ASE 2018

The A-level Biology essay

Accompanying materials

January 2018

Contents

Presentation slides

The A-level Biology essay

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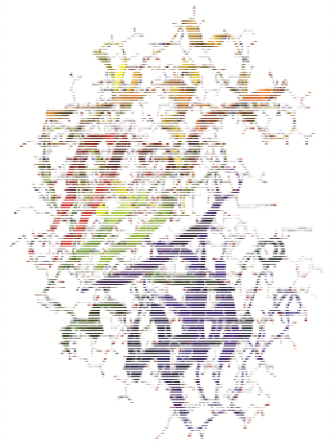
January 2018



The essay is a synoptic exercise

- As with the legacy specification BIOL5 paper, Paper 3 has a **free response essay** addressing a theme in a title, with **a choice from two titles**.
- The essay is designed to assess whether students can bring together material from a range of topics to **illustrate and explain an important concept or idea**.
- The essay is not just a memory test of what a student knows – it is also a test of whether they have some **understanding** of what they have learnt and can **apply** what they know.
- Marks are about equal for both aspects – average to lower marks tend to be where students focus mainly on AO1 rather than AO2.

What we expect from students in the essay

- To **identify an underlying theme or idea** in an essay title – it will be a 'big idea', not a minor topic.
- To select five or six **different examples** that they can use to illustrate the theme or idea.
- To write a reasonable paragraph about each example (using appropriate A-level terminology), **pointing out how it illustrates the theme or idea.**

What the essay is not

- 'Think of every possible thing that relates to the title and write as much as you can about it, with no thought of the main theme/idea.'
  - This would make it just a memory test (AO1).
- 'Write at a very high level (above A-level) about one or two topics.'
  - This is not a synoptic approach. We do not wish to encourage learning of rote answers involving one or two important topics which might apply to many titles – eg respiration.

The content of essay responses

Content has to be of A-level standard to score highly – this includes scientific terminology and the explanation of 'importance'.

- Example – importance of gas exchange in humans – many students gave reasonable degrees of detail about gas exchange in the lungs. Most then said this was important 'to stay alive', or 'for respiration' – not A-level standard.
- Strongest responses linked oxygen uptake to oxidative phosphorylation in respiration, as a source of most of the ATP the body requires.
- Or to prevent increase in concentration of carbon dioxide in blood – leading to fall in pH and adverse effects on eg enzymes.

Levels mark scheme

- The statements in the levels mark scheme are based on the descriptors for the essay in the previous specification.
- The expectation was that the outcomes would be very similar to those for the essay in BIOL5 – this proved to be the case.
- This year, the mean mark for the essay was 14.1 and the SD 5.0 – both slightly higher than for 2016 BIOL5.
- The discrimination index was 0.52 – equal highest on the paper and (historically) high for any question on a Biology paper – this means that there is strong correlation between performance on the essay and performance on the paper as a whole.

Levels mark scheme

- A commentary has been produced that gives further clarification of some of the statements in the levels mark scheme – in booklet.
- This summer's paper was standardised face-to-face, to give the same information to examiners.
- Note the important impacts of significant errors and irrelevant passages.
- Without these, content has to be sufficiently good to qualify for a given level.

Advice for the essay

- Any plan is purely for the student's use.
- **The essay is a prose exercise** – unless a plan is written as a series of sentences (ie as an essay), it won't add to the mark for the essay. The same applies to diagrams/drawings – they would have to be very heavily annotated to count.
- **No introduction or conclusion is required** – it wastes time that could be used for more content.
- Content from 'several' topic areas is required – **we have defined four topics as the minimum for 'several'** – five or six might be safer, since the amount of A-level content in the essay affects the level.

Advice for the essay

- The levels scheme states that **more than two A-level topics need to be addressed to get higher than 10 marks.**
- **A minimum of four topics is required to get higher than 15 marks**.
- A topic area is a numbered sub-section in the specification.
  - For example, for the 2017 ‘diffusion’ essay, gas exchange (3.3.2) was a topic area.
    - A few students wrote almost entire essays about different gas exchange systems – this made their essay ‘unistructural’, with a maximum of 6 to 10 marks.

Advice for the essay

- It might be possible to construct an essay around a single example – but not required.
- A-level detail is required – though not necessarily all the detail of a particular topic, just the **relevant detail**.
- **A-level terminology is required and more important than grammar** – this is an exercise concerned with biology, not English.

