



WARNING: This Examination Paper **MUST** be returned with your answer book(s) at the end of the examination: otherwise marks will be lost.

For Examiner's use only		
Sect.	Q.	Mark
Sect. A		
Sect. B		
Sect. C		
TOTAL		
%		

STUDENT NAME 

SCHOOL 

TEACHER 

PRE-LEAVING CERTIFICATE EXAMINATION, 2017

BIOLOGY – HIGHER LEVEL

TIME: 3 HOURS

Section A Answer any **five** questions from this section.

Each question carries 20 marks.

Write your answers in the spaces provided on **this examination paper**.

Section B Answer any **two** questions from this section.

Each question carries 30 marks.

Write your answers in the spaces provided on **this examination paper**.

Section C Answer any **four** questions from this section.

Each question carries 60 marks.

Write your answers in the **answer book**.

It is recommended that you spend not more than 30 minutes on Section A and 30 minutes on Section B, leaving 120 minutes for Section C.

You must return this examination paper with your answer book at the end of the examination.

Section A
Answer any five questions.
Write your answers in the spaces provided.

1. Answer any **five** of the following parts (a) to (f):

(a) Give **two** functions of water in a cell.

(i) _____

(ii) _____

(b) Name a protein that has a structural role in humans.

(c) Give an example of a catabolic reaction. _____

(d) Which **two** elements are present in the ratio 2:1 in carbohydrates?

(i) _____ (ii) _____

(e) Name a vitamin involved in the formation of connective tissue. _____

(f) Where would you expect to find lipoproteins in human cells? _____

2. (a) What is the precise meaning of the term *conservation* as used by ecologists?

(b) Suggest **two** reasons for conserving wild species.

1. _____

2. _____

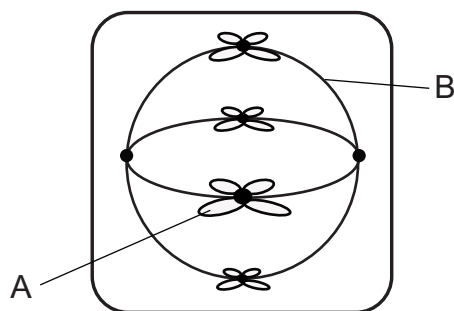
(c) Explain the term *pollution*.

(d) Give an example of a human activity that results in the pollution of air or water.

(e) Suggest a method of controlling the pollution that results from the activity referred to in (d).

(f) Give **one** example of the use of micro-organisms in waste management.

3. The diagram shows a stage of mitosis.



- (a) Identify the stage of mitosis shown in the diagram.

- (b) Name the parts labelled A and B.

A _____

B _____

- (c) Explain the significance of mitosis in single-celled organisms.

- (d) Once mitosis is complete, the cell divides. What is this process called in the case of animal cells?

- (e) What does the term *cancer* mean in relation to cells?

- (f) Suggest **two** possible causes of cancer.

(i) _____

(ii) _____

4. Use your knowledge of human development in the female reproductive system to answer the following questions.

(a) Name the structure formed after the zygote divides by mitosis.

(b) Approximately 5 days after fertilisation, the structure referred to in (a) develops into a hollow ball of cells. What is this hollow ball of cells called?

(c) Approximately 10 days after fertilisation, the structure referred to in (b) forms the embryo. Name the **three** germ layers formed from the cells of the embryo and for **each** germ layer, give **one** organ or system which develops from it.

Germ layer 1: _____

Develops into: _____

Germ layer 2: _____

Develops into: _____

Germ layer 3: _____

Develops into: _____

(d) What important structure is formed from the embryonic and uterine tissues?

5. In the case of the following pairs of terms, clearly distinguish between the first term and second term by writing a brief sentence about each.

(a) Antibody. _____

Antigen. _____

(b) Active immunity. _____

Passive immunity. _____

(c) B lymphocyte (B cell). _____

T lymphocyte (T cell). _____

(d) Antibiotic. _____

Vaccine. _____

(e) General defence system. _____

Specific defence system. _____

6. (a) ATP is a product of the light-dependent stage of photosynthesis.

