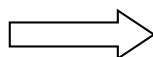


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**Coimisiún na Scrúduithe Stáit
State Examinations Commission**

LEAVING CERTIFICATE EXAMINATION, 2016

BIOLOGY – HIGHER LEVEL

TUESDAY, 14 JUNE – AFTERNOON, 2.00 – 5.00

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. Explain **five** of the following terms.

(a) Ecology. _____

(b) Symbiosis. _____

(c) Nutrient recycling. _____

(d) Contest competition. _____

(e) Edaphic. _____

(f) Biotic. _____

2. (a) Identify a non-metallic element, other than C, H, O and N, commonly found in proteins.

(b) Give a metabolic role of proteins in the human body.

(c) Give a structural role of proteins in the human body.

(d) Name the **two** different biomolecular components of a lipid.

(i) _____ (ii) _____

(e) Where would you expect to find phospholipids in human cells?

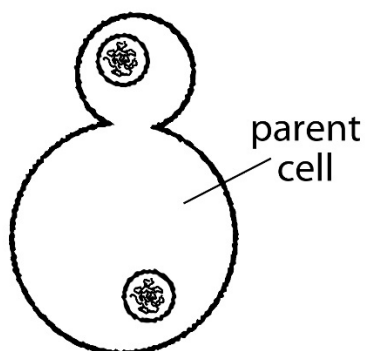
(f) Give a role of a named mineral, other than iron, which is required in the human body.

Named mineral: _____

Role: _____

(g) What is the approximate percentage of water, by mass, in a human cell? _____

3. The diagram shows asexual reproduction in yeast.



- (a) How do you know from the diagram that the reproduction is asexual?

- (b) What name is given to this type of asexual reproduction?

- (c) (i) How does the genetic make-up of the new yeast cell relate to that of the parent cell?

- (ii) Explain your answer.

- (d) Give an advantage **and** a disadvantage of asexual reproduction in organisms such as yeast.

Advantage: _____

Disadvantage: _____

- (e) Name another organism which belongs to the same kingdom as yeast.

4. (a) In a certain breed of cattle there is incomplete dominance between the allele for red coat and the allele for white coat. Heterozygous individuals are roan.

In each of the following three crosses state, in the space provided, the percentage chance that a calf of the cross will have a red coat.

- (i) roan \times white _____ %
(ii) roan \times red _____ %
(iii) roan \times roan _____ %

- (b) (i) In genetics, what is meant by the term *sex-linkage*?

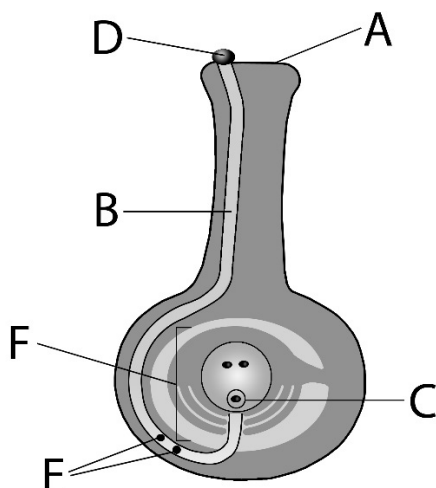
- (ii) Would human females or human males be more likely to suffer from sex-linked diseases such as haemophilia?

- (iii) Explain your answer to part (ii) by referring below to possible genotypes and their corresponding phenotypes.

Male: _____

Female: _____

5. The diagram shows some details of sexual reproduction in a flowering plant.



(a) Name the parts labelled A, B and C.

A _____

B _____

C _____

(b) Suggest **two** ways by which the structure labelled D could have arrived at its position on the structure labelled A.

(i) _____

(ii) _____

(c) By what process does the structure labelled D give rise to the **two** structures labelled E?

(d) What is the fate of **each** of the **two** structures labelled E?

(i) _____

(ii) _____

(e) Name the structure labelled F **and** say what it develops into after fertilisation.