Advice for the essay

- An essay containing **only GCSE-level material can score a maximum of 5 marks.**
- If asked about the importance of something, **factual detail and explanation of importance have to be at A-level standard to score above 15 marks**.
- **An example not from the specification has to be at (or above) A-level standard** – not GCSE, or what anyone who hasn't studied A-level Biology would know.
  - This example is only essential if a student is aiming for top marks ie 24/25 out of 25 – students can still score 23 out of 25 without examples not from the specification.
  - Example – quite a few students made reference to cystic fibrosis in essays about diffusion – relatively few made accurate links to this condition and chloride ion channel protein, diffusion and/or water potentials and osmosis.

AQA

Sample essays

Three essays with annotations – ten available from 2014 on website.
Four 2017 essays available with feedback materials on e-AQA soon.

Familiarise yourself with the levels mark scheme.

Read the essays and look for the following:

- Are they using A-level content and terminology?
- Do they address the biological importance of what they write about – and at what level – is it A-level?
- Are there significant errors – things that are biologically wrong and greatly affect the sense of what they are trying to say?
- Are there passages that are not relevant – or that they do not make relevant?

AQA

Preparing students for the essay

- **Practice!** Could start at AS, with titles that address 'big ideas' in sections.
- When teaching, point out **connections** between parts of the specification.
  - Especially through the 'big ideas' outlined at the start of each section.
- Encourage **outside reading** – eg *Biological science review* – which will help them to put what they learn into broader contexts. To get a top mark (24 or 25) in the essay, we will look for some evidence (at least in one topic) of reading beyond the specification.
- Example – Membranes are important in many processes in cells.
  - What could be the theme of the essay?
  - What might be suitable topic areas?

Preparing students for the essay

- **Theme/idea** – the **role** of membranes in processes – **not just processes** that involve membranes.
- Suitable topics include transport across membranes, protein synthesis, immune response, exchange surfaces, photosynthesis, respiration, receptors (in various topics such as insulin action), neurones, synapses, muscle contraction…

Preparing students for the essay

Example – photosynthesis.

- Weaker answers will focus on all of photosynthesis – as a process involving membranes – perhaps mention membranes in chloroplasts (this approach would gain a maximum of about 18 out of 25).
- Good answers will focus on thylakoid membranes in the chloroplast and the roles of components of these membranes in holding pigments, components of the electron transfer chain, ATP synthase and the membrane as a barrier allowing maintenance of a proton gradient – and, perhaps, role of membranes in maintaining the special chemical environment inside chloroplasts.

Preparing students for the essay

- At the end of each topic, make links to other topics to encourage answers to the essay question become more synoptic.
- Regularly give students an essay title. Ask them to list the topics that could be written about for that title.
- Draw mind maps with students showing the topics that could be linked to an essay title and the links between them.
- At the end of each teaching each topic, give a series of essay titles and ask students to write a paragraph on the topic and how it links to that title.
- Students write essays and peer-assess each others' work.
- Remember students should include five/six topics in the essay and the essay should take about 40 minutes to write.

How did we do?

- Please rate this session on the **Sched Conference app**.
- Using the post-its provided, please write:
  - one thing you enjoyed about our session or will take away for your teaching
  - one thing you feel could be improved.
- Stick these on the feedback poster as you leave.

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Thank you

Levels mark scheme

Question 7 Level of response marking guidance

Level of response marking instructions

Level of response mark schemes are broken down into five levels, each of which has a descriptor. The descriptor for the level shows the average performance for the level. There are five marks in each level. Thus the descriptor for the level represents the mid mark in that level.

Before you apply the mark scheme to a student's answer, read through the answer and annotate it (as instructed) to show the qualities that are being looked for. You can then apply the mark scheme.

Step 1 Determine a level

Start at the lowest level of the mark scheme and use it as a ladder to see whether the answer meets the descriptor for that level. The descriptor for the level indicates the different qualities that might be seen in the student's answer for that level. If it meets the lowest level then go to the next one and decide if it meets this level, and so on, until you have a match between the level descriptor and the answer. With practice and familiarity you will find that for better answers you will be able to quickly skip through the lower levels of the mark scheme.

