

Specimen answer 5

June 14 BIOL5 10b

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.

predator/prey food
trophic levels
respiration

ATP - anaerobic
aerobic
mitochondria

photosynthesis

digestion of carbs

light

muscle contraction

Active transport - ATP



ATP (adenosine triphosphate) is the human body's main source of energy. This is because it is readily available in muscle cells.

ATP can be used in aerobic and anaerobic respiration. ATP is resynthesised from $ADP + P_i + \text{energy}$. ATP is used in the glycolysis stage of respiration. 2 ATP molecules are ~~produced~~ used and 4 molecules are produced. This is then transferred out of the muscle sarcoplasm by diffusion.

ATP is used in active transport to move ions from areas of high concentration to areas of lower concentrations. The ATP diffuses across and binds to the receptors on certain proteins such as the sodium-potassium pump. This provides the pump with energy to move sodium and potassium ions in and out of the cell.

The digestion of carbohydrates and other food transfers energy throughout the body. The food is broken down to release glucose which is a sugar energy source.

This glucose is used in respiration and is transferred ~~through~~ ^{by} the blood to respiring

Turn over ►

→ This is called
glycogenesis

Issues: If the glucose is not needed it is transported back to the liver or muscle cells and converted into glycogen where it remains, ready available to be broken down back into glucose. The energy is transferred from the food into the respiring cells.

Producers, such as plants, use sunlight as their main source of energy. They make the light into glucose, via photosynthesis, which can be used by other animals/organisms. The light independent reaction uses CO_2 and ATP and reduced NADP from the light dependent reaction to produce glucose. The CO_2 combines with Ribulose biphosphate (RuBP) to form GP. The ATP and reduced NADP are used to convert GP to TP. One phosphate from the TP is used to make useful organic substances, such as glucose. The TP is then converted to RuBP. This is the Calvin cycle and must occur 6 times to make 1 glucose ($\text{C}_6\text{H}_{12}\text{O}_6$). This glucose is then eaten by other organisms which are primary consumers.



The primary consumers are then eaten by secondary consumers and so on until there is a top predator, such as the humans, which are not hunted by any predators.

These levels are called trophic levels.

During each trophic level energy is transferred in the form of glucose in muscles and other soluble compounds.

The energy transfer between each level is not very efficient as there are areas that cannot be eaten, such as bones, and not all the energy is stored. Some of the energy is excreted as not all of it can be digested. The transfer between the sun and producers is the least efficient as some of the waves are of the wrong wavelength, or do not strike the chlorophyll or are reflected back into the atmosphere.

In humans energy is transferred back to the atmosphere as heat. When a person sweats, their capillaries dilate, known as vasodilation. This causes them to come to the surface of the skin so heat is radiated out. Energy is also lost

Turn over ►



as sweat when a person becomes
too hot

10 



Senior examiner annotations				
#	Item	Page	Mark/symbol	Annotation
1	10	2	0	A – ATP included but not in context of energy transfer.
2	10	2	0	Significant error – high to low.
3	10	2	0	No – No reference to nerves but the only place in the spec where sodium potassium pumps are mentioned, so accept.
4	10	2	0	D – Digestion – not enough detail.
5	10	2	0	Ab – Absorption – idea of glucose transferred into cells but weak content.
6	10	3	0	P – Photosynthesis – A-level content.
7	10	3	0	Significant error here relating to GP and TP. Phosphate from TP is not used to make glucose.
8	10	4	0	Ec energy transfer – some A-level content.
9	10	4	0	P – superficial photosynthesis.
10	10	4	0	Not relevant – energy transfer to atmosphere, not within/between organisms.
11	10	4	0	Significant error.
12	10	5	10	Number of significant errors and an irrelevant passage. Only a couple of topics with any real A-level content - linked to generally poor terminology. Unistructural - awarded 10 marks.