MINISTRY OF EDUCATION

NAMIBIA SENIOR SECONDARY CERTIFICATE

BIOLOGY
SPECIMEN PAPERS 2–3 AND
MARK SCHEME
ORDINARY LEVEL
GRADES 11 – 12

THESE PAPERS AND MARK SCHEMES SERVE TO
EXEMPLIFY THE SPECIFICATIONS IN THE LOCALISED
NSSC BIOLOGY ORDINARY LEVEL SYLLABUS

2006
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MINISTRY OF EDUCATION

Namibia Senior Secondary Certificate (NSSC)

BIOLOGY: ORDINARY LEVEL

PAPER 2
SPECIMEN PAPER

TIME: 2 Hours

MARKS: 100

INSTRUCTIONS TO CANDIDATES

Write your Centre number and candidate number in the space at the top of this page.

Answer all questions.
Write your answers in the spaces provided on this question paper.
Use a sharp pencil for your drawings. Coloured pencils or crayons should not be used.

INFORMATION TO CANDIDATES

The intended number of marks are given in brackets [ ] at the end of each question.
1. Fig. 1.1 shows the heads of six different birds.
(a) Use the key to identify the genus of each bird.

Write the genus in Table 1.1.

1. Beak more than 3 times longer than its maximum width
   - Beak less than 3 times longer than its maximum width

2. Beak straight
   - Beak curved

3. Upper part of beak wider than lower part
   - Both parts of beak of equal width

4. Upper part of beak longer than lower part
   - Both parts of beak of equal length

5. Both parts of beak meet at the tip
   - The parts of the beak cross over

<table>
<thead>
<tr>
<th>bird</th>
<th>genus</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td></td>
</tr>
</tbody>
</table>

Table 1.1

[5]
[Total : 5]
2. Fig. 2.1 shows a typical plant cell.

(a) (i) Name the type of plant cell shown in Fig. 2.1.

........................................................................................................................................ [1]

(ii) Identify structures labelled A, B and C.

A ........................................................................................................................................
B ........................................................................................................................................
C ... .................................................................................................................................... [3]

(iii) State the functions of structures A and C.

A ........................................................................................................................................

........................................................................................................................................
B ........................................................................................................................................

........................................................................................................................................ [2]
The cell in Fig. 2.1 was put in a beaker containing concentrated salt solution for 30 minutes.

(b) (i) In the space below, draw the appearance of this cell in salt solution. **No labels are required.**

(ii) Name the process that has caused the change in appearance of the cell.

(iii) Explain the appearance of this cell in terms of water potential gradient.

[Total: 15]
3. Fig. 3.1 shows the human digestive system and associated organs.

(a) (i) On Fig. 3.1, use the letter \( X \) to identify the gall bladder. \[1\]

(ii) Name the parts labelled \( A \) and \( C \).

\[
\begin{align*}
A & \quad \text{………………………………………………………………………………………………..} \\
C & \quad \text{………………………………………………………………………………………………..} \quad [2]
\end{align*}
\]

(iii) State \textbf{two} functions of part \( D \).

\[
\begin{align*}
1 & \quad \text{………………………………………………………………………………………………..} \\
2 & \quad \text{………………………………………………………………………………………………..} \quad [2]
\end{align*}
\]
Part B contains villi.

(b) Draw a labelled diagram to show the structure of a villus.

(c) State two ways in which a villus is adapted for absorption.
   1 ……………………………………………………………………………………... ………………………………………………………………………………………... 2 ………………………………………………………………………………………... ………………………………………………………………………………………...

(d) Describe the role of pancreatic juices in the small intestine.
   ………………………………………………………………………………………... ………………………………………………………………………………………... ………………………………………………………………………………………... ………………………………………………………………………………………... ………………………………………………………………………………………... ………………………………………………………………………………………... ………………………………………………………………………………………...
Fig. 4.1 shows two different neurones.

(a) (i) Identify neurone A and neurone B.

A ……………………………………………………………………………………... [2]

B ……………………………………………………………………………………... [2]

(ii) State one difference in function between neurone A and neurone B.

…………………………………………………………………………………………... [1]

…………………………………………………………………………………………... [1]

A bare footed student steps on a thorn. He pulls his foot away immediately, without thinking.

(b) (i) State the name of this action.

