Write your Examination Number here ⇨ _____

Coimisiún na Scrúduithe Stáit
State Examinations Commission

LEAVING CERTIFICATE EXAMINATION, 2012

BIOLOGY – HIGHER LEVEL

TUESDAY, 12 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.

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Section A

Answer any <u>five</u> questions.
Write your answers in the spaces provided.

1. Answer **five** of the following:

(a) Name a monosaccharide.

_____

(b) Give the formula of the monosaccharide referred to in (a).

_____

(c) Name a polysaccharide that can be formed from the monosaccharide referred to in (a).

_____

(d) Give **one** way in which an amino acid differs from a monosaccharide, in terms of chemical composition.

_____

(e) What do carbohydrates and fats have in common, in terms of chemical composition?

_____

(f) How may one fat differ from another, in terms of chemical composition?

_____

2. (a) (i) What is a tissue?

_____

(ii) Give an example of an animal tissue.

_____

(iii) State a role of the animal tissue referred to in (ii).

_____

(iv) Give **one** way in which the tissue referred to in (ii) is adapted to carry out its function(s).

_____

(b) (i) Explain the term *tissue culture*.

_____

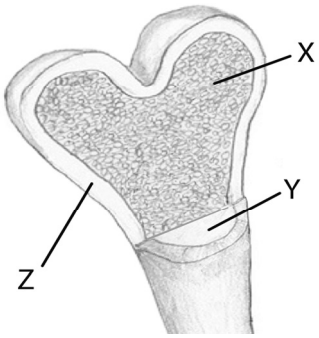
_____

(ii) Give **two** examples of the use of tissue culture.

1. _____

2. _____

3. (a) The diagram shows the macroscopic structure of part of a long bone.



(i) Name a long bone in the human body. _____

(ii) Name parts X, Y and Z in the diagram. X. _____

Y. _____

Z. _____

(iii) State a function of X. _____

(iv) State a function of Y. _____

(b) (i) Show clearly on the diagram where you would expect to find cartilage.

(ii) State **one** role of **this** cartilage. _____

4. (a) (i) What does an ecologist mean by the term *conservation*?

_____

(ii) Suggest a reason why nature reserves are important for conservation.

_____

(b) (i) Explain the term *pollution*. _____

(ii) Pollution may result from domestic, agricultural or industrial sources.
Select **one** of these areas **and** state an effect that may be produced by a **named** pollutant.

Pollutant: _____

Effect: _____

(iii) How may the pollution referred to in (ii) be controlled?

_____

(c) In relation to the incineration of domestic waste, suggest:

(i) an advantage of the process. _____

(ii) a disadvantage of the process. _____

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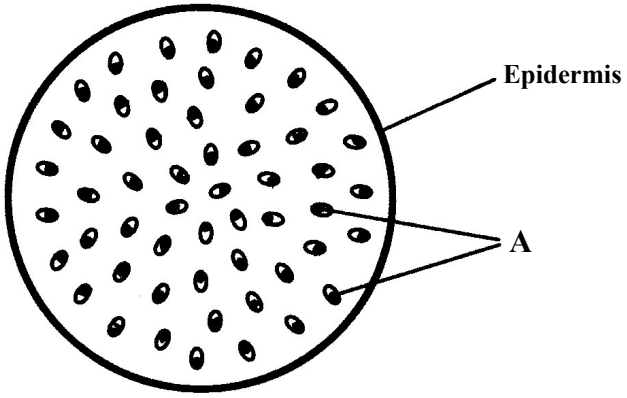
5. The diagram shows a transverse section through the stem of a monocotyledonous (monocot) plant.



(a) What is meant by the term *monocotyledonous*?

_____

(b) Give an example of a monocotyledonous plant. _____

(c) Name the structures labelled A. _____

(d) How do you know from the diagram that the section is taken from:

(i) a stem? _____

(ii) a monocot? _____

(e) How are the veins arranged in the leaves of monocots? _____

(f) How does the vein arrangement in the leaves of dicot plants differ from that in monocots?

_____

6. (a) In genetics, what is meant by the term *variation*?