(i) What does the abbreviation ATP stand for?

(ii) What is the function of ATP in cells?

(iii) In what part of the cell does the light-dependent stage of photosynthesis take place?

(b) NADPH is another product of the light-dependent stage of photosynthesis.

(i) What is the source of the hydrogen ions (protons) to make the NADPH?

(ii) Why is oxygen considered to be a waste product of the light-independent stage?

(iii) List **two** possible fates for the oxygen product of this stage.

1.

2.

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Section B

Answer any **two** questions.

Write your answers in the spaces provided.

Part (a) carries 6 marks and part (b) carries 24 marks in each question in this section.

7. (a) In relation to the scientific method, explain **each** of the following:

(i) Hypothesis. _____

(ii) Replicate. _____

(b) (i) To demonstrate osmosis two cellophane bags were half-filled with a 3% salt solution. The bags were placed in two beakers, one containing a 10% salt solution and one containing distilled water. Both were left for 30 minutes.

Describe, using words or a diagram, the appearance of the cellophane bag:

1. In the 10% salt solution.

2. In the distilled water.

(ii) Answer the questions below in relation to an investigation you carried out to show the effect of an environmental factor on the rate of photosynthesis.

1. State the environmental factor you studied, and explain how you varied it.

Factor: _____

How varied: _____

2. How did you measure the rate of photosynthesis?

(iii) Answer the questions below in relation to an investigation you carried out to determine the conditions required for the germination of seeds.

1. What were the conditions necessary for germination to occur in seeds?

2. Describe the control you used in this investigation.

(iv) In the course of your practical work you used iodine solution. State **two** different uses for iodine solution.

1. _____

2. _____

8. (a) The human circulatory system is described as a closed system.

(i) In relation to the human circulatory system, what is meant by a *closed* system?

(ii) Distinguish clearly between the *pulmonary* circuit and the *systemic* circuit in a two-circuit circulatory system.

(b) Answer the following questions in relation to the dissection you carried out to investigate the structure of a heart.

(i) How did you distinguish between the ventral and dorsal surfaces of the heart?

(ii) There are four main blood vessels attached to the heart.
How did you identify which were arteries and which were veins?

(iii) Describe how you dissected the right side of the heart to enable you to identify the internal structures of the atrium and ventricle. Use suitably labelled diagrams if necessary.

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(iv) Outline how you located the semi-lunar valves.

9. (a) Are fungi *prokaryotic* or *eukaryotic* organisms?

Give a reason for your answer.

- (b) Answer the following questions in relation to the growth of leaf yeasts in the laboratory.

- (i) A sterile nutrient medium should be used. What is the significance of the medium being sterile?

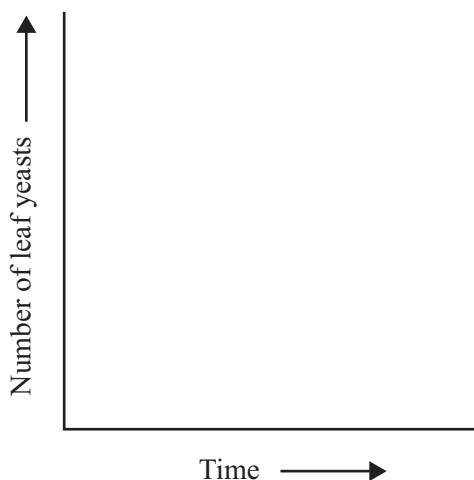
- (ii) Suggest **one** reason why leaf yeasts are more plentiful in July than in March.

- (iii) How did you introduce the leaf samples onto the sterile medium?

- (iv) How did you incubate the petri dishes once you had attached the leaf samples?

- (v) How did you recognise the presence of the yeasts?

- (vi) Using the axes below, draw a graph to show how the number of leaf yeasts varied following their introduction into the petri dish.

