

*EXAMINATIONS COUNCIL OF ESWATINI*

# **EGCSE**

**EXAMINATION REPORT**

**FOR**

**BIOLOGY (6884)**

**YEAR**

**2021**

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**EGCSE BIOLOGY****Paper 6884/01****Short Answers****General Comments**

This is a short answer question paper, which has total marks of 40. Its aim is to test 75% of knowledge with understanding and 25% handling information and solving problems of candidates.

The 2021 Biology paper was of same difficulty as previous paper. However, the overall performance was very low compared to 2020 question paper due to a number of factors such as lack of understanding of biology concepts, language barrier, and spelling mistakes. A small percentage of candidates scored zero while a number of candidates scored between 4 and 17. Very few candidates managed to score above 30. The most challenging questions were **Question 3, Question 11, Question 17**.

**Comments on Specific Questions****Question 1**

This question was accessible to a number of candidates. The question was based on a root hair cell.

- (a) The question required candidates to state the function of **A**, which was a nucleus. Some candidates named the feature instead of stating the function. Some gave incorrect functions such as “it is where chemical reactions take place/it stores food for the plant/for metabolic reactions/for cell activity’.

**Expected response:** controls metabolic reactions/controls cell activities/controls cell development/contains hereditary information

- (b) A majority of candidates managed to score 1 mark instead of the maximum 2 marks because they failed to explain why root hairs are found in plants, while some did not name the substance(s) absorbed by the root hairs, while others assumed that the structure resembled that of cilia so they incorrectly gave the function of the respiratory tract cilia.

**Expected response:** - increase surface area  
- absorption of water/mineral ions

**Question 2**

This question was based on a model representing two different molecules before and after digestion. Molecule **C** was easily identified by almost all candidates. However, a number of candidates failed to score a mark for molecule **B** because they mentioned both fatty acid and glycerol instead of only glycerol.

**Expected response:** - **B**- glycerol; **C**- amino acid

**Question 3**

This question was very challenging to a majority of candidates. Although most candidates had an idea on mechanical digestion, they failed to score full marks because they gave incomplete responses such as breakdown of food into small molecules/ breakdown of food for easy swallowing. Some confused particles with molecules which then made the responses to be incorrect. For example, incorrect responses such as: use of insoluble to soluble or large food molecules to small food molecules.

**Expected response:** - breakdown of food into smaller pieces without chemical change  
- To increase surface area for chemical digestion/for enzyme activity)

**Question 4**

This question was on the double circulating systems in humans.

- (a) It was most accessible to candidates as they correctly identified the pulmonary vein.
- (b) Candidates only scored one mark for stating that blood had to be transported over long distances but did not mention the reason. e.g. the structure of the ventricles.

**Expected response:** - thicker muscle of the left ventricle  
- to pump blood to many body parts

**Question 5**

A number of candidates could not link the question to the function of auxins, instead they gave incorrect responses such as “plant would have yellow leaves’ or “plant would not photosynthesise” or “plant would only grow on side that received light”. Some candidates’ responses were on geotropism instead of phototropism. Language barrier also contributed to loss of marks as some candidates failed to express themselves. For example, candidates would say “the plant shoot moves to light”.

**Expected response:** - auxins concentrate on the shaded part  
- where they causes cell elongation/ stimulate cell growth/ causes differential growth  
- causing shoot to grow towards source of light

**Question 6**

This was fairly attempted as most candidates correctly labeled the silk as **F**, although a few failed to correctly label it as they could not relate it to a flower.

- (a) A few candidates did not follow instructions and therefore lost marks.
- (b) Some candidates wrote wind pollination instead of wind. Others incorrectly wrote air as the answer.

**Question 7**

This question was testing candidates' understanding on a reflex action. It was generally challenging to some candidates.

- (a) Most candidates correctly named the synapse but failed to write the correct spelling so lost a mark.
- (b) A majority of candidates failed to link the sensory neurone to the CNS so instead gave incorrect responses such as response would not be sent to receptor or to brain, neurone would not be sent, muscle would not move, impulse would not work. Some even linked the effect of cutting the neurone to loss of blood instead of giving a response based the on effect.  
**The expected response:** no movement of knee / no action / no transmission of nerve impulse to relay neurone or to spinal cord.
- (c) This was the most challenging part of the question for most candidates. Incorrect responses included brain not involved, fast or rapid alone, happens on its own, is unexpected, is natural.  
**The Expected response:** automatic/no conscious decision/action taken without thinking.

**Question 8**

Many candidates confused cerebellum with cerebrum, while others wrote incorrect spellings like cellebelum, celleberum, ceberellum or ceberellum. A few gave medulla oblongata as their response.

**Question 9**

This question was fairly attempted by the majority of candidates even though they did not obtain full marks. The question was on the fermenter to be used in the manufacture of enzymes for biological washing powders.

- (a) Candidates were able to correctly name the microorganisms as bacteria or fungi.

- (b) This question was a bit challenging for candidates as some gave the incorrect response such as clean the jacket, to remove stains, to keep fermenter warm of to allow water in and out.

