

EXAMINATIONS COUNCIL OF ESWATINI

EPC

EXAMINATION REPORT

FOR

SCIENCE (513)

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Paper 513/02

Key messages

Candidates are advised to carefully read each question before writing their answer and to make sure they address all aspects 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 in order to be awarded full credit. When describing the energy changes in **Question 3(b)(ii)**, it was not enough to state that rubbing created charge only. A reference of different charges attracting was necessary to earn full marks.

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 2(b)**, **Question 2(c)**, **Question 3(a)(ii)**, **Question 5(b)(ii)** and **Question 7(a)(iii)**.

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 a 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 this section requires that candidates cover 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 25 000 candidates who registered and wrote this paper.

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

Most candidates were unable to demonstrate sound knowledge and understanding of some areas of the syllabus. However, they displayed confidence 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.

Few candidates 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(b)**, **Question 2(b)**, **Question 3(a)(i)**, **Question 4(a)(ii)**, **Question 4(c)** and **Question 5(a)(ii)(iii)** while **Question 2(d)**, **Question 3(b)(ii)**, **Question 4(e)(ii)**, **Question 6(b)(ii)** and **Question 7(c)(iii)** were found to be the most demanding.

Grammatical errors were common for example, moon absorbs light from the sun, incorrect spelling was also common for example, kinetic written as cinetic. The use of comparative language was also a challenge, candidates failed to state differences correctly for example, in **Question 2(a)**, most candidates would state the differences without any comparison, they would say acids have a sour taste while bases are slippery to touch.

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 practical work before they sat for this assessment.

However, most of the candidates had a challenge with questions that required application of knowledge. It seemed they were familiar with the contexts but could not apply the knowledge in novel situations for example, **Question 3(b)(ii)**, most candidates were unable to explain why the pieces of paper were attracted to the plastic comb, instead they stated that it was because of the rubbing or combing.

Comments on specific questions

SECTION A

Question 1

This was a fair question but challenged most candidates. Most scored below average.

- (a) (i) Most candidates were able to correctly state the characteristics the processes and most scored full marks. A few wrote ambiguous spellings which resulted to loss of both marks. The most common incorrect responses were vertebrates, plants and breathing.

Expected response: reproduction, feeding/nutrition, movement, sensitivity/irritability, growth, respiration and excretion;

- (ii) This question was challenging with most candidates scoring 1 mark. As noted in **key messages**, candidates need to carefully read each question before writing their answer. The question asked about 'classify the organisms into two groups of living things rather

than using their own organisms, so those that used organisms not in the list were unable to gain credit. Some incorrectly identified the groups but used the correct examples in each column and were awarded 2 marks.

Expected response:

group	plants	Animals;
examples	Spinach Tree Grass;	Lion Fish Rabbit;

- (b) The question was accessible to most of the candidates. It required candidates to identify parts of a leaf. A few candidates lost marks due to incorrect spellings such as madrid, madrip, midrip. Others just stated the two types of leaves, monocots and dicots

Expected response: A – midrib;
B – margin;

- (c) This question was challenging. A few candidates scored all the marks with a majority scoring 1 mark. Candidates were expected to state the colours observed in the areas C, D and E when testing the leaf for starch. However, candidates had a challenge in stating the correct colours for C and E resulting to loss of marks. Common incorrect responses for C and E were purple, blue, yellow and for D most candidates simply wrote that it remains the same.

Expected response: C - blue-black;
D - yellow/ light brown;
E - blue-black;

Question 2

This question was fairly done.

- (a) This was a fair question, but a majority of candidates could not get the correct response. This question required candidates to compare the properties of acids and bases. Candidates could not do the comparisons very well. A majority of candidates were able to describe differences between an acid and a base. It was a great concern that some candidates are still challenged with writing comparative statements. For instance, they would compare taste and pH of the substances instead of comparing one property at a time.