…………………………………………………………………………………………... [1]

(ii) Using the example above, describe the process that resulted in the action.

…………………………………………………………………………………………... [4]
Both the nervous and hormonal systems are responsible for coordination in the human body.

(e) Complete the table using ticks (✓) and crosses (✗) to show the differences between the nervous and hormonal systems.

<table>
<thead>
<tr>
<th></th>
<th>nervous</th>
<th>hormonal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Uses electrical impulses</td>
<td>✓</td>
<td>✗</td>
</tr>
<tr>
<td>2. Effects are long lasting</td>
<td>✓</td>
<td>✗</td>
</tr>
</tbody>
</table>

[Total: 10]
5. Read the following extract from a magazine and answer the questions:

360 billion dollars are spent annually by industrialised countries on subsidies to their farmers. This money is used to produce food for western countries. A large percentage is used to buy pesticides and fertilisers to increase crop yield.

Some of the crops, such as maize are produced and used as food for humans. However, much is fed to animals such as cows that are then eaten.

(a) (i) Name the trophic level represented by:

1 cow .................................................................

2 maize ............................................................ [2]

(ii) Construct a food chain involving cow, maize and man.

[b] [2]

(b) Explain how fertilisers and pesticides can be used to increase crop yield.

1. fertilisers ..........................................................

.................................................................................

................................................................................. [4]

2. pesticides ...........................................................

.................................................................................

................................................................................. [4]

(c) Explain how the overuse of pesticides may lead to serious environmental damage.

.................................................................................

................................................................................. [4]
(d) Explain why there is an increased efficiency in supplying maize as human food rather than using maize as food for cows, that are then eaten by humans.

........................................................................................................................................... [3]

[Total: 15]
Fig. 6.1 shows an external view of the heart.

Fig. 6.1

(a)  (i) Identify the blood vessels labelled A and B, using names from the list of blood vessels below.

<table>
<thead>
<tr>
<th>aorta</th>
<th>pulmonary artery</th>
<th>pulmonary vein</th>
<th>vena cava</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(ii) State and explain the effect on the heart of a blockage in the coronary vessel at X.

Effect...................................................................................................................

Explanation............................................................................................................

.............................................................................................................................. [3]

(iii) State one way in which the risk of such a blockage could be reduced.

.............................................................................................................................. [1]
Fig. 6.2 shows a section through the heart.

(b) (i) On the diagram, shade the ventricle that contains deoxygenated blood. [1]

(ii) Name the organ to which deoxygenated blood is pumped after leaving the heart.

........................................................................................................................................ [1]

(c) (i) Name the valve labelled Y.

........................................................................................................................................ [1]

(ii) Describe the function of valves in the heart.

........................................................................................................................................
........................................................................................................................................
........................................................................................................................................ [2]

[Total : 10]
Protea seed company has packets of seeds for sale. The label on the seed packet is shown in Fig. 7.1.

A farmer planted seeds from one of these packets and found that all of the plants produced were tall. These were then cross pollinated with each other. The farmer collected all the seeds produced. The next year when he planted these seeds, some of the new plants were tall while the rest were short.

Height in these plants is controlled by a gene with two alleles, T (tall) and t (short).

(a) (i) Define the term *allele*.

(ii) State the term used to describe the genetic condition in an organism whose cell nuclei contain pairs of identical alleles.
(b) Using the symbols $T$ and $t$, list the possible genotype crosses that the Protea seed company could have used to produce the seeds in the packet. Briefly explain your answer.

Genotype crosses

Explanation

(c) (i) Using the symbols $T$ and $t$, complete the diagram to show the genotype(s) of the seeds in the packet that the farmer bought, the gametes and the offspring produced through cross-pollination.

Parents: ...........................................  X  ...........................................

Gametes:  


(ii) State the ratio of phenotypes in the offspring of the above cross.

(iii) Suggest a possible reason for the presence of both tall and short plants in the second generation.

(iv) Explain whether the farmer can guarantee that all the seeds collected in the fifth year will result in tall plants.

The farmer wanted to produce a pure breeding line of tall plants. He collected seeds only from tall plants. The following summer, he planted the collected seeds and then repeated the same process for five years.

[Total: 14]
Table 8.1 indicates the estimated life expectancy, as a result of a HIV / AIDS infection in the three Sub-Saharan countries in 1982 and 1999.