Name: _____

Develops into: _____

6. (a) What term is used to describe the long stage of the cell cycle when cell division is not occurring?

(b) Name **two** types of biomolecule that are produced in the cell during this stage of the cell cycle.

(i) _____

(ii) _____

(c) Name **one** organelle that is replicated at this stage of the cell cycle.

(d) Give any **two** other changes which will have occurred in the cell by the end of this stage of the cell cycle.

(i) _____

(ii) _____

(e) Suggest why mature human red blood cells do not undergo cell division.

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) Give **two** examples of limitations of the scientific method.

(i) _____

(ii) _____

(b) (i) When testing a solution for the presence of a reducing sugar, you used either Benedict's or Fehling's test. A control was included.

1. Name the substance which you used as a control.

2. What colour were the contents of the control tube at the end of the test?

(ii) During your practical studies you carried out certain routine procedures. In **each** of the following instances describe how you:

1. Added a very small volume of a solution.

2. Ensured that the pH of a solution remained constant.

(iii) When preparing a microscope slide of human cheek cells or other animal cells, describe how you:

1. Transferred the cells to the slide.

2. Improved the visibility of the cells on the slide.

(iv) When immobilising an enzyme you used a gel substance to trap the enzyme. You also used a second substance to make the gel insoluble.

1. Name the gel substance you used to trap the enzyme.

2. Name the second substance you used to make the gel insoluble.

[OVER]

8. (a) Answer the following questions in relation to the human pulse.

(i) What is the pulse?

(ii) What makes the wrist (or temple, or neck) a suitable part of the body to detect a pulse?

(b) Answer the following questions in relation to the investigation you carried out on the effect of exercise on the breathing rate **or** pulse rate.

(i) What was the control in this investigation?

(ii) What is the purpose of this control?

(iii) You carried out this investigation on two women of the same age. One of the women (A) was a very fit athlete. The other (B) was overweight and rarely took exercise.

1. Appropriately label each of the axes below.
2. Draw two curves or plots to summarise the most likely results of your investigation, clearly labelling which curve relates to which individual.



(iv) Recovery time is the duration of the period following exercise during which the breathing rate or pulse rate returns to normal. Suggest how you might measure recovery time.

9. (a) (i) Explain what is meant by the term *dormancy* in seeds.

(ii) How does digestion contribute to successful seed germination?

(b) Answer the following questions in relation to the investigation you carried out to show digestive activity during seed germination.

State whether you carried out this investigation using starch agar **or** skimmed milk (protein) agar.

(i) Name a type of enzyme in the seed that carries out this digestion.

(ii) Why were the seeds soaked in water at the start of the investigation?

(iii) When preparing the seeds, they were also split and sterilised.

1. Why is it recommended that you sterilise the seeds?

2. Why were the split seeds placed open-side down on the agar?

(iv) How did you know that digestive activity had occurred on one of your investigation plates?

(v) How did you know that digestive activity had **not** occurred on one of your investigation plates?

(vi) Give **one** reason for what you observed in part (v).

Section C

Answer any four questions.

Write your answers in the answer book.

10. (a) (i) What is the precise meaning of the term *niche* as used by ecologists?
- (ii) From your investigations of a **named** ecosystem, give **one** example **each** of:
1. A safety hazard.
 2. A source of error. (9)
- (b) In the course of your studies you carried out an investigation of an ecosystem.
- (i) In the case of this **named** ecosystem, explain how you carried out **each** of the following.
1. Collection of fauna using a named method.
 2. Identification of the collected fauna.
 3. A quantitative study of a **named** plant species.
In your answer explain how you ensured that the sample was random.
- (ii) Why is it essential to use a random sampling technique?
- (iii) Suggest **two** abiotic factors that could affect the distribution of the named plant species.
- (iv) State **one** way in which human activity can have an impact on your named ecosystem. (27)
- (c) A typical grazing food chain, consisting of four trophic levels, is shown below.
Each letter represents a different species.
- A → B → C → D
- (i) What is meant by the term *trophic level*?
- (ii) Explain why food chains are generally short.
- (iii) Which letter represents the secondary consumer?
- (iv) Give a possible reason why the population of C may decline naturally.
- (v) Suggest a possible consequence for the population of A if the population of C was significantly reduced. Explain your answer.
- (vi) Suggest how members of species D might respond, if the population of C was significantly reduced.
- (vii) A food web is a series of interconnected food chains. Suggest how it may be possible for the secondary consumer, in the food chain above, to be a primary consumer in another food chain. (24)