**Expected response:** to maintain a constant (optimum) temperature/ to remove excess heat.

- (c) This question was accessible to most candidates as they were able to correctly state protease. However, some would give an example of a washing powder like surf as the correct response and no marks were awarded.

### Question 10

This question was well answered by most candidates. However,

- (a) Some candidates failed to recognise that the arrow was from cells to alveolus so gave the wrong gas which was oxygen instead of carbon dioxide so ended up losing a mark.
- (b) Candidates misunderstood the question and describe the gaseous exchange of oxygen (diffusion of oxygen from alveolus to blood) yet they were expected to describe how oxygen gets transported in the blood after gaseous exchange.

**The expected response was:** oxygen combines with haemoglobin (to form oxyhaemoglobin), then is transported by the red blood cells.

### Question 11

This question was the most demanding question to the majority of candidates on genetic engineering was inaccessible to most candidates.

- (a) Some candidates gave the definition of inheritance instead genetic engineering.

**Expected response:** changing the genetic material of an organism by removing, changing or inserting individual genes OR transfer of genes from one organism to another.

- (b) Candidates stated characteristics of enzymes, such as, they are not destroyed, while some gave incorrect responses based on advantages of asexual reproduction such as they require one parent. A few gave characteristic features of bacterial cell, e.g. lack of true nucleus, unicellular but most candidates were able to score a mark for mentioning fast reproduction even though they could not mention the other reasons.

**Expected responses include:** - fast/rapid reproduction

- has plasmids/required DNA/ are easy to manipulate
- produce pure product/ have no allergic reactions
- have no ethical concerns

**Question 12**

This question on DNA coding was challenging to most candidates such that a number of them left it unanswered. Those that attempted to answer the question could not pair the bases correctly so lost the mark. Very few got the question correct.

**Expected response:** G, T, T, C, G, G.

**Question 13**

This was an easy question for candidates as they were able to correctly state the signs and symptoms of gonorrhoea. However, a few gave incorrect responses such as yellow urine discharge, painless sore, irritation of vagina, rash on vagina pain on private parts.

**Expected response included:**

- discharge of pus/yellowish discharge on vagina or penis
- burning sensation during urination
- pain on lower abdomen

**Question 14**

This question was generally well done. Most candidates correctly identified the products of fermentation. However, a few misunderstood the question for aerobic respiration and therefore gave oxygen and glucose as their responses. Others, seemed to associate anaerobic respiration with muscles thereby giving the incorrect response which was lactic acid.

**Expected response:** ethanol and carbon dioxide

**Question 15**

Generally, this was a well attempted question although some candidates confused social problems with personal problems (such as addiction, withdrawal, mental disturbance, pregnancy, school dropout) and health problems (such as vein collapse, heart failure, brain damage or cancer).

**Expected response included:** - crime; prostitution leading to increased HIV/AIDS or hepatitis infection; family breakdown.

**Question 16**

This question was on the stages in the development of immunity against chicken pox in a human being.

- (a) This question was well attempted to a majority of candidates as they correctly identified stage **K** as a stage where the person becomes ill.
- (b) This question proved to be difficult for a majority of candidates. Few candidates were able to state that the production of antibodies was as a result of the infection. It seemed some candidates thought the antibodies were injected, while some had the misconception that the lymphocytes engulf the virus or the pathogen attacks and destroys the antibodies. A few candidates mistaken

antibodies for antibiotics. Some failed to acknowledge the fact that the virus would not spread because it was quickly destroyed.

**Expected response:** lymphocytes produce antibodies which remain in the blood and lymph as memory cells; and quickly destroy the pathogen before the person gets ill

### Question 17

This question was inaccessible to most candidates as some would give cloning, sustainable, conservation as their responses. Some even thought of organisations that provide food like World food organisation, red cross etc.

**Expected response:** sustainable development

### Question 18

Most candidates were able to score a mark on the function of rods but failed to describe the distribution of the rods. The retina was incorrectly mentioned as the area where rods are distributed.

**Expected response:** found on retina except fovea/ yellow spot (distribution); responsible for night vision/low light intensity/ detecting shades of grey (function).



**EGCSE BIOLOGY****Paper 6884/02****Structured Questions5****General Comments**

Generally, this paper was not well done compared to the previous year. There were no candidates scored 70 and above while most candidates got a single digit mark. Questions that seemed easy were **Question 4, Question 1(a), Question 2(a)** and **Question 7(a) (iii)**. The most challenging questions were **Question 3, Question 5** and **Question 6**.

It seemed the syllabus was not fully covered by most candidates, which was evident in the way candidates were answering the questions. A lot of questions were left unanswered. Candidates had challenges with questions where they are expected to apply knowledge. For example, in **Question 6(b)** most candidates described natural selection without referring to the given situation in the question.

Candidates also had challenges in expressing themselves as well as understanding of the content questions asked. In **Question 2 (c)**, instead of stating the features of a green house, candidates would mention the factors that increase rate of photosynthesis. Wrong spellings were also common e.g. amniotic sac was written as ammonium, amnoic or amniotic and sweat written as sweet.

**Comments on Specific Questions****Question 1**

This question was fairly done, especially **Question 1(a)**. Most candidates were able to score 4 marks out of 7.