Expected response: an acid has a sour taste whilst a base has a bitter taste an acid turns litmus paper red whilst a base turns a litmus paper blue;
an acid has a pH less than 7 whilst a base has a pH greater than 7; an acid is not slippery to touch whilst a base is slippery;

- (b) (i) The question was accessible to most of the candidates. It required candidates to describe a mixture, and quite a number of candidates were able to give a good description. Some lost the second mark for not stating that the substances are different.

Expected response: a physical combination of two or more different substances

- (ii) Most candidates were able to answer this question correctly showing a good understanding of physical changes. Few candidates wrote answers related to chemical changes and were not credited.

Expected response: reversible/can be separated by physical means/no new substance is formed/ change in appearance but no change in identity/ no change in mass.

- (c) This question was challenging to most candidates. The question required candidates to write the change of state in each of the activities provided. A few candidates seemed to be familiar with the changes of state. A majority stated how matter changes when heated or cooled, such as writing 'liquid to gas' instead of 'evaporation' which resulted to no credit.

Accepted response: evaporation;
freezing;
condensation;

- (d) This question was challenging, with many candidates obtaining a mark for the use of carbon dioxide in plant growth. It was common to get responses in relation with any other use of carbon dioxide such as 'used in fire extinguishers' and such responses were not accepted. It also appeared that most candidates were not familiar with the use of nitrogen in plant growth. Common wrong responses for the role of nitrogen were for growth, producing proteins. Others

Expected description: carbon dioxide – for photosynthesis to occur; nitrogen – formation/provision of nitrates;

Question 3

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

- (a) (i) This was a straightforward question for a small minority of candidates who were able to accurately identify the circuit. Most candidates showed lacked understanding of closed and open circuits. A common incorrect response was 'it will not give light' and this was a response from previous year's examination, this was evidence enough that candidates try to master the marking points from previous exams without mastering the concepts. Candidates are therefore discouraged from such act.

Expected response: H;

- (ii) The question required candidates to state why the bulb in connection J would not give light. A majority of the candidates were able to answer correctly. A few lost the mark as their responses lacked reference to the circuit or stating that it was open. It was not clear whether the 'it' was referring to the bulb or the circuit, hence resulted to loss of mark.

Expected response: open circuit;

- (b) (i) The question required candidates to state what caused the comb to attract the papers. Most gained the mark for this question. Incorrect responses included current , charges, friction etc.

Expected response: static;

- (ii) This question was challenging to most candidates. A majority were unable to explain why the pieces of paper were attracted to the plastic comb. Instead they would mention that it is the rubbing with the comb that attracted the paper, and there was minimum reference to 'charge created' and 'different charges'.

Expected response: rubbing/friction creates charge on the comb;
charge on comb is different from charge on paper pieces;
created upon bringing the comb;
different charges attract;

- (c) (i) This question was fairly done with a majority of candidates scoring full marks. Some candidates lost marks because of wrong spellings such as electricity, electric. Other incorrect responses that were not credited included kinetic, light, potential.

Expected response: electrical → heat;

- (ii) This question was fairly done with a majority of candidates scoring full marks. There was an improvement from previous years responses.

Expected description: use energy saving bulbs/ switch off lights in unused rooms/ boil just enough water to be used/ unplug unused appliances/ use less hot water/ use a thermostat in geyser;

- (d) (i) The question was fair but challenged most candidates. A majority of candidates repeated statements in the stem of the question without interpreting what they meant. For example, one end of bar **K** attracts one end of bar **L**, and the same end of bar **K** repels the other end of bar **N**.

Expected response: two bars repelling;

- (ii) The question required candidates to name a bar which was non-magnetic from the investigation. Most candidates were able to correctly identify it. A few wrote **M** and **N** hence they lost the mark.

Expected response: M;

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 because of incorrect order of planets or writing a planet which was not in the list such as Saturn and Pluto.

Expected response: Mercury, Venus, Earth, Jupiter, Uranus, Neptune;;

- (ii) This was the most accessible question to candidates. Most were able to correctly state the largest planet.

