
Specimen answer 10

June 14 BIOL5 10a

EITHER**10 (a)**

How cells and organisms carry out exchanges with their external environment to maintain their internal environment.

[25 marks]**OR****10 (b)**

How energy is transferred within and between organisms.

[25 marks]

If you want to make a plan write it here.

Plan

10a → diffusion
 → osmosis
 → active transport

CO₂ & food plants
 →

→ lungs ✓
 → plant exchange ✓

→ fish ✓
 → insects ✓

→ plants ✓



10a. Most organisms have to exchange gases in order to produce energy for processes in the body by respiration and/or photosynthesis.

Mammals have lungs which are the exchange surface for gases. Air is taken in by the lungs due to a decreased pressure in the thorax created by the movement of the diaphragm which moves down and out.

The air then travels through the structures of the lungs to the alveoli where oxygen diffuses into the blood in the capillaries of the alveoli and CO_2 diffuses out of the blood and is removed during exhalation.

Fish have gills which is their gas exchange surface. Fish take in water through their mouth which then passes over the gills. Lamellae on the gills contain lots of capillaries to produce a rich blood supply. The water passes over the lamellae in the opposite direction to the flow of blood. This countercurrent system means that more oxygen is removed from the water and diffuses into the blood. This is because a high concentration

Turn over ►

gradient it constantly be maintained over the whole surface of the gills lamellae. In this way 80% of the available oxygen is removed from the water. Water has high ~~content~~ concentration as it passes over the gill and the blood has a very low concentration of oxygen as oxygen diffuses into the blood it is carried away into the opposite direction to the water so the water is always at a high concentration of oxygen compared to the concentration of oxygen in the blood. CO_2 also diffuses out of the blood into the water and is carried away from the fish ^{and transport it}.

Insects take in air through tracheoles which go run throughout the insects body to all cells so oxygen diffuses directly into the cells ^{that need it}. As insects don't have blood to carry oxygen round their bodies.

Plants taken in CO_2 and give out O_2 and CO_2 through stomata which are gaps in the leaves of the plant.

Guard cells on either side of the stomatal pore control the amount of gases



that enter and leave the leaf. They also control how much water is lost through transpiration.

Plants require lots of CO_2 to photosynthesise so when it is light plants take in lots of CO_2 from their external environment. In photosynthesis O_2 is produced as well as ~~glucose~~ energy which is then given out to the surroundings as it diffuses out of the leaves or it is taken up and used for respiration.

Plants require water, ions and minerals from the soil for processes in the plant. Ions are actively transported into the root hair cells of plants and water diffuses ⁰ by osmosis into these cells due to there being a lower water potential inside the cell than outside of it.

The active transport of ions ^{into the root} requires ATP as it is going ⁰ against a concentration gradient. ATP is produced in respiration and photosynthesis.

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Senior examiner annotations				
#	Item	Page	Mark/symbol	Annotation
1	10	2	0	
2	10	2	0	L – Lung function but there is limited A-level detail of pressure changes.
3	10	2	0	G – Gas exchange. Includes detailed explanation of fish, insect and plant gas exchange.
4	10	4	0	W – Passage of water through plant. Good detail of absorption of water by osmosis into root hair cells.
5	10	4	0	C - Cells. Relevant selection but not enough detail for further credit.
6	10	4	15	A bit limited in scope with 4 topics but A-level content - if often limited in detail. Not really interrelated, or addressing the theme of the essay in a coherent fashion. Multistructural - awarded 15 marks.