

1. What product of photosynthesis can be used in respiration?
2. What substance is glucose converted into for storage in plants?
3. What molecule strengthens plant cell walls?
4. What type of molecule is produced when glucose is converted into fats or oils?
5. What are amino acids used to make?
6. Explain why plants need nitrate ions as well as glucose to make proteins.

4.4.2.1 Aerobic and Anaerobic Respiration

1. What is respiration?
2. Where does respiration happen in cells?
3. What gas is needed for aerobic respiration?
4. Write the word equation for aerobic respiration.
5. Compare the products of aerobic and anaerobic respiration in muscles.
6. Explain why anaerobic respiration transfers less energy than aerobic respiration.

Aerobic Respiration

1. What type of reaction is respiration?
2. Is aerobic respiration an exothermic or endothermic reaction?
3. What are the products of aerobic respiration?
4. What happens to the energy released during respiration?

5. State three processes that require energy from respiration.
6. Explain why organisms need a constant supply of energy from respiration.

Anaerobic Respiration

1. What does anaerobic mean?
2. When does anaerobic respiration occur in muscles?
3. What is the product of anaerobic respiration in muscles?
4. What products are made during anaerobic respiration in yeast?
5. What is fermentation?
6. Explain why anaerobic respiration is useful despite releasing less energy.

4.4.2.2 Response to Exercise

1. What happens to heart rate during exercise?
2. What happens to breathing rate during exercise?
3. Why do muscles need more oxygen during exercise?
4. What substance builds up during anaerobic respiration in muscles?
5. What is oxygen debt?
6. Explain why muscles become fatigued during vigorous exercise.

Oxygen Debt and Lactic Acid

1. Where is lactic acid produced?
2. Why does lactic acid build up during vigorous exercise?
3. Which organ removes lactic acid from the blood?
4. What is lactic acid converted back into in the liver?
5. Why is extra oxygen needed after exercise?
6. Explain how the body repays oxygen debt.

Investigating Exercise Effects

1. What measurements can be taken to investigate the effect of exercise?
2. What happens to breathing rate after exercise?
3. What happens to heart rate after exercise?
4. Why should measurements be repeated in an exercise investigation?
5. Calculate the change in heart rate if it increases from 70 bpm to 130 bpm.
6. Explain why exercise increases the demand for energy.

4.4.2.3 Metabolism

1. What is metabolism?
2. Where do metabolic reactions occur?
3. What molecule is glucose converted into for storage in animals?
4. What molecules combine to form lipids?
5. What molecules are joined together to make proteins?
6. Explain how respiration provides energy for metabolic reactions.

Metabolism and Biological Molecules

1. What are the building blocks of proteins?
2. What are the building blocks of carbohydrates?
3. What are the building blocks of lipids?
4. What is glycogen used for?
5. Explain how plants use glucose to make cellulose.
6. Explain how glucose and nitrate ions are used to make amino acids.

Topic 4 Review

1. Write the word equation for photosynthesis.
2. State three factors that affect the rate of photosynthesis.
3. Write the word equation for aerobic respiration.
4. State one difference between aerobic and anaerobic respiration.
5. Explain why muscles become fatigued during vigorous exercise.
6. Explain how glucose is used in living organisms.

Paper 2:

Topic 5 – Homeostasis and Response Retrieval Starters (AQA 8461)

4.5.1 Homeostasis

1. What is homeostasis?
2. State one condition in the body that is controlled by homeostasis.
3. What is the role of receptors in a control system?
4. What is the role of effectors in a control system?
5. Name the three main parts found in all control systems.
6. Explain why maintaining stable internal conditions is important for enzyme action.

4.5.2.1 Structure and Function of the Human Nervous System

1. What is the function of the nervous system?
2. What type of signal travels along neurones?
3. Name the two parts of the central nervous system (CNS).
4. What is the pathway of a nervous response from stimulus to response?
5. What is the difference between a sensory neurone and a motor neurone?
6. Explain why nervous responses are usually rapid.

4.5.2.1 Reflex Arc

1. What is a reflex action?
2. Which type of neurone carries information from a receptor to the CNS?
3. Which type of neurone carries information from the CNS to an effector?
4. What is the role of a relay neurone?
5. What happens at a synapse?
6. Explain why reflex actions do not require conscious thought.

