



L-Università
ta' Malta

MATSEC
Examinations Board



Specimen Papers
SEC 04 Biology

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Specimen Controlled Assessments Level 1-2

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE
EXAMINATIONS BOARDL-Università
ta' Malta

SECONDARY EDUCATION CERTIFICATE LEVEL

SAMPLE PAPER

SUBJECT: **Biology**
 PAPER NUMBER: **Level 1 – 2**
 DATE:
 TIME: 2 Hours

SECTION A: Answer ALL questions from this section.

1. In the space below draw a labelled diagram of a plant cell. In your diagram label the following structures: nucleus, cytoplasm, chloroplasts, cell membrane, cell wall, cell vacuole.

(Total: 5 marks)

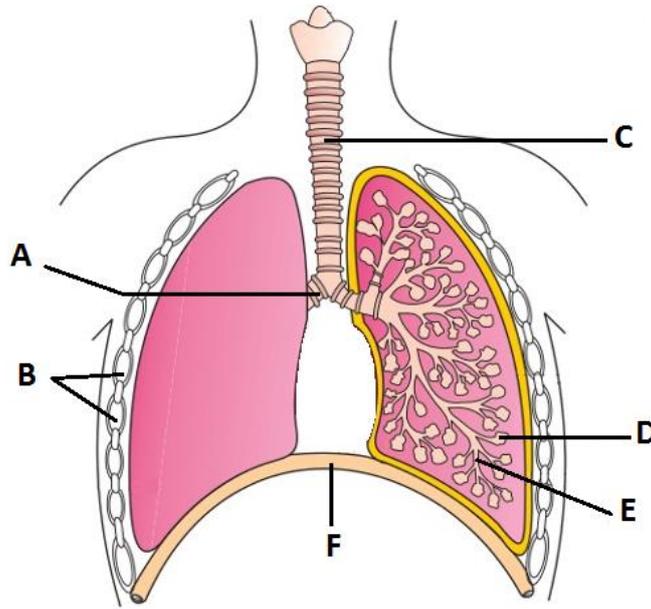
2. Match each statement in the table below to one of the following terms. (Each term may be used once, more than once or not at all).

Carbohydrates**Proteins****Calcium****Lipids****Water****Iron**

| | |
|--|--|
| | Act as a store of energy. |
| | Are responsible for the growth and repair of body cells. |
| | Is an important component of bone. |
| | Are the main source of energy needed for physical activity. |
| | Act as enzymes that speed up the rate of chemical reactions. |

(Total: 5 marks)

3. The diagram below shows the human respiratory system.



(a) Label the structures shown in the diagram.

A: _____

B: _____

C: _____

D: _____

E: _____

F: _____

(3)

(b) Identify the following structures:

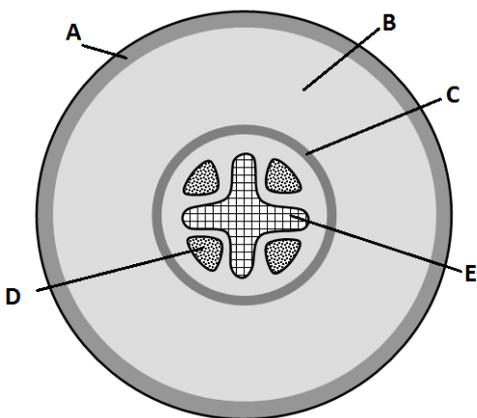
(i) a sheet of muscle that separates the chest from the abdomen; _____

(ii) the site where oxygen enters the blood. _____

(2)

(Total: 5 marks)

4. (a) The following diagram shows a cross section through a part of a dicot plant.



(i) Name the part of the plant through which this section was taken: _____

(1)

(ii) Name the structure through which water and mineral salts are transported: _____

(1)

(b) Define transpiration.

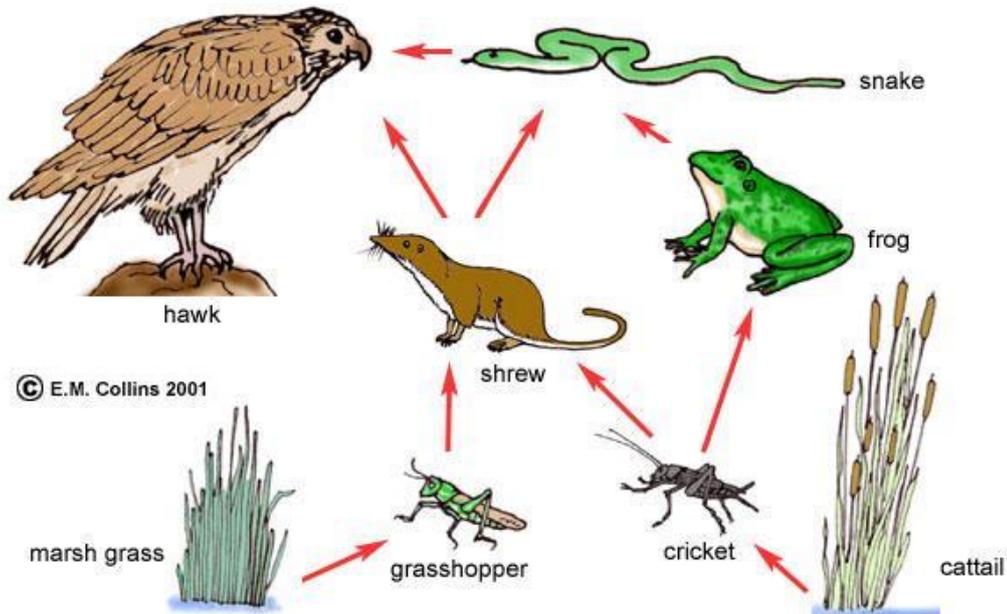
(1)

(c) The part of the plant shown above usually has hairs. Briefly explain what the function of these hairs.

(2)

(Total: 5 marks)

5. The following questions are based on the food web shown below.



(a) Name **ONE** abiotic factor of the marsh grass: _____ (1)

(b) Name **ONE** common biotic factor, shown in the food web, of the grasshopper and the cricket:
 _____ (1)

(c) Name the **TWO** producers: _____ (2)

(d) Name **ONE** primary consumer: _____ (1)

(e) Pesticide spray from a nearby field reached the cattail killing off most of the population of crickets. Explain why:

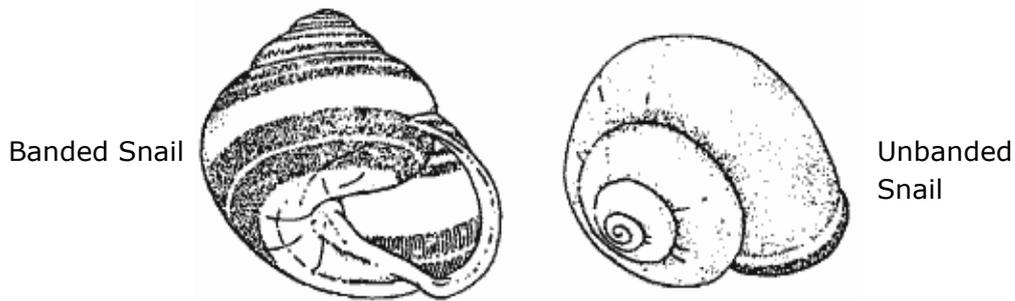
(i) the population of frogs decreased; _____ (2)

(ii) the population of shrews remained the same, but the population of grasshoppers decreased.

(3)

(Total: 10 marks)

6. The shells of a common species of snail vary in the pattern of dark bands found on their shells. The drawings show a banded snail and an unbanded snail. Song thrushes are birds that feed on these snails by breaking the snail shell on a flat stone and eating the soft parts.



In an investigation, two enclosed areas of a garigue floor were cleared of all snails and 300 banded and 300 unbanded snails were then introduced. The table below shows the number of living snails found in the two areas after two weeks.

| Garigue floor | Number of living banded snails | Number of living unbanded snails |
|------------------------|--------------------------------|----------------------------------|
| Area with vegetation | 226 | 147 |
| Area with small stones | 153 | 235 |

(a) Explain why:

(i) the number of banded snails was greater in the area with vegetation;

(2)

(ii) the number of unbanded snails was greatly reduced in the area with vegetation.

(2)

(b) If the two populations of banded and unbanded snails remain separated, what would happen to the two different forms of snails after several generations?

(1)

(c) Name the evolutionary process controlling the type of snail population dominant in a particular environment.

(1)

(d) Plants inhabiting the garigue evolved characteristics that help them survive in an environment where water is scarce, the soil is very shallow and the land is swept by strong winds. List **TWO** examples of such adaptations.

_____ (2)

(e) Reptiles were the first true land vertebrates. List **TWO** features that made them successful land animals.

_____ (2)

(Total: 10 marks)

Section B: This section carries 20 marks.

7. Read the following passage, and use your knowledge and information from the text to answer the questions below:

All our lives, we have been repeatedly warned by our elders to avoid excessive social contact for fear of contracting harmful germs and bacteria. Turns out that it may not be all bad. A recently released study suggests that interaction with others also helps in the acquisition of good bacteria - at least in chimpanzees.

The scientists were trying to determine if seasonal changes in social behaviour impacted the beneficial microbes that reside in the chimpanzee's gastrointestinal tract.

What they discovered was that during the rainy season, when the chimps were often seen sharing the abundant food with others, their gut bacteria had a lot of diversity.

In dry periods, when the food supply was scarce and the animals spent time alone, their gut microbes were less varied.

While the change in diet and weather played a role, the researchers think social interaction was the main reason for the difference.

Though the study was conducted on chimpanzees, the researchers think the results could also apply to humans. That's because we share numerous bacterial gut species with these mammals.

(Adapted from: dogonews.com)

(a) What is a microbe?

_____ (2)

(b) What is an immune system?

_____ (2)

(c) Give a named example for:

(i) a viral disease; _____ (1)

(ii) a bacterial disease. _____ (1)

(d) From the text, list how microbes mentioned in the passage may be transmitted from one chimpanzee to another.

(2)

(e) In some cases it is important to resort to vaccinations to reduce or prevent a disease.

(i) What is a vaccine?

(2)

(ii) A large proportion of population is vaccinated against a specific strand of the influenza microbe. Suggest why the spread of the microbe will be very much reduced.

(2)

(f) The text refers to chimpanzees as being mammals. Are these ectotherms or endotherms? Define your choice.

(1, 2)

(g). Explain how the human body regulates its body temperature when the temperature becomes too high.

(3)

(h) Regulating body temperature is a form of homeostasis. Define the term homeostasis.

(2)

(Total: 20 marks)

Section C: This section carries 20 marks.