When assigning a level you should look at the overall quality of the answer and not look to pick holes in small and specific parts of the answer where the student has not performed quite as well as the rest. If the answer covers different aspects of different levels of the mark scheme you should use a best fit approach for defining the level and then use the variability of the response to help decide the mark within the level. i.e. if the response is predominantly level 3 with a small amount of level 4 material it would be placed in level 3 but be awarded a mark near the top of the level because of the level 4 content.

Step 2 Determine a mark

Once you have assigned a level you need to decide on the mark. The descriptors on how to allocate marks can help with this. The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This answer will have been awarded a mark by the Lead Examiner. You can compare the student's answer with the example to determine if it is the same standard, better or worse than the example. You can then use this to allocate a mark for the answer based on the Lead Examiner's mark on the example.

You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do not have to cover all of the points mentioned in the indicative content to reach the highest level of the mark scheme.

An answer which contains nothing of relevance to the question must be awarded no marks.

21–25	Extended Abstract Generalised beyond specific context	Response shows holistic approach to the question with a fully integrated answer which makes clear links between several different topics and the theme of the question. Biology is detailed and comprehensive A-level content, uses appropriate terminology, and is very well written and always clearly explained. No significant errors or irrelevant material. For top marks in the band, the answer shows evidence of reading beyond specification requirements.
16–20	Relational Integrated into a whole	Response links several topics to the main theme of the question, to form a series of interrelated points which are clearly explained. Biology is fundamentally correct A-level content and contains some points which are detailed, though there may be some which are less well developed, with appropriate use of terminology. Perhaps one significant error and, or, one irrelevant topic which detracts from the overall quality of the answer.
11–15	Multistructural Several aspects covered but they are unrelated	Response mostly deals with suitable topics but they are not interrelated and links are not made to the theme of the question. Biology is usually correct A-level content, though it lacks detail. It is usually clearly explained and generally uses appropriate terminology. Some significant errors and, or, more than one irrelevant topic.
6–10	Unistructural Only one or few aspects covered	Response predominantly deals with only one or two topics that relate to the question. Biology presented shows some superficial A-level content that may be poorly explained, lacking in detail, or show limited use of appropriate terminology. May contain a number of significant errors and, or, irrelevant topics.
1–5	Unfocused	Response only indirectly addresses the theme of the question and merely presents a series of biological facts which are usually descriptive in nature or poorly explained and at times may be factually incorrect. Content and terminology is generally below A-level. May contain a large number of errors and, or, irrelevant topics.
0		Nothing of relevance or no response.

Commentary on terms and statements in the levels mark scheme

The levels mark scheme for the essay contains a number of words and statements that are open to different interpretations. This commentary defines the meanings of these words and statements in the context of marking the essay. Many words and statements are used in the descriptions of more than one level of response. The definitions of these remain the same throughout.

Levels mark scheme word/statement	Definition
Holistic.	Synoptic, drawing from different topics (usually sections of the specification)
A fully integrated answer which makes clear links between several different topics and the theme of the question.	All topics relate to the title and theme of the essay; for example, explaining the biological importance of a process. When considering, for example, the importance of a process, the explanation must be at A-level standard. 'Several' here is defined as at least four topic areas from the specification covered. This means some sentences, not just a word or two. It does not mean using many examples from one topic area.
Biology is detailed and comprehensive A-level content, uses appropriate terminology, and is very well written and always clearly explained.	Detailed and comprehensive A-level content is the specification content. Terminology is that used in the specification. Well written and clearly explained refers mainly to biological content and use of terminology. Prose, handwriting and spelling are secondary considerations. Phonetic spelling is accepted, unless examiners are instructed not to do so for particular words; for example, glucagon, glucose and glycogen.
No significant errors or irrelevant material.	A significant error is one which significantly detracts from the biological accuracy or correctness of a described example. This will usually involve more than one word. Irrelevant material is several lines (or more) that clearly fails to address the title, or the theme of the title.
For top marks in the band, the answer shows evidence of reading beyond specification requirements.	An example that is relevant to the title and is not required in the specification content. The example must be used at A-level standard.
Response mostly deals with suitable topics but they are not interrelated and links are not made to the theme of the question.	Not addressing the biological theme of the essay (eg importance) **at A-level standard**.

Specimen answer 1

June 2014 BIOL5 10b

Script

10 Write an essay on **one** of the following topics.

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.

