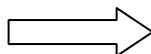


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**Coimisiún na Scrúduithe Stáit
State Examinations Commission**

LEAVING CERTIFICATE EXAMINATION, 2009

BIOLOGY – HIGHER LEVEL

THURSDAY, 11 JUNE – MORNING, 9.30 TO 12.30

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 **five** of the following:

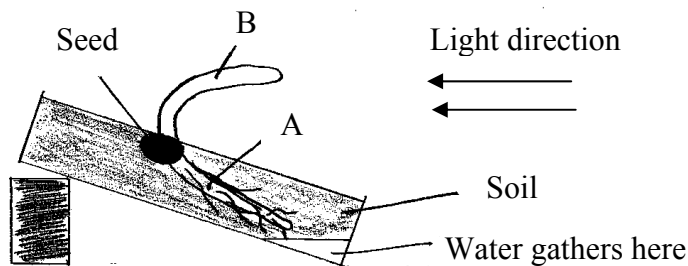
- (a) In carbohydrates, which two elements are in the ratio 2:1? _____
- (b) Cellulose is a polysaccharide. Explain the term *polysaccharide*.

- (c) Name a polysaccharide other than cellulose. _____
- (d) Where precisely in a plant cell would you expect to find cellulose? _____

- (e) Name a test or give the chemicals used to demonstrate the presence of a reducing sugar.

- (f) In relation to the test referred to in (e) which of the following is correct?
 1. No heat needed.
 2. Heat but do not boil.
 3. Boil.

2. The diagram shows a young plant growing in a tilted seed box.



- (a) From which structure in the seed did A develop? _____
- (b) Name the growth response shown by A. _____
- (c) Name the growth response shown by B. _____
- (d) Suggest a benefit to the plant of the growth response shown by B.

- (e) Give an example of a regulator in plants that inhibits growth. _____
- (f) Give **two** uses of plant growth regulators in horticulture.
 1. _____
 2. _____

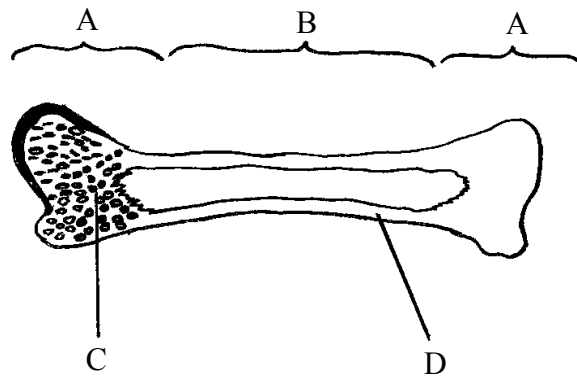
3. (a) Define *predation*. _____

- (b) Give an example of predation by naming a predator and its prey.
 Predator: _____
 Its prey: _____
- (c) Explain the term *niche*. _____

- (d) Name an anabolic process carried out by plants. _____
- (e) Explain the term *edaphic*. _____

- (f) Give an example of an edaphic factor. _____

4. (a) The diagram shows a longitudinal section of a long bone.



- (i) Name the parts of the diagram labelled A, B, C, D.
 A. _____ B. _____
 C. _____ D. _____
- (ii) Where are the discs in the human backbone? _____

- (iii) What is the function of the discs in the human backbone? _____

- (b) Give a role for **each** of the following in the human body:
- (i) Yellow bone marrow. _____
- (ii) Red bone marrow. _____

[OVER]

5. The diagram shows a stage of mitosis.

A _____

B _____

- (a) Name this stage of mitosis. _____
- (b) Give a feature from the diagram which allowed you to identify this stage.

- (c) Name the parts of the diagram labelled A and B.
A. _____
B. _____
- (d) What is the function of mitosis in single-celled organisms? _____
- (e) Give **one** function of mitosis in multicellular organisms. _____
- (f) Give **one** location where mitosis occurs in flowering plants. _____

6. (a) What is *genetic engineering*? _____

- (b) Name **three** processes involved in genetic engineering.
1. _____
2. _____
3. _____
- (c) Give an example of an application of genetic engineering in each of the following cases:
1. A micro-organism. _____
2. An animal. _____
3. A plant. _____

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) (i) Why is a dicotyledonous (dicot) plant so called? _____
(ii) Name a dicotyledonous plant. _____
- (b) (i) Describe in detail how you prepared a microscope slide of a transverse section of the stem of a dicotyledonous plant.