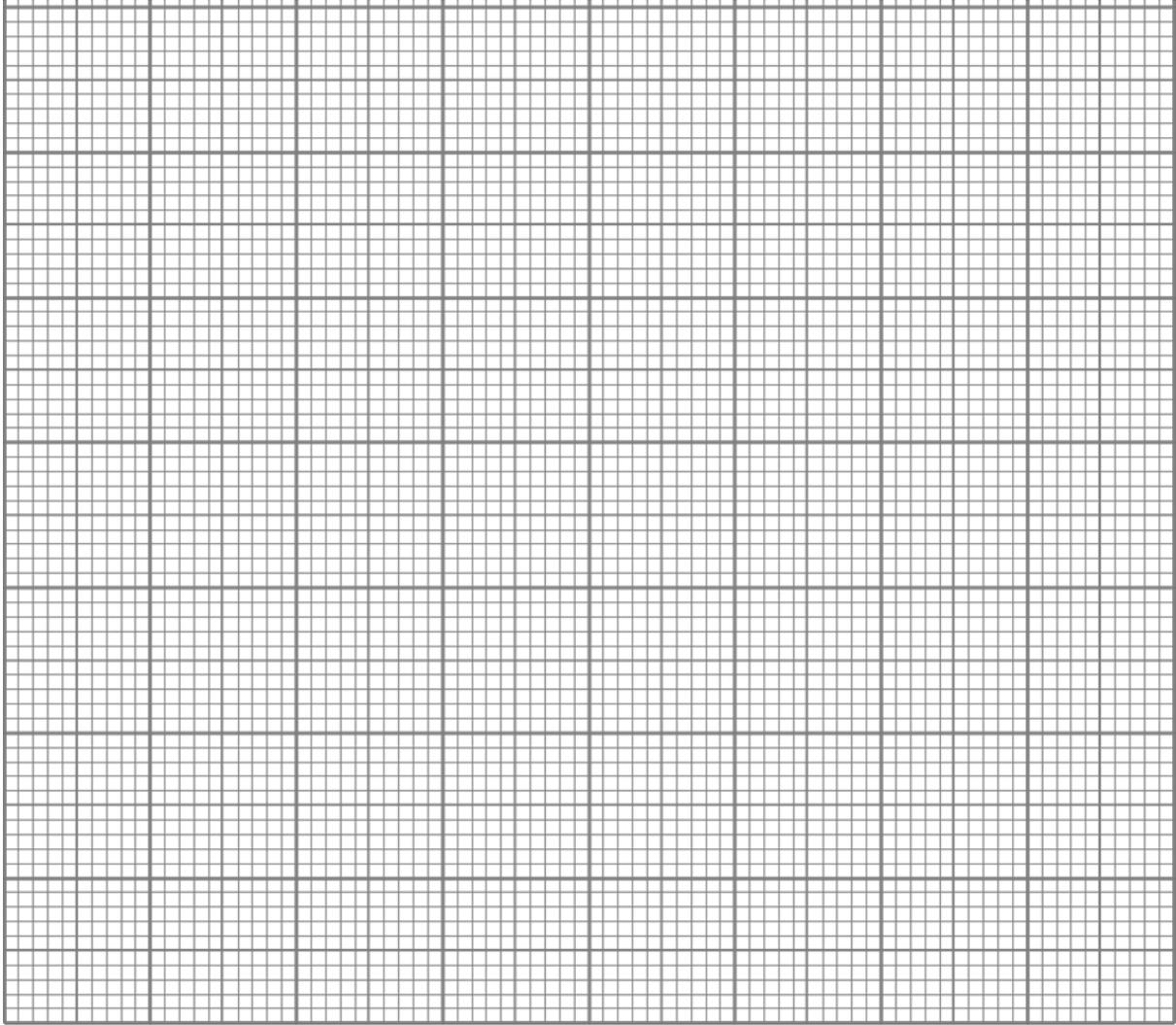
8. Interpret the data below and answer the following questions.

A group of students conducted a study of the change in carbon dioxide concentration in a closed greenhouse full of tomato plants over a 24 hour period. The green house uses natural light for plant growth.

| Time – in a 24 hour period (hrs) | Carbon dioxide concentration (in arbitrary units) |
|----------------------------------|---|
| 0 (Midnight) | 30 |
| 3 | 40 |
| 6 (Dawn) | 50 |
| 9 | 43 |
| 12 (Midday) | 30 |
| 15 | 20 |
| 18 (Dusk) | 16 |
| 21 | 20 |
| 24 (Midnight) | 30 |

Adapted from: <https://www.tes.com/teaching-resource/photosynthesis-data-handling-worksheet-6374772>

(a) On the graph paper provided, plot a graph of carbon dioxide concentration on the y-axis against time on the x-axis. (6)



(b) Describe the trend of the graph:

(i) from midnight to dawn;

_____ (2)

(ii) from dawn till dusk.

_____ (2)

(c) List **TWO** products of photosynthesis.

_____ (2)

(d) Cellular respiration is occurring throughout the 24 hour period of the investigation. Define cellular respiration.

(2)

(e) With reference to the various forms of cellular respiration:

(i) write a word equation to summarize;

- aerobic respiration

(2)

- alcoholic fermentation

(2)

(ii) list the main difference in the reactants between the two processes.

(2)

(Total: 20 marks)

Section D: This section carries 20 marks.

9. This question is about reproduction:

(a) (i) Distinguish between sexual and asexual reproduction.

(2)

(ii) Name **ONE** example of an organism for **each** mode of reproduction.

(2)

(b) (i) Explain **TWO** advantages that sexual reproduction has over asexual reproduction.

(4)

(ii) Excluding reasons given in (i) explain **ONE** disadvantage of asexual reproduction.

(2)

(c) Flowers play an important role in reproduction.

(i) Give **TWO** differences between insect pollinated and wind pollinated flowers.

(2)

(ii) Give **ONE** example of **each** type of flower.

(2)

(d) (i) Define the process of pollination.

(4)

(ii) Explain why the fruit produced as a result of successful pollination are important for the survival and distribution of a plant or tree.

(2)

(Total: 20 marks)

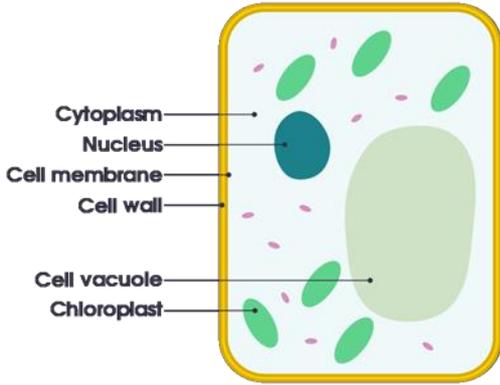
Specimen Controlled Assessments Level 1-2 Marking Scheme

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE
EXAMINATIONS BOARDL-Università
ta' Malta

SECONDARY EDUCATION CERTIFICATE LEVEL

MARKING SCHEME FOR SAMPLE PAPER

SUBJECT: **Biology**
 PAPER NUMBER: **Level 1 – 2**
 DATE:
 TIME: 2 Hours

| Section A | | Marks | Comments |
|---------------|---|----------------------|--|
| 1 | <p>Correct diagram Correct labelling of the following structures: nucleus, cytoplasm, chloroplasts, cell membrane, cell wall, cell vacuole.</p>  | 2 3 | Accept diagram similar to the one shown ½ mark each label |
| Total: | | 5 marks | |
| 2 | <p>Lipids Proteins Calcium Carbohydrates Proteins</p> | 5 | 1 mark each |
| Total: | | 5 marks | |
| 3 | <p>a. A: Bronchus B: Ribs or Ribcage C: Trachea D: Alveolus E: Bronchiole F: Diaphragm</p> | 3 | ½ mark each label |
| | <p>b. (i) F or Diaphragm (ii) D or Alveolus</p> | 1 1 | |
| Total: | | 5 marks | |

| | | | |
|---------------|---|--|--|
| 4 | a. (i) Root (ii) E or Xylem | 1 1 | |
| | b. Transpiration is the evaporation of water from the stomata of leaves. | 1 | |
| | c.: <ul style="list-style-type: none"> ● Waxy cuticle ● Hairy leaf surface ● Reduction of stomata ● Sunken stomata ● Reduction of leaf size | 2 | 1 mark each Any two from the following or any other correct feature |
| Total: | | 5 marks | |
| 5 | a.: sunlight; water; mineral salts; carbon dioxide. | 1 | Any one from the following or any other correct factor |
| | b. Shrew | 1 | |
| | c. Marsh grass and cattail | 2 | 1 mark each |
| | d. Grasshopper or Cricket | 1 | |
| | e. (i) The frogs' food supply was reduced and hence a lot of frogs died of starvation. (ii) When one of the shrews' food supply (crickets) decreased, the shrews started eating more grasshoppers, Reducing the population of grasshoppers but keeping the shrew population constant. | 1 1 1 1 | |
| Total: | | 10 marks | |
| 6 | a. (i) The vegetation provided camouflage and the banded snails were not easily spotted by the birds. (ii) The white shell made the unbanded snails more visible among the vegetation and easily spotted by the birds. | 2 2 | |
| | b. They will diverge into two separate species. | 1 | |
| | c. Natural selection | 1 | |
| | d. <ul style="list-style-type: none"> ● reduced leaves to reduce water loss ● have thick waxy cuticles to prevent evaporation ● have water storage organs ● leaves have aromatic oils that prevents water loss ● grow - short and compact bushes acting as a wind breaker | 1 1 | Any two from the following or any other correct adaptation |
| | e.: <ul style="list-style-type: none"> ● dry scaly waterproof skin ● strong limbs support body on land ● internal fertilization ● lay shelled eggs on land | 1 1 | Any two from the following or any other correct feature |
| Total: | | 10 marks | |
| 7. | a. A microbe is an agent that causes an infectious disease. | 2 | May refer to pathogen |
| | b. An immune system is a system recognising self from non self. | 2 | |

| | | | |
|--|--|--|--------------------------------|
| <p>c. (i) HIV (ii) Salmonella</p> | <p>1 1</p> | <p>Accept other equivalent examples</p> | |
| <p>d. Through food or via close contact with other chimpanzees.</p> | <p>2</p> | <p>Any one or equivalent</p> | |
| <p>e. (i) A vaccine is dead or inactive pathogenic material used in vaccination to develop immunity to a disease in a healthy person. (ii) The large proportion of the population who have been vaccinated against the pathogen won't catch the disease. This means that the people who aren't vaccinated are unlikely to catch the disease because there are fewer people able to pass it on.</p> | <p>2 2</p> | | |
| <p>f. Chimpanzees are mammals which are therefore endothermic, because they maintain a constant body temperature, irrelevant of their surroundings.</p> | <p>1 2</p> | | |
| <p>g. When the body temperature becomes too high, energy is transferred from the blood and skin to the environment. The blood vessels dilate so more blood can flow near the surface of the skin and sweat evaporates from the skin.</p> | <p>3</p> | <p>1 mark for each point</p> | |
| <p>h. Homeostasis is the maintenance of a constant internal body environment.</p> | <p>2</p> | | |
| Total: 20 marks | | | |
| <p>8.</p> | <div style="text-align: center;"> </div> <p><i>Figure 1 - A graph of of concentration of carbon dioxide against time(hrs)</i></p> <p>a. Correct title Correct axes with units Correct scale Correct plotting</p> | <p>Do not award marks if axes are inverted.</p> <p>1 1 1 3</p> | |
| | <p>b. (i) From midnight till dawn the carbon dioxide concentration increases. (ii) From dawn till dusk the carbon dioxide concentration decreases.</p> | <p>2 2</p> | |
| | <p>c. Products are glucose and oxygen.</p> | <p>2</p> | <p>1 mark for each product</p> |

| | | | |
|---------------|--|--|---|
| | d. A series of metabolic processes that take place within a cell in which the energy is harvested from substance (glucose) and then stored in energy-carrying biomolecule (ATP) for use in energy-requiring activities of the cell. | 1 1 | Award marks for simpler definition |
| | e. (i) Aerobic respiration: Glucose + oxygen \longrightarrow carbon dioxide + water + ATP Alcoholic fermentation: Glucose \longrightarrow Ethanol + carbon dioxide + ATP (ii) Aerobic respiration needs oxygen to occur while alcoholic fermentation occurs without oxygen. | 2 2 1 1 | Accept the term energy or Adenosine Triphosphate instead of ATP. Accept alcohol instead of ethanol |
| Total: | | 20 marks | |
| 9. | a. A mode of reproduction involving the fusion of female gamete (ovum) and male gamete (sperm), which forms a zygote. Additional info: A zygote that potentially develops into an offspring genetically distinct from the parent organisms. A mode of reproduction in which the offspring comes from a single organism, and not from the union of gametes as it is in sexual reproduction/each example -sexual/-asexual | 1 1 1/1 | Accept examples to both plants and animals for sexual reproduction |
| | b. Listing of two advantages - Variation, appearance of new characteristics, removal of defective genes, and one disadvantage - More prone to disease, more difficult to adapt in a changing environment Explanation of advantages Explanation of disadvantage | 2 1 2 1 | 1mark for each explanation |
| | c. -Definition of wind pollination A process that involves the successful transfer of pollen grains from the male organ to the female organ (of flowers) by airborne pollen grains that are transferred by wind action. Definition of insect pollination Insect pollination describes the pollination process whereby pollen is transferred from one flower to another by insects. An example for each type of pollination. | 1 1 2 | |
| | d. -Process of pollination When a flower has been pollinated, there will be pollen grains that have landed on the stigma. If the pollen grains are from of the same species of plant, then the pollen grain starts to grow a tube called a pollen tube which grows down through the style. The pollen tube then enters the ovule through a tiny opening through which the male gametes can be transferred from the pollen grain allowing fertilization to occur. -Role of fruit, with seed inside. Fruits protect the seeds, attract animals, fruits aid in the dispersal of mature seeds | 4 2 | |
| Total: | | 20 marks | |