10 b) How energy is transferred within and between organisms

Plan:

- ecosystems energy loss
- nitrogen cycle
- carbon cycle
- ATP
- digestion
- Pacinian corpuscle
- photosynthesis
  - light chemical
- rod cells, cone cells

Do not write outside the box

Energy is transferred between organisms in a number of different ways. Energy transfers are vital for the survival of organisms and for them to carry out specialised processes such as ectone transport, muscle contration etc and regulation of body temperature. Energy cannot be created or destroyed, it is transformed from one type to another.

The sun is vital for survival on Earth for many organisms. The sun provides energy in the form of both heat and light. Photosynthetic organisms such as plants contain leaves with lots of chloroplasts and which are full of pigments such as chlorophyll A & B. Light energy strikes these chlorophyll molecules where it excites electrons to a higher energy level. They pass down a series of electron carriers in redox reaction and the energy is used to combine ADP with Pi to form ATP. The This is called photophosphorylation. Photolysis of water by light splits water into protons, electrons and oxygen, this produces reduced NADP. CO_2 enters through stomata and the enzyme Rubisco catalyses the formation of 2 molecules of GP from CO_2 and RUBP.

Turn over ▶

WMP/Jun14/BIOL5

Do not write outside the box

*1

$ GP is then reduced $ to TP by reduced NADP and energy from ATP. TP can be regenerated to form RUBP and can also be converted to useful organic substances such as glucose. In photosynthesis, light energy from sun is converted to chemical energy in the form of glucose which then passes along food chain.

At each trophic level, there is a loss of energy between organisms and their environment. Firstly, not all light energy that strikes chlorophyll molecule is of the right wavelength and not all light energy strikes chlorophyll molecule, so energy is lost between the sun and producers. Energy is also lost between consumers as not all of the organism is eaten, for example the roots in plants or bones of animal. Not all of organism can be digested, for example cellulose in plants, and is excreted, lost in faeces. Energy is also lost between organism and its environment due to respiration and maintenance of body temperature but also during movement. Energy is transferred between consumers, producers and their

environment in many ways, and energy is converted into a number of different forms.

In carbon cycle, when organisms die, saprobionts release enzymes that break down organic matter. They absorb products of digestion by diffusion, then when they respire, they release CO_2 into the atmosphere. Energy is also transferred when fossil fuels are burnt as they release CO_2 and methane.

In Nitrogen cycle, nitrogen fixing bacteria convert nitrogen gas from atmosphere into nitrogen. In process of ammonification, saprobionts release enzymes that break down nitrogen containing compounds such as urea into ammonium ions, this is an example of energy transfer. Nitrifying bacteria can then oxidise ammonium ions to nitrite ions then nitrate ions, which can be absorbed by plants, and nitrate nitrogen used by plants for protein synthesis.

In living organisms, there are receptors on cell surface membranes such as the Pacinian corpuscle. The pacinian corpuscle converts mechanical energy into electrical energy. In a Pacinian corpuscle pressure

& causes sodium ion channels to stretch and change shape. This causes sodium ions to enter causing depolarisation and creation of an action potential, which is then transpated along sensory neurones to the CNS. Other receptors include rod cells and cone cells which also act as transducers. They Rod cells display detect in black while, while cone cells display in full colour. Rod cells Several rod cells are connected to one bipolar neurone, therefore they have poor visual acuity compared to cone cells where each cone cell is connected to one neurone. Rod and cone cells are sensitive to light and are photoreceptors that convert light energy into nervous, electrical impulses, which then pass to optic nerve

ATP, adenosine triphosphate is produced in both the stroma and cristae by of photo oxidine phosphorylation and photophosphorylation. ATP is an immediate energy source, that cannot be stored and is broken down by a single one step reaction. The energy transfer when an ATP molecule is hydrolysed, is used in many processes

including active transport and muscle contraction. Hydrolysis of ATP transfers energy which is used in muscle contraction for the 'power stroke' movement and the crossing over of actin, myosin filaments but is also very important in the detachment of actin myosin cross bridges.

There is a transfer of energy in digestion as polymers in food which are insoluble and cannot be directly absorbed into the blood and assimilated, are broken down into monosaccharides. Proteases break down proteins into amino acids, carbohydrases break down polysaccharides into monosaccharides such as glucose. These can products can then be absorbed into the blood where they can be used by body. Chemical energy in glucose can be converted into to heat energy or other forms of energy during respiration, this can be used by the food body to maintain regular body temperature and constant internal environment (homeostasis).