11. (a) (i) In the context of cell metabolism, what does NAD stand for?
(ii) Name **two** types of particle that are transferred by NAD. (9)
- (b) Answer the following questions from your knowledge of photosynthesis.
- (i) Where in plant cells does the process take place?
 - (ii) Name a substance which absorbs light energy for the process.
 - (iii) In which pathway of the light stage is oxygen produced?
 - (iv) Outline how this oxygen is produced.
 - (v) Give **one** fate of this oxygen.
 - (vi) What is the fate of the carbon in the carbon dioxide used in the dark stage?
 - (vii) Give **one** reason why a suitable temperature is necessary for the dark stage to occur.
 - (viii) Aquatic plants such as *Elodea* are particularly suitable for investigating photosynthesis. Suggest a reason for this. (27)
- (c) Answer the following questions from your knowledge of respiration.
- (i) Name the 3-carbon molecule that is an intermediate compound in both aerobic and anaerobic respiration.
 - (ii) What name is given to the biochemical pathway by which this intermediate compound is produced?
 - (iii) What happens to the intermediate compound referred to in (i) above when oxygen is available and used in the breakdown of glucose?
In your answer refer to:
 - 1. Krebs cycle.
 - 2. Electron transport system.
 - (iv) What is produced from the intermediate compound referred to in (i) above when oxygen is **not** available
 - 1. in muscle?
 - 2. in yeast? (24)

12. (a) (i) Distinguish between the terms *excretion* and *egestion* by writing a sentence about each term.
(ii) Suggest how excretion may occur in simple organisms such as *Amoeba*. (9)
- (b) (i) Name **two** excretory products, other than water, of mammals.
(ii) For **each** product referred to in (i), give a location in the body in which it is produced.
(iii) Describe the role of ADH (vasopressin) in human excretion.
(iv) Suggest **two** structures in flowering plants which play a role in excretion. (27)
- (c) (i) What is meant by the term *homeostasis*?
(ii) Increased metabolic rate, piloerection and vasoconstriction are responses in mammals to falling external temperatures.
1. Explain the term *metabolism*.
 2. What is the effect of an increase in metabolic rate in response to falling external temperatures?
 3. What term is used to describe animals that can vary their metabolic rate significantly?
 4. Suggest how animals that cannot significantly vary their metabolic rate may respond to falling external temperatures.
 5. What is meant by the term *piloerection*?
Explain how piloerection can be an important response to falling external temperatures.
 6. Explain how vasoconstriction can be an important response to falling external temperatures. (24)

13. (a) Growth regulators are important substances found in plants. They play a role in responses to environmental factors.
- (i) What name is given to the regions of plants which secrete growth regulators?
 - (ii) Give an example of a growth regulator which has a negative effect on plant growth.
 - (iii) Explain the term *thigmotropism*.

(9)

- (b) (i) Draw a large diagram to show the structure of the human ear, labelling each of the following parts:

pinna semi-circular canals stirrup ear drum cochlea Eustachian tube

- (ii)
- 1. Briefly outline the function of the pinna.
 - 2. To which part of the body does the Eustachian tube link the ear?
 - 3. What is the role of the Eustachian tube?
 - 4. Name another part of the ear that has a function similar to that of the stirrup.
 - 5. The semi-circular canals play a role in balance. Suggest why there are three semi-circular canals in each ear.

(27)

- (c) (i) Name the part of the eye that has a corresponding function to the cochlea of the ear. Explain your answer.