Specimen Controlled Assessments Level 2-3



L-Università
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MATRICULATION AND SECONDARY EDUCATION CERTIFICATE
EXAMINATIONS BOARD

**SECONDARY EDUCATION CERTIFICATE LEVEL
SAMPLE PAPER**

SUBJECT: **Biology**
PAPER NUMBER: **Level 2 – 3**
DATE:
TIME: 2 Hours

Answer ALL questions in ALL sections.

SECTION A: This section carries 40 marks.

1. Match each statement in the table below to one of the following terms. (Each term may be used once, more than once or not at all).

| | | | |
|------------------|----------------------|--------------------|----------------------|
| Nucleus | Cell membrane | Flagellum | Vacuole |
| Cytoplasm | Cell wall | Chloroplast | Mitochondrion |

| | |
|--|--|
| | Contains the green pigment needed to absorb light for photosynthesis. |
| | Contains the genetic material that controls the functioning of the cell. |
| | Organelle that provides energy from the breakdown of glucose. |
| | Controls the exchange of materials between the cell and its environment. |

(Total: 4 marks)

2. Explain the following statements:

(a) An enzyme speeds up a biochemical reaction, but remains unchanged at the end of the reaction.

_____ (2)

(b) Animals living in very cold environments have a very thick fat (lipid) layer under their skin.

_____ (2)

(c) Starch and glycogen are better storage compounds than glucose.

(2)

(Total: 6 marks)

3. (a) List **THREE** features of the alveolus that make gaseous exchange easy and efficient.

(i) _____

(ii) _____

(iii) _____

(3)

(b) Smoking causes emphysema. Briefly explain how this disease negatively affects gaseous exchange.

(2)

(Total: 5 marks)

4. (a) How are xylem vessels adapted for the transport of water?

(2)

(b) Briefly explain how each of the following factors affects the rate of transpiration.

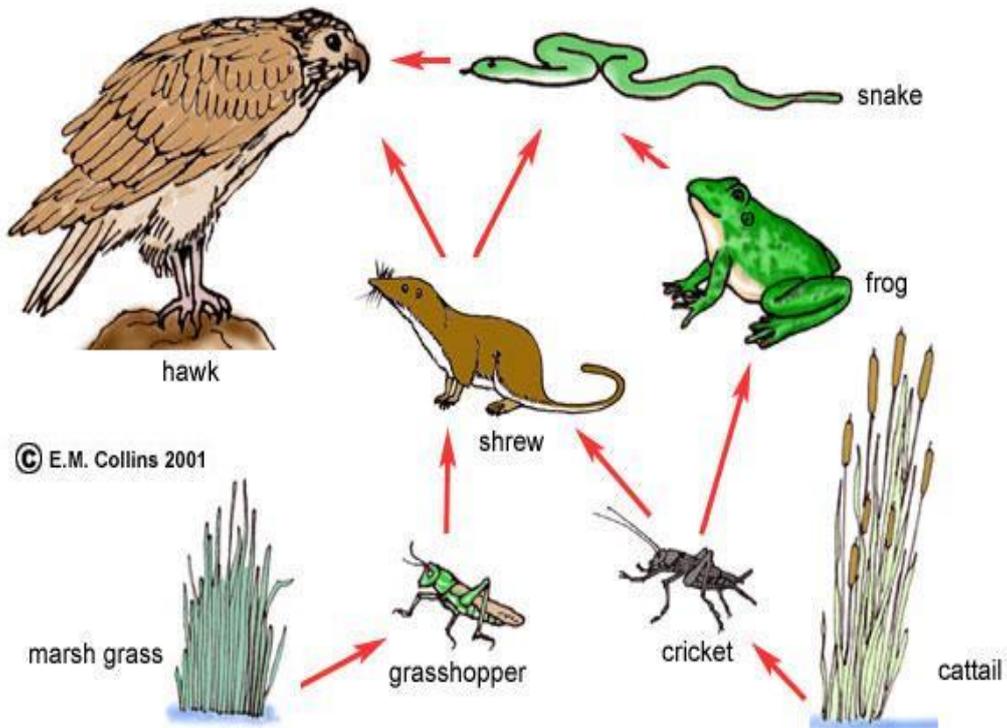
(i) Light: _____

(ii) Humidity: _____

(4)

(Total: 6 marks)

5. The following questions are based on the food web shown below.



- (a) Name **ONE** abiotic factor of the marsh grass: _____ (1)
- (b) Name **ONE** common biotic factor, shown in the food web, of the grasshopper and the cricket:
 _____ (1)
- (c) In the space below draw a simple pyramid of numbers, representing a food chain with five trophic levels from the food web above. (3)

(d) Explain why only 10% of the energy at any trophic level is transferred to the next trophic level.

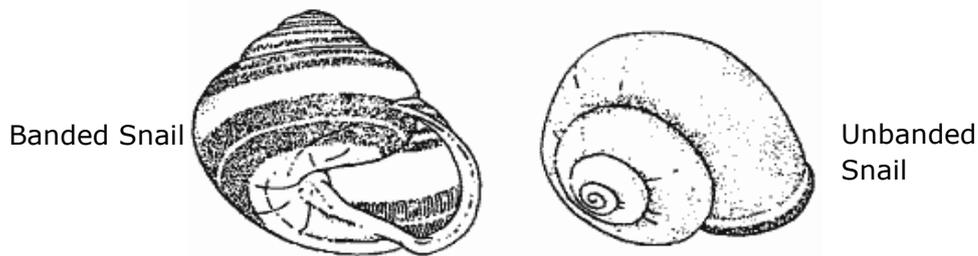
_____ (2)

(e) Stray cats have greatly reduced the population of shrews. Explain how this will affect the population of marsh grass.

_____ (2)

(Total: 9 marks)

6. The shells of a common species of snail vary in the pattern of dark bands found on their shells. The drawings show a banded snail and an unbanded snail. Song thrushes are birds that feed on these snails by breaking the snail shell on a flat stone and eating the soft parts.



In an investigation, two enclosed areas of a garigue floor were cleared of all snails and 300 banded and 300 unbanded snails were then introduced. The table below shows the number of living snails found in the two areas after two weeks.

| Garigue floor | Number of living banded snails | Number of living unbanded snails |
|------------------------|--------------------------------|----------------------------------|
| Area with vegetation | 226 | 147 |
| Area with small stones | 153 | 235 |

(a) Give **TWO** possible explanations for the results shown above.

 _____ (4)

(b) Explain why after several generations the two populations of banded and unbanded snails living in the two different garigue floors developed into two different snail species.

 _____ (3)

(c) Name the evolutionary process responsible for the development of two distinct snail species mentioned in (b) above.

_____ (1)

(d) List **TWO** examples of adaptations plants evolved to help them survive in a garigue.

(2)

(Total: 10 marks)

Section B: This section carries 20 marks.

7. Read the following passage, and use your knowledge and information from the text to answer the questions below:

All our lives, we have been repeatedly warned by our elders to avoid excessive social contact for fear of contracting harmful germs and bacteria. Turns out that it may not be all bad. A recently released study suggests that interaction with others also helps in the acquisition of good bacteria - at least in chimpanzees.

The study, a collaboration between scientists from several universities involved observing a group of wild chimpanzees in Tanzania's Gombe National Park from 2000 to 2008. The scientists were trying to determine if seasonal changes in social behaviour impacted the beneficial microbes that reside in the chimpanzee's digestive tract.

What they discovered was that during the rainy season, when the chimps were often seen sharing the abundant food with others, their gut bacteria had a lot of diversity. Conversely, in dry periods, when food supply was scarce and the animals spent time alone, the diversity of their gut bacteria was less varied.

While the change in diet and weather played a role, the researchers think social interaction was the main reason for the difference.

This is important because not only do good gut microbes play an essential role in digestion, but they also synthesize vitamins and help train the body's immune system.

Though the study was conducted on chimpanzees, the researchers think the results could also apply to humans. That's because we share numerous bacterial gut species with these mammals.

(Adapted from: dogonews.com)

(a) Microbes may carry harmful diseases. Define the term disease.

(2)

(b) Give a named example for:

(i) a viral disease; _____

(ii) a bacterial disease. _____ (2)

(c) Explain **TWO** ways how microbes mentioned in the passage, may be transmitted from one chimpanzee to another.

(4)

(d) People can be vaccinated against a large number of diseases.

(i) Why would an individual vaccinated for mumps become immune to the microbe causing mumps?

(2)

(ii) A large proportion of population is vaccinated against a specific strand of the influenza microbe. Suggest why the spread of the microbe will be very much reduced.

(2)

(e) The drugs that have really changed the treatment of communicable diseases are antibiotics.

(i) Explain what are antibiotics.

(2)

(ii) What types of diseases do they treat?

(1)

(f) Argue why antibiotics are not the complete answer to the problem of infectious diseases.

(2)

(g) Explain why the emergence of antibiotic-resistant bacteria is a cause of concern.

(3)

(Total: 20 marks)

Section C: This section carries 20 marks.

