EXAMINATIONS COUNCIL OF ESWATINI

EPC

EXAMINATION REPORT

FOR

SCIENCE {513/02}

YEAR

2021

SUBJECT CODE	NAME OF COMPONENT	Page No:
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EPC SCIENCE 513/02

Key messages

Candidates are advised to read carefully each question before writing their answer and to make sure they address all aspect of the question. Successful candidates pay more attention to the wording of the stem of each question and make use of the information given in the question context.

Candidates should consider the number of marks available when answering each question. This indicates the number of separate points that each candidate will need to make in order to be awarded full credit. When describing the energy changes in **Question 5(c)**, it was not enough to describe the energy changes. Reference needed to be made to **Fig.5.3** to show evidence of use of the diagram in the correct energy change or correct context to be awarded full credit.

Candidates should be reminded of the differences between command words, particularly 'describe' and 'explain'. In the same vein, candidates should also know how to respond to questions that ask 'how' and 'why' certain processes occur. Often candidates wrote descriptions when explanations were required. **Question 1(b)(i)** asked students to describe how she can separate the mixture to obtain the sugar. Most candidates listed the methods of separation involved without explaining how each will be carried out. This meant that credit was not gained by candidates who only stated the methods of separation.

When planning an investigation, it is necessary to set out the work in a logical way and for it to be detailed enough for another person to follow. In addition, it is not important to copy out all the information given in the question.

Candidates should use appropriate specific terminology when phrasing their answers. Inappropriate use of terms hampered candidates in **Question 1(b)(i)**, **Question 1(c)**, **Question 2(a)**, **Question 2(d)**, **Question 4(c)(ii)**, **Question 6(d)** and **Question 7(b)(i)**.

General Comments

Science Paper 2 is a theory paper comprised of two sections, **Section A** and **Section B**.

Section A comprises of structured questions designed to test Assessment Objective A and B of the Assessment syllabus and has weighting of 80%. It aims at assessing the level of candidate achievement in knowledge, comprehension and application of scientific information in various contexts. the nature of the section requires that candidates have covered all the theoretical aspects of the syllabus. Candidates need to be familiarised with the use of scientific vocabulary and command terms.

Section B is an alternative to a practical section designed to test Assessment Objective C of the Assessment syllabus and has weighting of 20%. It aims at assessing the level of candidate achievement in investigative skills embracing the scientific method of inquiry. The nature of the section demands that candidates are exposed to as much practical activities and the science process skills as possible. 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 fairness, validity and reliability of experimental data, drawing conclusions from experimental data.

There were about 31 000 candidates who registered and wrote this paper.

There was a poor performance on this paper compared to previous year.

Most candidates were unable to demonstrate sound knowledge and understanding of some areas of the syllabus. However, they displayed confident with recall questions. A few candidates were able to develop effective responses in novel contexts by making links with the underlying scientific principles that are rooted in the syllabus.

No candidate scored 50 and above and quite a number scored between 0 and 9. In general, questions that seemed easy were **Question 1(a)(i)**, **Question 1(ii)**, **Question 2(b)**, **Question 3(a)**, **Question 4(a)(i)**, **Question 4(c)(iii)** and **Question 7(a)(iii)** while **Question 1(b)(i)**, **Question 1(c)**, **Question 2(c)**, **Question 2(d)**, **Question 2(e)**, **Question 4(a)(iii)**, **Question 4(c)(ii)**, **Question 5(a)**, **Question 5(c)**, **Question 5(e)**, **Question 6** and **Question 7(b)** were found to be the most demanding.

Grammatical errors were common e.g pollen fuses with ovule instead of male nucleus fuses with female nucleus, incorrect spelling was also common e.g kinetic written as cinetic. The use of comparative language was also a challenge, candidates failed to state differences correctly e.g in **Question 1(c)**, most candidates would list the differences without any comparison, they would say mass is measured in kilogram, weight is measured in Newton all written in different answer spaces.