In conclusion, the transfer of energy from one ~~one~~ form to another is vital

Do not write outside the box

for the overall survival of organisms

Senior examiner annotations

#	Item	Page	Mark/ symbol	Annotation
1	10	1	0	Plan viewed, no creditable material.
2	10	2	0	Introduction. Do not view as irrelevant material.
3	10	2	0	P – Idea of light energy to chemical energy.
4	10	2	0	P – Correct reference to photolysis and using energy from ATP and reduced NADP to form glucose in light-independent reaction.
5	10	3	0	Et – Correct references to loss of energy between trophic levels and the different ways in which this occurs.
6	10	4	0	Irrelevant material about nutrient cycles.
7	10	4	0	Sr – Pacinian corpuscle converting mechanical energy into electrical energy.
8	10	5	0	Sr – Correct reference to the functioning of light receptors transferring light energy into electrical energy.
9	10	6	0	Correct material about chemical energy from ATP being converted into movement energy and used in active transport. The error in referring to both the stroma and the cristae as the site of ATP production is not a significant error so does not negate.
10	10	6	0	Mc – Noted as a topic however insufficient material.
11	10	6	0	D – Glucose produced as a result of digestion can then be converted into other energy forms eg heat to maintain body temp.
12	10	7	0	Following theme using examples (holistic) – directly addressing theme. One irrelevant passage but, on balance, offset by content. Nothing detailed beyond specification. Extended abstract – awarded 22 marks.

Specimen answer 2

June 2014 BIOL5 10b

Script

10 Write an essay on **one** of the following topics.

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
ATP - anaerobic
aerobic
respiration
mitochondria
photosynthesis
digestion of carbs
(light)
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 + Pi + energy. ATP is used in the glycolysis stage of respiration. 2 ATP molecules are ~~made~~ used and 4 molecules are produced. This is then transferred ~~a~~ 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 ins 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 transported ~~by~~ through the blood to respiring

tissues if the glucose is not needed it is transported back to the liver or muscle cells and converted into glycogen where it remains, readily 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 this 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 produced 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 $6(C_6H_{12}O_6)$.

This glucose is then eaten by other organisms which are primary consumers.

* Thus is called glycogenesis

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

Do not write outside the box

a) sweat makes a person become 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.

Specimen answer 3

June 2014 BIOL5 10b

Script

10 Write an essay on **one** of the following topics.

EITHER

10 (a) How cells and organisms carry out exchanges with their external environment to maintain their internal environment.

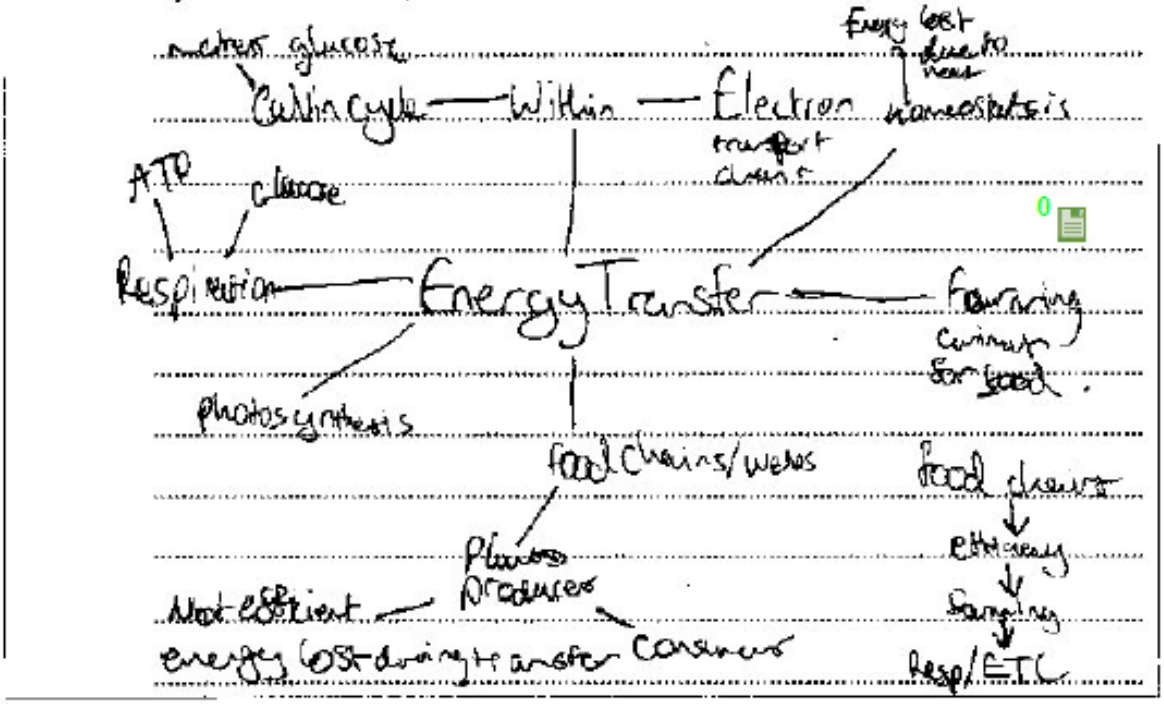
[25 marks]