<table>
<thead>
<tr>
<th>country</th>
<th>Life expectancy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1982</td>
</tr>
<tr>
<td>Botswana</td>
<td>59</td>
</tr>
<tr>
<td>Namibia</td>
<td>54</td>
</tr>
<tr>
<td>South Africa</td>
<td>58</td>
</tr>
</tbody>
</table>

(a) (i) State which country has:

1. the smallest decrease in life expectancy between 1982 and 1999;


percentage decrease …………………. [2]

(b) Describe two ways in which HIV / AIDS infection can be prevented.

1. ………………………………………………………………………

2. ………………………………………………………………………... [2]

[Total: 6]
Fig. 9.1 shows a section through a leaf.

(a) On Fig. 9.1

(i) draw arrows to show the movement of water from the xylem to a spongy mesophyll cell; [2]

(ii) write letter A to indicate where transpiration will take place; [1]

(iii) write letter B to indicate the region where most photosynthesis takes place. [1]

(b) Explain why photosynthesis in the leaf may be reduced if it suffered from a magnesium ion deficiency.

........................................................................................................................................
........................................................................................................................................
........................................................................................................................................ [2]

[Total: 6]
MINISTRY OF EDUCATION

Namibia Senior Secondary Certificate (NSSC)

BIOLOGY: ORDINARY LEVEL

PAPER 2:
MARK SHEME

Question 1
1. (a) A Numenius;  
   B Loxia;  
   C Parus;  
   D Pelecanus;  
   E Psittacus;  
   F Phalacrocorax;  
   max. 5

Question 2
2. (a) (i) palisade (mesophyll);  
   (ii) A chloroplast;  
        B vacuole;  
        C cell wall;  
        max. 3
   (iii) A site of photosynthesis / trap light;  
        C gives shape to cell / prevents bursting;  
        max. 2

(b) (i) IGNORE LABELS, EVEN IF WRONG
   drawing marks for:
   double layer to indicate wall;  
   organelles present;  
   cytoplasm pulled away from cell wall;  
   clear lines;  
   max. 4
   (ii) plasmolysis;  
        osmosis;  
        exosmosis;  
        max. 1
   (iii) external water potential is more negative than that of the cell;  
        cell has more solutes / ref. to cell contains hypertonic solution;  
        net flow of water is out of the cell;  
        from a high water potential to lower water potential;  
        less fluid in vacuole + so cytoplasm pulls away from cell wall AW;  
        max. 4
Question 3

3. (a) (i) X to gall bladder ;

(ii) A = colon / large intestine;
C = hepatic portal vein ; R hepatic vein

(iii) deamination / converts or breaks down excess amino acids;
controls blood glucose level;
stores carbohydrate as glycogen;
produces / makes + bile or cholesterol;
breaks down + red blood cells;
breaks down hormones;
breaks down alcohol;
stores vitamins + D / A;

(b) AWARD ONE DRAWING MARK AND UP TO FOUR LABELS CORRECT
drawing recognisable and proportioned;
lacteal;
epithelial cells;
capillary;
artery;
vein;

(c) microvilli(+) to increase the surface area;
one cell thick walls + for faster absorption;
R refs. to cell walls
lacteals + for absorption of fatty acids / glycerol;
blood capillaries + for faster transport / to maintain
diffusion gradient / to absorb named substance;

(d) contains enzymes:
ref. to amylase;
to digest / breaks down + starch to form maltose;
ref. to trypsin/ protease;
digests / breaks down proteins or polypeptides + to form
amino acids;
ref. to lipase
to digest / break down + fats to fatty acids and glycerol;
contains sodium hydrogencarbonate;
to neutralise the chime / to make pH suitable for

max. 6

max. 18
**Question 4**

4 (a) (i) **A** = motor neurone;  
**B** = sensory neurone;  

(ii) motor neurone carries impulse from CNS to the effector + sensory neurones carry an impulse from a sensory receptor to the spinal cord / in opposite direction AW;  
motor neurone has cell body at end of cell + sensory neurone has cell body near the end of cell AW;  
motor neurone has axon only + sensory neurone has axon and dendron;  
motor neurone has dendrite attached to cell body + sensory neurone has no dendrites on the cell body AW;  
motor neurone has motor end plates + sensory neurone has no motor end plates;  

max. 1

(b) (i) reflex action ;  