- (ii) Give an account of the procedures that you followed in order to view your slide under the microscope.

- (iii) In the space below draw enough of your section to show and label the location of **each** of the following:
1. Phloem. 2. Xylem. 3. Ground tissue.

[OVER]

8. (a) (i) What is meant by *germination*? _____

- (ii) Why is digestion necessary in a germinating seed? _____

- (b) (i) Digestive activity during germination can be demonstrated by using agar plates.
What is an agar plate? _____

- (ii) An extra food material is added to the agar plate for **this** demonstration.
Give an example of such an extra food material. _____
- (iii) Outline the procedures that you carried out in setting up this demonstration.

- (iv) What control did you use for this demonstration?

- (v) What procedure did you carry out in order to show that digestive activity had taken place?

- (vi) Describe the results that you obtained in:
1. The experimental plate. _____

2. The control plate. _____

9. (a) (i) To which group of biomolecules do enzymes belong? _____

(ii) Name a factor that influences the activity of an enzyme.

(b) In the course of your practical investigations you prepared an enzyme immobilisation. Answer the following questions in relation to that investigation.

(i) Describe how you carried out the immobilisation.

(ii) In the space provided draw a labelled diagram of the apparatus that you used to investigate **the activity** of the immobilised enzyme.

(iii) Briefly outline how you used the apparatus referred to in (b) (ii) above.

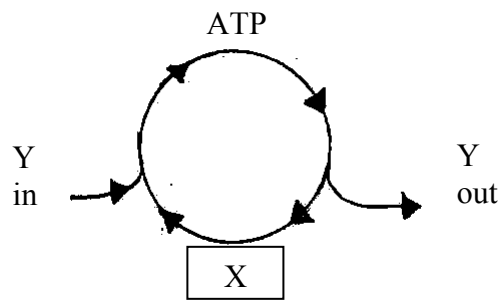
Section C

Answer **four** questions.

Write your answers in the answer book.

10. (a) (i) State Mendel's Law of Segregation. (9)
(ii) Name two cell organelles, other than the nucleus, that contain DNA. (9)
- (b) In guinea pigs the allele for black hair (B) is dominant to the allele for brown hair (b) and the allele for short hair (S) is dominant to the allele for long hair (s). The alleles governing hair colour are located on a different chromosome pair to those governing hair length.
- (i) Explain the terms *alleles* and *dominant*.
(ii) What term is used to describe alleles that lie on the same chromosome?
(iii) Why is it significant that the two pairs of alleles, mentioned above in relation to guinea pigs, are located on different chromosome pairs?
(iv) Determine all the possible genotypes and phenotypes of the offspring of a cross between the following guinea pigs:
- Brown hair, heterozygous short hair X Heterozygous black hair, long hair (27)
- (c) (i) Explain the term *species*.
(ii) Within a species a considerable degree of variation is usually seen.
1. What is meant by *variation*?
2. State **two** causes of variation.
(iii) What is the significance of inherited variation in the evolution of species?
(iv) State **two** types of evidence used to support the theory of evolution. (24)
11. (a) (i) What does an ecologist mean by the term *conservation*?
(ii) Give an outline of **one** conservation practice used in agriculture **or** fisheries **or** forestry. (9)
- (b) Read the following passage about foxes and answer the questions that follow:
- Red foxes are found in many ecosystems. A pair of foxes will occupy a territory and will defend it from other foxes in the breeding season. Territory boundaries are marked with scent and urine. Red foxes are usually solitary and hunt alone except during the breeding season, when they hunt in family groups. The young accompany the parents while hunting and foraging in order to learn skills. Red foxes do not hibernate and are active all year round though they are nocturnal in habit. They are omnivores but they prefer animals such as small rodents, frogs, insects and birds. Preferred plant foods include acorns, grasses, fruits and berries. In urban areas they scavenge for discarded human food. They also eat roadkill whether in a rural or urban setting. (Adapted from: Ontario Ministry of Natural Resources fact sheet: Red fox ecology, 6th June 2007)
1. Give **two** activities of adult foxes, apart from breeding itself, which are associated with the breeding season.
2. How is the territorial boundary marked?
3. How do young foxes learn to hunt?
4. Suggest a reason why wheelie bins are making life more difficult for urban foxes.
5. What is meant by the term *omnivore*?
6. Suggest an advantage to the fox of being "nocturnal in habit".
7. In general, are urban foxes or rural foxes more successful at finding food? Give a reason for your answer. (27)
- (c) (i) In relation to ecological surveys, explain the meaning of the terms:
1. *Qualitative*.
2. *Quantitative*.
(ii) In the course of your ecological studies you investigated an ecosystem. Name this ecosystem and describe how you conducted a **quantitative** survey of plants present in it.
(iii) How did you present the results of your survey?
(iv) Suggest a possible source of error in your survey. (24)