- (ii) Light passes through the pupil in the eye.

- 1. Name the structure that determines the diameter of the pupil.
- 2. Why is there a mechanism for changing the diameter of the pupil?

- (iii) Certain parts of the eye are transparent and have curved surfaces.

- 1. Name **two** such parts.
- 2. How does the curvature contribute to the functioning of the eye?

- (iv) The eyes of carnivores are located relatively close together at the front of the skull. In herbivores they tend to be located more to the sides of the skull. Referring clearly to either carnivores **or** herbivores, suggest a benefit of **either** arrangement.

(24)

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

(30, 30)

- (a) (i) Explain the term *species*.
- (ii) What term is used to describe the differences which exist between individuals of a species?
- (iii) The differences referred to in (ii) form the basis of evolution by natural selection.
1. Explain the term *evolution*.
 2. Outline the role of natural selection in evolution.
- (iv) Explain the term *mutation*.
- (v) Give **one** example **each** of a disorder caused by:
1. Gene mutation.
 2. Chromosome mutation.
- (vi) Give **one** cause of the differences referred to in (ii) above, other than mutation.
- (b) (i) Cells can be classified as either prokaryotic or eukaryotic.
Give **two** features of eukaryotic cells which distinguish them from prokaryotic cells.
- (ii) Give **one** function of one **named** tissue found in plants.
- (iii) Give **one** function of one **named** tissue found in animals.
- (iv) In the case of **each** of the tissues referred to in (ii) and (iii) above, state **one** way in which the tissue is adapted to carry out the function that you have indicated.
- (v) How does an organ differ from a tissue?
- (vi) 1. What is meant by the term *tissue culture*?
2. State **two** requirements for successful tissue culture.
- (c) (i) 1. What do you understand by the term *turgor* in plant cells?
2. How do plant cells remain turgid for a considerable period of time?
3. What happens to a plant if many of its cells lose turgidity?
4. If an animal cell were subjected to the conditions that result in a plant cell becoming turgid, suggest what may happen to the animal cell. Explain your answer.
- (ii) 1. In relation to the passage of materials through cell membranes, distinguish between *diffusion* and *osmosis* by writing **one** sentence about each term.
2. In your study of human physiology you encountered an example of active transport. Name the location **and** a material involved.

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

(30, 30)

- (a) (i) Draw a labelled diagram of a transverse section **and** a labelled diagram of a longitudinal section through a human vein to show its structure.
- (ii) In **each** of the following cases name a vein which fits the description.
1. Transports blood out of the muscle of the heart.
 2. Brings blood away from the kidneys.
 3. Carries very little carbon dioxide.
 4. Brings blood into the right atrium.
 5. Has capillaries at both ends.
- (iii) Briefly describe how blood is moved through veins.
- (b) Answer the following questions in relation to the typical human female menstrual cycle.
- (i) State **one** change that occurs, **and** the approximate day(s) of the cycle on which it occurs
1. in the endometrium.
 2. in the ovary.
- (ii) FSH and LH each plays a role in the cycle. Where in the body are these hormones produced?
- (iii) State **one** role of **each** of these hormones in the cycle.
- (iv) Name **two** other hormones that play a role in the cycle.
- (v) Stating clearly which of the two hormones you have chosen from (iv), give a function in the cycle of that hormone.
- (c) (i) Long bones contain both yellow marrow and red marrow. Give **one** function of **each** type of marrow.
- (ii) Diseases in humans occur for a number of different reasons. In **each** of the following cases explain how the presence of a named disease may be recognised.
1. A dietary deficiency of a named water-soluble vitamin.
 2. A genetically sex-linked disease, other than haemophilia.
 3. Excessive secretion of a named hormone.
 4. Caused by a virus.
- (iii) Explain the biological basis of **each** of the following.
1. The use of micro-organisms in waste management.
 2. Vaccination.
 3. The artificial propagation of flowering plants.
 4. Increasing the amount of wholegrain foods in the diet.