(ii) thorn causes the stimulus AW;  
ref. to receptor cells in skin / foot;  
stimulus detected + impulse generated;  
impulse is carried along the sensory neurone to the spinal cord;  
(in spinal cord) impulse travels from sensory neurone to connector neurone to motor neurone;  
motor neurone carries impulse to effector / thigh muscle;  
which contracts and foot is lifted;  

max. 4

(c) (nervous) (hormonal)  
tick cross;  
cross tick ;  

max. 10
Question 5

5. (a)  
   (i)  (cow) - primary consumer;  
        (maize) - producer;  
        2

   (ii) 1 mark for organisms in correct order;  
        1 mark for correct arrows;  
        maize → cow → man  
        2

(b)  (fertilisers)  
     enables more growth of leaves / plant;  
     ref. to greater photosynthetic rate AW;  
     ref. to no mineral deficiencies;  
     (pesticides)  
     kill insects / fungi / other pests;  
     which could damage the crop / so crop not damaged AW;  
     max. 4

(c) pesticides are harmful substances;  
    some are persistent / cannot be broken down;  
    remain in soil and living organisms;  
    ref. to bioaccumulation / accumulation in + food chain or web;  
    higher trophic levels could carry a very high concentration of the pesticide;  
    ref. to damage to food chain / food web;  
    ref. to many persistent pesticides being non-specific /  
    not only harmful to pest but also to other organisms;  
    ref. to killing of useful organisms e.g. pollinators;  
    max. 4

(d) energy moves from one trophic level the next;  
    ref. to energy lost between each trophic level;  
    example: as heat energy / movement / undigested food;  
    the shorter the chain the less energy is lost to environment;  
    maize → man is the shortest chain;  
    max. 3

max. 15
Question 6

6. (a) (i)  \( A = \text{vena cava} \);  
             \( B = \text{pulmonary artery} \);  
             2

          (ii) (effect) ref. to heart attack;  
               (explanation) shortage of oxygen or glucose;  
               for heart muscles + so they die AW;  
               3

          (iii) regular exercise;  
               low cholesterol diet;  
               avoid getting obese AW;  
               no smoking;  
               reduce stress;  
               max. 1

(b) (i) shaded right ventricle;  
       1

          (ii) lungs;  
       1

(c) (i) \( Y = \text{tricuspid valve} \);  
       1

          (ii) valves prevent backflow of blood;  
               tricuspid /bicuspid valves + prevent backflow from ventricle into  
               atrium;  
               semilunar valves prevent backflow from arteries into the ventricles;  
               max. 2

               ---------
               max. 11

               ---------
Question 7

7. (a) (i) different forms of the same gene / one form of a gene; 1

(ii) homozygous; 1

(b) TT x Tt; TT x tt; All offspring must be tall; so parental cross must pass on at least one T allele to offspring; 4

(c) (i) (parental genotypes)
Tt x Tt;

(gametes)
T t x T t;

(F1 genotypes)
TT Tt Tt tt; 3

(ii) 3 tall to 1 short; 1

(iii) tall offspring from the farmers seedlings were both heterozygous for the tall characteristic; 1

(iv) Yes, he can; he has bred out all of the recessive homozygous seeds AW; so the short allele does not exist in the plant stock AW; 3

max. 14
Question 8
8. (a) (i) 1. Namibia; Botswana; 2

(ii) \(54 - 50 = 4;\)
\[
\frac{4}{54} \times 100 = 7.4; \\
\]
2

(b) avoid blood contact with other person; practice safe sex / ref. to use of condom or femidom; ref. to abstinence from sex; ref. to use of sterile needles / surgical equipment; ref. to screening of blood for transfusions AW; max. 2

max. 6

Question 9
9. (a) (i) arrow from xylem to parenchyma of bundle; arrow from parenchyma of bundle to spongy mesophyll; 2

(ii) A labelled at stoma; B labelled in palisade cell; 2

(b) magnesium ions are needed to form chlorophyll; chlorophyll is needed + to trap light / for photosynthesis; 2

max. 6
MINISTRY OF EDUCATION

Namibia Senior Secondary Certificate (NSSC)

BIOLOGY: ORDINARY LEVEL

PAPER 3: (APPLIED TO PRACTICAL SKILL PAPER)
SPECIMEN PAPER

TIME: 1 Hour 30 Minutes

MARKS: 60

INSTRUCTIONS TO CANDIDATES

Write your Centre number and candidate number in the space at the top of this page.

