

Assessment Schedule – 2015**Biology: Demonstrate understanding of life processes at the cellular level (91156)****Assessment Criteria**

Achievement	Achievement with Merit	Achievement with Excellence
<i>Demonstrate understanding</i> involves defining, using annotated diagrams or models to describe, and describing characteristics of, or providing an account of, life processes at the cellular level.	<i>Demonstrate in-depth understanding</i> involves using biological ideas to give reasons how or why life processes occur at the cellular level.	<i>Demonstrate comprehensive understanding</i> involves linking biological ideas about life processes at the cellular level. The discussion of ideas may involve justifying, relating, evaluating, comparing and contrasting, analysing.

Evidence

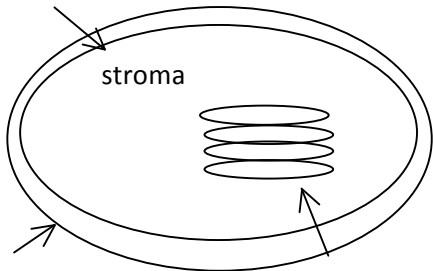
Q	Expected Coverage	Achievement	Merit	Excellence
ONE (a) (b)	Cell respiration occurs in the mitochondria of a cell. The purpose of respiration is to release energy from food, which is needed for metabolism, growth, and other cellular processes. OR The purpose of respiration is to form ATP OR energy for the cell/life processes. The purpose of an enzyme is to speed up chemical reactions OR lower the activation energy of reactions. Enzymes function in specific conditions. Outside of these conditions, the enzymes will not function as well. If environmental temperature is too low, this means that substrate/enzyme collisions and interaction will be lower, and therefore so will be the rate of respiration. As environmental temperature increases, respiration will also increase. However, there will be an optimum temperature for the functioning of the enzymes associated with cell respiration in the oyster. This will be the temperature at which the peak rate of respiration occurs. Beyond (above) this temperature, the enzymes may become denatured, which makes them inactive and is irreversible. They are denatured because of a change in the shape/structure of the active site, which can no longer fit the substrate(s) involved in the process. Once the active site begins to change shape, the rate of cell respiration will decrease, or may stop altogether. Cadmium can combine with the active site / enzyme, blocking it or changing its shape, and prevents substrates from attaching and a product being formed. This prevents the enzyme functioning correctly and is	- Describes the purpose of respiration. - Describes where respiration takes place. - Word or symbol equation for respiration. - Describes the purpose of an enzyme. - Describes one way that temperature can affect enzyme activity. - States that cadmium can affect enzyme function as an inhibitor. - States that enzymes have a role in cellular respiration.	- Explains how cadmium affects enzyme activity. - Explains one way that temperature affects enzyme activity. - Explains how an enzyme denatures, (by temp or inhibitor). - Explains how low or high oxygen concentration affects enzyme action OR respiration.	Discussion includes how factors affect enzyme action, and how this in turn affects cell respiration AND / OR how high AND low O₂ conc directly affects respiration.

irreversible. Candidates may identify Oxygen as a substrate and that substrate concentration affects enzyme activity. Low substrate conc will lower enzyme action whilst higher substrate concentration will increase it. Enzymes are involved in each step of cell respiration and therefore the rate is dependent on the factors such as temperature and cadmium levels affecting enzyme action. Oxygen concentration affects cell respiration because the cell uses oxygen to break down glucose to produce carbon dioxide, water, and ATP / energy $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O} + \text{Energy (ATP)}.$ (Doesn't need to be balanced and can also state the reactants and products in words.) Low oxygen concentration prevents the cell / mitochondria from producing energy as there is less O₂ available to help release energy from Glucose / high oxygen concentration means the cell can produce (a lot of) energy as more glucose can be broken down.			
--	--	--	--

N0	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	Provides any 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.	Discusses how TWO factors are linked to cell respiration.	Discusses how THREE factors are linked to cell respiration.