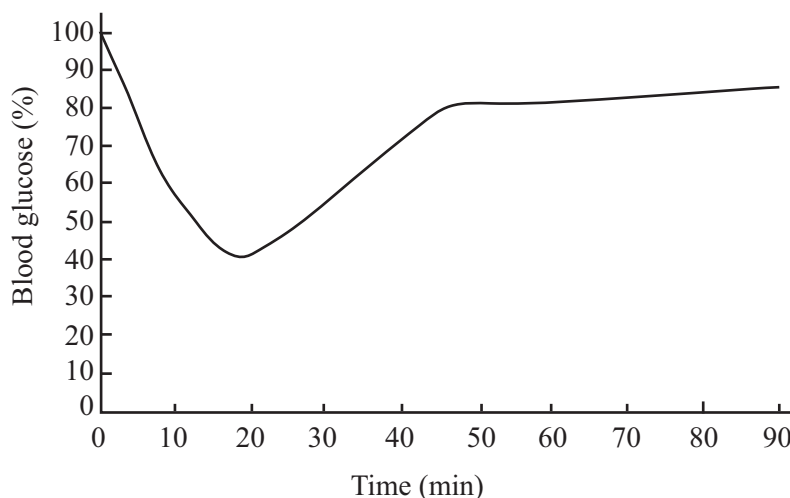


Section C

Answer any **four** questions.

Write your answers in the answer book.

10. (a) All organisms need to have the ability to maintain suitable constant conditions in their cells and bodies, such as fluid balance, temperature and chemistry.
- (i) What term is used to describe this ability?
 - (ii) Name **two** organs, other than the kidneys, which help humans to maintain a constant fluid balance. (9)
- (b) Urine production involves the processes of filtration and reabsorption.
- (i) Explain **each** of the underlined processes.
 - (ii) The nephron is the functional unit of the kidney.
 - 1. Name the site of filtration in the nephron.
 - 2. By what process is glucose reabsorbed in the nephron?
 - 3. Give the precise site of action of the hormone ADH (vasopressin) in the nephron.
 - (iii) A medical laboratory tested two urine samples.
 - 1. The first urine sample was found to contain protein. Would this be considered a normal result? Explain your answer.
 - 2. The second urine sample was found to contain glucose. Would you consider this to be a normal result? Explain your answer. (27)
- (c) (i) Give the precise location in the human body of **each** of the following endocrine glands: thyroid, adrenal(s), thymus.
- (ii) Name a hormone produced by **each** of the glands in (i) and give a function of **each** hormone.
- (iii) An insulin injection was administered to an individual at 0 minutes. The graph shows how this injection of insulin affected the blood glucose levels of that individual.



- 1. What is the effect of injecting insulin?
- 2. For how long did the insulin injection affect the level of glucose in the blood?
- 3. What property of insulin means that it has to be administered by injection? (24)

11. (a) (i) What is meant by the term *genetic engineering*?

(ii) State **one** application of genetic engineering in **each** of the following:

1. A plant.
2. A micro-organism.

(9)

(b) Colour blindness is a sex-linked characteristic in humans. Normal vision results from the possession of a dominant allele (C).

(i) What is meant by the term *sex-linked*?

(ii) What term is used to describe a person who has a gene for colour blindness but who does not exhibit the condition?

(iii) 1. Show by means of diagrams the genotypes and phenotypes of the possible offspring of a colour blind father and a mother who is heterozygous for the condition.

2. What percentage of the male offspring are colour blind?

3. Is it possible for this couple to have a colour blind daughter?
Briefly explain your answer.

(27)

(c) In your answer book, say whether **each** of the following statements is true or false **and** give a reason for your choice in each case:

(i) mRNA is found in the nucleus *and* the cytoplasm in a cell.

(ii) Down's Syndrome is a condition caused by a gene mutation.

(iii) The shape of a protein in an enzyme is vital to its function.