Required Practical 7: Investigating Reaction Time

1. What is reaction time?
2. Name one factor that could affect human reaction time.
3. What equipment can be used to measure reaction time?
4. Why should reaction time experiments be repeated?
5. Calculate the mean reaction time from a set of results.
6. Explain why controlling variables is important when investigating reaction time.

4.5.2.2 The Brain (Biology Only)

1. What organ controls complex behaviour in humans?
2. What type of cells make up the brain?
3. Which region of the brain controls conscious thought?
4. Which region of the brain coordinates movement and balance?
5. Which region of the brain controls unconscious activities such as breathing?
6. Explain why investigating the brain is difficult.

4.5.2.3 The Eye (Biology Only)

1. What type of stimulus does the eye detect?
2. Which part of the eye contains light receptors?
3. What is the function of the optic nerve?
4. What is accommodation?
5. Describe what happens to the lens when focusing on a near object.
6. Explain how spectacle lenses correct problems with focusing light on the retina.

4.5.2.4 Control of Body Temperature (Biology Only)

1. What is the normal human body temperature?
2. Which part of the brain monitors body temperature?
3. What happens to blood vessels when the body is too hot?
4. What process causes sweat to cool the body?
5. What happens to muscles when the body is too cold?
6. Explain how vasodilation helps reduce body temperature.

4.5.3.1 Human Endocrine System

1. What is a hormone?
2. Where are hormones released from?
3. How are hormones transported around the body?
4. What is the difference between nervous and hormonal coordination?
5. What is the role of the pituitary gland?
6. Name the glands that produce hormones involved in blood glucose, reproduction and metabolism.

4.5.3.2 Control of Blood Glucose Concentration

1. Which organ controls blood glucose concentration?
2. Which hormone lowers blood glucose concentration?
3. What happens to excess glucose in the liver and muscles?
4. What hormone increases blood glucose concentration?
5. What happens in Type 1 diabetes?
6. Explain how insulin helps return high blood glucose levels to normal.

Type 1 and Type 2 Diabetes

1. What causes Type 1 diabetes?
2. What causes Type 2 diabetes?
3. How is Type 1 diabetes commonly treated?
4. State one risk factor for Type 2 diabetes.
5. How can exercise help someone with Type 2 diabetes?
6. Explain one difference between Type 1 and Type 2 diabetes.

4.5.3.3 Maintaining Water and Nitrogen Balance (Biology Only)

1. Which organ removes excess water from the body?
2. What is urine?
3. Name two substances removed in urine.
4. Why must excess amino acids be removed from the body?
5. What toxic substance is produced when amino acids are broken down?
6. Explain how the kidneys help maintain water balance.

ADH and Kidney Control (HT Only)

1. What does ADH stand for?
2. Which gland releases ADH?
3. When is ADH released into the blood?
4. What effect does ADH have on kidney tubules?
5. How does ADH help prevent dehydration?
6. Explain how negative feedback controls water levels in the body.

4.5.3.4 Hormones in Human Reproduction

1. Where is oestrogen produced?
2. Where is testosterone produced?

3. What hormone stimulates sperm production?
4. What is ovulation?
5. Which hormone causes the release of an egg?
6. Explain the role of progesterone in the menstrual cycle.

Menstrual Cycle (HT Only)

1. What is the average length of the menstrual cycle?
2. What does FSH cause to happen in the ovary?
3. What does LH trigger?
4. What happens to the uterus lining during the menstrual cycle?
5. Which hormones maintain the uterus lining?
6. Explain how FSH, LH, oestrogen and progesterone interact during the menstrual cycle.

4.5.3.5 Contraception

1. What is contraception?
2. Name one hormonal method of contraception.
3. How do condoms prevent pregnancy?
4. What hormone is used in many contraceptive methods?
5. How do oral contraceptives prevent ovulation?
6. Explain how different contraceptive methods prevent fertilisation or implantation.

4.5.3.6 Use of Hormones to Treat Infertility (HT Only)

1. What is infertility?
2. Which hormones are used in fertility treatment?
3. What is IVF?
4. What is the role of FSH during IVF treatment?
5. What happens to fertilised eggs during IVF?
6. Explain how IVF increases the chance of pregnancy.

4.5.3.7 Negative Feedback (HT Only)

1. What is negative feedback?
2. Which gland produces adrenaline?
3. What effect does adrenaline have on heart rate?

4. Which gland produces thyroxine?
5. What does thyroxine control?
6. Explain how negative feedback controls thyroxine levels.