Answer all questions.

INFORMATION TO CANDIDATES

The intended number of marks are given in brackets [ ] at the end of each question.
1. (a) (i) Describe how you would carry out a test to show the presence of fat in a biscuit. State what you would observe if fat was present.

Test..................................................................................................................................................
..................................................................................................................................................

Observation..........................................................................................................................................
..................................................................................................................................................
.................................................................................................................................................. [3]

(ii) Describe how you would use this test to compare the fat content of two different types of biscuit.

..................................................................................................................................................
..................................................................................................................................................
..................................................................................................................................................
..................................................................................................................................................
.................................................................................................................................................. [2]

(b) Complete the equation below to summarise the process of fat digestion.

\[
\text{fat} + \text{water} \rightarrow \text{enzyme} \rightarrow \ldots + \ldots\]

[Total: 8]
2. Fig. 2.1 is a photograph of one half of a fleshy fruit, cut lengthwise.

(a) (i) In the space below, make a large, labelled drawing to show the structures visible in the photograph. [6]
(ii) What does the structure of the fruit suggest about how its seeds might be dispersed?

........................................................................................................................................ [1]

........................................................................................................................................ [1]

(b) Some students collected six seeds from one fruit. They chopped and crushed two of the seeds separately on a tile. The crushed and chopped material from each seed was tested immediately (on day 1) as follows. The material from one seed was tested with iodine solution and the material from the other seed was heated in a test-tube with Benedict's reagent.

The remaining four seeds were then placed in a covered dish, on moist filter paper, in a warm incubator. Two of the incubated seeds were then tested in the same way a day later (day 2) and the remaining pair after a further day (day 3). The results are shown in Table 2.1.

Table 2.1

<table>
<thead>
<tr>
<th></th>
<th>iodine test-colour of seed pieces</th>
<th>Benedict's test-colour of tube contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>day 1</td>
<td>blue-black</td>
<td>clear blue</td>
</tr>
<tr>
<td>day 2</td>
<td>dark brown</td>
<td>cloudy green</td>
</tr>
<tr>
<td>day 3</td>
<td>very light brown</td>
<td>orange-red</td>
</tr>
</tbody>
</table>

(i) Explain these results.

........................................................................................................................................ [2]

........................................................................................................................................ [2]

........................................................................................................................................ [2]

........................................................................................................................................ [2]

(ii) Suggest why the seeds were chopped and crushed.

........................................................................................................................................ [1]

........................................................................................................................................ [10]
3. Fig. 3.1 shows a vertical section through a fruit.

![Fig. 3.1](image)

(a) (i) Name three visible features of the fruit in Fig. 3.1.

1. .................................................................
2. .................................................................
3. ................................................................. [3]

(b) The mass of 30 individual fruits, similar to those in Fig. 3.1, from a kilogram of freshly gathered fruits was measured and recorded.

(i) In the table below, record the number of fruits in each group of masses, using tally marks. One example has been completed for you.

<table>
<thead>
<tr>
<th>group by mass (g)</th>
<th>number of fruits</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-3.49</td>
<td></td>
</tr>
<tr>
<td>3.50-3.99</td>
<td></td>
</tr>
<tr>
<td>4.00-4.49</td>
<td>⎣II I</td>
</tr>
<tr>
<td>4.50-4.99</td>
<td></td>
</tr>
<tr>
<td>5.00-5.49</td>
<td></td>
</tr>
<tr>
<td>5.50-5.99</td>
<td></td>
</tr>
<tr>
<td>6.00-6.49</td>
<td></td>
</tr>
</tbody>
</table>
| 6.50-6.99         |                  | [2]
(ii) On the grid below, present the data you have recorded to show the frequency distribution of the masses.

(iii) State the type of variation shown by the data.

........................................................................................................................................ [1]

[10]
4. Female flowers of maize each produce a fruit called a grain. The grains are grouped together to form cobs.

The colour of a grain is determined genetically. Usually, grains are pale, but some varieties of maize form dark grains.