_____

(b) Variation can result from mutation. Name **one** other cause of variation.

_____

(c) Name **two** types of mutation.

(i) _____ (ii) _____

(d) Name **two** agents responsible for increased rates of mutation.

(i) _____ (ii) _____

(e) Briefly explain the significance of mutation in relation to natural selection.

_____

_____

Section B

Answer any <u>two</u> 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) Data. _____

(ii) Replicates. _____

(b) Answer the following by reference to some of the investigations that you carried out in the course of your studies.

(i) How did you expose the semi-lunar valves when dissecting the sheep's or ox's heart?

_____

(ii) How did you show that alcohol was present when investigating the production of alcohol by yeast?

_____

_____

(iii) What type of agar plates did you use when investigating the digestive activity of seeds?

_____

(iv) How did you demonstrate that digestive activity had taken place in the investigation referred to in part (iii)?

_____

_____

(v) How did you demonstrate the requirement for oxygen when investigating the factors necessary for seed germination?

_____

_____

(vi) What did you use as the selectively permeable membrane in your investigation of osmosis?

_____

(vii) What growth regulator did you use when investigating plant growth?

_____

(viii) A microscope has an eyepiece lens marked ×10 and an objective lens marked ×20. What is the total magnification of the image?

_____

[OVER

8. (a) (i) Are fungi prokaryotic or eukaryotic? _____

(ii) Name **one** structure in plant cells not found in fungi.

_____

(b) (i) What is the purpose of using agar when growing fungi or bacteria in the laboratory?

_____

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

_____

(iii) Describe how you introduced the leaf yeasts into agar plates.

_____

_____

_____

(iv) What was the precise purpose of a control in this investigation?

_____

_____

(v) How did you recognise the leaf yeasts when they appeared on the agar?

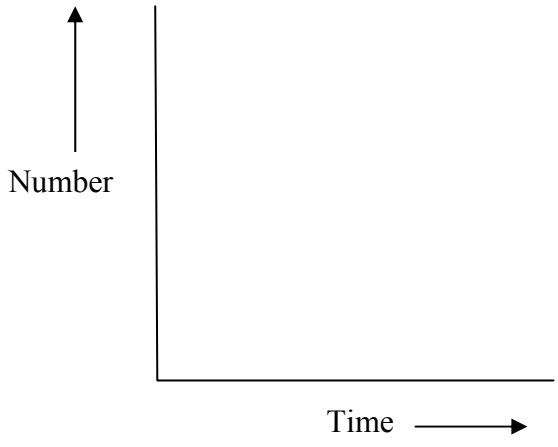
_____

(vi) How did you safely dispose of the plates at the end of the investigation?

_____

_____

(vii) Using the axes below, draw a graph to show how the number of leaf yeasts varied following their introduction into the plate.



9. (a) Answer the following in relation to enzymes.

(i) What is their chemical nature? _____

(ii) Comment upon their molecular shape. _____

(b) Answer the following in relation to an investigation that you carried out into the effect of temperature on the rate of enzyme action.

(i) Name the enzyme that you used.

_____

(ii) Name the substrate of this enzyme.

_____

(iii) Why was it necessary to keep the pH constant in the course of the investigation?

_____

(iv) How did you keep the pH constant?