- (a)** It was an easy question requiring candidates to recall the levels of classification in hierarchical order. Not many were able to get maximum marks. Most remembered the position for the Phylum and Genus but were confusing the other 3 levels. Spelling proved to be a problem. Phylum was phloem, Genus was Genes or Genius/genous.

**Expected response:** Phylum, Class, Order, Family, Genus.

- (b)** It was a fair question but proved to be tricky for most candidates. It required them to construct a dichotomous key to classify organisms, they were given a guide on points to use in a given order. It was not well attempted and most candidates did not attempt to answer at all. Those that did either could not follow the given order of points or came up with their own features for classifying e.g. presence or absence of wings/feathers and they got zero marks. Those few that attempted got 2 out of the 3 marks because they failed to describe the tails for the zebra and cat appropriately. They

mentioned that the cat had a long tail or the zebra had a short tail, instead of a cat having a long tail than the hind legs and zebra having a tail shorter than the hind legs.

**Expected response:**

- |    |   |         |
|----|---|---------|
| 1. | 2 legs                                    | bird    |
|    | More than 2 legs                          | go to 2 |
| 2. | No stripes                                | lion    |
|    | Stripes                                   | go to 3 |
| 3. | Bushy tail/tail shorter than legs         | zebra   |
|    | Tail not bushy/tail longer than hind legs | cat     |

**Question 2**

This question was not well done, with candidates scoring on the average six out of fourteen (6/14).

- (a) (i) It was well done. A majority of candidates got the mark. Those who did not get it left out units and some used wrong units e.g. days/g.

**Expected response:** 70g

- (ii) It was fairly done, a majority got 2/3.

Common mistakes: Omitting units, especially units for light intensity. Some candidates did not consider AU as a unit. Units for carbon dioxide concentration were well written, for temperature, a majority wrote degrees as a unit other than degrees celsius. A few failed to extrapolate information from the graph.

**Expected response:** light intensity ..... 7 arbitrary units  
 CO<sub>2</sub> concentration..... 4%  
 temperature ..... 25° C

- (b) It was not well attempted as the majority of candidates scored 1/3.

They wrote the stem of the question instead of answering it. A majority failed to establish the link between factors affecting photosynthesis and the process of photosynthesis. Instead of writing increase in photosynthesis a majority of candidates wrote enough or optimum. Candidates also failed to relate the observations to the presence of a limiting factors, instead they stated that the light was constant. Lastly, few candidates related temperature to enzyme activity.

**Expected response:** - at higher temperature, greater enzyme activity.  
 - at higher CO<sub>2</sub> concentration, rate of photosynthesis is higher.

- as a result of higher temperature/CO<sub>2</sub> more growth is observed make reference to CO<sub>2</sub>/ temperature as a limiting factor

- (c) It was very challenging for a majority of candidates. A few candidates scored 3, most did not earn any marks.

For the **feature**, a majority of candidates mentioned factors affecting photosynthesis and some even wrote the explanation instead of the feature e.g. candidates mentioned temperature and Carbon dioxide as features in the greenhouse instead of highlighting main features of a greenhouse. Candidates mentioned additional features such as artificial lights, bulbs, air conditioners and sprinklers and burning coal.

**For the explanation**, very few candidates obtained 2 marks. The majority scored zero.

Candidates failed to link light to an increase in photosynthesis, instead many used terms like trapping light/reflecting or absorbing light. Other candidates confused the feature to factors affecting transpiration.

**Expected response:** transparent/glass/plastic

To allow maximum light intensity or increase in temperature for increase in rate of photosynthesis

**OR**

reference to ventilation to regulate temperature/ to allow gas circulation for maximum enzyme activity for increased photosynthesis

- (d) The question was exceptionally well done. A majority scored the maximum points. Common mistakes included failure to write the correct formula especially for glucose. Some candidates wrote wrong formula for glucose. C<sub>6</sub>H<sub>12</sub>C<sub>6</sub> or H<sub>12</sub>C<sub>6</sub>O<sub>6</sub> instead of C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>. Some candidates did not write the formula for Carbon dioxide and wrote it as CO<sub>2</sub>, and h<sub>2</sub>o for H<sub>2</sub>O. while others did not balance the equation and included energy as a product of the reaction.

**Expected response:**  $6\text{CO}_2 + 6\text{H}_2\text{O} \longrightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$

- (e) This was a demanding question. The majority of candidates scored 0/2. Candidates failed to understand what the question was looking for. As a result they mentioned what kills the worms. Other candidates confused xylem vessels for phloem.

**Expected response:** pesticide enters the phloem; translocated to the rest of the plant.

**Question 3**

- (a) It was a challenging question to a majority of candidates. Most candidates did not score even half of the marks allocated to the question. Candidates could not identify the diagrams as expected. They gave responses that were opposite to the ones expected. Some candidates' responses showed that candidates were seeing these diagrams for the very first time.

Common mistakes made by candidates were leaving out one of the two terms in the definition, either 'constant or internal', sometimes there was a mix-up of the terms in the definition e.g. constant maintenance of internal environment.

Other candidates thought that homeostasis referred to body temperature e.g. the maintenance of a constant internal body temperature. This resulted in candidates losing the marks allocated since homeostasis is the maintenance of a constant internal environment.