When certain varieties of maize are crossed, the cobs produced by the F2 plants have both pale and dark grains. An example of such a cob is shown in Fig. 4.1. Fig. 4.2 shows part of the same cob enlarged.
(a) In the space below, make a large drawing of the middle horizontal row of grains shown in Fig. 4.2.

(b) (i) Count the total number of each kind of grain shown in Fig. 4.2.

Number of pale grains: ....................................................
Number of dark grains: .................................................... [1]

(ii) What simple genetic ratio do these numbers represent?

Suggested ratio: ................................................................. [1]

(iii) Given the whole cob shown in Fig. 4.1 how would you confirm this ratio?

....................................................................................................................
....................................................................................................................
....................................................................................................................
....................................................................................................................
....................................................................................................................
....................................................................................................................
....................................................................................................................
.................................................................................................................... [2]
(c) Taking into account your answer to (b)(i),

(i) suggest a suitable letter to represent the allele for each of the two grain colours:

*allele for pale grain:* ................................................................. [2]

*allele for dark grain:* ................................................................. [2]

(ii) use these letters to show the genotype of each of the maize plants that were crossed to produced the cob shown.

*genotypes:* .............................................................................. X [2] [12]
5. Fig. 5.1 is a photograph of a flight feather of a bird.
(a) Determine the surface area of the feather, excluding the quill.

Show your working.

.......................................................................................................

Surface area of feather .....................................................cm$^2$ [3]

Fig. 5.2 is a photograph of a down feather. These feathers form a dense layer close to the skin surface of a bird.
(b) Complete Table 5.1 to show **three visible** differences between the flight feather in Fig. 5.1 and the down feather in Fig. 5.2.

**Table 5.1**

<table>
<thead>
<tr>
<th></th>
<th>flight feather</th>
<th>down feather</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>---------------</td>
<td>--------------</td>
</tr>
<tr>
<td>2</td>
<td>---------------</td>
<td>--------------</td>
</tr>
<tr>
<td>3</td>
<td>---------------</td>
<td>--------------</td>
</tr>
</tbody>
</table>

(c) (i) Suggest how the down feathers may be important especially to young birds in cold climates.

..................................................................................................................................
..................................................................................................................................
..................................................................................................................................
.................................................................................................................................. [2]

(ii) Using a beaker of hot water to represent a young bird, describe an experiment you could carry out to support your suggestion in (c)(i).

..................................................................................................................................
..................................................................................................................................
..................................................................................................................................
..................................................................................................................................
.................................................................................................................................. [3] [Total: 11]
6. Fig. 6.1 shows the pulse rates of two students, A and B, before, during and after a short period of vigorous exercise.

Fig. 6.1

(a) How long was the period of exercise? ....................................................... [1]

(b) (i) State three differences between the curve for student A and the curve for student B.

   1. ......................................................................................................
   2. ......................................................................................................
   3. ........................................................................................... [3]

(ii) Suggest two reasons why the results were different.

   1. .................................................................................................................
   2. ...................................................................................................... [2]
(c) State **three** ways in which the increase in pulse rate during and after exercise would affect the metabolism of student A.

1. ........................................................................................................................................
2. ........................................................................................................................................
3. ........................................................................................................................................

[Total : 9]
MINISTRY OF EDUCATION

Namibia Senior Secondary Certificate (NSSC)

BIOLOGY: ORDINARY LEVEL

PAPER 3:
MARK SHEME

Question 1
1. (a) (i) **Emulsion test**
   add ethanol / alcohol + to biscuit;
   add water / pour into water
   \[\text{R}\] if only water referred to; \hspace{1cm} 2
   OR
   Grease - spot
   rub on paper ;ONLY
   1

   Observation
   cloudiness / white / milky / emulsion ; \hspace{1cm} 1
   OR
   translucent mark/mark doesn't disappear or dry; \hspace{1cm} 1

   (ii) equal quantities of biscuit / same conditions;
   \[\text{R}\] same process / same test - not enough detail.

   any comparison if qualified;
   this is an independent mark not linked to the first.
   Even if the test is wrong, comparison of colour / cloudiness etc.
   will gain mark. \hspace{1cm} 2