Q	Expected Coverage	Achievement	Merit	Excellence
TWO	Diffusion is the net movement of a substance from an area of high concentration to low concentration. Diffusion takes place along a concentration gradient. A concentration gradient exists until the diffused substance is evenly distributed. Diffusion is passive / has no energy requirement. Osmosis is the diffusion of water across a semi-permeable membrane from an area of higher water concentration/water potential/free water molecules to an area of lower water concentration/water potential/free water molecules. Osmosis is passive / has no energy requirement. Active transport is the movement of substances across a membrane against a concentration gradient from low concentration to high concentration. It requires energy / ATP. It occurs through proteins in the cell membrane. Respiration provides the energy / ATP for active transport whereas no energy is required for Osmosis / diffusion due to concentration gradient. The movement of salt across the lugworm membrane occurs via facilitated diffusion because Salt moves from an area of high conc to low conc down the conc gradient through protein channels in the cell membrane. OR because Salt cannot move through the cell membrane due to size/polarity/solubility, and therefore moves through the protein channels embedded in the cell membrane. This requires no energy, therefore oxygen is not needed to produce ATP, and hence remains at a constant concentration. Water moves via osmosis, as described above, and also requires no energy. Therefore, the lugworm always has the same salt water concentration / is in equilibrium as the surrounding seawater. The movement of salt across the hogchoker cell membrane is via active transport. Salt moves against the conc gradient from an area of low conc to an area of high conc through protein channels in the cell membrane. This requires energy / ATP. Oxygen is required to make ATP via cell respiration therefore oxygen consumption increases when the hogchoker is in high salt conc water because more energy is required to pump salt ions against the steep gradient. Osmosis as stated above requires no energy.	• Describes diffusion AND / OR fully annotated diagram / model. • Describes osmosis AND / OR fully annotated diagram / model. • Describes active transport AND / OR fully annotated diagram / model. • Describes movement across lugworm membrane. • Describes movement across hogchoker membrane. • Describes facilitated diffusion. OR Fully annotated model.	• Explains movement of salt across the lugworm membrane via facilitated diffusion AND water as osmosis. • Explains movement of salt across hogchoker membrane as active transport AND water as osmosis. • Explains why oxygen consumption remains constant in the lugworm OR why it varies in the Hogchoker. • Explains the role of respiration in cellular membrane transport.	• Discusses that more oxygen is consumed as salt water concentration increases to make energy / ATP via cell respiration for active transport to pump salt out of the cell against the concentration gradient in the hogchoker. • Discusses why oxygen consumption remains constant in the lugworm and relates this to the types of transport involved. e.g. additional oxygen not required for cellular respiration as both facilitated diffusion and osmosis are passive as they move substances down the concentration gradient so do not require ATP produced through respiration

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	Provides any partial statement from Achievement. (e.g. osmosis defined without semi- permeable membrane specified).	Provides any ONE statement 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 ONE bullet point for Excellence.	Provides BOTH bullets points for Excellence.

	Expected Coverage	Achievement	Merit	Excellence
THREE				
(a)	Inner membrane  stroma outer membrane thylakoid	• Draws a labelled diagram of chloroplast. • Describes the process of photosynthesis, (could be a word equation) • Describes chloroplast move within cell to get more light	• Explains the process of photosynthesis. • Explains why chloroplasts move within cell to maximise photosynthesis. • Explains why shade plants have bigger chloroplasts. • Explains why non-shade plants have smaller chloroplasts.	• Justify why shade plants have bigger chloroplasts than non-shade plants and how this relates to photosynthesis. • Relates chloroplast distribution in the cell to the efficiency of photosynthesis with reference to light energy and its role.
(b)	Photosynthesis is the process in which plants use sunlight to produce glucose. OR May say converts solar energy into chemical potential energy. The plant splits molecules of water and combines Hydrogen with molecules of carbon dioxide, and converts them into glucose and oxygen. $6\text{CO}_2 + 12 \text{ (or 6) H}_2\text{O} \xrightarrow{\text{light}} \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 + 6 \text{ (or not) H}_2\text{O}$ Accept non-balanced equation and word equation. In low light, chloroplasts move in order to get more light. This either ensures that the maximum surface area faces the light OR to give chloroplasts equal access to light /CO₂/H₂O In turn the chloroplast / thylakoids absorb more total light energy that initiates the process / splits water molecules and increases efficiency. In extreme light the intensity can damage chloroplasts so they move to adjust/reduce their light exposure Shade plants have bigger chloroplasts compared to non-shade plants so they can photosynthesise sufficiently due to increased surface area. This allows them to have more chlorophyll exposed to light at any one time. Non shade plants don't need larger chloroplasts as enough light energy is provided / bigger chloroplasts. Non-shade plants have smaller chloroplasts as high light intensity triggers earlier chloroplast division OR to reduce unnecessary energy use. Light is not the limiting factor for photosynthesis so chloroplasts don't need to be large OR smaller chloroplasts are adapted for better diffusion, (SA / vol ratio).	• States that shade plants have bigger chloroplasts to get more light. • States that non shade plants have smaller chloroplasts as they get enough light.		

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	Provides any 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 ONE statement for Excellence.	Provides TWO statements for Excellence.

Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 7	8 – 13	14 – 18	19 – 24