# Assessment Schedule – 2020

## Biology: Demonstrate understanding of biological ideas relating to a mammal(s) as a consumer(s) (90929)

### Evidence Statement

| Q | Achievement | Merit | Excellence |
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| ONE | **Describes** (single, simple ideas):<br>• digestion that occurs in the stomach<br>• conditions required for digestion of protein in the stomach.<br>**Examples** of possible descriptions include:<br>• HCl is secreted into the stomach.<br>• Pepsin is the enzyme that digests protein.<br>• Pepsin breaks large protein molecules (polypeptides) into smaller molecules.<br>• Pepsin requires a low pH to function / HCl lowers the pH in the stomach.<br>• Pepsin requires a specific / correct temperature to work.<br>• Physical digestion / churning breaks down food. | **Explains** (gives reasons and examples):<br>• Explains how / why digestion of protein occurs in the stomach.<br>• Explains the results in test tubes – **must** makes links to colour changes.<br>**Examples** of possible explanations include:<br>• In **test tube A** the protein / egg white was not digested as indicated by the colour remaining cloudy / white. This is because test tube A contained only the protein / egg white, and the digestive enzyme for protein, pepsin. However, the pepsin was unable to digest the protein because it was not at its optimal low pH as is provided by the HCl in the stomach. Therefore, the protein / egg white remained as large protein molecules and a cloudy / white colour.<br>• In **test tube B** the protein / egg white was not digested as indicated by the colour remaining cloudy / white. This is because test tube B contained only the protein / egg white and HCl. The digestive enzyme for protein, pepsin was not present therefore no digestion occurred. Therefore, the protein / egg white remained as large protein molecules and a cloudy / white colour.<br>• In **test tube C** the protein / egg white was digested as indicated by the colour turning colourless / clear. This is because test tube C contains the enzyme pepsin with HCl. Therefore, digestion did occur.<br>• In **test tube D** the protein / egg white was not digested as indicated by the colour remaining cloudy / white. This is because test tube D contained boiled (denatured) pepsin and HCl. The digestive enzyme for protein, pepsin did not function as it was boiled. Therefore, the protein / egg white remained as large | **Discusses** (compare and contrast, makes links between explanations):<br>• Makes links between the findings of the investigation to discuss how digestion occurs in the stomach. *(must make links to colour changes in test tubes)*<br>**Examples** of possible discussions include:<br>• In test tube A the protein / egg white was not digested, as indicated by the colour remaining cloudy / white. This is because test tube A contained only the protein / egg white and the digestive enzyme for protein, pepsin. However, the pepsin was unable to digest the protein because it was not at its optimal low pH, as is provided by the HCl in the stomach. Therefore, the protein / egg white remained as large protein molecules and a cloudy / white colour. Similarly, in test tube B, the protein / egg white was not digested, as indicated by the colour remaining cloudy / white. This is because test tube B contained only the protein / egg white and HCl. The digestive enzyme for protein, pepsin was not present; therefore, no digestion occurred. Therefore, the protein / egg white remained as large protein molecules and a cloudy / white colour. Likewise, in test tube D, the protein / egg white was not digested, as indicated by the colour remaining cloudy / white because the pepsin was boiled and no longer able to function.<br>• We can see that the only conditions in which the protein was able to be digested, as indicated by the colour change from cloudy / white to colourless, due to molecules changing from large polypeptide chains into smaller molecules was in test tube C. In test tube C, all the conditions required for protein digestion in the stomach were present. All the test tubes, including test tube C, were kept at 37 °C by the water bath; this is the optimal temperature for the enzyme pepsin to work at. Also, the requirement for a low pH was met by the addition of HCl, and pepsin itself was also present. These conditions simulate those found in the stomach, etc.<br>• **Pepsin** works best in acidic conditions (approximately pH 1 – 2) and HCl provides optimal conditions for the enzyme to carry out its functions. There is also an optimal temperature that pepsin works best, |