- (b) This question was very challenging to a majority of the candidates. Very few candidates were able to obtain full marks. Most candidates identified **A** as a blood vessel, nerves, thermo receptors or sweat glands instead of arterioles.

Candidates who identified the arteriole correctly did not describe how it leads to heat loss. Most candidates did not refer to blood flowing to capillaries on the skin surface instead they mentioned blood flows to the surface of the skin but omitted the capillaries. As a result they lost the second mark. For the third marking point candidates would mention the heat loss and that was not acceptable.

**Expected response:** Arterioles dilate (vasodilation) allowing more blood to flow to capillaries on the skin surface resulting to more heat radiated.

A majority of candidates did identify **B** as a sweat gland which produces sweat. However, they did not further describe how sweating results to heat loss. As a result, they got only 1 mark.

The common mistake mentioned by candidates was that the sweat evaporates instead of the water in the sweat evaporating. Other candidates had some misconception in that they thought sweat evaporates with the heat, hence lowering body temperature yet heat does not evaporate.

**Expected response:** Sweat glands produce sweat leading to evaporation of water in sweat on skin surface, taking away heat.

- (c) This part of the question was fairly done. Mistakes included reference to oxygen being inhaled into blood instead of the heart pumping blood with oxygen. A few candidates referred to blood flowing to the muscles or muscle cells instead they would refer to the heart pumping blood to the body. No marks were awarded for such an explanation.

**Expected response:** Increased rate of heartbeat resulted to faster blood flow with more glucose and oxygen to muscle cells. This resulted to more energy released/higher rate of respiration and faster removal of carbon dioxide from cells.

- (d) This part of the question was difficult to most candidates. Most of them would confuse the diagram given with that of the digestive system or the kidney machine.

**Expected response:** to identify it as the nephron.

(i) A majority of candidates would incorrectly describe ultrafiltration as the process taking place at C. Those who could identify C referred to the process taking place as absorption instead of reabsorption. Candidates correctly identified glucose as one of the substances reabsorbed. Some candidates would describe the process taking place as diffusion instead of reabsorption. Candidates also failed to describe the process by which each of the substances mentioned were reabsorbed into the blood.

**Expected response:** The process is reabsorption of glucose, some water and some salts.

Glucose and salts are reabsorbed by diffusion and active transport and water by osmosis.

(ii) Even this part of the question was not well done. Candidates could only describe the features of the dialysis machine but failed to relate them to their functions. For example, they would state that the dialysis tubing was partially permeable and long without stating the reason. Which was to allow small molecules to pass through and to increase surface area for diffusion respectively.

Candidates who described the machine without giving reasons were not awarded any marks. Candidates also failed to name the unwanted substances which diffuse.

**Expected response:** The dialysis machine has a long, coiled dialysis tubing to increase the surface area for diffusion of urea and excess salts. The coiled tubule is also partially permeable which allows small molecules to pass through. The dialysis fluid has the same concentration of salts and glucose as in the blood to prevent their loss from the blood. The dialysis fluid is constantly changed to maintain a steep concentration gradient.

#### Question 4

Generally, this question was well attempted by candidates. Most candidates were scoring above average.

- (a) Most candidates were able to score all the 2 marks. Some candidates failed to name the conditions that affect the rate of transpiration. They gave responses such as moisture, windy day, sunny date, warmth, high temperature, optimum pH which were not acceptable responses.

**Expected responses:** light intensity; air movement; humidity; temperature

- (b) The question was fairly done with most candidates scoring full marks. Candidates who described the absorption of water from the soil by root hair cells. However, some candidates were confusing the process of respiration with that of transpiration. Also photosynthesis was unnecessarily mentioned. No marks were awarded to candidates did not give clear explanation of how water is transported.

**Expected responses:** Transpiration pull causes water to be transported by the xylem vessel.

The water molecules move by cohesive forces forming a column of water. capillary nature of the xylem and the adhesive forces of the water molecules on the walls of the xylem vessels assist the cohesive forces in the transpiration stream. The water moves by osmosis from the stem xylem vessels, a region of high-water potential to the leaf cells, a region of low water potential. Water then evaporates from the cell walls of the leaf cells into the air spaces then the water vapour diffuses into the atmosphere through the stomata in the process of transpiration.

- (c) This part of the question was not well done.
- (i) Most candidates were drawing the vascular bundle from the roots and from the stem in the same given space. The ring in the vascular was drawn in such a manner that it left a small pith.

**Expected response;** vascular bundle distributed in a ring. The ring should form close to the epidermis than to the centre. The pear-shaped vascular bundle should show the cambium in order to be able to identify the xylem and the phloem.

(ii) Most candidates labelled both the phloem and the xylem instead of labelling the xylem which was the correct answer. Some lost a mark by labelling red dye.

- (d) The question was fairly done. However, some candidates were giving responses such as dying, shrinking, plasmolysed, flaccid.

**Expected response:** wilt

### Question 5

This question was not well done. A majority of the candidates obtained marks below the average, scoring 4/13.