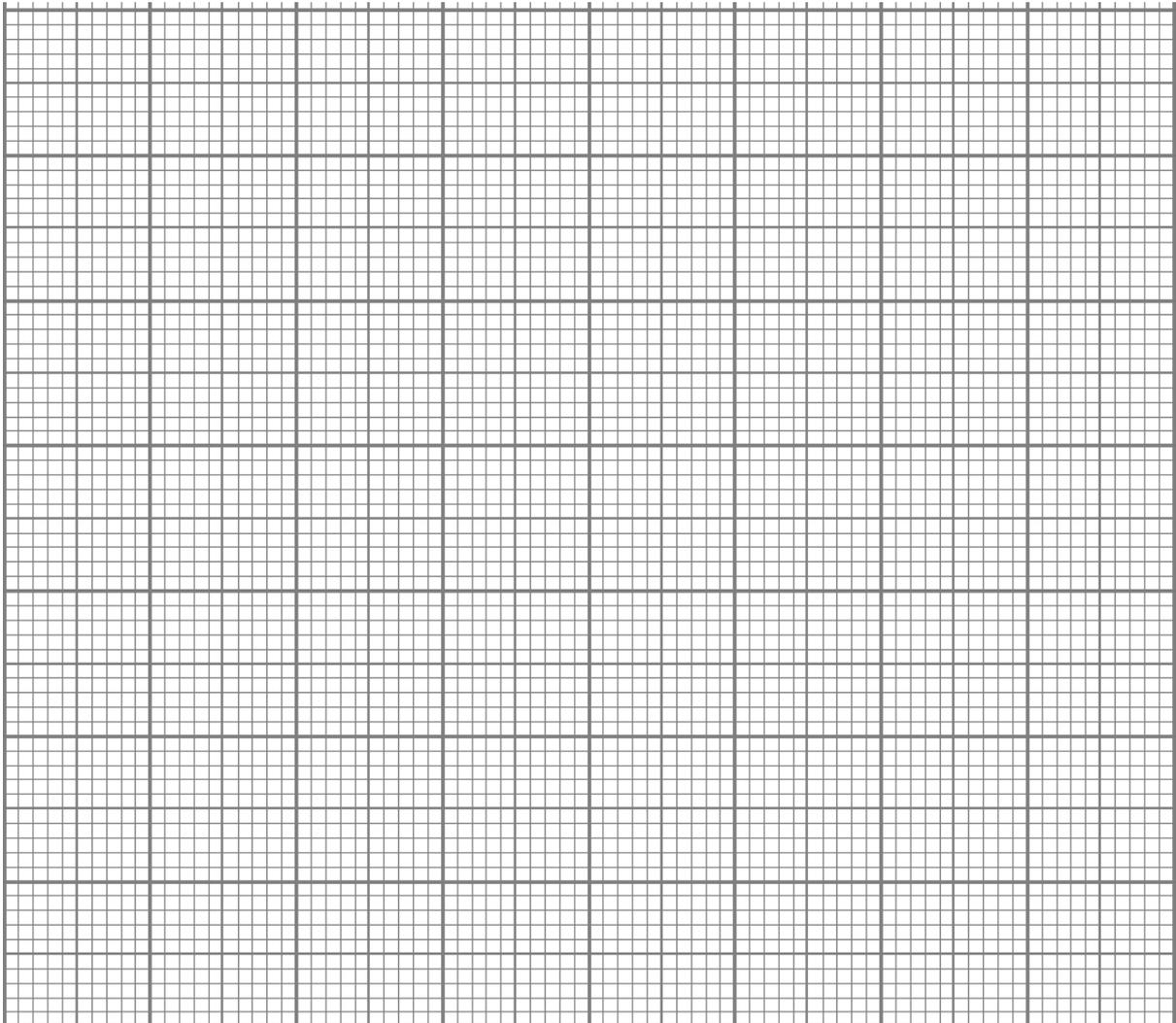
8. Interpret the data below and answer the following questions.

A group of students conducted a study of the change in carbon dioxide concentration in a closed greenhouse full of tomato plants over a 24 hour period. The green house uses natural light for plant growth.

| Time – in a 24 hour period (hrs) | Carbon dioxide concentration (in arbitrary units) |
|----------------------------------|---|
| 0 (Midnight) | 30 |
| 3 | 40 |
| 6 (Dawn) | 50 |
| 9 | 43 |
| 12 (Midday) | 30 |
| 15 | 20 |
| 18 (Dusk) | 16 |
| 21 | 20 |
| 24 (Midnight) | 30 |

Adapted from: <https://www.tes.com/teaching-resource/photosynthesis-data-handling-worksheet-6374772>

(a) On the graph paper provided, plot a graph of carbon dioxide concentration on the y-axis against time on the x-axis. (4)



(b) Describe the trend of the graph.

(3)

(c) Explain, using biological knowledge, why:

(i) Carbon dioxide concentration is at its highest at dawn.

(3)

(ii) Carbon dioxide concentration is at its lowest at dusk.

(4)

d. At what time of day will light intensity not be a limiting factor of photosynthesis?

(1)

e. Tomato fruits contain carbohydrates, fats and proteins. Out of the total carbohydrates, 31% is dietary fibre while the remaining 69% are monosaccharides.

(Reference <http://nutritiondata.self.com/facts/vegetables-and-vegetable-products/2682/2>)

(i) Explain the role of dietary fibre in the human alimentary canal.

(2)

(ii) Will the monosaccharide glucose in tomatoes be digested in the human alimentary canal? Give **ONE** reason for your answer.

(1, 2)

(Total: 20 marks)

Specimen Controlled Assessments Level 2-3 Marking Scheme

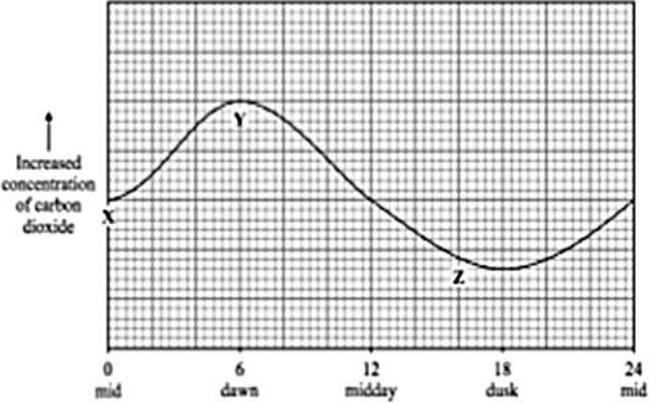
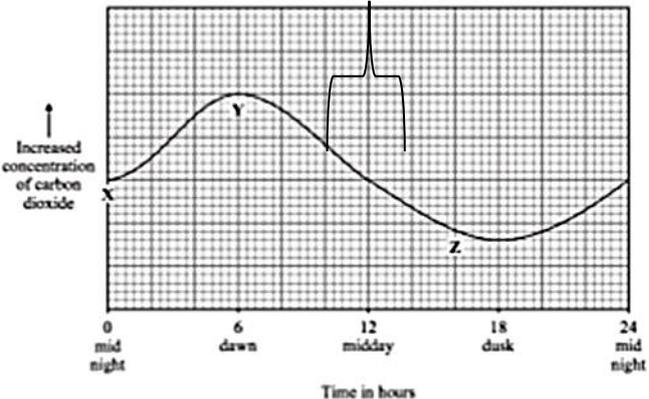
MATRICULATION AND SECONDARY EDUCATION CERTIFICATE
EXAMINATIONS BOARDL-Università
ta' Malta**SECONDARY EDUCATION CERTIFICATE LEVEL
MARKING SCHEME FOR SAMPLE PAPER**

SUBJECT: **Biology**
 PAPER NUMBER: **Level 2 – 3**
 DATE:
 TIME: 2 Hours

| Section A | | Marks | Comments |
|------------------|--|----------------------|--|
| 1 | Chloroplast Nucleus Mitochondrion Cell membrane | 4 | 1 mark each) |
| Total: | | 4 marks | |
| 2 | a. An enzyme is a biological catalyst that just facilitates the reaction without acting as a reactant. | 2 | |
| | b. Fat (lipid) layers insulate the body and prevent body heat from escaping. | 2 | |
| | c. Being made up of large molecules starch and glycogen are insoluble, while glucose is soluble. | 2 | |
| Total: | | 6 marks | |
| 3 | a.: <ul style="list-style-type: none"> • a large surface area • a moist surface • a thin alveolar wall • a dense capillary network | 3 | Any three from the list provided. 1 mark each |
| | b. Emphysema damages the delicate linings of the alveoli thus reducing the large surface area needed for efficient gaseous exchange. | 2 | |
| Total: | | 5 marks | |
| 4 | a. The xylem vessels are adapted for water transport because they are wide and continuous (have no end walls) tubes and have thick walls of lignin preventing them from collapsing. | 1 1 | |
| | b. (i) Light: In bright light stomata open to allow more carbon dioxide into the leaf for photosynthesis thus increasing transpiration. (ii) Humidity: Diffusion of water vapour out of the leaf slows down if the leaf is already surrounded by moist air (high humidity). | 2 2 | |
| Total: | | 6 marks | |

| | | | |
|--|---|----------------|---|
| 5 | a. sunlight; water; mineral salts; carbon dioxide | 1 | <i>Any one from the following or any other correct factor.</i> |
| | b. Shrew | 1 | |
| | c. Pyramid showing (i) the correct sequence of trophic levels, (ii) the correct number of trophic levels, (iii) the correct approximate size of each trophic level | 3 | Accept any alternative correct version of the pyramid. |
| | | | |
| | d. Most of the energy in a trophic level is lost as metabolic heat. | 2 | |
| e. Less shrews results in an increase in grasshoppers which reduces the population of marsh grass. | 2 | | |
| Total: | | 9 marks | |
| 6 | a. <ul style="list-style-type: none"> • The vegetation provided camouflage for the banded snails and so they were not easily spotted by the birds. • The white shell made the unbanded snails more visible among the vegetation and easily spotted by the birds. • The small stones provided camouflage for the unbanded snails and so they were not easily spotted by the birds. • The bands made the banded snails more visible among the small tones and thus easily spotted by the birds. | 4 | <i>Any two from the following or any other correct explanation.</i> 2 marks each |
| | b. As the selection pressure continues (birds eating 'visible' snails) the genes for particular shell patterns become more common in the genetic pool of their respective areas (i.e. banded snails in areas with vegetation and unbanded snails in areas with small stones). This increases the chances of these genes showing up in the following generations. | 3 | |
| | c. Natural selection | 1 | |
| | d. <ul style="list-style-type: none"> • reduced leaves to reduce water loss • have thick waxy cuticles to prevent evaporation • have water storage organs • leaves have aromatic oils that prevents the plant from being eaten by grazing animals | 2 | Any two from the following or any other correct feature. 1 mark each |

| | | | |
|---------------|---|----------------------------------|---|
| | <ul style="list-style-type: none"> grow a short and compact bushes acting as a wind breaker | | |
| Total: | | 10 marks | |
| 7 | (a) A disease is an attack on the organism by a harmful microbe that cause disruption to body processes and is recognised by signs and symptoms. | 2 | |
| | (b) (i) HIV (ii) Salmonella | 1 1 | Accept other equivalent examples |
| | (c) Through blood; through body fluid; from contaminated surfaces; from contaminated food; via animals; from the air e.g. air droplets. | 4 | 2 marks each |
| | (d) (i) Because the body would be able to rapidly mass-produce antibodies to kill off the mumps pathogens. (ii) The large proportion of the population who have been vaccinated against the pathogen won't catch the disease. This means that the people who aren't vaccinated are unlikely to catch the disease because there are fewer people able to pass it on. | 2 2 | |
| | (e) Antibiotics are medicines that can work inside the body by killing bacteria that cause disease. They damage the bacterial cells without harming the person's own cells. | 2 1 | 1 mark specifically for mentioning bacteria |
| | (f) Antibiotics cannot destroy viral pathogens so they have no effect on diseases caused by viruses. It is extremely difficult to develop drugs that will kill the viruses without damaging the cells and tissues of the body at the same time. | 2 | Allow for other equivalent relevant arguments |
| | (g) Strains of bacteria that are resistant to antibiotics are evolving. This means that antibiotics which used to kill a particular type of bacteria no longer have an effect. This is a cause for concern because unless scientists can discover new antibiotics soon, we may no longer be able to cure bacterial diseases. This means that many millions of people in the future will die of bacterial diseases that we can currently cure. | 1 1 1 | |
| Total: | | 20 marks | |

