Biology AQA Topic 2 Mark Scheme

Q1. Tissues in the human body

(a) What is a tissue?

- A group of similar cells working together to perform a specific function
  (1 mark)

(b) Name one example of a tissue in the stomach.

- Muscular tissue
- Glandular tissue
- Epithelial tissue
  (1 mark)
  (Any one correct)

Q2. Enzymes

(a) What type of molecule is an enzyme?

- Protein
  (1 mark)

(b) What happens to enzymes at high temperatures?

- They become denatured
  (1 mark)
- The shape of the active site changes so the enzyme no longer works
  (1 mark)

Q3. Small intestine adaptations

(a) Name one adaptation of the small intestine.

- Villi
  (1 mark)

(b) Explain how this adaptation helps absorption.

- Villi increase the surface area
  (1 mark)

- This allows faster absorption of nutrients
  (1 mark)

Q4. Blood vessels

(a) Name the blood vessels that carry blood away from the heart.

- Arteries
  (1 mark)

(b) Name the blood vessels that carry blood to the heart.

- Veins
  (1 mark)

Q5. Circulatory system

(a) What is the function of the heart?

- To pump blood around the body
  (1 mark)

(b) What is the function of red blood cells?

- To carry oxygen
  (1 mark)

(c) Name one other component of blood and its function.

- White blood cells – fight infection
  (1 mark)

- Platelets – help blood clot
  (1 mark)
  (Any one correct component and correct function = 2 marks)

Q6. Heart chambers

(a) Name the two chambers at the top of the heart.

- Atria / Left atrium and right atrium
  (1 mark)

(b) Name the two chambers at the bottom of the heart.

- Ventricles / Left ventricle and right ventricle
  (1 mark)

(c) What is the function of valves in the heart?

- To prevent backflow of blood
  (1 mark)

- Ensure blood flows in one direction
  (1 mark)

Q7. Coronary heart disease

(a) What causes coronary heart disease?

- Build-up of fatty material in the coronary arteries
  (1 mark)

(b) Name one treatment for coronary heart disease.

- Stents

- Statins

- Bypass surgery
  (1 mark)
  (Any one correct)

Q8. Amylase

(a) What is the role of amylase in digestion?

- Breaks down starch into sugars
  (1 mark)

(b) Where is amylase produced in the body?

- Salivary glands
- Pancreas
- Small intestine
  (1 mark)
  (Any one correct)

Q9. Bile

(a) State the function of bile.

- Neutralises stomach acid
- Emulsifies fats
  (1 mark)
  (Either is acceptable)

(b) Name the organ that produces bile.

- Liver
  (1 mark)

Q10. Organs and systems

(a) What is an organ system?

- A group of organs working together to perform a function
  (1 mark)

(b) Give an example of an organ system in humans.

- Digestive system
- Circulatory system
- Respiratory system
  (1 mark)
  (Any one correct)

Q11. Enzyme temperature

(a) What does "optimum temperature" mean for an enzyme?

- The temperature at which the enzyme works best
  (1 mark)

(b) What happens if the temperature gets too high?

- The enzyme becomes denatured
  (1 mark)
- The shape of the active site changes
  (1 mark)

Q12. Blood components

(a) What is the main function of white blood cells?

- Fight infection / destroy pathogens
  (1 mark)

(b) Platelets are also found in blood. What is their role?

- Help blood clot / prevent bleeding
  (1 mark)

Q13. Lungs and gas exchange

(a) Name the tiny air sacs in the lungs where gas exchange happens.

- Alveoli
  (1 mark)

(b) How are these air sacs adapted for efficient gas exchange?

- Large surface area
  (1 mark)

- Thin walls / good blood supply
  (1 mark)
  (Any two correct adaptations)

Q14. Enzyme experiment

(a) What is the independent variable in this experiment?

- pH
  (1 mark)

(b) Name one variable that should be kept the same.

- Temperature

- Volume of solution

- Enzyme concentration
  (1 mark)
  (Any one correct)

Q15. Plant tissues

(a) Name one tissue found in the leaf of a plant.