Many candidates displayed a challenge in answering questions that required investigative/experimental skills making it difficult to ascertain whether they had adequate time to do enough practicals before they sat for this assessment.

However, a majority of the candidates had challenge of questions that required application of knowledge. It seemed they were familiar with the contexts but could not apply the knowledge in novel situations e.g. **Question 4(a)(iii)**, most candidates were unable to describe how the white blood cells protect the body against infections, instead they copied what was stated in the question.

Lastly, it was difficult to determine whether candidates had enough time to finish the paper as even the better performing candidates left blank spaces in the essay type questions.

Comments on specific questions

SECTION A

Question 1

This was a fair question but was poorly done. Most candidates scored below average.

(a) (i) Most candidates were able to correctly identify the processes and most scored full marks. A few mixed up the processes by writing A as melting and B as condensation which resulted to loss of both marks. The most common incorrect responses were condensing, condense, dissolving, evaporation and freezing. Incorrect spellings such as malting, condesitions were not credited.

Expected response: A – Condensation

B- Melting

(ii) This question was poorly done with most candidates scoring no mark. As noted in **key messages**, candidates need to read carefully each question before writing their answer. The question asked about 'describe …in terms of volume' rather than 'describe… in terms of shape' so those that wrote the property in terms of shape were unable to gain credit. Some incorrectly stated the property as it has volume, has fixed volume, has no volume.

Expected response: volume is not fixed/ is variable/ takes the volume of the container

(b) (i) The question was a challenging and a majority of the candidates scored 0 out of 3.

The strongest responses took a sequential approach to this question and produced a full account by packing all the required detail into a few concise sentences. There was some careful use of scientific terminology, for example, filter the mixture. This can be compared to a weaker response, for example, pour mixture into filter paper to remove the sand. A number of candidates were not credited since they only stated the separation methods, for instance, use filtration, evaporation without describing how each will be carried out. Grammar was also a challenge as a majority would write 'filtrate the mixture' instead of 'filter the mixture'. Evaporate the mixture was also a common wrong response which was not awarded a mark.

Expected response: dissolve mixture in water/ add water and stir to dissolve sugar

Filter/decant to remove sand

Evaporate/ heat/crystallise sugar solution

(ii) Most gained the mark for this question. Incorrect responses included spring balance, bathroom scale, scale, lever scale

Accepted responses: a balance. For instance, arm lever balance/ top pan balance/ electronic balance/ triple beam balance

(iii) It was expected that candidates would notice that the mass of sugar would not change after separation. Many candidates were confused and offered values of 10g, 25g, 14.5g, 14g and 5g.

Expected response: 15g

(c) This question was challenging. A few candidates scored 1 out of 2.

Candidates could not do the comparisons very well. A majority would list the differences without any comparison, for instance. mass is measured in kilogram, weight is measured in Newton all written in different answer spaces. They would mention definition of mass and not say anything about weight. They also mismatched the features being compared. For example, mass is measured in kilograms whilst weight is measured using a spring balance. This question pointed to a need to expose candidates more to comparative language during the teaching and learning process.

Accepted comparisons:

Basis of comparison	mass	weight
Definition	a measure of the amount/ quantity of matter/ measure of inertia	a measure of gravitational pull/ force of gravity/amount of force that acts on mass because of gravitational pull
Location	Does not change with planet/space	Changes with position or location in planet/space
SI unit/ instrument of measurement	kilogram/ using a balance	Newton/ using a spring balance
Physical quantity	Scalar quantity	Vector quantity

Question 2

This question was poorly done. A majority of candidates scored below average.

(a) This was a fair question but a majority of candidates could not get the correct response. Instead, most copied out the information given in the question 'to reduce competition amongst themselves'. Other common wrong responses were 'to increase their numbers', 'have new seeds' and 'spread the plants'

Expected response: colonisation of new areas

(b) Most candidates were able to answer this question correctly showing a good understanding of the methods of fruit and seed dispersal. Few candidates wrote the names of the fruits and were not credited.