_____

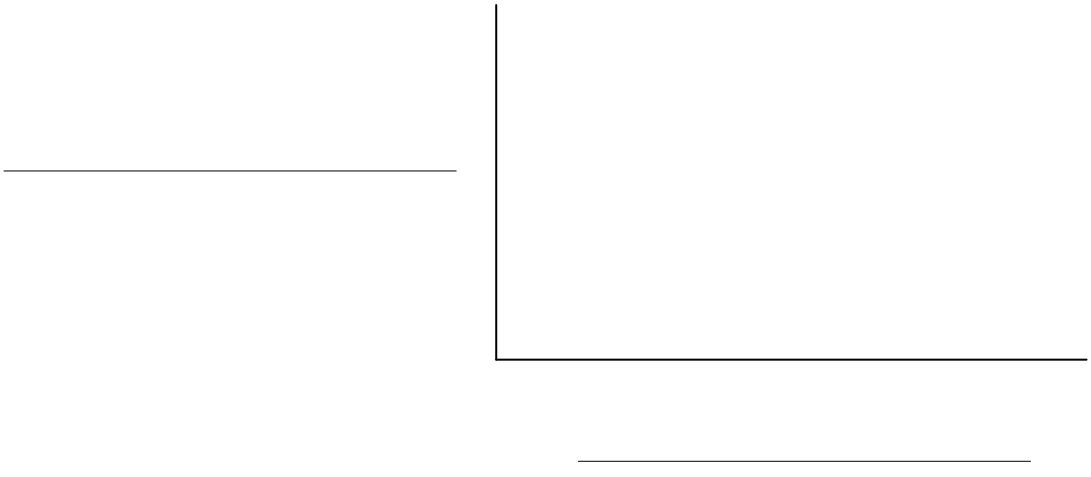
(v) How did you vary the temperature in the course of the investigation?

_____

(vi) How did you know that the enzyme was working?

_____

(vii) Use the axes below to summarise the results of your investigation.
Do this by
1. labelling the axes,
2. drawing a graph to show how the rate of enzyme action varied with temperature.



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Section C

Answer any <u>four</u> questions.
Write your answers in the answer book.

10. (a) (i) Nucleic acids are composed of subunits called nucleotides. Each nucleotide is formed from a sugar, a phosphate group and a nitrogenous base.
Name the two **types** of nitrogenous base found in DNA.

(ii) Give **both** of the specific base pairs in DNA structure. **(9)**

(b) In the sweet pea plant the texture and colour of the testa (seed coat) are governed by two pairs of alleles, which are not linked. The allele for smooth (S) is dominant to the allele for wrinkled (s) and the allele for yellow (Y) is dominant to the allele for green (y).

(i) State the Law of Segregation **and** the Law of Independent Assortment.

(ii) Using the above symbols, and taking particular care to differentiate between upper case and lower case letters:
1. give the genotype of a pea plant that is homozygous in respect of seed texture and heterozygous in respect of seed colour.
2. state the phenotype that will result from the genotype referred to in 1.

(iii) What phenotype will be produced by the genotype SsYy?
Give another genotype that will produce the same phenotype. Do not use a genotype that you have already given in response to part (ii) 1.

(iv) If the allele for smooth were linked to the allele for green and the allele for wrinkled were linked to the allele for yellow, give the genotypes of the **two** gametes that parent SsYy would produce **in the greatest numbers**.

(27)

(c) (i) What is meant by the term *genetic engineering*?

(ii) In genetic engineering all or some of the following procedures may be involved.

Isolation;
Cutting (restriction);
Transformation (ligation);
Introduction of base sequence changes;
Expression.

Briefly explain **each** of the above terms in the context of genetic engineering.

(iii) Give **one** application of genetic engineering in **any two** of the following.

1. An animal.
2. A plant.
3. A micro-organism.

(24)

11. (a) (i) Distinguish between a food chain and a food web.
Include a clear reference to each in your answer.

(ii) What do ecologists mean by a *pyramid of numbers*? **(9)**

(b) Organisms that are introduced into new environments outside their natural ranges are referred to as exotic species. In some cases these introductions have been deliberate and in other cases accidental e.g. when a species kept in captivity in a new country escapes and gives rise to a wild population. Worldwide, the great majority of deliberate attempted introductions have been unsuccessful.

(i) Suggest a reason for attempting to establish an exotic species in a new country.

(ii) Suggest **two** reasons why the great majority of attempted introductions have been unsuccessful.

(iii) Use your knowledge of the life cycle of flowering plants to suggest how an exotic plant may escape from captivity.

(iv) Use the knowledge that you have gained in your studies of ecology to suggest how the introduction of an exotic species may:
1. impact negatively on an existing community.
2. impact positively on an existing community.

(v) It has been stated that an exotic species has a good chance of becoming established in a new environment if there is a vacant niche.
1. Explain the term *niche* in this context.
2. Do you agree with the above statement?
3. Explain your answer. **(27)**

(c) **Name the ecosystem** which you investigated during your study of ecology.