| | | | |
|-----------------|--|---|--|
| <p>8</p> | <p>a.</p>  <p style="text-align: center;"><i>Figure 2 - Graph of concentration of carbon dioxide against time (hrs)</i></p> <p>Correct scale</p> <p>Correct title/axes</p> <p>Correct plotting</p> | <p>1</p> <p>1</p> <p>2</p> | |
| <p>8</p> | <p>b. The carbon dioxide increases from midnight till dawn, decreases from dawn till dusk and increases again after dusk.</p> | <p>1</p> <p>1</p> <p>1</p> | |
| | <p>c.(i). Cellular respiration occurs during the night producing carbon dioxide that is released in the greenhouse through the stomata via gaseous exchange. No photosynthesis occurs during the night.</p> <p>(ii). From dawn till dusk the rate of photosynthesis increases with light intensity. It supersedes the rate of cellular respiration using carbon dioxide produced from cellular respiration and that which has accumulated in the greenhouse. Therefore the CO₂ concentration decreases.</p> | <p>1</p> <p>1</p> <p>1</p> <p>2</p> <p>1</p> | |
| <p>8</p> | <p>d.</p>  <p style="text-align: center;">Time in hours</p> | <p>1</p> | |

| | | | |
|----------|---|--|--|
| | e(i.) Dietary fibre is not digested in the alimentary canal but is used as bulk for the food as it moves down the alimentary canal. (ii). No, monosaccharides are the smallest molecules and can be absorbed by the ileum. | 2 1 1 1 | |
| | Total: | 20 marks | |
| 9 | a. Definition female/male gametes. The male gamete is the sperm. It is the reproductive cell that contains half the genetic material of the organism. The female gamete is the ovum. It is the reproductive cell that contains half the genetic material of the organism Importance of haploid since fusion will bring back correct number. | 2 2 | |
| | b. Brief explanation of implantation - Implantation is a process in which a developing embryo, moving as through the uterus makes contact with the uterine wall and remains attached to it until birth. The lining of the uterus prepares for the developing embryo and will develop into the placenta. Explanation of gestation - Period of development following implantation. From embryo to foetus and a significant increase in size once the baby is fully developed. Throughout gestation period the developing individual is attached to and dependent on the placenta for nutrients and exchange of substances Brief explanation of birth- Hormone induced process that involves muscular contracts from the mother, rapture of the amniotic sac, passage of baby through the cervix and out of vagina | 2 3 2 | |
| | c. -Crossing over in meiosis -Fusion of gametes from two individuals therefore variation Changes in environment and changes in competition | 1 ½ 1 ½ 2 | |
| | 2/3 examples from where stem cells can be obtained from around the body - Teeth, bone marrow, ovaries and testes, other examples are also valid Examples on how stems cells can be used and even save lives - Cure macular degeneration, stroke, burns, heart disease, diabetes, osteoarthritis, and rheumatoid arthritis. | 2 2 | |
| | Total: | 20 marks | |

Specimen Controlled Assessments Level 1-2-3 Private Candidates



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EXAMINATIONS BOARD

**SECONDARY EXAMINATION CERTIFICATE (SEC)
PRIVATE CANDIDATES PAPER
Level 1-2-3 SAMPLE PAPER**

SUBJECT: **Biology**

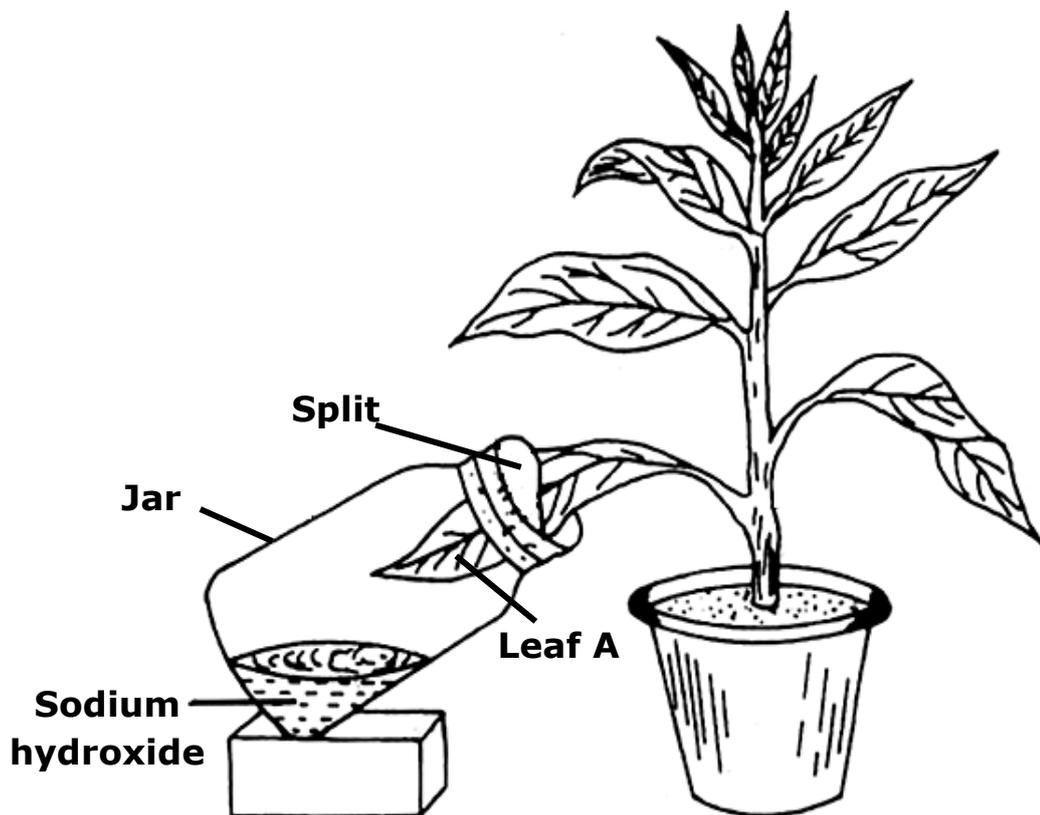
DATE:

TIME:

Answer ALL questions in ALL sections.

SECTION A: This section carries 15 marks

1. The apparatus shown below was set up to identify the gas/es necessary for photosynthesis to occur. Half of Leaf A is kept inside the jar with the help of a split cork. Sodium hydroxide inside the jar absorbs carbon dioxide.



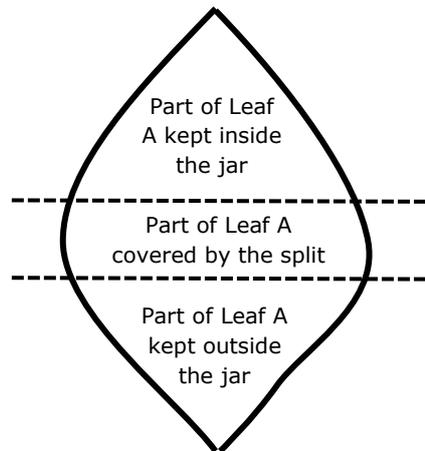
- a. Briefly explain why the apparatus was kept in a dark cupboard for three days **BEFORE** the start of the experiment.

_____ (2)

- b. Describe the effect of the presence of sodium hydroxide on photosynthesis.

_____ (2)

c. The sketch below shows the different areas of Leaf A. On the diagram lightly shade the areas that will test positively for starch.



(3)
(Total: 7 marks)

2. Three chips of equal size were cut from a raw sweet potato. Each potato chip was then placed in a different test tube for 30 minutes in the following way:

- Potato Chip A was placed in very strong sugar solution.
- Potato Chip B was placed in distilled water.
- Potato Chip C was placed in a solution of unknown concentration.

a. Describe the changes in size of the potato chips you would observe:

i. in Potato Chip A;

(1)

ii. in Potato Chip B.

(1)

b. After 30 minutes, no change was observed in Potato Chip C. Describe the concentration of the solution in the test tube of Potato Chip C.

(1)

c. Name the process responsible for the changes observed in the potato chips.

(1)

d. Mention **ONE** way how the experiment could be improved.

(2)

e. During the arid summer months, plants may exhibit wilting. Are the cells of the plant flaccid or plasmolysed? Explain your answer.

(2)

(Total: 8 marks)

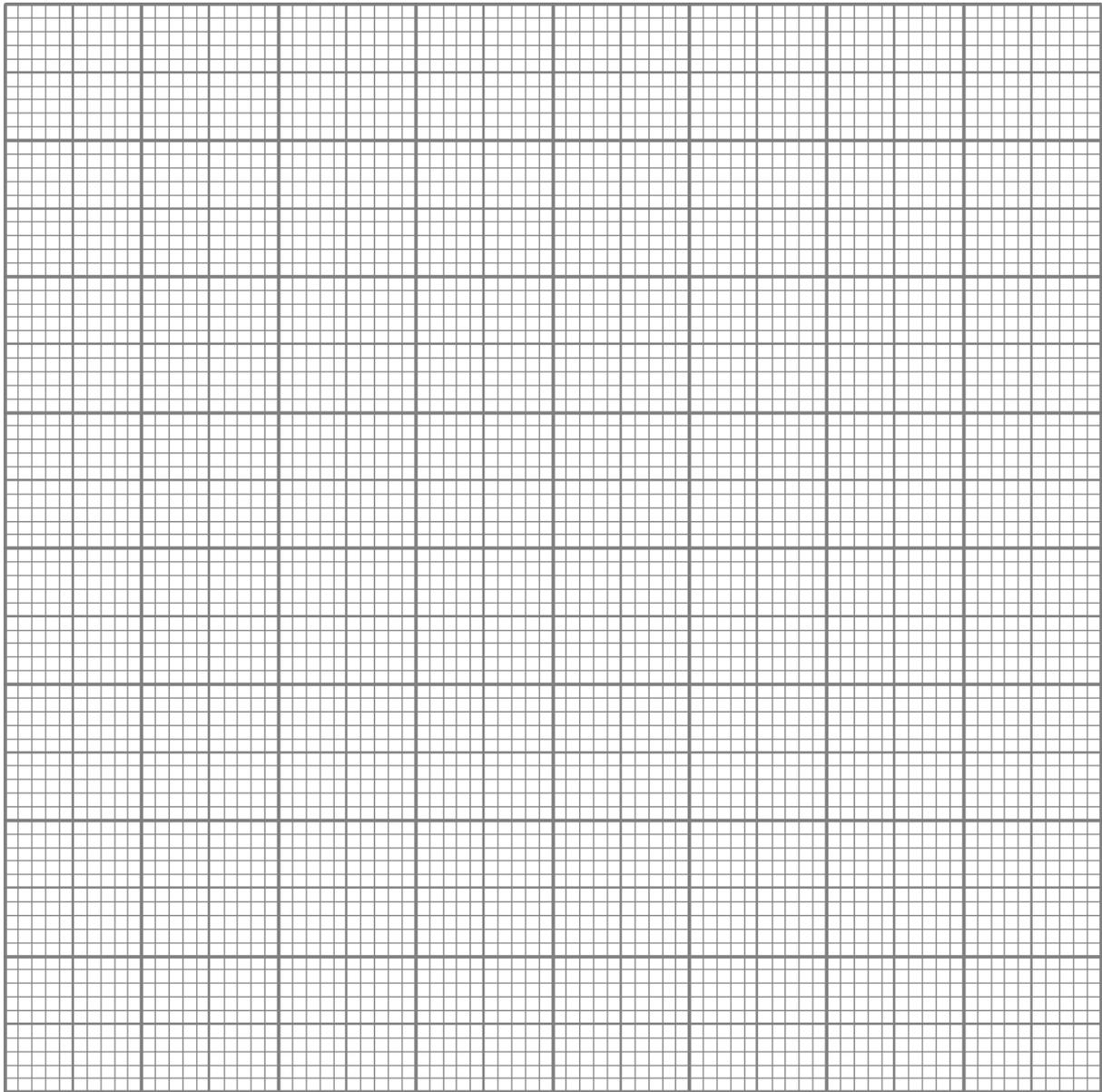
Section B: This section carries 30 marks.