- (a) Many candidates did not understand the stages in the menstrual cycle. They mentioned ovary instead of ovum follicle in their explanation. Some even mentioned ovule. Many candidates mentioned the ovary instead of the ovum/ follicle. They also did not understand the term as shown from their responses. Some confused ovum with ovule, which was not accepted because ovules are only found in the ovaries of plants.

**Expected response:** follicle increases in size/ matures stimulated by FSH. The follicle secretes oestrogen.

- (b) This part of the question was challenging. Some candidates obtained 1/3. Most candidates did not refer to the graph in Fig.5.1 but gave general descriptions. Hence, they could only get 1 mark for mentioning menstruation. They were referring to menstruation as the egg breaking, or releasing blood which is a misconception. Other candidates stated that the menstrual cycle begins instead of menstruation. Very few candidates were able to mention the corpus luteum/yellow body. Those who mentioned it stated that it disappears or breaks. Also, candidates did not mention that the level of progesterone/oestrogen would decrease. Those who did talk about the hormones stated that the hormones were being secreted.

**Expected response:** The corpus luteum degenerates. The lining of the uterus becomes less thick due to the falling levels of progesterone/oestrogen.

- (c) A majority of the candidates were scoring 2 out of 4. They stated the ways by which infertility in women may be overcome but did not explain further. It seemed some candidates showed a lack of understanding of the term infertility. These responses were not acceptable.

Candidates mentioned methods of overcoming infertility in both men and women such as artificial insemination which applies to men. They were also mentioning adoption as means of overcoming infertility.

**Expected response:** use of hormones in fertility drugs; FSH to stimulate development of the ova, LH to stimulate ovulation surrogacy: the embryo develops in another woman's uterus.

in vitro fertilisation; sperm and eggs fertilised in a petri dish and the embryo is inserted back into the mother's uterus.

- (d) A majority of the candidates did not perform well in this question. They only able to identify the structures but failed to describe the changes they undergo during birth. Most wrote the functions of the structures during the gestation period. Others wrote wrong spelling such as amotic, ammonium, amnioc for amniotic.

Identification of structure **J** was a challenge as most candidates referred to it as the vagina. Some candidates incorrectly mentioned that **J** which was the cervix enlarged.

**Expected responses:** **F** - placenta breaks away from the maternal/ uterus wall

**G** - amniotic sac ruptures/ breaks

**H** -amniotic fluid is released

**J** - cervix dilates

**Question 6**

This question was demanding. A majority of candidates scored below average.

- (a) (i) This part of the question was not attempted. Most candidates misunderstood the question. Most wrote (46 chromosomes) chromosomes as the correct response, others gave the gender as the response i.e. XX and XY.

**The expected response:** X and Y.

- (ii) This part of the question was also not well done. A majority of candidates were able to score 2 out of 5 marks. Most drew genetic diagrams showing inheritance of sex instead of colour blindness which is sex-linkage. Those who were able to draw the sex-linkage diagram chose letters whose small and capital letters are similar. Most used the letter **C** and it could not be ascertained if it was capital or small letter, hence they lost marks.

Other common errors were:

- Candidates failed to state the phenotype correctly; they did not include the gender e.g. normal instead of normal daughter/son.
- They also wrote blind instead of colour-blind, which resulted to a loss of marks.
- Other candidates placed the sex-linkage also on the Y chromosome instead of the just the X chromosome e.g.  $X^N Y^n$  instead of  $X^N Y$  or  $X^n Y$ .
- They also used capital letters for the faulty recessive allele instead of a small letter.

**The expected response:**

Parents phenotype	female		male	
	carrier		normal	
<i>genotype</i>	$X^N X^n$		$X^N Y$	
<i>gametes</i>	$X^N$	$X^n$	$X^N$	Y
<i>offspring genotype</i>	$X^N X^N$	$X^N X^n$	$X^N Y$	$X^n Y$
phenotype	normal	carrier	normal	colour-blind
	female	female	male	male

- (iii) This part of the question was not well attempted. Most candidates did not even score 1 out of 2 marks. They were general in their description. For example, variation that stops/does not continue.



**The expected response was:** it is variation with no intermediates/ no ranges/has distinct or discrete groups. It is not influenced by the environment but only controlled genes.

- (b) This part of the question was fairly done. Most candidates did scored 3/5 marks. Most candidates described natural selection without reference to the diagram. The candidates in their description started with reproduction instead of reference to variation and survival of the fittest.

**Expected response:** describe variation in terms of short-necked/long-necked giraffes make reference to unavailability of food for short-necked giraffes survival of the fittest/death of short-necked giraffes due to starvation make reference to reproduction in long-necked giraffes, reference to time frame/over many -generations/ long period of time.

### Question 7

This question was well done by most candidates.

- (a) (i) The question required candidates to construct a food chain with only two tropic levels and most candidates presented a short food chain. They did not earn a mark because they added a third tropic level after the wild rabbit. Some even included the nutrients ammonia and nitrates that appeared in the nutrient cycle. Other candidates included the sun at the beginning food chain.

**Expected response:**

bean plant → wild rabbit

(iii) Candidates were required to state the two ways by which the wild rabbits can be conserved. The candidate's responses suggested that this part of their syllabus was not adequately covered, hence their responses failed to help them attain all the marks. They used the general knowledge they had on the protection of endangered species.