(i) Expected response: D

(ii) Expected response: F

(c) This question was challenging to most candidates. A majority could identify the method of dispersal but could not describe how the fruit is dispersed. Candidates who were unable to gain credit gave answers that lacked detail, such as describing the specific reason why animals throw away the seed. Common wrong methods of dispersal were people, wind and human. Some candidates would write animal and/or wind which resulted to no credit.

Accepted response: animal dispersal

animals eat fleshy part of seed and throw away inedible/hard seed/ seed hard therefore passes though alimentary canal undigested

(d) This was poorly answered, with many candidates giving answers that lacked detail and specific biological terminology, such as describing movement of pollen grain down the style rather than movement of the pollen tube and describing fusion of pollen with ovule rather than male gamete with female gamete. Some candidates omitted this question suggesting a lack of knowledge of this syllabus learning outcome.

Expected description: pollen grain germinates on stigma

forms pollen tube

pollen tube grows down the style to ovule carrying

male gamete/tube nucleus

male gamete fuses with female gamete/ nucleus

(e) This question was fairly done with a majority of candidates scoring 1 out of 2. The loss of marks was due to candidates giving responses that repeated information in **Table 1** in sentence form rather than explaining why paper is a better material. Better answers involved correct interpretation and comparison of the time taken by the paper and plastic to decay. A common error in weaker responses was to copy the time take to decay as stated in **Table1** into the answer space without any logical reasoning and also general reasons without critical thinking, for instance, 'people will not see the groceries in a paper'.

Expected response: provides paper friendly environment/ avoids littering/land pollution

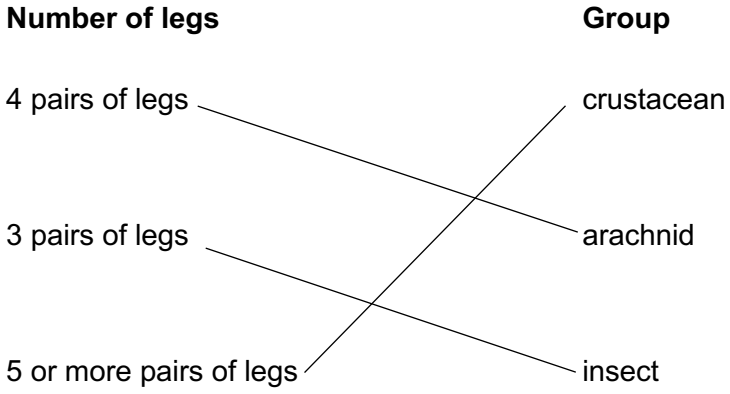
takes a short time to decay

Question 3

This question was fairly done. Most candidates could answer the questions and were able to score half of the marks.

(a) This was a straightforward question for a small minority of candidates who were able to accurately match the statements about the groups of arthropods. Most candidates were unable to demonstrate sound knowledge and understanding of classification of invertebrates. A majority confused the number of legs of crustacean and arachnid resulting to them obtaining 1 out of 3.

Expected matching:



(b) **(i)** Most gained the mark for this question. Incorrect responses included potential energy and use of wrong spelling, for example, cinetic and kinet.

Expected response: kinetic energy

(ii) This question was challenging to most candidates. A majority were unable to identify the form of energy in food. Common wrong answers were potential energy and heat energy

Expected response: chemical energy

(c) **(i)** This question was well done with a majority of candidates scoring full marks. Some candidates lost marks as a result of wrong spellings such as simplet, single, simpule and compad. Other responses that were not credited were monocots and dicots, flowering and non-flowering and names of plant leaves, for example, guava leaf

Expected response: compound leaf

simple leaf

(ii) There were many well written and detailed accounts of the mechanism of water movement into the plant. A few candidates attempted to describe water movement using the scientific terms xylem and transpiration pull. Weak responses were in relation to the definition of photosynthesis which was irrelevant.