(i) Explain the terms
1. *Flora,*
2. *Fauna.*

(ii) Name **one** animal from your named ecosystem **and** describe how you carried out a quantitative study of that animal.

(iii) Suggest **one** way in which marking an animal might endanger it.

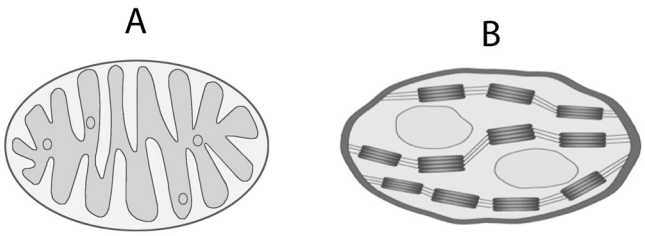
(iv) Ecosystems are subject to changes, both natural and artificial.
Mention **one** of **each** type of change as it applies to your named ecosystem. **(24)**

[OVER

12. (a) (i) From the following list, **write into your answer book** any term that describes the nutrition of a typical plant:

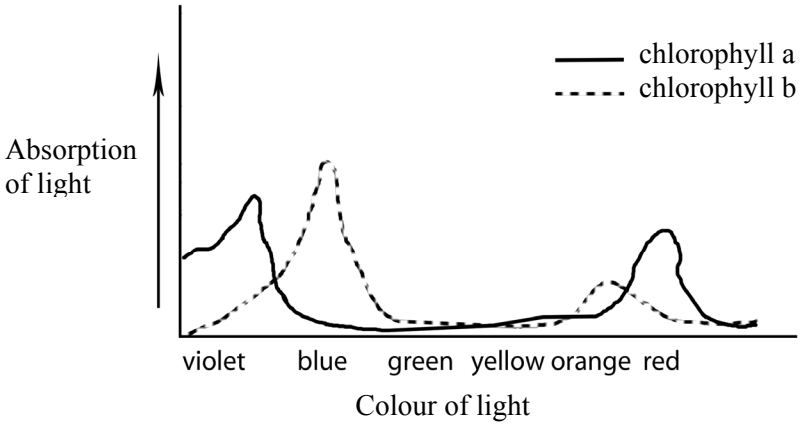
parasitic; heterotrophic; saprophytic; autotrophic.

(ii) Identify, **in your answer book**, the cell organelles A and B.



(9)

(b) Chlorophyll is composed of various pigments.
Two of these pigments are **chlorophyll a** and **chlorophyll b**.
The graph below shows the amount of light of different colours absorbed by chlorophyll a and chlorophyll b.



(i) 1. What **colours** of light are absorbed most by chlorophyll a?
2. What **colour** of light is absorbed most by chlorophyll b?

(ii) What happens to yellow light when it strikes a leaf?

(iii) Suggest **one** possible benefit to plants of having more than one chlorophyll pigment.

(iv) From the information provided by the graph suggest how a commercial grower might try to increase crop yield in his glasshouses or tunnels.

(v) 1. What is the main source of carbon dioxide used by plants in the dark stage of photosynthesis?
2. State **one** role of NADP **and one** role of ATP in the dark stage of photosynthesis.

(27)

(c) Write a brief note on **each** of the following items in relation to respiration.

(i) Glycolysis.
(ii) Acetyl Co-enzyme A.
(iii) Adenosine triphosphate.
(iv) Electron transport chain. **(24)**

13. (a) (i) Distinguish between the central nervous system and the peripheral nervous system. Include a clear reference to each in your answer.

(ii) Give **one** way in which a nervous response differs from a hormonal response. **(9)**

(b) (i) Draw a large labelled diagram of a motor neuron.

(ii) Give one function **each** of any **two** parts found **only** in neurons.

(iii) Place an arrow on or near your diagram to indicate the direction of impulse transmission.

(iv) Name **and** state the role of any **two** types of neuron, other than the motor neuron. **(27)**

(c) (i) State **one** function for **each** of the following parts of the human brain.