- Palisade tissue
- Spongy mesophyll
- Xylem
- Phloem
  (1 mark)
  (Any one correct)

(b) What is the function of xylem tissue?

- Transports water and minerals
  (1 mark)

Q16. Blood vessels

(a) Name the three types of blood vessels.

- Arteries
- Veins
- Capillaries
  (3 marks)

(b) Which blood vessel has thick muscular walls?

- Arteries
  (1 mark)

Q17. Digestive system

(a) State the function of the stomach.

- Breaks down food / digests food
  (1 mark)

(b) Describe the role of the large intestine.

- Absorbs water from undigested food
  (1 mark)

- Forms faeces
  (1 mark)

Q18. The diagram shows the human heart.
(a) Name the blood vessel that brings oxygenated blood into the heart.

- Pulmonary vein — **1 mark**

(b) Name the chamber of the heart that pumps blood to the body.

- Left ventricle — **1 mark**

(c) Explain how the structure of the heart ensures blood flows in one direction.

- Valves prevent backflow of blood — **1 mark**

- Valves open and close to ensure one-way flow — **1 mark**

Total: 4 marks

Q19. Enzymes are important in digestion.
(a) What is the function of enzymes in the digestive system?

- Enzymes break down large molecules into smaller molecules — **1 mark**

- This speeds up digestion by catalysing chemical reactions — **1 mark**

(b) Name the enzyme that breaks down starch and state where it is produced.

- Amylase — **1 mark**

- Produced in salivary glands and pancreas (either named) — **1 mark**

(c) Explain why enzymes become denatured at high temperatures.

- High temperature changes shape of the enzyme's active site — **1 mark**

- This prevents substrate binding and stops the reaction — **1 mark**

Total: 6 marks

Q20. A student investigates the effect of pH on the activity of amylase.
(a) Name the product of starch digestion.

- Maltose (or simple sugars) — **1 mark**

(b) Describe how the student could measure how much starch is broken down.

- Use iodine solution to test for starch — **1 mark**
- Record time taken for iodine to no longer change color / measure reducing sugars with Benedict's test — **1 mark**

(c) The student uses a water bath. Explain why.

- To keep the temperature constant during the experiment — **1 mark**
- Ensures enzyme activity is affected only by pH, not temperature — **1 mark**

Total: 5 marks

Q21. The lungs are adapted for gas exchange.
(a) Describe two ways the alveoli are adapted for gas exchange.

- Large surface area — **1 mark**
- Thin walls (one cell thick) — **1 mark**

(b) Explain why oxygen moves from the alveoli into the blood.

- Oxygen moves down its concentration gradient — **1 mark**
- Higher oxygen concentration in alveoli than in blood — **1 mark**

Total: 4 marks

Q22. The circulatory system is a double circulatory system.
(a) Explain what is meant by a double circulatory system.

- Blood passes through the heart twice in one complete circuit — **1 mark**
- Once to lungs (pulmonary), once to body (systemic) — **1 mark**

(b) Give one advantage of a double circulatory system.

- Blood can be pumped at higher pressure / faster flow — **1 mark**

Total: 3 marks

Q23. Blood contains different components.
(a) Name the component of blood that carries oxygen.

- Red blood cells — **1 mark**

(b) Describe how red blood cells are adapted to carry oxygen.

- Contain haemoglobin to bind oxygen — **1 mark**
- Biconcave shape gives large surface area — **1 mark**

(c) What is the function of platelets?

- Help blood clot / prevent bleeding — **1 mark**

Total: 4 marks

Q24. Coronary heart disease is caused by a build-up of fatty deposits.
(a) State one risk factor for coronary heart disease.

- Smoking / high blood pressure / high cholesterol / obesity (any one) — **1 mark**

(b) Describe how stents help treat coronary heart disease.

- Stents keep arteries open — **1 mark**

- Improve blood flow to the heart muscle — **1 mark**

(c) Give one disadvantage of using stents.

- Risk of infection / blood clots / artery narrowing again — **1 mark**

Total: 4 marks

Q25. A scientist tests different solutions to treat blocked arteries.
(a) Explain the difference between a stent and a statin.