3. A group of nutritionists performed a survey on dietary habits of young adolescent secondary school students. The following is some of the data they received.

| | Food | Categories of times per week | | | | |
|---------------------------------|------------------|------------------------------|--------------------|--------------------|------------|-------------|
| | | Never | 1 – 3 times a week | 4 – 6 times a week | Once daily | Twice daily |
| % frequency of food consumption | Legumes | 25 | 53 | 9 | 7 | 12 |
| | White meat | 37 | 48 | 7 | 6 | 5 |
| | Red meat | 40 | 32 | 13 | 12 | 3 |
| | Green vegetables | 55 | 26 | 4 | 4 | 4 |
| | Milk | 17 | 35 | 14 | 23 | 10 |

Adapted from http://applications.emro.who.int/emhj/1006/10_6_2004_853_862.pdf?ua=1

- a. Plot a bar chart to compare the % frequency of food consumption (y-axis) against the categories of times per week (x-axis) for milk. (5)



b. Identify **FOUR** components of milk which make it important for a balanced diet.

(4)

c. Discuss the merits of eating legumes rather than red or white meat.

(4)

d. Briefly describe **ONE** eating disorder that results from an unbalanced diet.

(2)

(Total: 15 marks)

4.

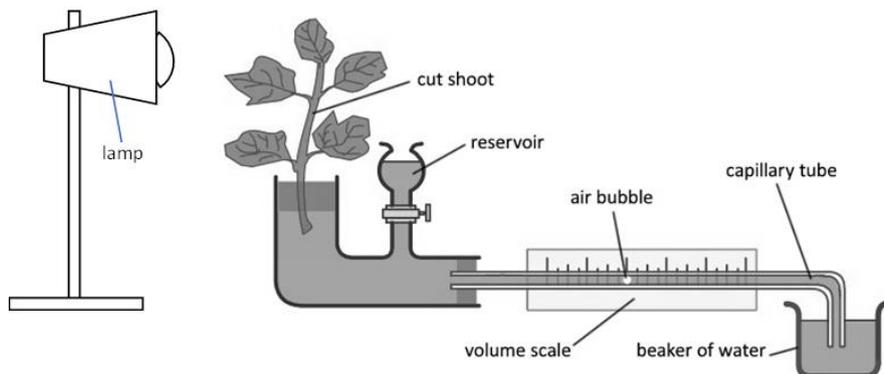
a. Define the term transpiration.

(2)

b. Identify **TWO** adaptations of plants that live in dry conditions to conserve water.

(2)

c. The apparatus below was used in an investigation on the effect of light intensity on the rate of transpiration.



Adapted from: <https://www.passmyexams.co.uk/GCSE/biology/images/potometer.jpg>

i. The rate of transpiration was measured by observing the movement of the air bubble. Explain what is causing the air bubble to move.

(3)

ii. State a way how the experiment was conducted under various light intensities.

(2)

iii. What is the function of the reservoir?

(1)

Graphs A and B are plotted from results taken by students on the effect of environmental factors on the rate of transpiration.

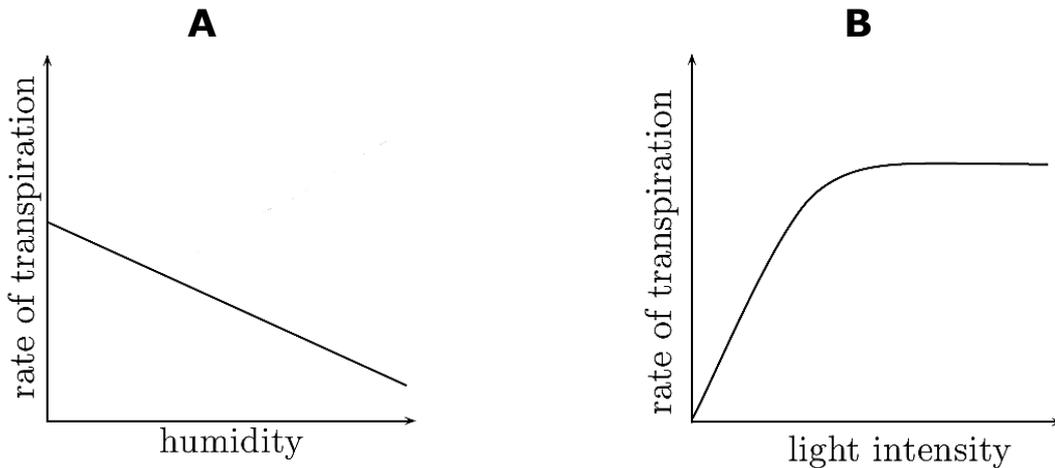


Figure 4.1

<https://www.siyavula.com/read/science/grade-10-lifesciences>

d. Describe Graph A: rate of transpiration against humidity.

(2)

e. From your biological knowledge, explain the observations in part (d).

(3)

(Total: 15 marks)

Section C: This section carries 25 marks.

5. Figure 5.1 shows a field method employed to survey an area of rather flat vegetated land. The term objects may refer to small plants, grasses, trees, shrubs or other types of non-moving and/or slow moving organisms.

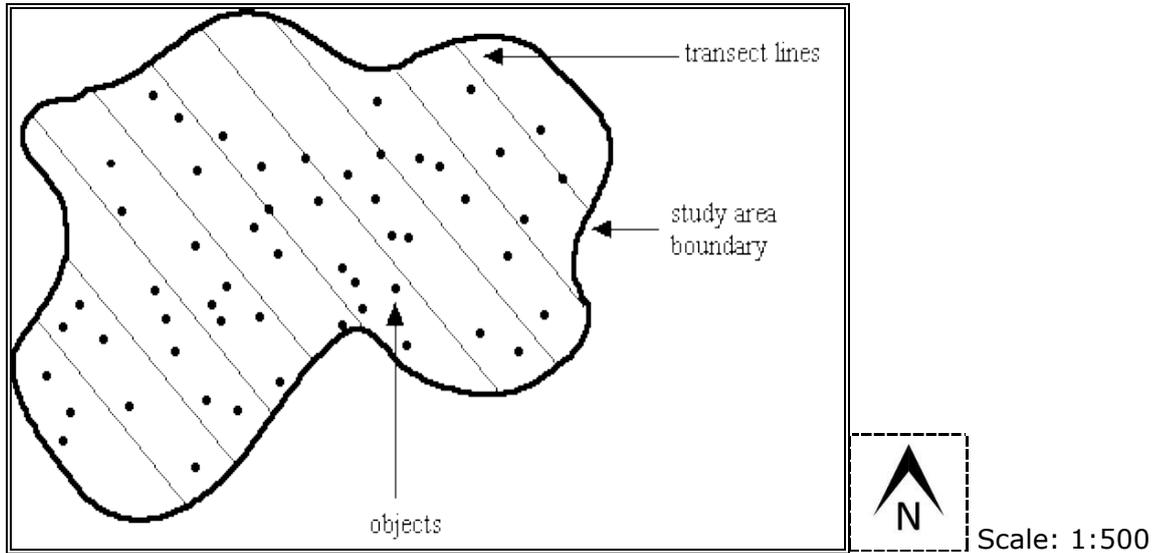


Figure 5.1 Area of land under investigation

Part I

a. With reference to Figure 5.1 answer the following questions.

i. In your own words, describe what is a line transect.

(2)

ii. Measure the longest and shortest line transects as shown in figure 5.1. Give your answers in cm.

(1,1)

iii. Using the scale provided in figure 5.1, calculate the actual length of **both** the longest and shortest line transects. Show your working and give your answer in metres.

(1,1)

b. The double lined rectangle surrounding the study area indicates the external boundary of the entire site under investigation.

i. Using the same scale, calculate the actual total area of the site under investigation. Show your working and give your answer in metres².

(2)

ii. On the diagram, draw line transects (to cover the entire site) from South to North with an inter-transect distance of 10 m. (2)

c. The site shown in figure 5.1 is located in the southern plains of Malta. The terrain in the study area shown is mostly covered with soil about 1.0 – 1.4 m deep. The black dots marked as 'objects' are in

fact large shrubs and trees 1.0 – 3.0 m high generally low-lying and rather wide. Smaller shrubs occur mostly towards the northern tip of the study area while carob trees dominate the south-western tip of the area.

i. Underline the correct answer.

This community may be described as; (garigue, maquis, pine woodland, sand dune, steppe). (1)

ii. Give **TWO** reasons for your answer.

(2)

iii. Excluding the carob tree, give **TWO** examples of indigenous trees you would expect to find in such a community.

(2)

Part II

Five classes from five schools in different countries took part in an international fieldwork project. Each class went on a fieldtrip and observed several habitats and ecosystems. Students were told to keep a photographic record of all their observations.

After sorting out all the pictures they took, students from the different countries met in small groups on social media to discuss their observations. Each group uploaded a number of images, and observations were discussed with other groups that had not actually visited the site shown in the uploaded pictures.

Below are some examples of the uploaded pictures. Each picture is accompanied by one or more observations.



While walking in the forest a group of students in Slovenia took this photo. They noted that the path was full of grass while inside the forest no grass was present under the trees.

a. Give **ONE** possible explanation for this observation.

(1)

A group of students went on a field trip to what is known as 'The Slovak Paradise'. They later uploaded the following images.



Mushrooms growing in between stones on rough terrain.



Mushrooms growing on a dead tree trunk deep inside the forest.

b. These mushrooms are growing in two very different habitats. State **ONE** environmental condition needed for them to grow successfully.

(1)

c. From your knowledge about Fungi, state **ONE** environmental factor which these mushrooms do **not** need, but which is necessary for the plants in the forest to survive.

(1)



Students walking along a path on the Isle of Wight noted this plant with the following characteristics:

- bright yellow flowers;
- a distinct sweet scent;
- growing very low on the ground.

d. Give **ONE** possible explanation for the bright yellow flowers and sweet scent.

(1)

Another group of students visited the sand dunes in Gdansk, Poland. They later uploaded the picture below. Some students from Italy noticed that the sand dune ended abruptly and was replaced by a thick forest with a very sharp boundary.

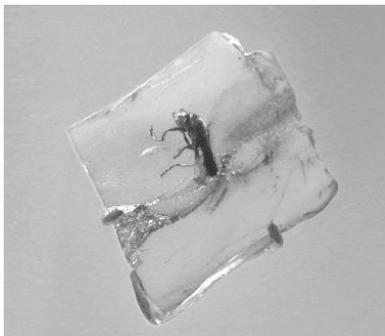


e. Which abrupt change in terrain would you expect to find if you had to walk from the sand dune into the forest? Explain your answer.

(2)

f. These sand dunes face the Baltic Sea which is rough and stormy sometimes for more than one week at a time. Explain briefly why the grasses seen growing on the sand dune are important for the dunes themselves.

(2)



The group of Italian students visited the local natural history museum in Poland. They were amazed by the exhibit of the 'fossilized' insects and flowers trapped in amber. This picture shows one example.

g. The caption with this exhibit explained that many species of modern flowering plants and insects evolved at approximately the same time. Explain why this statement is probably true.

(2)

(Total: 25 marks)

Section D: This section carries 30 marks

6. Fruits contain the seeds of a plant. They are dispersed from the parent plant in a variety of ways. A student investigated the dispersal of two different fruits, **E** and **F**, by measuring the distance travelled by the fruits from their parent plants. Figure 6.1 below shows fruits **E** and **F**.