(iv) Transcription occurs in the ribosomes in a cell.

(24)

12. (a) (i) Humans can be classified as primary consumers and secondary consumers. Explain **each** of the underlined terms.

- (ii) Give **one** example of a producer from a **named** ecosystem you have studied.

(9)

- (b) (i) What is the function of the nitrogen cycle?

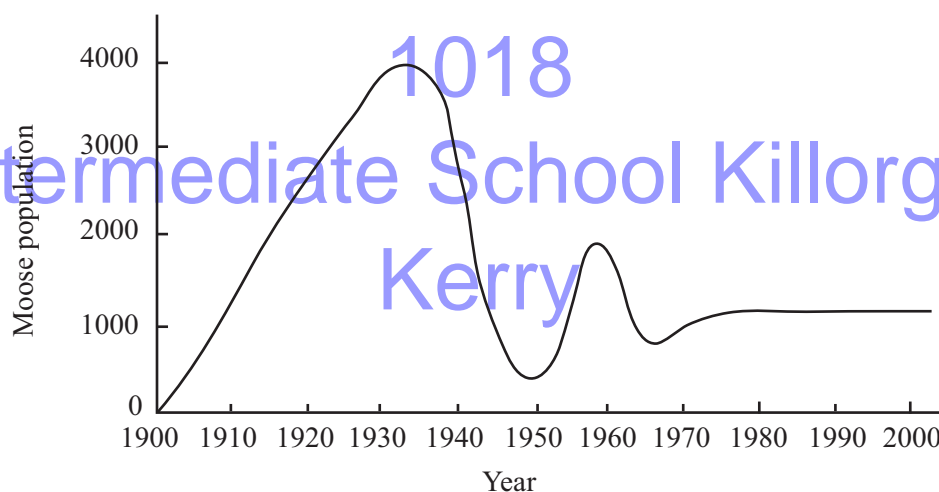
- (ii) Micro-organisms in the form of bacteria are important drivers of the nitrogen cycle. List any **three** categories of these bacteria and briefly describe the specific role of **each** in the nitrogen cycle.

- (iii) Name another type of micro-organism which plays a major role in the nitrogen cycle and briefly describe its role.

- (iv) During the nitrogen cycle, plants absorb compound X from the soil. This is used in the synthesis of plant proteins. Animals then break down these proteins to form compound Y, which is used in the synthesis of animal proteins. Name the compounds X and Y.

(27)

- (c) The graph below shows changes to the population of moose in Canada. Moose did not have a natural predator until wolves arrived around 1950. Moose eventually became a staple part of the wolves' diet.



- (i) Why, other than because of the absence of predators, in your opinion, did the moose population increase rapidly between 1920 and 1930?

- (ii) Suggest a reason why the moose population decreased between 1930 and 1940.

- (iii) What effect did the arrival of the wolves have on the moose population?

- (iv) Suggest a reason why the moose population levelled out from about 1970 onwards.

- (v) 1. Suggest **one** possible effect on the moose population **and one** possible effect on the wolf population if a niche was created for another herbivore in the habitat.

2. Give a reason for each answer you have given above.

(24)

13. (a) Enzymes play an important role in controlling metabolic reactions in plants and animals.
- (i) What is an enzyme?
 - (ii) Comment on the molecular shape of enzymes.
 - (iii) Name a process, other than digestion, that occurs in a plant or animal cell which requires the use of enzymes.

(9)

- (b) (i) Describe, with the aid of diagrams, the Active Site Theory of enzyme action.
- (ii) What is meant by the term *denaturation* in relation to enzymes?
 - (iii) State **two** ways by which an enzyme may be denatured.
 - (iv) Name **two** enzymes found in the digestive system **and** state precisely where in the digestive system **each** is active.