**Expected responses:** protecting their habitats, legislature, education, captive breeding programmes, sperm banks.

- (b) The question required the candidates to describe the undesirable effects of artificial fertiliser running off-field into nearby river.

It was fairly attempted. A number of the candidates got the maximum marks though many failed to do so. Most remembered to state the process as eutrophication but spelling of the word proved to be a challenge. Candidates knew that the fish die from shortage of oxygen but failed to mention that it got depleted in the water as the bacteria consume the oxygen during decomposition. They also knew that the algae grows rapidly but would say it blocks oxygen from entering the water instead of sunlight.

**Expected response:** nutrients/nitrates are washed to nearby water sources, causing rapid growth of algae. The algae blocks sunlight for algae below resulting in the death of algae below. Aerobic bacteria decomposes dead algae depleting oxygen in the water is leads to suffocation of the aquatic animals in a process called eutrophication.

**EGCSE BIOLOGY****Paper 6884/03****Practical Test****General comments**

Biology Paper 3 is a practical paper designed to test Assessment Objective C of the Assessment syllabus aimed at assessing the candidates' investigative as well as the scientific method of inquiry. The nature of the paper demands that candidates are exposed to practical activities and the science process skills including observation, drawing and making conclusions. Candidates need to be familiarised with basic laboratory equipment and apparatus as well as the skills to correctly use them. Over and above that, candidates need to be trained on the scientific method of inquiry, including designing of investigative experiments and the basic principles underlying investigative activities such as ensuring validity and reliability of experimental data, drawing conclusions from experimental data as well as improving the methods used in investigative processes.

The paper was of the same difficulty level as the previous papers. The paper comprised of two compulsory questions with a maximum possible score of 40. Most centres reported that they had no problems providing the required examination materials. The general performance in the paper was much better than for the 2020 paper. This was evidenced in an improved average in the overall performance. Also, the highest score improved from the 34 which was attained in 2020 to 37. Furthermore, the lowest score of zero was not realised in 2021 as the lowest score was 1 as opposed to a couple of zeros that were recorded for some candidates in 2020. In general, **Question 2** was better performed than **Question 1**.

It is worth noting that the level of English Language was better in 2021 compared to 2020. Centres are commended for encouraging candidates on the use of proper English Language. The candidature seemed more prepared for the paper with a few exceptions

Although the questions were both intended to be accessible and well discriminating between different grade candidates, Questions **1 (h)**, **1 (g)**, **1(d)** and **2 (b) (ii)** in order of the level of difficulty proved to be particularly difficult to the candidature while Questions **2(b) (iv)**, **1 (e) (i)**, **2 (b)(iii)** and **2(b) (i)** in order of the accessibility level proved to be particularly easy for candidates.

**Comments on Specific Questions****Question 1**

This question was an investigation on the rate of heat loss between organisms with fur and those without. Candidates were given two boiling tubes **A** and **B**. They were to cover boiling tube **A** with cotton wool to represent a mammal with fur. They were also provided with two thermometers and hot water at about 70

°C. They had to record the temperature every two minutes for ten minutes, record and interpret their results as well as make inferences on the basis of their results.

- (a)** This was a fairly well scoring question as slightly more than half of the candidates were able to record the temperature of the water they were provided with. Candidates lost marks by recording that the temperature was 0 °C and anything above 80 °C. The expected range of temperatures was 60 – 70 °C. The temperatures were expected to decrease with time in both boiling tubes with a faster drop in boiling tube **B** than in boiling tube **A**. Furthermore, candidates were expected to complete headings for the table of results where they were given the time heading. The expected response was for them to write “Temperature/ °C. Common errors included writing units in brackets instead of using the solidus line, writing temperature without units. Some candidates knew the temperature unit but wrongly presented it as °, CO, C° or OC resulting in loss of marks.
- (b)** This question was well scoring. Candidates were expected to draw a graph using the results recorded in **(a)**. A few candidates left the question un-attempted leading to loss of all the marks allocated to the question. Others drew bar charts while a few drew one graph instead of two. Worth noting was that a few candidates lost marks for failing to correctly orient the axis according to the variables where the independent variable was time. Others lost marks through failure to present a consistent scale for their values starting at the zero mark. On the same nerve, others lost marks by either failing to label the graphs or labelling them incorrectly.
- (c)** The question was fairly well done by candidates. It required candidates to use their graphs to estimate the temperature of the water in boiling tube **A** at 5 minutes. A lot of responses correctly indicated the value without showing on the graph how they had come up with the value and this cost them a mark while others drew a line on one axis and not doing the same on the other.
- (d)** The question was fairly well scoring although about half of the candidature did not know what an independent variable is. It was expected that they would identify the independent variable as temperature since it was dependant on the time which was being controlled.
- (d) (i)** This was a well scoring question. Candidates correctly attributed the use of cotton wool to represent fur in mammals or to minimise heat loss to the environment through radiation.
- (d) (ii)** This question was also a high scorer with candidates correctly articulating the rationale behind the immediate closure of the boiling tube with a rubber stopper to minimising heat loss from the tube through evaporation. Common errors were to the effect that closing the tube immediately would prevent evaporation of heat.