12. (a) ATP and NAD / NADP⁺ play important roles in cell activities.

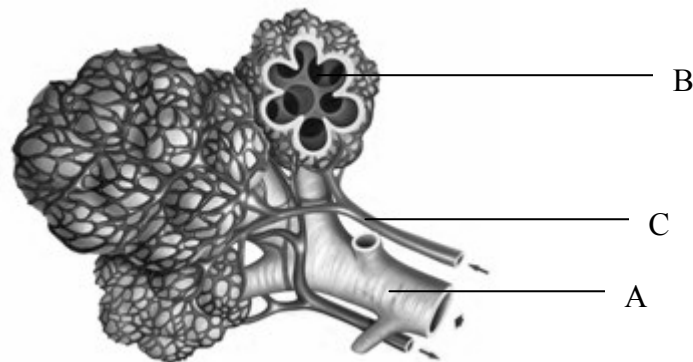


The ATP Cycle

- (i) Name the substance X, formed by the loss of a phosphate group.
(ii) The ATP cycle is kept going by Y. What is Y?
(iii) Suggest a role for NAD / NADP⁺ in cell activities. (9)
- (b) (i) What name is given to the first stage of respiration?
(ii) The first stage ends with the formation of pyruvate (pyruvic acid).
In **anaerobic** conditions, what is produced from this pyruvate:
1. In muscle cells?
2. In yeast cells?
(iii) If conditions are **aerobic**, pyruvate next passes to an organelle in which the second stage of respiration takes place. Name this organelle.
(iv) In this organelle pyruvate is broken down to CO₂ and a two-carbon compound. Name this two-carbon compound.
(v) This two-carbon compound passes directly into a series of reactions in the second stage of respiration.
Name this series of reactions **and** give **one** product, other than electrons, of these reactions.
(vi) The electrons released from the above reactions pass along a transport chain and in the process energy is released.
1. To what use is this energy put?
2. At the end of the transport chain what happens to the electrons? (27)
- (c) One laboratory activity that you carried out demonstrated the influence of light intensity **or** of carbon dioxide concentration on the rate of photosynthesis. Answer the following in relation to this activity:
(i) Explain how you measured the rate of photosynthesis.
(ii) Explain how you varied light intensity **or** carbon dioxide concentration.
(iii) State how you kept another **named** factor constant.
(iv) Draw a graph with labelled axes to show the results that you obtained.
(v) Briefly explain the trend in your graph. (24)

[OVER]

13. (a) The human circulatory system has two circuits.
- Give the name of each of these circuits.
 - Which of these circuits involves the pumping of blood by the left ventricle? (9)
- (b) (i) Write a short note on **each** of the following:
- Pulse.
 - Blood pressure.
- (ii) Comment on the effect of **each** of the following on the circulatory system:
- Diet.
 - Exercise.
- (iii) Give **two** ways, other than colour, in which a red blood cell differs in structure or composition from a typical body cell such as one in the cheek lining.
- (iv) What is the role of the SA (sinoatrial) and AV (atrioventricular) nodes in the heart?
- (v) Give the **precise** locations of **both** the SA and the AV nodes in the heart. (27)
- (c)



The diagram shows microscopic detail from a human lung.