4.5.4.1 Plant Hormones: Control and Coordination (Biology Only)

1. What chemical controls plant growth responses?
2. What is phototropism?
3. What is gravitropism?
4. Where is auxin produced in plants?
5. How does auxin affect shoot growth towards light?
6. Explain how unequal distribution of auxin causes plant growth responses.

Required Practical 8: Plant Responses to Light or Gravity

1. What is auxin?
2. What type of plant is used to investigate responses to light or gravity?
3. What is measured when investigating seedling growth?
4. What is meant by the independent variable?
5. Why should measurements be repeated when investigating plant growth?
6. Explain how auxin causes seedlings to grow towards light.

4.5.4.2 Uses of Plant Hormones (HT Only)

1. What plant hormone is used as a weed killer?
2. What hormone is used to promote rooting?
3. Which hormone controls fruit ripening?
4. How are gibberellins used in agriculture?
5. How is ethene used commercially?
6. Explain how plant hormones can be used to control plant growth.

Topic 6 – Inheritance, Variation and Evolution Retrieval Starters (AQA 8461)

4.6.1.1 Sexual and Asexual Reproduction

1. What type of cell division produces genetically identical cells?
2. What type of cell division produces genetically different cells?
3. What is sexual reproduction?
4. What happens when male and female gametes fuse during sexual reproduction?
5. Why does sexual reproduction produce variation in offspring?
6. What are the main features of asexual reproduction?

4.6.1.2 Meiosis

1. What is the purpose of meiosis?
2. Where does meiosis occur in organisms?
3. How does meiosis change the chromosome number in gametes?
4. How many gametes are produced from one cell during meiosis?
5. Why are gametes produced by meiosis genetically different?
6. How does fertilisation restore the normal chromosome number?

4.6.1.3 Advantages and Disadvantages of Sexual and Asexual Reproduction

1. What is one advantage of sexual reproduction?
2. Why can variation from sexual reproduction help a species survive?
3. How can humans use selective breeding to increase food production?
4. What is one advantage of asexual reproduction?
5. Why is asexual reproduction faster than sexual reproduction?
6. Why are offspring from asexual reproduction genetically identical?

4.6.1.4 DNA and the Genome

1. What chemical makes up genetic material?
2. Where is DNA found inside a cell?
3. What is a gene?
4. What does a gene code for?
5. What is meant by the genome of an organism?
6. Why is understanding the human genome important for medicine?

4.6.1.5 DNA Structure

1. What type of molecule is DNA?
2. What shape does a DNA molecule form?
3. What are the four bases found in DNA?
4. How does the order of bases affect the protein produced?
5. What is a mutation?
6. How can a mutation affect the protein made by a gene?

4.6.1.6 Genetic Inheritance

1. What is an allele?
2. What is the difference between a dominant and recessive allele?
3. What is the difference between genotype and phenotype?
4. What does homozygous mean?
5. What does heterozygous mean?
6. How can Punnett squares be used to predict inheritance?

4.6.1.7 Inherited Disorders

1. Why are some disorders inherited?
2. Which type of allele causes polydactyly?
3. Which type of allele causes cystic fibrosis?
4. What is embryo screening?
5. How can embryo screening help reduce inherited disorders?
6. What ethical issues are linked to embryo screening?

4.6.1.8 Sex Determination

1. How many pairs of chromosomes are found in human body cells?
2. Which chromosomes determine biological sex in humans?
3. What sex chromosomes do females have?

4. What sex chromosomes do males have?
5. How is sex inheritance shown using a genetic cross?
6. What is the probability of producing a male or female child?

4.6.2.1 Variation

1. What is variation?
2. What causes genetic variation?
3. What causes environmental variation?
4. How do genes and the environment interact to influence phenotype?
5. What effect do most mutations have on organisms?
6. How can a beneficial mutation affect a population?

4.6.2.2 Evolution

1. What is evolution?
2. How does natural selection cause evolution?
3. Why are organisms with advantageous characteristics more likely to survive?
4. How are advantageous characteristics passed to future generations?
5. How can populations become separate species?
6. What is meant by a species?

4.6.2.3 Selective Breeding

1. What is selective breeding?
2. Why do humans use selective breeding?
3. How are organisms chosen for selective breeding?
4. How does selective breeding continue over many generations?
5. What are the benefits of selective breeding?
6. What problems can be caused by inbreeding?