Expected description: absorption/absorbed by root hairs

moved into xylem

pulled upward through xylem by transpiration pull

(iii) The question was fair but poorly answered. A majority of candidates were unable to describe how the structure of leaves help a plant to survive in arid conditions. The most common wrong responses were stomata, broad leaves, apex, midrib, and veins.

Accepted response: shiny/hairy/thorny/ thick cuticle/ needle shaped/ narrow/ thick/ small

Question 4

This question was challenging. Most candidates were unable to get 5 out of 10.

(a) **(i)** This question was well answered by most candidates. A few candidates lost credit as a result of incorrect spelling, for example, heat, hart, and hurt. Incorrect responses included kidney, liver and lung.

Expected response: heart

(ii) Question was fair but poorly done. Incorrect responses included food, red blood cell, urine, carbon dioxide and waste

Expected response: oxygen/nutrients or named nutrient (for instance, iron,

glucose, amino acids, vitamins)

(iii) The question required candidates to apply their understanding of the role of blood in protecting the body against infection. A majority of the candidates seemed familiar with the context but were unable to describe how the white blood cells protect the body against infections, instead they copied what was stated in the question as the role, 'protect the body against infection. Improper use of grammar was common, for instance, 'kill disease' and 'fight diseases' instead of 'kill disease-causing organisms'.

Accepted response: white blood cells/ leucocytes/lymphocytes/phagocytes kill disease-causing organisms/pathogens

(b) This question was fairly done. Incorrect responses for colour as green and for type of substance were neutral and alkali.

Expected response:

colour change			Blue/purple/ violet/mauve
Acid, alkali or neutral		acid	

(c) **(i)** This was poorly answered, with many candidates giving answers that showed lacked understanding of closed and open circuits. Incorrect responses were 'it will not give light' and 'it will lightning'. Candidates are discouraged to use 'it' when referring to an object, for example, in this context it was not clear whether the candidate was referring to the lamp or circuit.

Expected response: lamp will give light

(ii) Most candidates were challenged by this question. A few candidates showed understanding of description of current and gave a correct response. A high proportion of responses were 'electricity flows', 'there is charge', 'current flows' and 'it flows through the wires' which did not earn them a credit.

Expected response: charge flows though the circuit

(iii) Most candidates were able to state a natural source of light. Incorrect responses were moon and candle.

Expected response: sun/stars/fire/lightning

(iv) This question was well done. Most candidates were able to suggest valid ways of conserving electrical energy at home. Incorrect responses were switching off unnecessary appliances, use firewood.

Expected response: switch off lights in unoccupied rooms/ unplug unused appliances/ use less hot water/ use a thermostat in geyser/ use energy-efficient light bulbs/ energy savers/ close refrigerator door as quickly as possible

Question 5

This question was poorly done with a majority of candidates scoring at less than 4 out of 10

(a) This question was poorly done. Most candidates scored 1 out of 2. There were some very good answers to this question, in which candidates demonstrated understanding of electromagnets. Candidates who were unable to gain credit gave answers that lacked specific scientific terminology, such as adding battery rather than increasing current/voltage.

Expected response: increase current/voltage/ increase the number of cells increase the number of turns/coils

(b) This question was well done with a majority of candidates scoring 2 out of 3. Candidates who were unable to gain credit gave answers such as fossil fuel rather than fuel, solar energy rather than sun and wind energy or air rather than wind.

Expected response: generator – fuel, for instance, petrol, diesel

Solar panel – sun

Wind turbines – wind

(c) This was a fair question but was challenging to most candidates. A few candidates were able to score a mark for correctly identifying that there is gravitational potential energy in G. Better answers involved correctly identifying the energy changes and evidence of using **Fig. 5.3**. Weaker responses only listed the forms of energy at each point without showing that there is a change, that is, 'changes to…' was rare and there was no reference to **Fig. 5.3**.