- (f) This question was fairly well done. Candidates were expected to describe and explain the changes in temperature between the two boiling tubes. Most candidates clearly recognized that with increase in time, the temperature in both tubes decreased but there was a more rapid decrease in boiling tube **B** than in boiling tube **A**. This was correctly attributed to the presence of the cotton wool in boiling tube **A** which acted as an insulator against heat loss to the environment while there was no insulation in boiling tube **B** allowing more heat loss through radiation.
- (g) This question was demanding. Candidates were required to state means by which they could improve the reliability of the results of the investigation. Most candidates scored a mark for correctly stating that they would repeat the investigation using the same materials and under the same conditions. When it came to increasing the sample size, only a minority of candidates were able to earn a mark.
- (h) This was the most demanding question. Candidates were expected to use their results to draw an inference. They were expected to predict the effect of using a larger tube without cotton wool on the rate of temperature loss. Most candidates incorrectly thought that the rate of heat loss would be higher in the larger boiling tube than in the smaller one. The reason attached to the speculation was related to larger animals having more fur or fat compared to smaller animals. Others erred by stating that the larger the animal, the larger the surface area for heat loss yet the response should have been the contrast.

## Question 2

This question was generally better scoring than **Question 1**. Candidates were given a maize seed and a peanut seed to investigate and compare the fat content of each seed.

- (a) This question was accessible to a majority of candidates. They were expected to split open the peanut seed and then make a large drawing of the part of the seed which bore the reproductive parts. Most candidates correctly followed the instruction and drew neat diagrams. It was expected that a large, proportional drawing of the half peanut, with a neat and continuous outline was drawn with only the specified labels **E**, **F** and **G** directed to the radicle, cotyledon and testa respectively. There were isolated cases where candidates drew the structure of a bean seed or the maize seed. Some lost marks by labelling parts that were not asked for. Some candidates lost marks by using arrows instead of label lines to label the parts of the seed. Others lost marks by making their label lines cross over each other.

- (b) (i)** This was a well-done question. Most candidates correctly stated that it was important to wash the knife and tile in order to prevent contamination of the contents of the maize seed. There were a few way-off responses to the effect that the equipment was washed in order to keep the clean.
- (ii)** Candidates were expected to explain why the peanut was cut into pieces before testing for fats. Most candidates correctly stated that the cutting was aimed at increasing the surface area for the peanuts so that more fats would be exposed.
- (iii)** This question was well done by most candidates. All that was expected of candidates was a knowledge of the emulsion test. Although there were some generalisations to the procedure, some candidates described the test very well by stating that the fats had to be extracted by mixing the sample with ethanol and shaking followed by a filtration after which the filtrate would be poured into a test tube with distilled water. Common errors included addition of either ethanol or water only to the sample while others started with the addition of water followed by the ethanol.
- (iv)** This was the most accessible question which required candidates to perform the test for fats in the two samples and then recording their observations and conclusions. Most candidates found this easy. Common errors included confusing and swapping the observation and the conclusion, something that led to loss of marks. Some candidates recorded the results of the fat test in peanuts in the space for the fat test in maize and vice versa. Overall, the performance in this question was satisfactory.
- (c)** This question was also fairly well done. Candidates were expected to describe an experiment they would carry out to compare the concentration of glucose in the two seeds. The skill for experimental design was once again being evaluated through this question. It was expected that candidates would chop equal masses or sizes of the two seeds separately and place them in different labelled boiling tubes. A specified volume of Benedict's solution would have to be added to each boiling tube. The two tubes would have to be heated in a hot water bath for a specified duration of time while observations were made to ascertain colour changes. A conclusion that would suffice to identify which seed had more glucose than the other was expected. Candidates were therefore expected to get to a point where they would use the colour comparisons to identify the seed that contained more glucose such as the seed that would have a green colour would have less glucose than the one that would change to yellow, orange or brick red. In most cases, candidates failed to arrive at the conclusion. Last but not least, candidates were expected to accommodate issues of reliability in their investigation.

**EGCSE BIOLOGY****Paper 6884/04****Alternative to Practical Test****General Comments**

The overall performance of candidates was more or less comparable to that of the previous years. It was worth noting however, that a significant number of candidates displayed inadequate preparation of the paper as they left some questions unanswered. A number of candidates struggled to understand command words such as *describe and explain* and therefore did not answer some of the questions as expected. It is crucial that candidates read and understand all the procedures in a given investigation before attempting to answer the questions. Centres need to be aware that candidates need to have the practical experience in preparation for this paper.

Candidates attempted all questions and showed that they had adequate time to finish the paper. Questions **1(h)** and **2(b)** (v) proved to be the most challenging questions for a majority of candidates whilst Question **1 (a) (ii)** was accessible to most candidates.