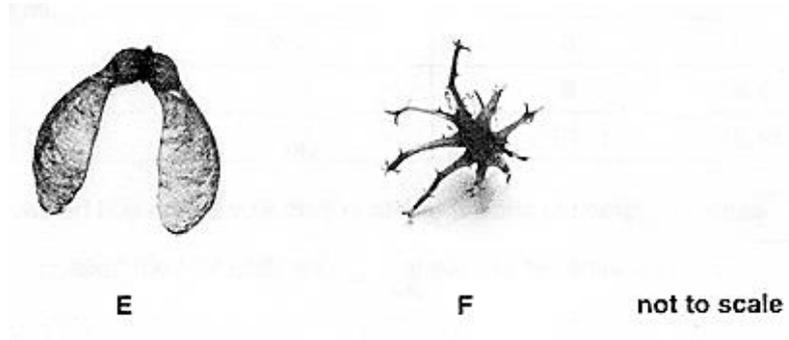


Figure 6.1

a. Use the figure to describe **TWO** visible differences, other than size, between fruits **E** and **F**. Write your answers in table 6.2 below. (2)

Table 6.2

| | E | F |
|---------------------|----------|----------|
| Difference 1 | | |
| Difference 2 | | |

b. Distinguish between self and cross pollination.

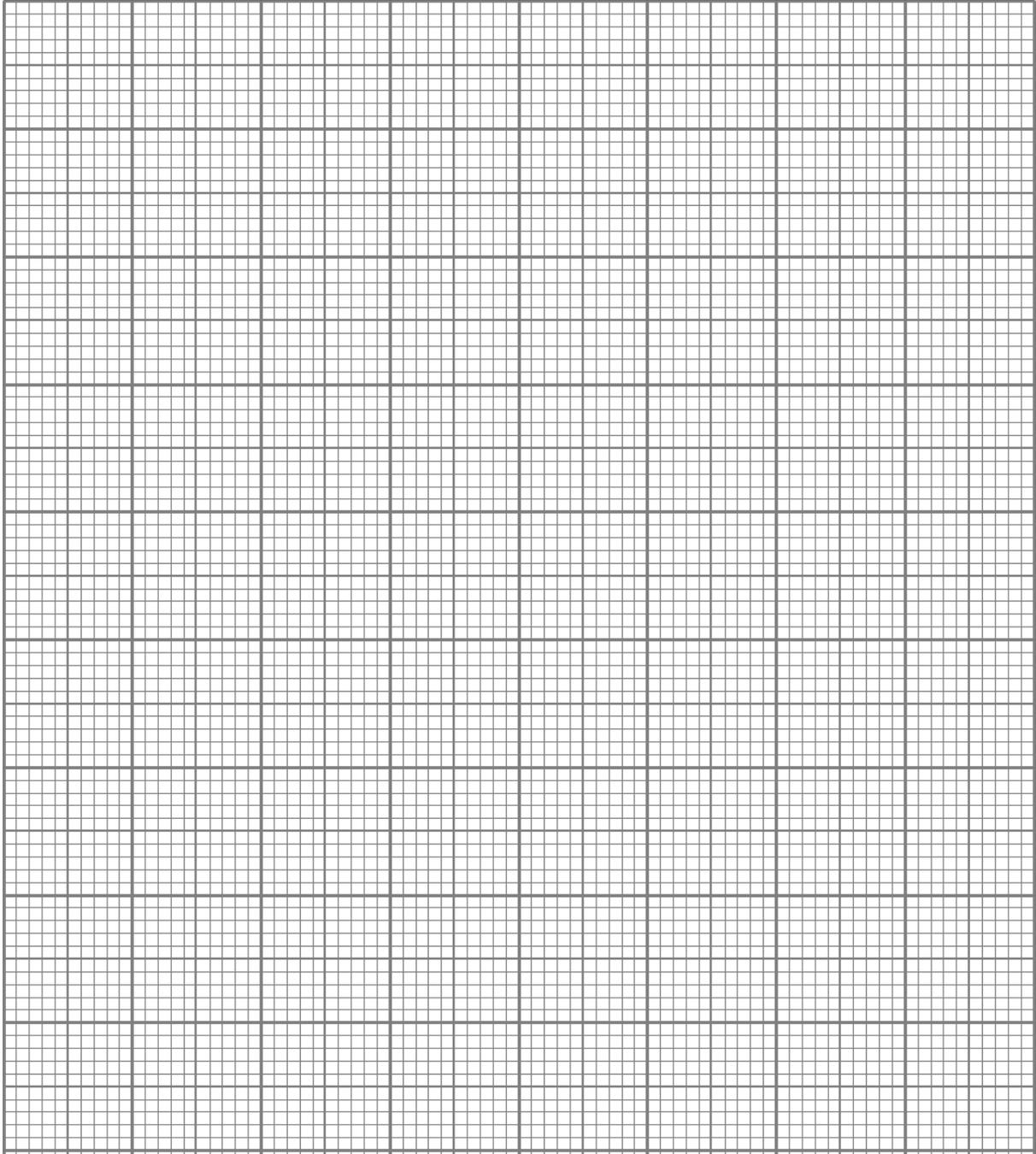
(2)

The student measured the distance travelled by 10 fruits of each type from their parent plants at different wind speeds. They calculated the average distance travelled at each wind speed. The results are shown in the Table 6.3.

| Wind speed / ms⁻¹ | Average distance travelled by fruit / m | |
|-------------------------------------|--|----------|
| | E | F |
| 2 | 2.6 | 0.2 |
| 4 | 4.5 | 3.6 |
| 6 | 7.9 | 2.3 |
| 8 | 9.9 | 4.2 |
| 10 | 14.2 | 6.7 |

Table 6.3

c. Draw a graph to show the data in the table above, on the grid below. Use the same set of axes to show the data for both fruits. (4)



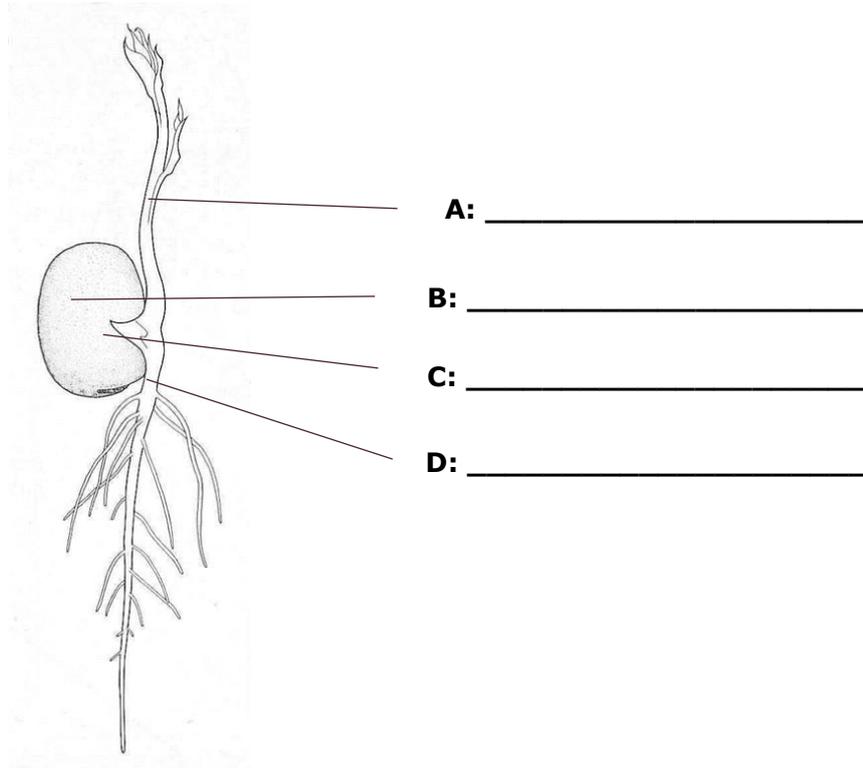
d. **E** is dispersed by the wind. Describe the evidence from the data that supports this statement.

(1)

e. Distinguish between the challenges faced by flowering and non-flowering plants to disperse their reproductive structures.

(2)

f. Once a fruit has been dispersed, the seeds can germinate. The figure below shows a germinating seed. Label the following diagram. (4)



g. A student wanted to find out how temperature might affect the germination of seeds. State:

i. the variable that should be changed;

_____ (1)

ii. the variable that should be measured and recorded;

_____ (1)

iii. **ONE** variable that should be kept constant.

_____ (1)

Another student decided to carry out an investigation to show the effects of temperature on plant growth.

- Two sets of soaked bean seeds were placed on moist paper in containers.
- The containers were wrapped in foil to keep out the light.
- One container was placed for three days in a refrigerator at 4°C.
- The other container was left for three days in a warm place at 30°C.

The figures below show these two sets of germinated bean seedlings after three days.

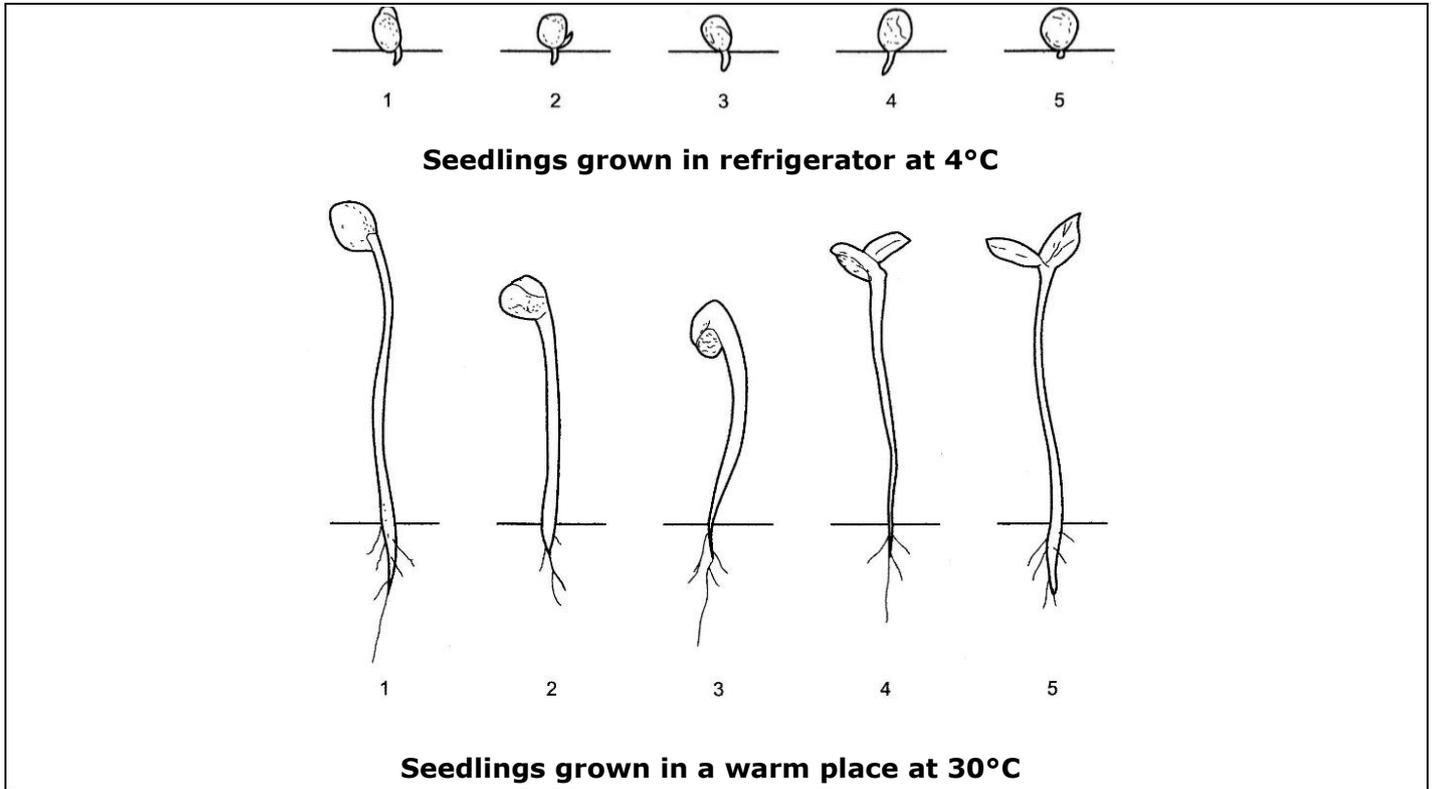


Figure 6.5

h. Describe the process of germination.