Expected response: gravitational potential energy in G

changes to kinetic energy in H which

changes to electrical energy in J

(d) This question was fairly done with a majority of candidates indicating familiarity with renewable energy sources. As noted in the **key messages**, candidates are discouraged from copying information from the stem of the question, as it was noted that quite a number of candidates' response was that sugar cane is a renewable source of energy and this was not credited. Incorrect responses included that 'sugar cane can be reused' and is renewable.

Expected response: sugar cane can be regrown/replaced over a short period of time

(e) This was a fair question yet challenging to a majority of candidates. Most candidates were unable to deduce that these sources are termed 'clean' because they do not release pollutants when used. Incorrect responses included that they are 'natural sources', 'renewable' and 'do not pollute' with no evidence to reference of energy production.

Expected response: release less/no pollutants during energy production

Section B

This section had two questions and candidates were expected to answer either of the two. It was noted with great concern that some candidates answered both questions. In such a case, the first question was considered for grading. As noted in the **key messages**, candidates are advised to read carefully the requirements of each section before writing their answer. When considering factors that could have made the performance to be low in this section, it was envisaged that the closure of schools for a long time could have impacted negatively on candidates' preparedness both psychologically and emotionally. Most likely, when the candidates returned to school after the COVID-19 break and political unrests, teachers focused more on covering the theoretical aspects of the syllabus at the expense of practical work in the process leaving the manipulative and investigative skills unattended.

Comments to the individual questions are as follows:

Question 6

This was the most challenging question. A majority of candidates who opted for this question scored less than 3 out of 10. The question aimed at assessing the level of candidate achievement in investigative and manipulative skills embracing the scientific method of inquiry. The nature of the question required that candidates were exposed to as much practical activities and the science process skills as possible.

(a) This question was fairly answered with most candidates obtaining the average score. A majority of candidates were able to state that sugar is added to water but then could not extend their responses by mentioning that the sugar is stirred until it dissolves.

Expected response: sugar added to water/ sugar stirred/ shaking apparatus /Sugar dissolves

(b) This was the most challenging question. Candidates were expected to explain why the learners used equal volumes of water. They were expected to make reference to making the experiment fair and/ or to ensure that the experiment was accurate. It was noted with great concern that candidates could not distinguish between the terms 'fair test', 'validity' and 'reliability'. This could be deduced from the many responses relating to improving reliability, to compare results, correct judgement.

Expected response: to make experiment fair/ to ensure experiment is accurate

(c) The question was poorly done. A majority of the candidates copied information from the procedure of the experiment which showed lack of understanding of crystallisation method. There was poor usage of the expected term 'saturated'. Scientific terminology should be encouraged as much as possible. It was noted that candidates would describe Lenkhulu's solution being strong rather than saturated or concentrated. Candidates were also unable to use comparative language correctly which culminated to a loss of a mark, for instance, most of the candidates' responses were with respect to Lenkhulu's solution only.

Expected response: Lenkhulu's solution is saturated/ concentrated

Sipho's solution was not saturated/ not concentrated/ dilute

(d) This question which tested experimental design skills was poorly done. The question required candidates to describe an improvement they would carry out to test whether large sugar crystals-dissolve faster than fine sugar. Candidates were expected to describe how they would vary the size of sugar particles while maintaining the same temperature for the water and controlling such variables as volumes of water and mass of sugar. A clear data collection strategy had to be described which could be measuring the time taken for either of the sugar crystals to dissolve. Lastly, the candidates had to state how they would use their data to draw the conclusion e.g. the sugar crystals that takes the shortest time to dissolve is fastest.

It was noted with concern that a majority of candidates used amount of reactants or named reactants as though amount is a synonym for volume and mass. Scientific terminology should be encouraged as much as possible. Poor scientific language was also manifest in responses such as "check the time or same amount of water or sugar, etc." This question pointed to a need to expose candidates more to the manipulative and investigative skills during the teaching and learning process. Most of the candidates who attempted this question lost the mark on how they would conclude their experiment as they did not arrive at the conclusion stage.