4.6.2.4 Genetic Engineering

1. What is genetic engineering?
2. What is transferred during genetic engineering?
3. What are genetically modified crops?
4. Why are some crops genetically modified?
5. How are bacteria genetically engineered to produce insulin?
6. What are the potential risks of genetic engineering?

4.6.2.5 Cloning

1. What is cloning?
2. Why are cloned organisms genetically identical?
3. How can plants be cloned using tissue culture?
4. How are cuttings used to clone plants?
5. What happens during adult cell cloning?
6. What are the benefits and risks of cloning?

4.6.3.1 Theory of Evolution

1. Who proposed the theory of evolution by natural selection?
2. What evidence did Darwin collect to support evolution?
3. How does natural selection change populations over time?
4. Why do organisms with useful characteristics reproduce more successfully?
5. Why was Darwin's theory controversial when first published?
6. Why did understanding genetics help explain evolution?

4.6.3.2 Speciation

1. What is speciation?
2. Who independently proposed the theory of natural selection with Darwin?
3. What happens when populations become isolated?
4. How do new species form?
5. Why can different species no longer produce fertile offspring?
6. How did Wallace contribute to understanding evolution?

4.6.3.3 Understanding of Genetics

1. Who carried out important experiments on inheritance in plants?
2. What did Mendel discover about inheritance?
3. What did Mendel call the units of inheritance?
4. Where are genes located?
5. How did scientists discover the structure of DNA?
6. How has our understanding of genetics changed over time?

4.6.3.4 Evidence for Evolution

1. What evidence supports the theory of evolution?
2. How do fossils provide evidence for evolution?

3. How does antibiotic resistance provide evidence for evolution?
4. Why are genes important evidence for evolution?
5. Why is evolution now widely accepted by scientists?
6. How does evidence from different sources support evolution?

4.6.3.5 Fossils

1. What are fossils?
2. How can fossils form when organisms do not decay?
3. How can minerals replace parts of organisms to form fossils?
4. What are preserved traces of organisms?
5. Why is the fossil record incomplete?
6. What can fossils tell scientists about evolution?

4.6.3.6 Extinction

1. What is extinction?
2. When does a species become extinct?
3. What environmental changes can cause extinction?
4. How can competition contribute to extinction?
5. How can human activity cause extinction?
6. Why is extinction evidence that species change over time?

4.6.3.7 Resistant Bacteria

1. Why can bacteria evolve rapidly?
2. How do mutations create antibiotic-resistant bacteria?
3. Why do resistant bacteria survive antibiotic treatment?
4. How does antibiotic resistance spread through a population?
5. How can the spread of resistant bacteria be reduced?
6. Why is developing new antibiotics difficult?

4.6.4 Classification of Living Organisms

1. Why are organisms classified into groups?
2. Who developed the Linnaean classification system?
3. What are the main levels of classification?
4. What is the binomial system of naming organisms?
5. What are the three domains used in modern classification?
6. How do evolutionary trees show relationships between organisms?

Topic 7 Ecology Retrieval Starters (AQA 8461)

4.7.1.1 Communities

1. What is an ecosystem?
2. What is meant by a community?
3. Name two things plants compete for.
4. Name two things animals compete for.
5. What is meant by interdependence?
6. Explain why removing one species from a community can affect other species.

4.7.1.2 Abiotic Factors

1. What does abiotic mean?
2. Give three examples of abiotic factors.
3. How does light intensity affect plant growth?
4. Why does temperature affect organisms?
5. Explain how soil pH can affect plant growth.
6. Explain how a change in an abiotic factor can affect the distribution of a species.

4.7.1.3 Biotic Factors

1. What does biotic mean?
2. Give two examples of biotic factors.
3. How can food availability affect a population?
4. How can new predators affect a community?
5. Explain how pathogens can affect population size.
6. Explain how one species outcompeting another can affect biodiversity.

4.7.1.4 Adaptations

1. What is an adaptation?
2. Name the three types of adaptation.
3. Give an example of a structural adaptation.
4. Give an example of a behavioural adaptation.
5. What are extremophiles?
6. Explain how adaptations help organisms survive in their environment.

4.7.2.1 Levels of Organisation

1. What is a producer?
2. What is a consumer?
3. What is a predator?
4. What is prey?
5. Why do all food chains begin with producers?
6. Explain how predator and prey populations affect each other.

4.7.2.2 How Materials Are Cycled

1. Name the two cycles studied in ecology.
2. What gas is used by plants during photosynthesis?
3. What process releases carbon dioxide into the atmosphere?
4. What role do microorganisms play in the carbon cycle?
5. Describe the water cycle.
6. Explain why materials must be recycled in ecosystems.