Cerebrum;
Hypothalamus;
Cerebellum;
Medulla oblongata.

(ii) In relation to the nervous system, distinguish between grey matter and white matter. Include a clear reference to each in your answer.

(iii) In the case of either paralysis or Parkinson's disease state:

1. a possible cause, other than accident;
2. a method of treatment. **(24)**

[OVER

14. Answer any **two** of (a), (b), (c). **(30, 30)**

(a) (i) Give a brief account of the role of **each** of the following in flowering plant reproduction.

1. Petal.
2. Anther.
3. Stigma.

(ii) Name **one** structure through which the pollen tube grows in order to reach the embryo sac.

(iii) Within the pollen tube the generative nucleus divides to form two male gametes.

1. What type of division takes place?
2. With what does **each** male gamete fuse in the embryo sac?
3. Name the product of **each** fusion.

(iv) As the seed forms following fertilisation, a food store develops in one of two structures. Name any **one** of these structures.

(b) Answer the following questions from your knowledge of early human development in the womb.

(i) 1. Name the **three** germ layers in the early human embryo.
2. For **each** germ layer name a structure in the adult body that develops from it.

(ii) From which tissues does the placenta develop?

(iii) 1. What is the amnion?
2. Explain the importance of the amnion for the foetus.

(c) (i) Answer the following questions in relation to sexual reproduction in the mould *Rhizopus*.

1. Sexual reproduction in *Rhizopus* is normally triggered by an adverse environmental stimulus. Suggest **one** such stimulus.

2. Draw diagrams to show the main events of sexual reproduction in *Rhizopus*. In your diagrams label **three** structures other than the zygospore.

3. Give **two** advantages to *Rhizopus* of zygospore formation.

(ii) Answer the following questions in relation to asexual reproduction in yeast.

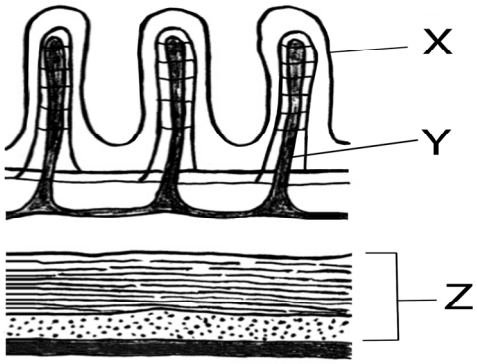
1. What term is used to describe the process of asexual reproduction in yeast?

2. What happens to the new cells formed in the process?

3. How does asexual reproduction in *Rhizopus* differ from that in yeast?

15. Answer any **two** of (a), (b), (c). **(30, 30)**

(a) The diagram shows part of a transverse section through the small intestine.



(i) Name structures X and Y.

(ii) What process results from the contraction of the two parts of tissue Z?

(iii) **In your answer book**, indicate which of the following most accurately represents the pH of the contents of the small intestine.

Acidic. Neutral. Alkaline.

(iv) Name **two** glands that pass their secretions into the small intestine.

(v) 1. What are *symbiotic* bacteria?
2. Give **two** functions of symbiotic bacteria in the human alimentary canal.

(vi) Where in the human alimentary canal is most water absorbed?

(b) (i) State **two** ways, other than colour, in which red blood cells differ from white blood cells.

(ii) Name a group of white blood cells, other than lymphocytes.

(iii) Lymphocytes may be divided into B cells and T cells. B cells produce antibodies.

1. What is the role of antibodies in the body?
2. Name any **three** types of T cell.
3. State a role of **each** of the T cell types that you named in part 2.

(c) (i) Explain the term *homeostasis*.

(ii) Homeostasis often requires an organism to exchange materials between different tissues, or between itself and the external environment by <u>diffusion</u>, <u>osmosis</u>, and <u>active transport</u>. Explain **each** of the underlined terms.

(iii) State **one** way in which **each** of the following contributes to homeostasis.

1. Liver.
2. Lungs.
3. Nephrons of kidneys.

(iv) Describe the role of the skin in controlling body temperature.

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