Assessment Schedule – 2018

Biology: Demonstrate understanding of life processes at the cellular level (91156)

Evidence

Q	Expected Coverage	Achievement	Merit	Excellence
ONE (a)	Diffusion is the movement of materials from areas of high to low concentration (by passive transport) / without the need for energy / ATP.	• The movement of particles from an area of high concentration to low / the movement of particles (molecules etc.) down a concentration gradient.		
(b)	Active transport is the movement of materials against a concentration gradient / low to high concentration. It requires the use of ATP (energy) and takes place through protein molecules in the cell membrane / ion pump.	• Active transport described as transport (of molecules) needing energy or ATP / The transport of molecules against a concentration gradient.	• Active transport explanation includes use of energy **AND** moving materials against concentration gradient through a membrane (or cell) / active transport uses energy to maintain a high level of molecules in or out of a cell (implies membrane).	

(c)	Aerobic respiration requires oxygen and glucose, and produces carbon dioxide and water, and many / 36 / 38 ATP. Anaerobic respiration only requires glucose, no oxygen, and produces carbon dioxide and ethanol / lactic acid / pyruvate, and few (2) ATP. Lower oxygen levels would decrease the rate of cellular respiration and therefore decrease the rate of ATP production. Low O_2 could also force the cell to turn to anaerobic respiration, which also produces less ATP. Low O_2 would, therefore, decrease the rate of nutrients absorbed from the intestines by active transport, since ATP is needed for active transport. Higher oxygen levels would increase the rate of cellular respiration and therefore increase the rate of ATP production. High O_2 would, therefore, increase the rate of nutrients absorbed from the intestines by active transport at the brush border since ATP is needed for active transport.	• Writes an equation for aerobic respiration OR describes BOTH raw materials and products. • Writes an equation for anaerobic respiration OR describes BOTH raw materials and products. (Accept unbalanced symbol equations or mix of symbols and words.) • Gives an example of a nutrient using active transport to get into gut cell eg glucose / Na (ion) pump, amino acids leave brush border to blood by active transport). • States that active transport is needed to absorb many nutrients as need high level. The brush border has a large surface area for active transport. Aerobic respiration gives more energy (ATP) than anaerobic (or similar).	• Explanation of aerobic respiration that states much more **ATP** is produced using oxygen. Included correct equation (raw materials and products). / Explanation of anaerobic respiration that states less ATP is produced without oxygen. • Explains why lowered O_2 concentration will decrease respiration rate. / Higher O_2 concentration will increase respiration rate. • The rate of respiration affects the amount of ATP produced to be used for active transport.	• An answer that clearly links knowledge of transport and knowledge of respiration → oxygen → respiration rate → ATP production and its effect on ***nutrient*** absorption. For example: Lower O_2 concentration will slow the rate of aerobic respiration and force the cell to use anaerobic respiration therefore reducing active transport because less ATP is made. The increased O_2 concentration will increase ATP production which will, therefore, allow continual active transport, which means more (continuous) nutrients will enter into the intestines. • Rate limiting steps so Oxygen going up won't keep level going up. Pump outlined. Cell will be forced to change if O_2 goes down. Passive transport will continue to be not affected by oxygen levels.

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	Provides ONE statement from Achievement.	Provides any TWO statements from Achievement.	Provides any THREE statements from Achievement.	Provides FOUR statements from Achievement.	Provides any TWO statements from Merit.	Provides any THREE statements from Merit.	Provides TOP bullet point for Excellence.	Provides BOTH bullet points for Excellence. Only an aspect of 2nd point needed.

Q	Expected Coverage	Achievement	Merit	Excellence
TWO (a)	Carbon dioxide + water → oxygen + glucose (plus water in the presence of light and chlorophyll).	• Word equation (Accept non-balanced symbol equation / mixture of symbol and word equation.) don't need light and chlorophyll.		
(b)	Chlorophyll absorbs light to drive the photosynthesis reaction. The thylakoid membranes / grana filled with chlorophyll provide a large surface area for the maximum absorption of light for the light reactions to occur, splitting water. These reactions convert solar energy to chemical potential energy of ATP / (NADPH). (These will provide the hydrogen ions / chemical energy that drive the light independent reactions / next set of reactions) Liquid stroma captures / fixes the carbon / CO_2 in order to make glucose and other carbon compounds. These reactions are the light independent reactions Double membrane is clear to allow light to pass through. It controls what goes in / out of chloroplast.	• Described chlorophyll / thylakoid membranes / grana absorb light / where light reactions happen. • Described stroma has light independent reactions / captures carbon / is clear. • Described that double membrane is clear to allow light through / described double membrane controls what goes in and out of chloroplast.	• 1 Explains chlorophyll filled thylakoid membranes / grana provide large surface area in order to maximise light absorption needed for the light reactions to occur / splitting water molecule. • Explains liquid stroma captures (fixes,combines) CO2 (has enzymes) so the carbon can be used to make glucose / other carbon compounds / light independent reaction • Explains double membrane is clear and semipermeable for **named** material transport.	