**Comments on Specific Questions****Question 1**

- (a) (i)** This question proved to be challenging for most candidates as they could not fill in the correct heading in Table 1.1 but instead wrote the aim of the investigation. Some candidates that were able to figure out that temperature was the appropriate heading, lost the mark by not including the units for temperature as °C in their heading. Candidates need to distinguish between an aim of an investigation, title of a table and sub headings of a table.
- (ii)** Fairly well done by most candidates as they were able to record 90°C as the temperature at 0 minutes in both boiling tubes.
- (b)** Overall, most of the graphs were well constructed and well presented. The labels and units for the axes should be taken directly from the headings on the table of results. Most candidates chose an appropriate scale, using more than half of the available grid for their plots, and they labelled their axes correctly with a minority that lost a mark by leaving out the units. A minority of candidates lost marks by incorrectly orienting their axes, drawing pyramids and not using a key to identify the curves they have plotted.

A majority of candidates were able to get 85°C but could not get the second mark as they did not indicate how they obtained their answers from the graph.

- (d) (i)** A fairly well attempted question. Candidates were expected to explain the importance of completely wrapping boiling tube A with cotton wool. Responses that made reference to providing efficient insulation were credited.
- (ii)** This question was accessible to a majority of candidates. Most candidates were able to state that quickly closing the boiling tubes with a rubber stopper minimised heat loss.
- (e)** This question proved to be demanding for most candidates. Candidates seemed to lack an understanding of what dependent and independent variables are in an investigation. Candidates were expected to identify temperature as a dependent variable in the investigation.
- (f)** Very few candidates were able to score all the marks in this question. It was common for candidates to bring the data from Table 1.1 as it was without describing and explaining the trend shown. Candidates were expected to recognize that the temperature is dropping in both boiling tubes with an increase in time, with a faster drop in the uncovered boiling tube. Candidates were expected to also explain the difference in the rate at which the temperature was dropping in boiling tubes **A** and **B** in relation to insulation or lack of. Very few candidates were able to identify that between 8 and 10 minutes in boiling tube **B** there was an anomaly in the temperature recorded. Candidates that made an effort to explain the cause of the anomaly such as an error in reading the thermometer or any valid explanation were awarded a mark.
- (g)** Very few candidates were able to score all the marks in this question. Repeating or having many set-ups of the investigation were accepted as methods that would improve the reliability of the investigation. Candidates need to clearly distinguish between the concepts of validity and reliability.
- (h)** This is one of the questions that proved to be very challenging for candidates. Quite a number of candidates kept on referring to the initial investigation in their responses. The question mainly tested if candidates understood the concept of surface area to volume which a majority of candidates proved to be struggling with. The prediction that was expected was that the larger animal or boiling tube will lose heat slowly compared to the smaller boiling tube/smaller animal. Expected explanation was that a smaller boiling tube has a larger surface area to volume for heat loss or the larger animal/ boiling tube has a lower surface area to volume for heat loss. The common mistake was to bring in the idea of fur covering in their responses.



**Question 2**

- (a) (i)** A fairly well done question. However, some candidates failed to identify the two cotyledons from the seed. Some lost marks by opting for features that were not shown in the photograph such as broad leaf and net-veined.
- (ii)** The quality of drawings of half of the seed containing an embryo was not very impressive for a significant number of candidates. The most common error was to draw half of the seed that did not accurately reflect the detail shown in the photograph. Some candidates drew their own diagrams rather than the one shown in the photograph whilst others seemed not to know what an embryo was. Candidates are to be reminded to always include all the details shown in the photograph they are requested to draw. Candidates were also expected to draw large diagrams without shading using a sharp pencil that exhibits clear and continuous lines. Most candidates were able to label the parts that were required in the question. Arrow heads are not accepted in labelling lines.
- (b) (i)** Most candidates gave good responses in this question. Chopping the cotyledons increased the surface area for the reaction.
- (ii)** This question was fairly done by most candidates. A majority of candidates were able to state that rinsing the knife was done to avoid contamination from the embryo. The importance of rinsing should have been linked to the investigation rather than the general importance of rinsing.
- (iii)** A majority of candidates were able to describe that they will add ethanol when testing for fats but very few candidates fully described the test for fats. Candidates were expected to add ethanol, shake and then add water in their description.
- (iv)** Generally, well answered by most candidates. Candidates were expected to state that in test-tube **F** there will be no white emulsion whilst in test-tube **G** there will be a white emulsion to indicate the presence of fats.
- (v)** This question proved to be very challenging for a majority of candidates. Some candidates acknowledged the fact that cotyledons store the fats but failed to recognise that in the embryo, fats are already digested to fatty acids and glycerol so that they can be used by the actively growing regions of the embryo.

- (c) A significant number of candidates were able to score some points in this question whilst others did not have an idea of what to write. This question tested the candidate's ability to design an experiment to compare the amount of reducing sugars in peanuts and maize. Most candidates were able to have different set-ups for the investigation, one for maize and one for peanuts. It was also worth noting that most candidates stated that they will chop both the peanuts and maize. Most candidates identified the correct reagent to be used as Benedict's solution and heating the samples in a water bath. There were some cases where candidates confused Benedict's solution with Biuret reagent which resulted in a loss of a mark. In experimental design, candidates should also describe the variables that need to be kept constant in their procedures which some candidates were able to do. It was also worth noting that a number of candidates were able to state how the results were going to collect their results and how they were going to make their conclusion. Credit was also given to those candidates who stated that they will repeat their investigations more than two times for reliability.