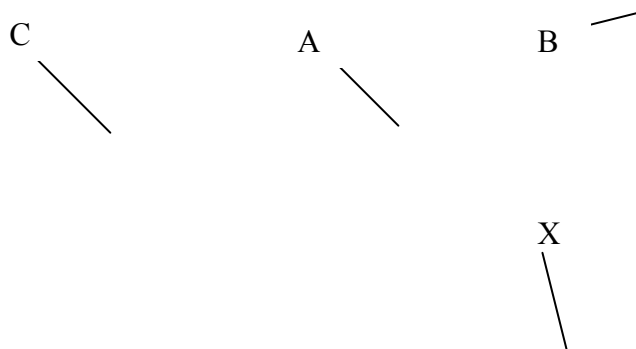
- Name the parts labelled A, B and C.
- Give **two** features of the structures in the diagram that allow for efficient gas exchange.
- Name a disorder of the breathing system and say how it may be:
 - Caused.
 - Prevented.
 - Treated.
- Which gas, dissolved in the blood, can trigger deeper or faster breathing? (24)

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

(30, 30)

- (a)
- (i) Draw a diagram of the reproductive system of the human female. On your diagram indicate where the following occur:
 1. Meiosis.
 2. Fertilisation.
 3. Implantation.
 - (ii) Give an account of the role of either oestrogen **or** progesterone in the menstrual cycle.
 - (iii) Name a human female menstrual disorder. In the case of this disorder give:
 1. A possible cause.
 2. A method of treatment.
- (b)
- (i) Give an account of the importance of the placenta during human development in the womb.
 - (ii) From what tissues is the placenta formed?
 - (iii) Outline how birth occurs.
 - (iv) What is meant by *in-vitro fertilisation*?
 - (v) After implantation, the embryo first develops into a *morula* and then into a *blastocyst*. Explain the terms in italics.

(c)



- (i) Identify the organism shown in the diagram.
- (ii) To which kingdom does this organism belong?
- (iii) Name the parts labelled A, B and C.
- (iv)
 1. Give a role, other than anchorage, for structure X.
 2. Describe how X carries out this role.
- (v) Which term describes the mode of nutrition of this organism.
- (vi) The cells of this organism are described as eukaryotic. Give **two** characteristic features of eukaryotic cells.
- (vii) What corresponding term is used to describe bacterial cells?

[OVER]

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

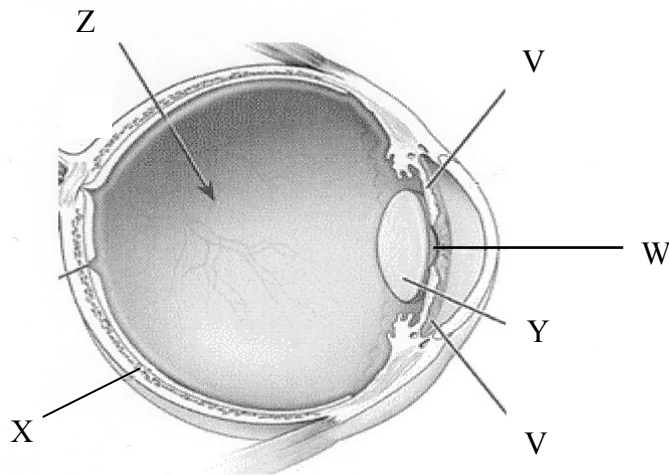
(30, 30)

- (a)
- (i) What is meant by *vegetative propagation*?
 - (ii) Horticulturists use a number of methods to artificially propagate plants. Suggest **one** advantage of artificial propagation.
 - (iii) Describe **two** methods used by horticulturists to artificially propagate plants.
 - (iv) Give **two** differences between vegetative propagation and propagation involving seeds.
 - (v) Seeds and fruits need to be dispersed.

Give:

- 1. **Two** methods of dispersal.
- 2. **Two** advantages of dispersal to the plant.

(b)



The diagram shows the human eye.

- (i) Name the parts labelled V, W and X.
- (ii) Give the functions of parts Y and Z.
- (iii) 1. Suspensory ligaments. 2. Cones. 3. Optic nerve. 4. Brain. Outline the roles in vision of any **three** of the above structures.
- (iv) Explain how the iris works.
- (v) Suggest a reason why two eyes are better than one.

(c) Write notes on **three** of the following topics:

- (i) The role of lymphocytes.
- (ii) Neurotransmitters.
- (iii) Homeostasis.
- (iv) Adaptations of wind-pollinated flowers.
- (v) The economic and medical importance of viruses.