- Stent is a physical device to keep arteries open — **1 mark**
- Statins are drugs that reduce cholesterol in the blood — **1 mark**

(b) Suggest why statins must be taken regularly.

- Because cholesterol levels will increase again if stopped — **1 mark**
- They must be taken long-term to be effective — **1 mark**

Total: 4 marks

Q26. The diagram shows a leaf.
(a) Name the tissue that transports water in a plant.

- Xylem — **1 mark**

(b) State the function of the phloem.

- Transports sugars / food from leaves to other parts of the plant — **1 mark**

(c) Explain how water moves through the xylem to the leaves.

- By transpiration pull — **1 mark**
- Cohesion and adhesion of water molecules help pull water up — **1 mark**

Total: 4 marks

Q27. Transpiration is the loss of water vapour from plant leaves.
(a) Name the part of the leaf where most transpiration happens.

- Stomata (or guard cells) — **1 mark**

(b) List two environmental factors that increase the rate of transpiration.

- Temperature (higher) — **1 mark**
- Wind (stronger) / light intensity (higher) / lower humidity — **1 mark**

(c) Describe how the guard cells control transpiration.

- Guard cells open and close stomata — **1 mark**
- Control water loss by changing shape to open/close pores — **1 mark**

Total: 5 marks

Q28. The digestive system contains several organs.
(a) What is the function of bile in digestion?

- Neutralises stomach acid — **1 mark**
- Emulsifies fats to increase surface area for lipase — **1 mark**

(b) Where is bile produced and stored?

- Produced in the liver — **1 mark**
- Stored in the gall bladder — **1 mark**

Total: 4 marks

Q29. A person eats food that is high in fat.
(a) Which enzyme breaks down fat?

- Lipase — **1 mark**

(b) What are the products of fat digestion?

- Glycerol — **1 mark**
- Fatty acids — **1 mark**

Total: 3 marks

Q30. A student investigates enzyme activity using different temperatures.
(a) Describe what happens to enzyme activity as temperature increases up to the optimum.

- Enzyme activity increases — **1 mark**
- Molecules move faster causing more enzyme-substrate collisions — **1 mark**

(b) Explain why enzyme activity decreases at high temperatures.

- Enzymes denature / active site changes shape — **1 mark**
- Substrate can no longer bind so reaction stops — **1 mark**

Total: 4 marks

Q31. A student investigates heart rate before and after exercise.
(a) Suggest why heart rate increases during exercise.

- Muscles need more oxygen for respiration — **1 mark**
- More carbon dioxide is produced and needs to be removed — **1 mark**

(b) Describe how you could measure heart rate safely in this experiment.

- Measure pulse at wrist or neck using fingers — **1 mark**
- Count beats per minute; do not use thumb because it has its own pulse — **1 mark**

Total: 4 marks

Q32
(a) Describe how the structure of the left ventricle is related to its function. (3 marks)

- Thick muscular wall (or thick myocardium) to generate high pressure — 1 mark
- Pumps blood all around the body (systemic circulation) — 1 mark
- Strong contraction to overcome high resistance in systemic circulation — 1 mark

Alternative answers:

- "More muscle" / "muscle thicker than right ventricle" for first point — accept
- "Pumps oxygenated blood to body" — accept for second point

(b) Explain why the valves in the heart are important for circulation. (3 marks)

- Valves prevent backflow of blood — 1 mark
- Ensure blood flows in one direction through the heart — 1 mark
- Maintain efficient circulation by preventing mixing of oxygenated and deoxygenated blood or backflow — 1 mark

Alternative answers:

- “Stop blood flowing backwards” — accept for backflow
- “Keep blood flowing forwards” — accept for one-direction flow

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Q33

(a) Describe the lock-and-key model of enzyme action. (3 marks)

- Enzyme has a specific active site shape — 1 mark
- Substrate fits exactly into the active site (like a key into a lock) — 1 mark
- Enzyme catalyses the breakdown or formation of products — 1 mark

Alternative answers:

- “Substrate binds to enzyme” or “substrate fits into enzyme” — accept

- “Enzyme changes substrate” or “enzyme lowers activation energy” — accept for last point