Expected response: Jupiter;

- (b) This question was fairly done. Candidates were required to explain how the moon gives light at night. Several good responses were observed. Incorrect responses included: the moon absorbs light..., light was reflected, the moon is shiny.

Expected response: the moon reflects light from the sun onto the earth;

- (c) This question was fairly done as most candidates could recall the term used to describe the movement of the Moon around the Earth. Some candidates lost credit because of wrong spelling and referring to 'rotation'.

Expected response: revolution;

- (d) The question was assessing students understanding of mass and weight of falling objects. It was challenging to many candidates.

- (i) This was unsatisfactorily answered, with many candidates giving answers which showed lacked understanding of why skydivers fall to the ground. Most candidates stated that it was because of gravity, yet even reference to 'pull' was required to earn the mark

Expected response: due to gravitational pull;

- (ii) Most candidates were able to answer this question correctly. Some missed the mark because of wrong spellings such as cinetic.

Expected response: kinetic;

- (iii) Most candidates were able to state what would happen to the mass of the skydiver as he falls back to the ground correctly. A few candidates stated that it would increase or decrease

Expected response: remains the same/does not change;

- (e) The question was assessing candidates practical skills, as it was about an experiment to show that light travels in straight lines. Most candidates seemed to be familiar with the experiment but lost marks due to use of wrong scientific terms.

- (i) This question was well done. Most candidates were able to suggest the source of light.

Expected response: candle/torch;

- (ii) Most candidates were challenged by this question. A high proportion of responses were 'look through the holes' which was not accepted. Perhaps imagine if the learner was visually impaired, so looking through the holes would be impossible.

Expected response: pass knitting needles/stretched string through holes;

Question 5

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

- (a) The question assessed candidates knowledge and understanding of digestion. A majority of the candidates earned 2 out of 5 marks.

- (i) This question was challenging. Most candidates scored 1 out of 2. There were some very good answers to this question, in which candidates demonstrated understanding of digestion. Candidates who were unable to gain credit gave answers that lacked specific scientific terminology, such as large insoluble.

Expected response: the breaking down of large insoluble food particles; to small soluble particles; that can be easily absorbed into the blood stream;

- (ii) This question was well done with a majority of candidates being able to identify a letter representing the stomach.

Expected response: Q;

- (iii) This question was well done with a majority of candidates being able to correctly identify the letter representing the part where mechanical digestion occurred.

Expected response: P;

- (iii) This was a fair question but was challenging to most candidates. Most candidates failed to score a mark because they either mentioned 'fatty acid' or 'glycerol' instead of writing both.

Expected response: fatty acids and glycerol;

- (b) (i) This question was well done with a majority of candidates. Candidates who were unable to gain credit gave answers such as takes short time only without qualifying with irrigating a large area.

- (ii) This question was challenging to most candidates. Candidates who were unable to gain full credit wrote the correct technology but failed to give a good explanation. Most candidates gave explanations like work will be fast.

Expected response:

Technology: tractors/ ploughs/ harvesters/ GPS guidance systems/ farm management software

Explanation: work is done easier/ more work at a shorter time/ less people employed/ more profit/ less money spent to pay employees

- (c) (i) This was a fair question to most candidates as they were able to score a mark for correctly identifying the type of reproduction that cloning can be classified into.

Expected response: asexual

- (ii) This was a fair question but was challenging to most candidates. A few candidates were able to score a mark for correctly stating the disadvantages of cloning reproduction in humans. Most students seemed to be clueless about cloning hence writing irrelevant responses, others gave disadvantages related to plants or other animals. This was an indicator that these candidates did not read the question.

Expected response: inherently unsafe/ transfer of genetic defects or disabilities/ could create unhealthy individuals/ expensive/ requires special equipment.

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 carefully read 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 envisioned that the time available for teaching and learning was a bit short which could have impacted negatively on candidates' preparedness both psychologically and emotionally. 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) (i) This question was fairly answered with most candidates being able to name the instrument labelled **U**. A majority of candidates could recall the name but lost the mark due to wrong spelling.