(2)

i. Explain the differences in appearance of the set of seedlings grown at 4°C and those grown at 30°C.

(4)

j. State **ONE** reason why it is necessary to calculate the mean to measure the length of more than one seedling.

(1)

A third student decided to observe yeast cells in a glucose solution. The figure below shows the number of yeast cells in a flask measured over a period of 12 hours.

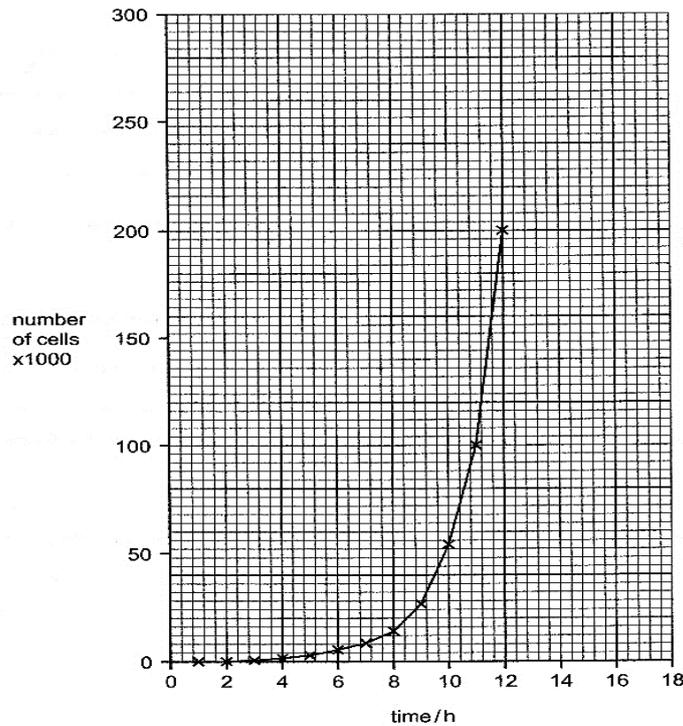


Figure 6.6

k. State how you would observe the yeast cells.

(1)

l. Describe the trend shown in the graph in figure 6.6 (2)

(1)

m. From the information provided, determine the population of yeast cells at 10 hours.

(1)

n. Explain **TWO** conditions required to maintain the maximum growth of the yeast population.

(2)

(Total: 30 marks)

END OF PAPER

Specimen Controlled Assessments Level 1-2-3 Private Candidates Marking Scheme



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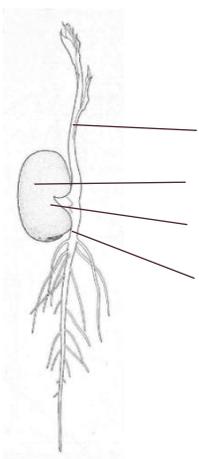
**SECONDARY EDUCATION CERTIFICATE LEVEL
MARKING SCHEME FOR PRIVATE CANDIDATES SAMPLE PAPER**

SUBJECT: **Biology**
PAPER NUMBER: **Level 1 – 2 – 3**
DATE:
TIME: 2 Hours

| Suggested Answers | | | Marks | Comments |
|-------------------|----|--|--|---|
| 1 | a. | No photosynthesis occurs in the dark. While in the dark the plant uses up all its stored starch. One can then be sure that any presence of starch found after the experiment would have been produced during the experiment. | 1 1 | |
| | b. | Carbon dioxide is a substrate in the process of photosynthesis. Lack of this gas will stop the process of photosynthesis. | 1 1 | |
| | c. | Shaded part: part outside the jar. Unshaded parts should include: (i) part inside the jar and (ii) part covered by split cork. | 3 | 1 mark for each correct part |
| Total: | | | 7 marks | |
| 2 | a. | (i) Potato Chip A would shrivel in size (ii) Potato Chip B would increase in size | 1 1 | |
| | b. | The concentration of the solution is equal to the concentration of the cytoplasm/ vacuolar sap of potato cells. | 1 | |
| | c. | Osmosis. | 1 | |
| | d. | Strips could be measured so that changes in size could be quantified. | 2 | Accept any other equivalent answer. |
| | e. | flaccid This is when the cell membrane is not detached. | 1 1 | |
| Total: | | | 8 marks | |
| 3. | a. | Title and axes. Correct scale. Key. Plotting of bars. | 1 1 1 2 | |
| | b. | Carbohydrates, lipids, and proteins, mineral ions*, vitamins and water. | 4 | Accept any four. * accept Calcium \` accept Vitamin D 1 mark each. |

| | | | | |
|------------------------|---|--|----------------------|---|
| | c. | Legumes are a source of proteins, lipids, and carbohydrates while meat is a rich source of protein but contains lipids that may lead to health problems. | 2 2 | |
| | d. | Name of disorder (e.g., obesity) Brief description of disorder (e.g., a disorder involving an excessive amount of body fat). | 1 1 | |
| Total: | | | 15 marks | |
| 4. | a. | Transpiration is the evaporation of water from the stomata of plant leaves. | 2 | |
| | b. | Sunken stomata; thicker waxy cuticle; short hairs on leaf surface; leaves able to roll | 2 | |
| | c. | i. Water is lost through the shoot by transpiration pulling the water (and the bubble) in the tube. ii. Moving the lamp to various distances away from the apparatus. iii. To reset the air bubble. | 1 | |
| | | | 1 | |
| | | | 1 | |
| | d. | As the humidity increases the rate of transpiration decreases. | 2 | |
| e. | As the air surrounding the stomata become saturated with water droplets the concentration gradient of water from the leaf to the surrounding air decreases. Less water droplets evaporate and diffuse out of the leaf. | 1 | | |
| | | 1 | | |
| | | 1 | | |
| Total: | | | 15 marks | |
| 5 Prt I | ai. | A line transect is a straight line that cuts across a habitat or natural landscape or part of it. It can be a made out of a simple string or rope (marked/graduated or unmarked/ungraduated) laid on the ground. Observations and measurements can be made along this line | 2 | Accept any other equivalent answer. |
| | aii. | <u>Longest:</u> 7.5 cm <u>Shortest:</u> 3.5 cm | 1 1 | 1 mark for each correct answer |
| | aiii. | <u>Longest</u> 7.5 X 500 = 3750 3750/100 = 37.50 m <u>Shortest</u> 3.5 X 500 = 1750 1750/100 = 17.50 m | 1 | |
| | | | 1 | |
| | bi. | 13 X 500 = 6500 6500/100 = 65 m 8.5 X 500 = 4250 4250/100 = 42.50 m Area = 65.00 X 42.50 = 2762.5 m ² | 2 | 1 mark for correct answer 1 mark for correct working |
| bii. | No. of transects should be six, with equal inter-transect distances. Borders excluded, transects should be N-S. | 1 1 | | |

| | | | | |
|-------------------------|--|---|-----------------|-------------------------------------|
| | ci. | Maquis | 1 | |
| | cii. | Any two of: Trees & size of trees, presence of carob trees, depth of soil. | 2 | Accept any other equivalent answers |
| | ciii. | Any two of: Lentisk, Olive and Buckthorn, Bay laurel Sandarac gum tree and Myrtle. | 2 | Accept any other two valid answers |
| 5 Prt II | a. | Much more sun reaches the path, so grass grows. Too much shade in the forest. | 1 | |
| | b. | Shade, water. | 1 | Accept dampness, moisture |
| | c. | Sun light | 1 | |
| | d. | To attract insects, the plant is insect pollinated | 1 | |
| | e. | From sand to soil. Forests don't grow on sand | 2 | 1 mark each |
| | f. | Grass and roots hold the sand in place, therefore protect the dunes from winds. | 2 | |
| | g. | Many flowering plants need insects for pollination while many insects need flowers as a source of food, pollen and nectar. Flowers and insects may be highly adapted to each other. | 2 | |
| Total: | | | 25 marks | |
| 6 | a. | Difference 1 (shape / outline) E – blades / wings / aerodynamic shape / smooth / 2 projections F – spines / thorns / spikes / hooks / branched / uneven Difference 2 (symmetry) E – regular F – irregular Difference 3 (seed) E – at one end / two F – not visible / one / number not known | 2 | 1 mark per difference |
| | b. | Self-pollination – pollen is transferred from the anther of a flower to the stigma of either the same flower or another flower of the same plant. | 1 | |
| | | Cross-pollination – when pollen is transferred from the anther of a flower to the stigma on a flower of another plan of the same species. | 1 | |
| | c. | Axes labelled correctly and scaled evenly; Graph title | 1 | |
| | | Points plotted accurately | 1 | |
| | | Correct lines for E and F | 1 | |
| Key | | 1 | | |
| d. | Distance travelled by E increases with wind speed. Positive correlation between the two. | 1 | | |
| e. | Any two from: lack of availability of dispersal mechanisms, large numbers and loss of gametes, competition when seeds fall close to parent for light, water and nutrients. | 2 | | |

| | | | |
|---------------|---|-----------------|--|
| f. |  <p>A: plumule B: testa / seed C: cotyledons D: radicle</p> | 4 | 1 mark per label Accept labels B and C interchanged |
| gi. | Temperature | 1 | |
| gii. | How many germinate or time taken to germinate | 1 | Any one |
| giii. | Volume of water; concentration of oxygen; seed type; seed species; seed size | 1 | Any one from the list provided |
| h. | Germination refers to the growth of seeds into a new plant. This happens when the roots start to grow towards gravity. They absorb water and minerals. This enables the shoots to start growing upwards towards the sun. The formation of leaves enables the plant to harvest energy from the sun. | 2 | |
| i. | Faster growth and development in seedlings grown at 30°C than 4°C. This is because the temperature is more ideal for enzymes and so overall reactions happen faster. Differences in: Shoot/plumule – not visible in seedlings at 4°C but present and elongated in seedlings at 30°C Testa – still present in seedlings at 4°C but some are detached in seedlings at 30°C Leaf – not present in seedlings at 4°C but present and developed in seedlings at 30°C Root/radicle – not developed in seedlings at 4°C but developed in seedlings at 30°C | 4 | |
| j. | This is necessary to eliminate differences / to make the test more reliable. | 1 | Any one |
| k. | By using a microscope. | 1 | |
| l. | The number of cells increases at a very slow rate till around 8hrs but increases exponentially to 200 cells until 12hrs. | 1 | |
| m. | 54 yeast cells | 1 | |
| n. | Any two of: Ensure warm/suitable temperature; sterile surrounding; suitable nutrients for yeast; well aerated. | 2 | |
| Total: | | 30 marks | |