4.7.2.3 Decomposition

1. What is decomposition?
2. Which organisms cause decay?
3. Name three factors that affect the rate of decay.
4. Explain how temperature affects decomposition.
5. Why is compost useful for plants?
6. Explain how anaerobic decay can produce methane.

4.7.2.4 Impact of Environmental Change (HT)

1. Name three environmental changes that affect species distribution.
2. How can temperature changes affect organisms?
3. How can water availability affect species?
4. How can changes in atmospheric gases affect ecosystems?
5. Explain how human activity can change species distribution.
6. Explain why environmental changes may cause extinction.

4.7.3.1 Biodiversity

1. What is biodiversity?
2. Why is biodiversity important?
3. How does biodiversity increase ecosystem stability?
4. Name three human activities that reduce biodiversity.
5. How does deforestation reduce biodiversity?
6. Explain why humans need to maintain biodiversity.

4.7.3.2 Waste Management

1. Why does human population growth increase waste production?
2. Name three types of pollution.
3. How can sewage affect ecosystems?
4. How can fertilisers cause pollution?
5. Explain how pollution reduces biodiversity.
6. Explain why waste management is important.

4.7.3.3 Land Use

1. Name three ways humans use land.
2. How does building reduce biodiversity?
3. Why are peat bogs important?
4. How does peat destruction increase carbon dioxide?
5. Explain the conflict between using peat and conserving peatlands.
6. Explain how changes in land use affect ecosystems.

4.7.3.4 Deforestation

1. What is deforestation?
2. Why are tropical forests cleared?
3. Give two reasons for deforestation.
4. How does deforestation reduce biodiversity?
5. How does deforestation affect carbon dioxide levels?
6. Explain the environmental impacts of deforestation.

4.7.3.5 Global Warming

1. What is global warming?
2. Which gases contribute to global warming?
3. Why are carbon dioxide levels increasing?

4. How can global warming affect species?
5. Explain how climate change can alter habitats.
6. Explain why climate change evidence is based on many scientific studies.

4.7.3.6 Maintaining Biodiversity

1. What is conservation?
2. Why are breeding programmes used?
3. How does protecting habitats maintain biodiversity?
4. How do hedgerows support biodiversity?
5. How does recycling help ecosystems?
6. Evaluate methods used to maintain biodiversity.

4.7.4.1 Trophic Levels

1. What is a trophic level?
2. What trophic level are producers?
3. What are primary consumers?
4. What are secondary consumers?
5. What are apex predators?
6. Explain the role of decomposers.

4.7.4.2 Pyramids of Biomass

1. What is biomass?
2. What does a pyramid of biomass show?
3. Which trophic level is at the bottom of a pyramid of biomass?
4. Why does biomass decrease at higher trophic levels?
5. How are pyramids of biomass constructed?
6. Explain why pyramids of biomass are usually pyramid shaped.

4.7.4.3 Transfer of Biomass

1. What percentage of biomass is transferred between trophic levels?
2. Why is some biomass lost as faeces?
3. Why is biomass lost through respiration?
4. Why are there fewer organisms at higher trophic levels?
5. How is biomass transfer efficiency calculated?
6. Explain why food chains are usually short.

4.7.5.1 Factors Affecting Food Security

1. What is food security?
2. How does population growth affect food security?
3. How can pests affect food production?
4. How can climate change affect food production?
5. How can conflict affect food availability?
6. Explain why sustainable methods are needed to feed the population.

4.7.5.2 Farming Techniques

1. How can farmers increase food production?
2. Why are animals kept in controlled conditions?
3. Why are animals fed high protein foods?
4. Explain how intensive farming improves efficiency.
5. Give one advantage of intensive farming.
6. Give one disadvantage of intensive farming.

4.7.5.3 Sustainable Fisheries

1. Why are fish stocks decreasing?
2. What is sustainable fishing?
3. How do fishing quotas help conservation?
4. Why are net sizes controlled?
5. Explain how fishing methods affect fish populations.
6. Explain why sustainable fisheries are important.

4.7.5.4 Role of Biotechnology

1. What is biotechnology?
2. Which fungus is used to produce mycoprotein?
3. What conditions are needed to grow Fusarium?
4. How are bacteria used to produce insulin?
5. How can GM crops improve food production?
6. Explain how biotechnology can help feed a growing population.