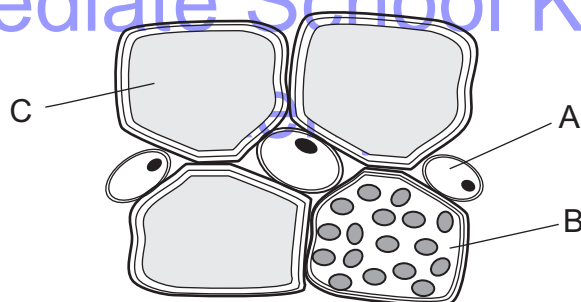
(27)

- (c) Bioprocessing often involves the use of immobilised enzymes in a bioreactor.
- (i) What does the term *immobilisation* mean when used in relation to enzymes?
 - (ii) What is a bioreactor?
 - (iii) In your practical studies you prepared an enzyme immobilisation and examined its application.
 - 1. Name the enzyme you used.
 - 2. Name the substrate you used.
 - 3. Name the product of the reaction.
 - 4. How did you test for the presence of the product?
 - 5. How would you store your immobilised beads overnight?
 - (iv) Give **two** advantages of using immobilised enzymes rather than free yeast in alcohol production.

(24)

- (a) (i) List **two** reasons why fungi are not classified as plants.
- (ii) Fungi can be saprophytic or parasitic.
 1. Explain **each** of the underlined terms.
 2. Give an example of a saprophytic fungus **and** a parasitic fungus.
- (iii) Write notes on **each** of the following topics in relation to *Rhizopus*.
 1. Gametangia.
 2. The role of meiosis in the lifecycle of *Rhizopus*.
- (iv) Describe how yeast reproduces.
- (b) (i) List **two** methods of natural vegetative propagation in plants.
- (ii) List **two** methods used by horticulturalists to artificially propagate plants.
- (iii) Write notes on how vegetative propagation differs from reproduction by seed in plants. In each case your notes should contain **two** points.
- (iv) Explain the biological basis for **each** of the following.
 1. Not removing spring bulbs, e.g. tulips, until approximately 6 weeks after flowering.
 2. Trimming hedges regularly to keep a hedge thick and full at the base.

- (c) The diagram shows a transverse section of a vascular tissue in a flowering plant.



- (i) Name the vascular tissue shown.
- (ii) Name the parts labelled A, B and C.
- (iii) Give the function of the parts labelled A and B.
- (iv) 1. Name the vascular tissue which transports water in a plant.
 2. Name and briefly explain any **two** processes involved in the upward movement of water in plants.

15. Answer any **two** of (a), (b), (c).

(30, 30)

- (a)
- (i) Distinguish clearly between the *axial* skeleton and the *appendicular* skeleton.
 - (ii) Give a function of **each** of the following in relation to the growth of bone:
 - 1. Osteoblasts.
 - 2. Osteoclasts.
 - 3. Growth plate.
 - (iii)
 - 1. Draw a diagram to show the structure of a synovial joint. Label **three** parts of the joint that you have drawn, other than bones.
 - 2. Explain the functions of any **two** parts that you have labelled.
 - (iv) Name a factor on which the renewal of bone depends.
- (b) Answer the following questions in relation to red blood cells.
- (i) Where precisely in the body are red blood cells made?
 - (ii) State **one** way in which red blood cells differ from plant cells.
 - (iii) State **two** ways, other than colour and function, in which red blood cells differ from white blood cells.
 - (iv)
 - 1. Where in the body are red blood cells broken down?
 - 2. The products of the breakdown of red blood cells help to form bile. Give **two** functions of bile in relation to digestion.
 - (v)
 - 1. Name a condition associated with lack of red blood cells.
 - 2. Name the trace element which is an essential component of haemoglobin in red blood cells.
- (c)
- (i) Draw a large labelled diagram of the respiratory system.
 - (ii) Where does gas exchange take place in the respiratory system?
 - (iii) What part of the brain is responsible for controlling breathing?
 - (iv) Identify a cause for a **named** disorder of the respiratory system.
 - (v) Where does gas exchange take place in plants?
 - (vi) Name the gas that controls gas exchange in plants and animals.

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