OR

10 (b) How energy is transferred within and between organisms.

[25 marks]

If you want to make a plan write it here.



Energy transfer occur all the time between organisms, one of the ways in which energy is transferred between organisms is through food webs and chains. The first part of a food chain is the sun, the sun provides light energy so that plants can photosynthesise and produce convert energy into growth. This is relatively inefficient process as much light does not even reach the chloroplasts. Just under 2% of the light energy from the sun is converted into growth by plants. Plants convert this light energy into growth, when light energy hits the chlorophyll, electrons get excited and are emitted, these they undergo a series of oxidation and reduction reactions, the energy lost by these reactions the electrons is ~~converted into ATP~~ used to combine ADP + Pi to form ATP, which is an energy source. Following this the light-independent reaction occurs which uses ATP from the light-dependent reaction to form Triose Phosphate, This is formed when Ribulose bisphosphate and CO_2 react to form Glycerate-3-phosphate, ATP and reduced NAD ~~reduced NAD~~ are used to convert this into Triose phosphate, this is used to make glucose, which is used in respiration as a source of energy.

Turn over ▶

During respiration glucose is broken down into pyruvate, using NAD, also energy from this reaction combines ADP+Pi to form ATP. Energy is also transferred during the electron transport chain where ATP is formed at various stages using the energy ~~transferred~~ transferred. During respiration some energy is also transferred into heat energy.

After the producers in the food chain there are consumers, they eat the plants, so that they can transfer the energy into growth. Consumers eat the plants which contain protein and carbohydrates. Starch and other carbohydrates are broken down in the saliva mouth, by enzymes in the saliva such as amylase. Starch is broken down into maltose, which can be broken down into glucose for use in respiration.

Endotherms that maintain their own body temperature often require more energy as more energy is transferred into maintaining body temperature. This is one of the reasons why to increase the efficiency of energy transfer in agriculture, intensive farming is used,

animals are reared in cramped and warm conditions, to reduce muscle contraction and to keep environment temperature close to the optimum body temperature. Muscle contraction is one way in which energy is transferred as ATP is required to form crossbridges between myosin and actin and detach them, so reduced muscle contraction leads to increased efficiency.

Energy is also required by active processes such as active transport, which requires ATP to be broken down to release energy, so that ions can be taken up. Such as in an action potential when the sodium-potassium pump takes over pumping sodium out and potassium ions in.

Overall energy is required for a variety of processes and is transferred in many different ways between organisms and within them.

18

Senior examiner annotations

#	Item	Page	Mark/ symbol	Annotation
1	10	1	0	Plan noted,
2	10	2	0	Ec – Energy transfer through ecosystems noted but not enough detail.
3	10	2	0	Photosynthesis LDR detail.
4	10	2	0	P – Photosynthesis LIR.
5	10	3	0	R – Respiration noted and ETC.
6	10	3	0	Ec again – combined with first paragraph now sufficient detail.
7	10	3	0	D – Digestion noted but not enough detail.
8	10	4	0	F– Food production noted but not sufficient detail.
9	10	4	0	Mc – Muscle contraction and along with food production above is given credit.
10	10	4	0	N – Nerve impulses noted but no real detail.
11	10	4	18	Several topics linked to title/theme. A-level detail in some and no significant errors – or irrelevant material. Relational – awarded 18 marks.

Notes

Notes

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