   (b) lipase / esterase;
   fatty acids / fat acid;
   glycerol;
   (accept last two in any order) \hspace{1cm} 3
   Exception - if no answer in third space - glycerol, fatty acids
   both written in second gap - award 2 marks

   \hspace{1cm} max. 8
Question 2

2. (a) (i) drawing should be as large as possible (at least same size as Fig. 2.1); clear lines; no shading; **labels: (up to four marks)**
   - ovule / seed;
   - ovary;
   - fleshy wall;
   - sepal;
   - stalk; max. 6

(ii) ref. to animals + eaten / dispersed through faeces; 1

(b) (i) at day 1 seeds contain starch + no reducing sugar / glucose / maltose; enzymes released during germination; that break down starch to reducing sugar / glucose / maltose; by day 3 all starch has been broken down + to reducing sugar AW; max. 2

(ii) increasing of surface area for the reactants to work on AW; 1

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max. 10
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Question 3

3 (a) (i) thin fruit wall / pericarp;
seeds arranged in linear order / along one side;
few seeds / six seeds;
ref. to remains of stigma / sepals ;
max. 3

(b) (i) use of tally system and accurate marks ; R- if figures only
1 MARK IF ONE LINE INCORRECT

<table>
<thead>
<tr>
<th>group by mass (g)</th>
<th>number of fruits</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-3.49</td>
<td>I</td>
</tr>
<tr>
<td>3.50-3.99</td>
<td>II</td>
</tr>
<tr>
<td>4.00-4.49</td>
<td>III I</td>
</tr>
<tr>
<td>4.50-4.99</td>
<td>III</td>
</tr>
<tr>
<td>5.00-5.49</td>
<td>III II</td>
</tr>
<tr>
<td>5.50-5.99</td>
<td>III</td>
</tr>
<tr>
<td>6.00-6.49</td>
<td>IIII</td>
</tr>
<tr>
<td>6.50-6.99</td>
<td>I</td>
</tr>
</tbody>
</table>

(ii) continuous distribution / fewer fruits in extreme classes / reference to mean (average) ;
1

H - histogram with blocks touching ;
A - both axes labelled correctly with units + orientated correctly ;
P - data plotted correctly ;
Q - quality of presentation, neatly ruled lines with sharp, clear line;
max. 10
**Question 4**

4 (a) same amount of grains; clear lines; no shading; correct proportions; 4

(b) (i) 10 pale grains + 9 dark grains; 1

(ii) 9 : 10 simplified to 1 : 1; 1

(iii) count all the grains on the cob / count a larger sample; calculate ratio for pale to dark; 2

(c) (i) pale = P; dark = p; 2

(ii) Pp x pp; (either way round) 2

**Question 5**

5 (a) evidence of number of whole squares counted; evidence of partial squares added; 24 – 26 (cm²); 3

(b) (flight feather) (down feather)

longer shorter;
thick quill / rachis quill / rachis + thinner;
vanes close together vanes further apart;
barbs present barbs absent;
all vanes to one side of rachis vanes on both sides; max. 3

(c) (i) ref. to birds being warm blooded; ref. to reduction of heat loss; ref. to insulation; trap layer of air / prevent air movement close to skin; max. 2

(ii) surround one beaker with down feathers; record temperature of hot water; place in cold conditions e.g. fridge; monitor heat loss over measured time AW; repeat with second beaker without feathers; max. 3

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max. 11
Question 6

6. (a) 4 minutes; R without units

(b) (i) student A has higher resting pulse rate than student B / student A = 76 bpm while student B = 68 bpm; pulse for student A rise more quickly during exercise; pulse for student A is higher during exercise / student A reaches 133 bpm while student B = 121 bpm; pulse for student A takes longer to return to normal; pulse for student B dips below normal after exercise while pulse for student A does not; max. 3

(ii) student A is less fit than student B; student A is younger than student B; ref. to student A being a smoker AW; ref. to student A + appropriate disease e.g. heart disease; max. 2

(c) ref. to supply of more oxygen to muscles during exercise to maintain aerobic respiration; increased oxygen supply will prevent build-up of oxygen debt; ref. to anaerobic respiration if oxygen supply not adequate; ref. to role of liver or pancreas to produce more glucose; ref. to removal of carbon dioxide produced by respiration; ref. to increase in heat production due to increased respiration; max. 3