(b) Explain how changes in pH affect enzyme activity. (3 marks)

- Changes in pH alter the shape of the enzyme’s active site — 1 mark
- This reduces the enzyme’s ability to bind substrate (substrate no longer fits) — 1 mark
- Extreme pH can denature the enzyme, stopping its activity altogether — 1 mark

Alternative answers:

- “pH affects hydrogen bonds causing shape change” — accept
- “Enzyme loses shape/function at wrong pH” — accept for denaturation

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Q34
(a) Describe two structural features of the small intestine that increase the rate of absorption. (4 marks)

- Large surface area due to villi — 1 mark
- Villi have microvilli to increase surface area further — 1 mark
- Good blood supply to maintain concentration gradient — 1 mark
- Thin walls of villi for short diffusion distance — 1 mark

Alternative answers:

- “Many villi” or “folded lining” — accept for surface area
- “Capillaries inside villi” — accept for blood supply
- “One cell thick walls” — accept for thin walls

Q32

(a) Describe how the structure of the left ventricle is related to its function. (3 marks)

- Thick muscular wall to generate high pressure (or thicker than right ventricle) — 1 mark
- Pumps blood all around the body (systemic circulation) — 1 mark
- Strong contraction to overcome high resistance in systemic circulation — 1 mark

Alternatives: “More muscle than right ventricle,” “pumps oxygenated blood to the body.”

(b) Explain why the valves in the heart are important for circulation. (3 marks)

- Valves prevent backflow of blood — 1 mark
- Ensure blood flows in one direction through the heart — 1 mark
- Maintain efficient circulation by preventing mixing or backflow — 1 mark

Alternatives: “Stop blood flowing backwards,” “keep blood flowing forwards.”

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- Substrate fits exactly into the active site (like a key in a lock) — 1 mark
- Enzyme catalyses the breakdown/formation of products — 1 mark

Alternatives: “Substrate binds to enzyme,” “enzyme lowers activation energy.”

(b) Explain how changes in pH affect enzyme activity. (3 marks)

- Changes in pH alter enzyme’s active site shape — 1 mark
- Substrate no longer fits, reducing enzyme activity — 1 mark
- Extreme pH denatures enzyme, stopping activity — 1 mark

Alternatives: “pH affects hydrogen bonds,” “enzyme loses shape/function.”

Q34

(a) Describe two structural features of the small intestine that increase the rate of absorption. (4 marks)

- Large surface area due to villi — 1 mark
- Villi have microvilli for further surface area increase — 1 mark
- Good blood supply to maintain concentration gradient — 1 mark
- Thin walls of villi for short diffusion distance — 1 mark

Alternatives: “Folded lining,” “capillaries in villi,” “one cell thick walls.”

(b) Explain how these features help the absorption of nutrients. (4 marks)

- Large surface area increases area for diffusion — 1 mark
- Good blood supply carries absorbed nutrients away maintaining gradient — 1 mark
- Thin walls reduce diffusion distance for faster absorption — 1 mark
- Microvilli increase surface area and enzyme action for digestion — 1 mark

Alternatives: “More contact with food,” “quick nutrient transport in blood.”

Q35

(a) Compare the structure of arteries and veins. (4 marks)

- Arteries have thicker muscular walls than veins — 1 mark
- Arteries have elastic fibres to stretch and recoil; veins have less elastic tissue — 1 mark
- Veins have valves to prevent backflow; arteries do not — 1 mark
- Veins have a wider lumen than arteries — 1 mark

Alternatives: “Arteries carry blood away from heart; veins carry to heart” (only if asked about function).

(b) Explain how the structure of capillaries is related to their function. (4 marks)

- Capillaries have thin walls (one cell thick) for short diffusion distance — 1 mark
- Small lumen to slow blood flow allowing exchange — 1 mark
- Large number of capillaries increase surface area for exchange — 1 mark
- Permeable walls allow substances to pass in and out — 1 mark

Alternatives: “Walls allow oxygen and nutrients through,” “slow blood flow aids exchange.”