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| | | protein molecules and a cloudy / white colour.<br>• Pepsin is a protease / breaks down protein. The proteins get broken down into polypeptides and this can occur in an acidic environment / optimal conditions / specific conditions. | which is 37 °C. The active site of pepsin is specific to the shape of proteins. If the active site gets damaged, then the enzyme does not work. Boiling pepsin will denature / damage the enzyme. The enzyme will be unable to carry out its job to breakdown proteins into smaller molecules for absorption. If the temperature is too low, pepsin will not work as efficiently. |

| NØ | N1 | N2 | A3 | A4 | M5 | M6 | E7 | E8 |
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| No response / no relevant evidence. | ONE relevant idea given. | TWO relevant ideas given. | THREE relevant ideas given. | FOUR relevant ideas given. | Explains TWO relevant idea. | Explains THREE relevant ideas. | Discusses ONE idea. | Discusses TWO ideas. |

| Q | Achievement | Merit | Excellence |
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| TWO | **Describes** (single, simple ideas)<br>• the process of circulation of the products of digestion<br>• the products of digestion<br>• the different types of blood vessels<br>• the process of absorption.<br>**Examples** of possible ideas include:<br>• The products of digestion are transported in the circulatory system / blood vessels / arteries.<br>• The heart pumps the blood that contains the products of digestion around the body.<br>• Capillary walls are one cell thick / fine blood vessels.<br>• Absorption of nutrients happens in small intestines (through villi) .<br>• Villi walls are one cell thick / folded or microvilli .<br>• Capillaries form a capillary bed around the body cells.<br>• Glucose / amino acids / fatty acids / glycerol is transported to the body cells.<br>• Absorption of nutrients is by diffusion.<br>• Network of capillaries are part of the villi that increase surface area for absorption of digested food.<br>• Fat is absorbed into lymphatic system / lacteal.<br>• Products of digestion transport around the body to produce energy (ATP / cellular respiration). | **Explains** (gives reasons and examples):<br>• how the circulatory system functions<br>• how the products of digestion move from the capillaries into the body cells.<br>**Examples** of possible explanations include:<br>• Capillaries form a network of vessels around the body cells / within the microvilli**.** This is called a capillary bed. This is so that each body cell has efficient access to the nutrients transported in the blood in the capillaries OR allow for efficient diffusion so that nutrients can be absorbed from small intestine to the bloodstream.<br>• The walls of the capillaries are only one cell thick. This is so that the diffusion distances are small, and therefore diffusion can occur quickly and efficiently. This is important because the body cells need a continuous supply of nutrients to function effectively. For example, muscle cells, when in use, require a continuous supply of glucose so that it can be broken down and the energy released for body functions, such as movement.<br>• The heart provides the pump to move the blood around the body. This is required because the products of digestion need to be transported from the intestine to cells around the body that require the products, e.g. glucose needs to be moved to the muscle cells, as they have a high energy demand to allow movement.<br>• Blood vessels are needed so that blood can be transported with the nutrients (and oxygen) to the body cells from the intestines / gut / alimentary canal, where digestion occurs to places in the body. The nutrients are used in cellular respiration.<br>• The lymph system / lacteals absorb the products of fat digestion (fatty acids and glycerol) which are then absorbed into the bloodstream for transport around the body or stored in the liver. | **Discusses** (makes links between explanations)<br>• Links the function of the digestive system and circulatory system to the efficient absorption of the products of digestion.<br>**Examples** of possible discussions include:<br>• The products of digestion are absorbed into capillaries through the walls of microscopic finger-like projections called villi, which line the walls of the intestine. The villi greatly increase the surface area available for the absorption of the products of digestion because each is inter-fused with capillaries, reducing the diffusion distance, thus allowing the process of absorption to occur with increased speed and efficiency.<br>• The digestive system works so that food is broken up into very small molecules. This occurs through the processes of both physical and chemical digestion. Chemical digestion involves the use of biological catalyst or enzymes which, in optimal conditions, break the food molecules down, so they as small as possible. This is important, because they need to be small enough to move through the capillary walls, which are one-cell thick (assimilation maybe mentioned).<br>• The capillaries in the microvilli feed into the hepatic portal vein (HPV). These capillaries have absorbed nutrients from the small intestine. HPV transport nutrient-rich blood where the nutrients are offloaded to the liver for processing before being distributed by the heart to the body cells via a network of arteries and capillaries where the nutrients are used in cellular respiration.<br>• The heart provides the pump to move the blood around the body. The arteries are needed so that blood can be transported. This blood is pumped at a huge volume in the capillaries and / or microvilli to absorb nutrients. The concentration gradient created in the walls of intestines and the capillaries in the microvilli which allows for effective and efficient absorption of nutrients. |