(c)	An enzyme is a biological catalyst. It is made of protein with an active site that binds to one specific substrate / is not used up in the reaction. The enzyme substrate complex / binding of the enzyme and substrate lowers the energy needed for the reaction to occur. pH affects enzyme activity, because each enzyme has a specific pH where it works at its optimum rate / efficiency. Either too low or too high pH will disrupt the bonds of the protein, causing the enzyme to denature. When this happens, the shape of the active site no longer fits the substrate, and the enzyme cannot catalyse the reaction. Enzyme inhibitors, on the other hand, don't cause the enzyme to denature like pH does. Inhibitors prevent the substrate from binding with the active site, either by occupying the active site themselves (competitive inhibitors) or by binding to the enzyme outside the active site in such a way that causes the active site to change shape. Both pH changes and inhibitors prevent the substrate from binding with the active site, and thus the enzyme from catalysing the specific reaction.	• Describes an enzyme is a (protein) catalyst. • Enzyme inhibitors stop / slow / block enzyme reactions. • States wrong pH will denature enzymes / alter shape. • enzymes have an optimal pH. • Enzymes are specific due to their active site. (Evidence may come from a labelled diagram.)	• Explains substrate must fit into the active site of the enzyme in order for reaction to occur / Explains lock and key or induced fit. • Explains that each enzyme has specific / different pH that they will have optimum activity. • Explains denaturing as changing shape leading to change of active site. • The reason the inhibitors slow rate is they change active site. (Evidence may come from a labelled diagram.)	• An answer that includes clear knowledge of photosynthesis including raw materials, products and explanation **an** aspect of chloroplast. Included is a discussion of how inhibitors prevent substrate from binding with active site by competing with substrate / binding with enzyme to change shape of active site. Links wrong pH with disruption of (hydrogen) bonds; changing shape of active site; substrate unable to bind with enzyme and reaction slowing / stopping. • Knows of competitive and non-competitive inhibitors. Knowledge of bonds within enzyme. Makes a comparison that while both pH and inhibitors prevent substrate from binding with active site, pH involves denaturing and inhibitors do not denature enzyme.

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	Provides ONE statement from Achievement.	Provides any TWO statements from Achievement.	Provides any THREE statements from Achievement.	Provides FOUR statements from Achievement.	Provides any TWO statements from Merit.	Provides any THREE statements from Merit.	Provides TOP bullet point for Excellence.	Provides BOTH bullet points for Excellence. Only an aspect of 2nd point needed.

Q	Expected Coverage	Achievement	Merit	Excellence
THREE (a)	DNA replication happens before cell division / mitosis / during interphase of cell cycle. DNA replication is necessary so that each new cell has the required, identical information to carry out its function.	• States DNA replication precedes mitosis / Draws labelled cell cycle diagram. • DNA is needed for the new cells / new cells have identical DNA.	• Explains DNA replication is needed so each new cell after mitosis has the exact information to carry out its function.	
(b)	Mitosis rate will be greatest in the shoot and root tips and young leaves / young fruit. This is because these are the **growing points /** parts of the plants, and **new cells** are needed for growth. Mitosis will also be greatest in a wounded / cut part of the plant because new cells are needed to repair the tissue Once the new cells are made and become part of the stem / root / grown leaf, mitosis slows / stops and will only be needed to repair wounds / replace cells. Mitosis will be greatest in the times of year where sunlight and water and optimum / warm temperatures support lots of photosynthesis. This is usually spring and summer in New Zealand. This is because photosynthesis will supply the building materials to create new cells. Photosynthesis also provides the glucose which provides the energy needed to drive mitosis. As light levels decline, the rate of photosynthesis will also decline and therefore, mitosis will slow / stop. Warm conditions could also increase the rate of mitosis because reactions occur at a faster rate in warm conditions. In addition, enzymes involved in mitosis have an optimal temperature, and when this optimal temperature is reached, rate of reaction increases.	• Defines mitosis includes idea of identical **cells.** • States that mitosis is needed for growth **/ repair / replacement** (of cells). • Names TWO plant parts where mitosis is greatest (specific). • Describes more light / water to more photosynthesis. • Mitosis will be greatest in spring / summer / when there is light / water. • States warmth will increase mitosis rate. • ONE time in life cycle given eg germination, when young.	• Links the increased rate of mitosis to growing regions of plant. • Links increased mitosis rate with the need to repair damaged tissue / replacement of cells. • Links warmer temperatures with increased mitosis reaction rate due to optimum enzyme activity. • Explains why mitosis is greater in named part of life cycle.	• An answer that links the need for DNA replication and its place in the cell cycle / prior to mitosis and links mitosis rate with growth AND need for **new cells**. E.g. mitosis is greatest in root / shoot tips because new cells are needed in order for plant to grow. Cells in non-growing parts of plant, such as the stem, will only undergo mitosis to repair tissue, therefore the rate of mitosis will be less in stem. Links optimum temperature, increased light and water levels with increased photosynthesis AND building materials for mitosis / DNA replication. E.g. mitosis will be greatest at times when there is enough light and water to support maximum photosynthesis. This is because photosynthesis is needed **to supply the glucose** for the building materials for DNA replication / mitosis / new cells. • Links mitosis and the need for the **energy** supplied by glucose produced photosynthesis. E.g. mitosis will be greatest at the time of year when there is enough light and water, and the optimum temperature to support maximum photosynthesis. This is because photosynthesis is needed to supply the glucose needed for energy to drive DNA replication / mitosis (energy to drive mitosis) / new cells.

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	Provides ONE statement from Achievement.	Provides any TWO statements from Achievement.	Provides any THREE statements from Achievement.	Provides any FOUR statements from Achievement.	Provides any TWO statements from Merit.	Provides any THREE statements from Merit.	Provides TOP bullet point from Excellence.	Provides BOTH bullet points from Excellence. Only an aspect of 2nd point needed.

Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 7	8 – 14	15 – 19	20 – 24