Q36

(a) Describe how temperature affects the rate of enzyme activity up to the optimum temperature. (3 marks)

- Increasing temperature increases enzyme activity — 1 mark
- Molecules move faster, increasing successful collisions — 1 mark
- Activity peaks at optimum temperature — 1 mark

Alternatives: “More kinetic energy,” “faster reactions.”

(b) Explain what happens to the enzyme structure at temperatures above the optimum. (3 marks)

- Enzyme active site changes shape (denatures) — 1 mark
- Hydrogen bonds break due to heat — 1 mark
- Substrate no longer fits, so enzyme activity decreases — 1 mark

Alternatives: “Loss of function,” “enzyme permanently damaged.”

Q37

(a) Describe the pathway of water through a plant from the roots to the leaves. (3 marks)

- Water absorbed by root hair cells from soil — 1 mark
- Water moves up xylem vessels through stem — 1 mark
- Water moves to leaf cells and evaporates from stomata — 1 mark

Alternatives: “Osmosis in roots,” “transpiration stream.”

(b) Explain how environmental factors influence the rate of transpiration. (3 marks)

- Higher temperature increases transpiration rate (water evaporates faster) — 1 mark
- Higher wind speed removes water vapour, increasing rate — 1 mark
- Lower humidity increases transpiration due to bigger concentration gradient — 1 mark

Alternatives: “Sunlight increases transpiration,” “dry air speeds up transpiration.”

Q38

(a) Describe how stents help patients with coronary heart disease. (3 marks)

- Stents keep arteries open (or widen narrowed arteries) — 1 mark
- Allow blood to flow freely to the heart muscle — 1 mark
- Reduce risk of heart attacks by improving circulation — 1 mark

Alternatives: “Prevent artery blockage,” “support artery walls.”

(b) Explain the advantages and disadvantages of statins compared to stents. (4 marks)

- Statins reduce cholesterol, preventing further fatty deposits — 1 mark
- Statins can prevent heart disease, not just treat it — 1 mark
- Statins need to be taken long term (disadvantage) — 1 mark

- Statins may have side effects; stents are a one-time surgical intervention — 1 mark

Alternatives: “Statins lower cholesterol levels,” “stents require surgery.”

Q39

(a) Describe how bile helps in the digestion of fats. (3 marks)

- Bile emulsifies fats, breaking them into smaller droplets — 1 mark
- This increases surface area for lipase to act — 1 mark
- Speeds up fat digestion — 1 mark

Alternatives: “Bile breaks fat into tiny droplets,” “helps enzymes work better.”

(b) Explain why bile is alkaline and how this affects enzymes in the small intestine. (3 marks)

- Bile is alkaline to neutralise acidic stomach contents — 1 mark
- Neutral pH provides optimum conditions for enzymes in the small intestine — 1 mark
- Allows enzymes to function effectively — 1 mark

Alternatives: “Protects intestine lining,” “raises pH for enzyme activity.”

Q40

(a) Describe the structure of the phloem tissue. (3 marks)

- Made of sieve tube elements (cells with holes for transport) — 1 mark
- Companion cells provide energy for active transport — 1 mark
- Cells arranged end to end forming tubes — 1 mark

Alternatives: “Phloem has sieve plates,” “thin-walled cells.”

(b) Explain how translocation occurs in the phloem. (3 marks)

- Sugars are actively loaded into phloem at source (leaves) — 1 mark
- Water moves in by osmosis, creating pressure — 1 mark
- Sugars move down pressure gradient to sink (roots/fruits) — 1 mark

Alternatives: “Mass flow theory,” “active transport involved.”

Q41

(a) Describe the role of white blood cells in immunity. (3 marks)

- Engulf pathogens by phagocytosis — 1 mark
- Produce antibodies to target specific pathogens — 1 mark
- Produce antitoxins to neutralise toxins — 1 mark

Alternatives: “White blood cells fight infection,” “destroy bacteria/viruses.”

(b) Explain how vaccines provide immunity. (3 marks)

- Vaccines contain dead or inactive pathogens — 1 mark
- Stimulate white blood cells to produce antibodies — 1 mark
- Memory cells are produced so body responds quickly to future infection — 1 mark

Alternatives: “Vaccines prepare immune system,” “immunisation.”