Expected description: add equal mass of large crystals and fine sugar in two containers/ add equal volumes of water

ensure water is at the same temperature

stir until either dissolves

measure and record the time taken for each to dissolve

the one that takes shortest time to dissolve is faster

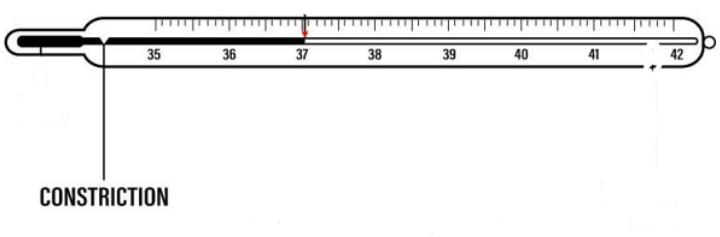
Question 7

This question was generally better scoring than **Question 6**. The question required candidates to demonstrate their manipulative and investigative skills. Candidates need to be familiarised with basic laboratory equipment and apparatus as well as the skills to correctly use them. As highlighted in Question 6, candidates need to be trained on the scientific method of inquiry, including designing of investigative experiments, drawing conclusions from experimental data and the basic principles underlying investigative activities. It was noted that some candidates did not respond to **Question b**, which made it difficult to predict whether was is due to lack of time or they were not familiar with the experiment.

Comments of the sub-questions are as follows:

(a) **(i)** The question was fairly done with a majority of candidates scoring the mark.Some candidates lost a mark for either writing a wrong label, for example, bulb rather than kink/ constriction or wrong identification of structure.

Expected response:



(ii) This question was fairly done. It was also noted that candidates demonstrated poor use of comparative language culminating to a loss of the mark, for instance, clinical thermometer has a short range or measures temperature from 35ºC to 42/43ºC without comparing to the laboratory thermometer. As noted in **Question 1(c),** this question also pointed to a need to expose candidates more to comparative language during the teaching and learning process. Some candidates lost a mark due to omission of units or writing wrong units such as degree (35º).

Accepted comparisons:

Clinical thermometer	Laboratory thermometer
Shorter range/ measures from 35ºC to 42/43ºC	Longer range/ measures from -10ºC to 110ºC
measures body temperature	Measures temperature of different objects in laboratory and factories
Can be tilted while taking reading/ temperature can be read after removing the thermometer from armpit or mouth	Has to be kept upright- while taking reading/ temperature is read while keeping the thermometer in the source e.g liquid

(iii) This question was well done with most candidates scoring the mark. Candidates who were not credited a mark was as a result of writing the temperature range or wrong units such as degree (38.5º).

correct response: 38.4/ 38.5 ºC

(b) (i) This question was performed poorly. The question required candidates to describe the main steps to de-colourise a leaf. As noted in the key messages, candidates are encouraged to set out the work in a logical way when planning an investigation and for it to be detailed enough for another person to follow. Most candidates demonstrated lack of presenting work in a logical way. Some candidates did not state the amount of time required for heating the leaf in boiling water and omitted the use of a hot water bath when boiling/ heating the leaf in ethanol which all resulted to no credit.

Expected response: heat leaf in boiling water for 30 – 60 seconds

heat in test tube with ethanol

placed in hot water bath

(ii) The question seemed accessible but was performed poorly. Responses such as rehydrate only, to make leaf slippery were not credited.

Expected response: to soften the leaf

(iii) This was a fair question but was poorly done. The question required candidates to describe how they would test the decolourised leaf to show that it has decolourised. A high proportion started with the steps of de-colourising the leaf which carried no marks. A very common error was the addition of iodine rather than iodine solution. Some candidates left the question unanswered.

Expected response: add a few drops of iodine solution

decoloured leaf changes to blue-black