| NØ | N1 | N2 | A3 | A4 | M5 | M6 | E7 | E8 |
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| No response / no relevant evidence. | ONE relevant idea given. | TWO relevant ideas given. | THREE relevant ideas given. | FOUR relevant ideas given. | Explains TWO relevant idea. | Explains THREE relevant ideas. | Discusses ONE idea to link both systems. | Discusses TWO ideas to link both systems. |

| Q | Achievement | Merit | Excellence |
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| THREE | **Describes** (single, simple ideas):<br>• aerobic respiration (in words or equation)<br>• anaerobic respiration (in words or equation)<br>• efficiency of aerobic / anaerobic respiration.<br>**Examples** of possible descriptions include:<br>• Aerobic respiration occurs in the presence of oxygen OR gives word equation for aerobic respiration.<br>• Anaerobic respiration occurs without oxygen **or** gives word equation for anaerobic respiration.<br>• Aerobic respiration releases more ATP molecules / more energy.<br>• Anaerobic respiration releases fewer ATP molecules / less energy.<br>• Respiration occurs in the body cells.<br>• Respiration occurs in the mitochondria in the body cells.<br>• The purpose of respiration is to build energy-rich molecules (ATP) from glucose. | **Explains** (gives reasons and examples):<br>• aerobic respiration<br>• anaerobic respiration<br>• why it is important for mammals to be able to respire aerobically and anaerobically.<br>**Examples** of possible explanations include:<br>• Horse (mammal) muscle cells can respire anaerobically for short periods of time. This often happens during vigorous exercise, such as when running. This is because the body struggles to supply the muscles with enough oxygen to keep doing aerobic respiration, but the muscles still need energy to contract.<br>• Horse (mammal) muscle cells can respire aerobically when resting. This produces more energy from the glucose from their food. The horse's body cells have access to enough oxygen therefore with enough oxygen they respire aerobically, giving they body cells the energy they need.<br>• Mammals like horses need to be able to respire aerobically and anaerobically at different times because certain activities like running require energy to be produced quickly (anaerobic respiration releases energy quickly), whereas activities like resting do not require as much energy to be produced (aerobic respiration produces more energy but slower).<br>• Mammals like horses always need to respire. This occurs in body cells, in the mitochondria. The purpose of respiration is to build ATP molecules from glucose. This ATP is an energy source in order to carry out cellular processes / for the cell to function. | **Discusses** (makes links between explanations):<br>• compares differences between aerobic and anaerobic respiration<br>• the efficiency of aerobic or anaerobic respiration.<br>**Examples** of possible discussions include<br>• Horse muscle cells can respire aerobically and anaerobically. The cells are able to respire aerobically when there is less demand for energy, such as when the horse is resting. This means there is a **plentiful supply of oxygen** to the cells, and hence the full amount of the energy-rich molecule ATP is produced from glucose.<br>• On the other hand, horse (mammal) muscle cells can respire anaerobically for short periods of time. This often happens during vigorous exercise, such as when running. This is because **the body struggles to supply the muscles with enough oxygen** to keep on doing aerobic respiration, but the muscles still need energy to contract. Respiration must switch to anaerobic. This is relatively inefficient, as anaerobic respiration does not make as much ATP, but it's better to continue respiring and have some ATP to allow muscles to contract to run the race, or, in nature, to be able to run away from danger.<br>• Lactic acid build-up occurs when respiring anaerobically. Lactic acid is toxic to the body and needs to be chemically broken down and removed. Therefore, if the horse only respired anaerobically lactic acid would build up and cause cramps / pain. Whereas the waste products from aerobic respiration are carbon dioxide and water, which are easily removed from the body. |

| NØ | N1 | N2 | A3 | A4 | M5 | M6 | E7 | E8 |
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| No response / no relevant evidence. | ONE relevant idea given. | TWO relevant ideas given. | THREE relevant ideas given. | FOUR relevant ideas given. | Explains TWO relevant ideas. | Explains THREE relevant ideas. | Discusses ONE idea in relation to efficiency of aerobic **OR** anaerobic respiration. | Discusses TWO ideas in relation to efficiency of aerobic **AND** anaerobic respiration |

**Cut Scores**

| Not Achieved | Achievement | Achievement with Merit | Achievement with Excellence |
|---|---|---|---|
| 0 – 6 | 7 – 13 | 14 – 20 | 21 – 24 |