

UNIVERSITY OF MALTA

**THE MATRICULATION CERTIFICATE EXAMINATION
INTERMEDIATE LEVEL**

BIOLOGY

May 2015

EXAMINERS' REPORT

**MATRICULATION AND SECONDARY EDUCATION
CERTIFICATE EXAMINATIONS BOARD**

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Biology

Intermediate Level

May 2015

Part 1: Statistical Information

Table 1: Distribution of Grades awarded in May 2015

GRADE	A	B	C	D	E	F	Abs	Total
Number	28	51	76	38	44	39	25	301
% of Total	15.98	23.08	27.22	8.28	7.69	8.28	9.47	100

Part 2: Comments regarding candidate's performance

Section A

General Comments

Candidates need to distinguish between the terms 'explain' and 'describe'.

The candidate's inability to use biological terms or spelling biological terms was evident.

Question 1: Cell membranes

The overall performance in this question was very poor. Vast majority of candidates scored marks in part 1.3 only.

Q 1.1: The vast majority of candidates were unable to explain the terms 'fluid' and 'mosaic' as applied to the structure of the plasma membrane. The idea of fluidity was generally expressed in terms of the membrane being similar to a liquid 'that can change shape' or it was confused with permeability.

Q 1.2: Practically none of the candidates answered this question well as the terms 'extracellular' and 'intracellular' side of the cell membrane were misinterpreted. A typical incorrect answer was 'The extracellular side is made up of hydrophilic heads, whilst the intracellular side consists of hydrophobic / fatty acid tails.'

Q1.3: Most candidates distinguished between passive and active transport. Yet the phrase 'passive transport does not need / use energy' was often included in the answers. This is incorrect as passive transport relies on the KE of diffusing molecules and thus energy is needed. Clear reference to ATP was thus expected. The terms to move 'across a concentration gradient' was often used but this does not indicate whether transport is occurring 'down' or 'against' a concentration gradient.

Question 2: Water and Biomolecules

Q2.1: Most candidates listed two properties of water, although several did not use the proper terms to name them. Several candidates however could not describe the biological importance of the particular property chosen. Some candidates confused 'specific heat capacity' and 'latent heat of evaporation'. One frequent incorrect response was listing the presence of 'hydrogen' and 'oxygen' as the two properties of water.

Q2.2: Varied responses were observed here, thus candidates either did quite well in this question or otherwise practically scored very low marks. Others were unable to name the monomers but correctly identified one function of the polymer. Indeed some classified the type of polymer listed rather than the monomer that builds them up.

A large amount of candidates suggested that cellulose 'makes up cell walls' without referring to plants. Others suggested that it is a source of energy in plants. A significant number of candidates could not name one function of collagen and did not write an answer. Some suggested that 'collagen makes skin elastic' – this is incorrect as elastin imparts this property. An incorrect response to the function of haemoglobin was 'it gives colour to blood'.

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Question 3: Diversity of Life

Q3.1: Most candidates answered this question well. Yet clear reference to 'the lack of a membrane bound nucleus' was often lacking. Some candidates confused the kingdom Prokaryota with kingdom Protocista.

Q 3.2: Majority of candidates answered this question correctly.

Q 3.3: Vast majority of answers were correct.

Q 3.4: Most candidates answered this question well. Yet incorrect answers often included characteristics of mammals rather than of the kingdom Animalia.

It was noted that when scientific names of organisms were written, practically none of the candidates underlined them.

Question 4: Plant structure and Photosynthesis

Q 4.1: Varied responses were presented here. Generally candidates identified the tissues well (rather than the cell types) except for cell D where guard cells were often mistaken for 'stomata'. The functions of the cell types were generally correct except that of the guard cells which was not linked to the opening and closing of the stomata. Amongst the incorrect answers, the following points were prevalent:

- Cellular structures were named instead of cell types.
- The suggestion that 'guard cells open and close the cell'
- The suggestion that 'stomata open to allow sunlight through'.

Q 4.2: Majority of candidates answered this question incorrectly because they described the curves rather than explained them. Furthermore, candidates often did not mention that light is actually the energy source in photosynthesis. Reference to other limiting factors influencing the rate of photosynthesis at high light intensities was lacking. Candidates frequently but incorrectly linked the decrease of the rate of photosynthesis at high temperatures to denaturation of enzymes rather than closure of stomata.

Q 4.3: Majority of candidates were not able to explain the importance of the light-dependent and light independent reactions. Some candidates confused the light-independent stage with respiration as 'light is not needed'. Amongst the partially correct answers NADH rather than NADPH was mentioned.

Question 5: Homeostasis

Q 5.1: Most candidates defined homeostasis well. Incorrect answers often limited homeostasis to controlling body temperature.

Q 5.2: Generally candidates correctly suggested that thermoreceptors are found in the skin. Yet they did not mention the presence of thermoreceptors in the hypothalamus. Incorrect answers included reference to thermoreceptors 'all over the body' or 'in the brain'. Generally candidates suggested that thermoreceptors monitored temperature. (Although the term monitored was rarely used!). However they rarely specified whether this was environmental temperature or internal body temperature. Some candidates incorrectly linked thermoreceptors with co-ordination of responses to changes in internal body or environmental temperatures.

Q 5.3: Generally candidates correctly described three involuntary mechanisms used by humans to lower body temperature. Some candidates listed the responses but did not describe them. Incorrect answers included misreading the question and listing three involuntary mechanisms used by humans to increase body temperature.