Expected response: rain gauge;

- (ii) The question was fairly done with most candidates showing knowledge of precautions when using the instrument labelled **T**. Most candidates seemed to have mastered the skill of using a measuring cylinder. Some who lost the mark was because failure to identify the name of instrument **T**, resulting to stating a wrong precaution.

Expected response: put on flat surface/ read bottom of meniscus/ keep eye level with level of meniscus;

- (b) (i) This was the most challenging question. Candidates were expected to show by using an arrow line a reading of 16.4 g on a given balance scale. Most left the question unanswered and others gave a mass of 16.8 g.

Expected response: correct arrow to 16.4 g on scale;

- (ii) This question which tested experimental design skills was challenging. Candidates were expected to describe how they could measure the volume of the ring. 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, record volume as V_1 . This can be compared to a weaker response, for example, check the volume.

Expected description: pour water into a measuring cylinder and record volume as V_1 ;
gentle insert ring into measuring cylinder with water and read volume as V_2 ;
subtract V_1 from V_2 to get volume of ring; OR
fill displacement/ eureka can with water until it overflows;
wait for water to stop overflowing and place measuring cylinder/ collecting vessel below spout;
gentle insert ring into the displacement can and collect overflowing water;
volume of water collected is equal to volume of ring;

- (iii) Candidates were required density of the ring given that its volume is 2cm^3 . The question was fairly done with a majority of candidates scoring two marks. Some candidates lost a mark for either using 16.6 g or leaving the units.

Expected response: $D=m/V$ or $D = 16.2/2$;
 $= 8.1$;
 g/cm^3 ;

- (iv) The question was fairly done. A majority of the candidates could identify the metal. Some lost a mark as they just copied the 'copper' from the table without interpreting the results from the experiment.

Expected response: iron;

Question 7

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.

Comments of the sub-questions are as follows:

- (a) (i) Candidates were given a picture of a bumblebee and expected to state a feature showing that it is an arthropod. The question was fairly answered with many candidates being able to recall features of arthropods. Some candidates lost a mark for stating the number of legs or even naming the insect.

Expected response: segmented body/ jointed legs;

- (ii) This question was fairly done. It was also noted that candidates demonstrated good recall of characteristic features of insects but lost marks due to omission of key terms such as 'jointed' when referring to legs.

Accepted responses: three pairs of jointed legs/ pair of antenna/ three body parts/ head, thorax and abdomen

- (iii) This question was fairly done with most candidates scoring one mark. Candidates who were not credited the second mark was because of not showing how the presence of hairs is an advantage.

Correct response: bumblebees are hairy; more pollen carried in the hairs;

- (b) This question was performed fairly. The question required candidates to describe the how they will carry out a test for carbon dioxide. Most candidates demonstrated lack of presenting work in a logical way. Some candidates did not state that the carbon dioxide should be bubbled **into** the lime water which resulted to no credit.

Expected response: test: bubble exhaled air through lime water; result: limewater will turn milky/cloudy/ chalky;

- (c) (i) The question seemed accessible but was performed poorly. Candidates were

given a plant that was placed in a box with one hole for ten days. The plant after the ten days was shown to have bent to one side. They were expected to the position of the hole using a letter **X**. Most candidates left this question unanswered. Those who tried it lost the mark as they put the cross either inside the box, inside the pot or on top of the box.

Expected response: X should be very close to the top right corner of the box;

- (ii) This was a fair question but was some candidates could not get it right. The question required candidates to state a factor affecting the rate of transpiration. Incorrect responses included the Sun, carbon dioxide which were not credited.

Expected response: light;

- (iii) The question seemed accessible but was performed poorly. Responses such as dark, no air and so on was not credited.

Expected response: reduces the rate of transpiration; no wind/ no sunlight/ cool/ low temperature/ more water vapour;