Q42

(a) Name the enzyme that digests proteins and where it is produced. (2 marks)

- Protease — 1 mark
- Produced in stomach, pancreas, or small intestine (any one) — 1 mark

Alternatives: “Pepsin” (accept only if stomach mentioned).

(b) Describe the products of protein digestion and how they are absorbed. (4 marks)

- Proteins are broken down into amino acids — 1 mark
- Amino acids absorbed by diffusion or active transport into bloodstream — 1 mark
- Absorption happens through small intestine lining — 1 mark
- Amino acids transported to body cells via blood — 1 mark

Alternatives: “Absorbed into villi,” “active transport needed.”

Q43

(a) Describe how the structure of veins differs from arteries. (3 marks)

- Veins have thinner walls than arteries — 1 mark
- Veins have valves to prevent backflow, arteries do not — 1 mark
- Veins have larger lumen than arteries — 1 mark

Alternatives: “Veins carry blood at lower pressure.”

(b) Explain how capillaries facilitate exchange between blood and tissues. (3 marks)

- Capillaries have thin walls (one cell thick) — 1 mark
- Narrow lumen slows blood flow for exchange — 1 mark
- Permeable walls allow diffusion of gases and nutrients — 1 mark

Alternatives: “Large surface area,” “close contact with body cells.”

Q44

(a) Describe how alveoli are adapted for efficient gas exchange. (4 marks)

- Large surface area due to many alveoli — 1 mark
- Thin walls (one cell thick) — 1 mark
- Good blood supply maintains concentration gradient — 1 mark

- Moist lining allows gases to dissolve — 1 mark

Alternatives: “Rich capillary network,” “short diffusion pathway.”

(b) Explain how oxygen and carbon dioxide move between alveoli and blood. (4 marks)

- Oxygen diffuses from alveoli into blood (high to low concentration) — 1 mark
- Carbon dioxide diffuses from blood into alveoli — 1 mark
- Diffusion occurs across thin alveolar walls — 1 mark
- Maintained by ventilation and blood flow (steep concentration gradients) — 1 mark

Alternatives: “Gas exchange by diffusion,” “oxygen binds to haemoglobin.”

Q45

(a) Describe a method to measure heart rate changes during exercise. (3 marks)

- Measure resting heart rate by palpation or heart rate monitor — 1 mark
- Have subject perform exercise (e.g., running) — 1 mark
- Measure heart rate immediately after exercise and compare — 1 mark

Alternatives: “Use stopwatch and count pulses.”

(b) Explain why heart rate increases during physical activity. (3 marks)

- Muscles need more oxygen for respiration — 1 mark
- Increased carbon dioxide production stimulates faster heart rate —

1 mark

- More blood flow delivers oxygen and removes waste — 1 mark

Alternatives: “To release more energy,” “to remove lactic acid.”

Q46

(a) Describe the role of root hair cells in water absorption. (3 marks)

- Increase surface area of root for water uptake — 1 mark
- Water enters by osmosis from soil — 1 mark
- Absorbs minerals by active transport — 1 mark

Alternatives: “Thin wall,” “absorbs water and nutrients.”

(b) Explain the cohesion-tension theory of water movement in the xylem. (3 marks)

- Water molecules stick together (cohesion) — 1 mark
- Water pulled up xylem in a continuous stream — 1 mark
- Transpiration creates tension (suction) from leaves — 1 mark

Alternatives: “Water pulled by evaporation,” “chain of water molecules.”

Q47

(a) Match the following enzymes with their substrates. (3 marks)

- Amylase → Starch — 1 mark
- Protease → Proteins — 1 mark
- Lipase → Fats/lipids — 1 mark

(b) Explain why enzymes are specific to substrates. (3 marks)

- Each enzyme has a specific active site shape — 1 mark
- Substrate must fit active site (lock-and-key model) — 1 mark
- If shape doesn't match, reaction won't occur — 1 mark

Alternatives: “Enzyme-substrate specificity,” “only certain substrates fit.”