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A prevalent misconception was that during vasodilation skin blood vessels 'rise closer to the skin to allow more heat loss' rather than reference to an increase in diameter where 'more blood flows close to the skin surface thus allowing heat loss'. Very often candidates did not refer specifically to skin blood vessels.

Question 6: Sexual Reproduction

- Q 6.1:** Vast majority answered this question well. Some however described the link between sexual reproduction and evolution, and thus did not answer the question.
- Q 6.2:** The functions of the listed hormones were often correct. Progesterone was sometimes incorrectly linked to development of secondary sexual characteristics in females. Also, a number of candidates suggested that 'testosterone is responsible for the development of secondary sexual characteristics' without referring to males.

Section B

General Comments

Overall the majority of candidates showed a good command of the English language providing satisfactory scientific, comprehensible answers.

Question 7: Digestive System

- Q 7.1:** Majority of students provided an incomplete answer for the definition of digestion with many simply indicating that it is the breakdown of food, it provides nutrients or that it involved ingestion, digestion, absorption, assimilation and egestion. Reference to production of soluble molecules as well as physical and chemical digestion was made only by a few.
- Q 7.2:** Most students obtained high marks in this question. Marks were mostly deducted with regards to lipid digestion as candidates focused on digestion of fats by bile and referred to bile as an enzyme. A common misconception was that bile is released in the small intestine or stomach from the pancreas. Approximately 12% of students went out of point in focusing on the lock and key theory and effects of pH and temperature on enzymes.
- Q 7.3:** Full marks were attained by many students. Some candidates failed to indicate that length and high amount of folds increase surface area for absorption. There were ample references to villi being hair-like structures rather than finger-like projections.
- Q 7.4:** Few candidates obtained a full mark in this question. Scores obtained were rather low as reference to the hepatic portal vein and transportation to the liver were often omitted. Several students made reference to the pancreas which will release insulin or glucagon to control glucose levels without referring to the fate of glucose with regards to it being stored in the liver as glycogen or used by cells in respiration.

Question 8: Populations

- Q 8.1:** Definitions for the term population were rather poor with the majority referring to it as the number of different species found in an area. Others focused on different groups of organisms and their interactions with the living and non-living environment. Indication that organisms in a population cohabit for a particular time span was seldom mentioned.
- Q 8.2:** Majority of graphs provided were correct. Occasionally students failed to show the initial slow increase in the population and provided just the exponential growth line followed by the stationary phase. There were a few students who were unable to provide correct labels for the axis.
- Q8.3:** This question was tackled well by majority of candidates, except those who focused the whole question on the human population and related it to immigrants. Not many made reference to the changes observed in birth rates and death rates throughout the growth period.

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Q 8.4: Marks were mostly deducted as students failed to indicate that the carrying capacity is the maximum amount of organisms that the environment can sustain indefinitely. Others made reference to it as being the largest group a population can grow to, without reference to the environmental capacity.

Q 8.5: The carrying capacity was marked well in majority of answers.

Q 8.6: A low score was obtained by 5% of candidates as they just listed the factors and did not describe them as indicated. Majority obtained a full score in this question.

Question 9: Gaseous Exchange

Q 9.1: Definition of cellular respiration was tackled well overall. Incomplete definitions were provided for ventilation and gas exchange due to omitted keywords such as lungs, alveoli, carbon dioxide and oxygen.

Q 9.2: Answers mostly focused on the importance of the respiratory system in providing clean, filtered air to the body not on the importance of ventilation. Few students attained full marks here.

Q 9.3: 35% of candidates were unable to provide a well labelled diagram.

Q 9.4: A large amount of students obtained a perfect score in this question. Features of alveoli were tackled well. It is important to make reference to the fact that the film of moisture lining alveoli is required for the gases to dissolve in prior to transportation by circulatory system.

Q 9.5: Most of the students who attempted this questions listed "smoking" as the health problem. Many of those who mentioned lung cancer as a problem, failed to focus on how it is induced by carcinogens and shifted onto describing emphysema or smoker's cough.

Question 10: DNA replication and Protein synthesis

Q 10.1: Majority of students included meiosis as part of the cell life cycle or refrained from mentioning nuclear division occurs during mitosis.

Q 10.2: Full score obtained by most candidates. Some failed to refer to complimentary base pairing of nucleotides.

Q 10.3: Functions of Helicase and DNA polymerase were known well.

Q 10.4: Almost all those who attempted this question provided a perfect answer.

Q 10.5: Many students presented correct steps for transcription and translation but failed to point out the importance of keeping the DNA enclosed in the nucleus. RNA polymerase function was omitted by many.

Question 11: Biotechnology

Q 11.1: Definitions provided were not always up to standard and half the students failed to give an example with reference to recombinant DNA.

Q 11.2: 80% of the candidates who attempted this question were confident with the procedure involved. A few students failed to include reverse transcription and cDNA.

Q 11.3: Majority of answers were correct. There was an incorrect reference to the bacterium as being the vector instead of the host cell in a few answers.

Q 11.4: Most students could not list five reasons as to the usefulness and selection of bacteria as host cells. Average correct statements provided were three.

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- Q 11.5:** Only a few students were capable of providing an adequate definition of gene therapy. Consequently most presented an incorrect example and follow-up explanation. Main example quoted was production of insulin using recombinant plasmid vectors in bacteria.
- Q 11.6:** Few students were able to describe an advantage. A number of students briefly mentioned the advantage but failed to describe it.

Chairperson

2015 Examination Panel