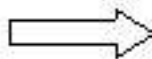


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**Coimisiún na Scrúduithe Stáit
State Examinations Commission**

LEAVING CERTIFICATE EXAMINATION, 2007

BIOLOGY - HIGHER LEVEL

TUESDAY, 12 JUNE - AFTERNOON, 2.00 TO 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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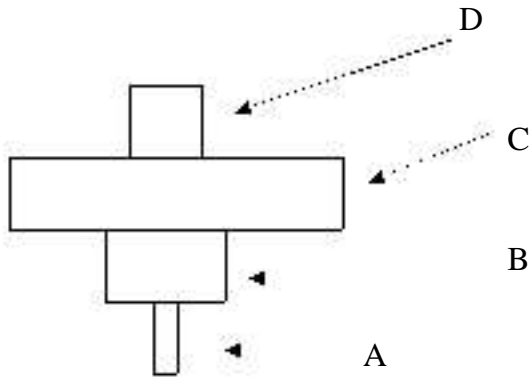
Section A

Answer any five questions.

Write your answers in the spaces provided.

1. Give an example of **five** of the following;
 - (a) A catabolic reaction in an animal.
 - (b) An anabolic reaction in a plant.
 - (c) A fat-soluble vitamin.
 - (d) A reducing sugar.
 - (e) A polysaccharide.
 - (f) A trace element in the human diet.

2.
 - (a) In ecology what is meant by a trophic level?
 - (b) Complete the pyramid of numbers by naming an organism in each case of A, B, C and D.



A B.....

C D.....

- (c) Which letter represents the producer in the pyramid?
- (d) Comment on the relative sizes of an individual producer and an individual primary consumer in the pyramid.

.....

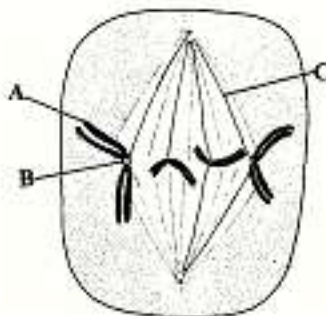
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| | | | |
|-----------|-----------------|--|------------------|
| 1. | <i>any five</i> | | 2(7)+2(3) |
| | (a) | respiration or digestion or deamination or other correct process or named stage or example of chemical reaction (word or equation) | |
| | (b) | photosynthesis or protein synthesis or replication or other correct process or named stage or example of chemical reaction (word or equation) | |
| | (c) | Vitamin A or D or E or K or chemical name | |
| | (d) | glucose or maltose or other correct sugar | |
| | (e) | cellulose or starch or other correct polysaccharide | |
| | (f) | iron or copper or zinc | |

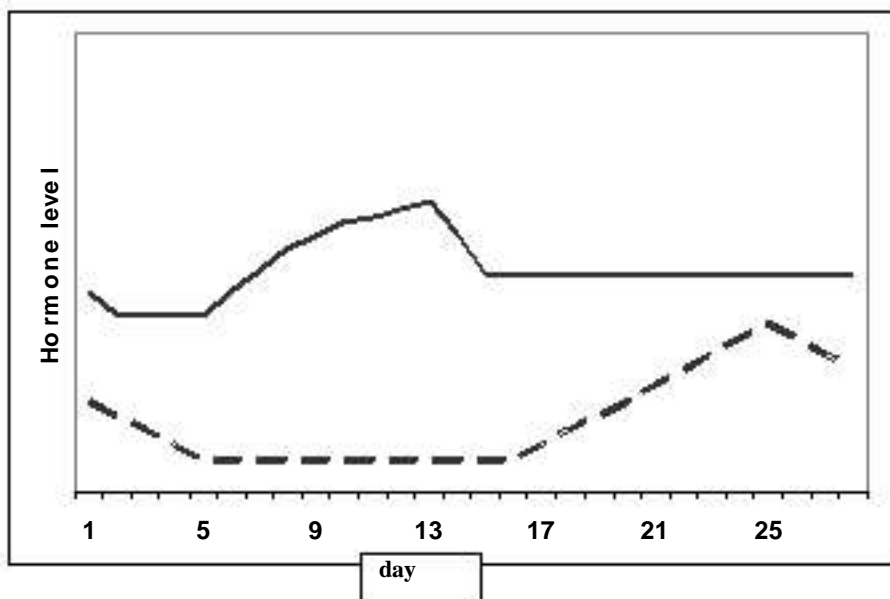
| | | | |
|-----------|------------|---|----------------------|
| 2. | | | |
| | (a) | feeding level or energy level or position in food chain | 5 |
| | (b) | name A + B C = parasite or scavenger or decomposer or correctly named | 3 2 |
| | (c) | A | 5 |
| | (d) | (producer) larger or consumer smaller | 5 |

3. Study the diagram of a stage of mitosis in a diploid cell and then answer the questions below.



- (a) Name A, B and C.
 A B C
- (b) What stage of mitosis is shown?
 Give a reason for your answer.
- (c) What is the diploid number of this nucleus which is undergoing mitosis?
- (d) Give a role of structure A.
- (e) Some cells in the human body undergo meiosis. Give one function of meiosis.....

4. The graphs illustrate changes in the levels of two hormones, A and B, which are involved in the development of the endometrium, during the human female menstrual cycle.



A _____
 B - - - -

- (a) Name one of these hormones.....
- (b) What happens in the ovary around day 14 of the cycle?

- (c) Apart from the two hormones illustrated, another hormone called FSH has a role in the cycle.
 - (i) Where is FSH produced?
 - (ii) Give one function of FSH.....

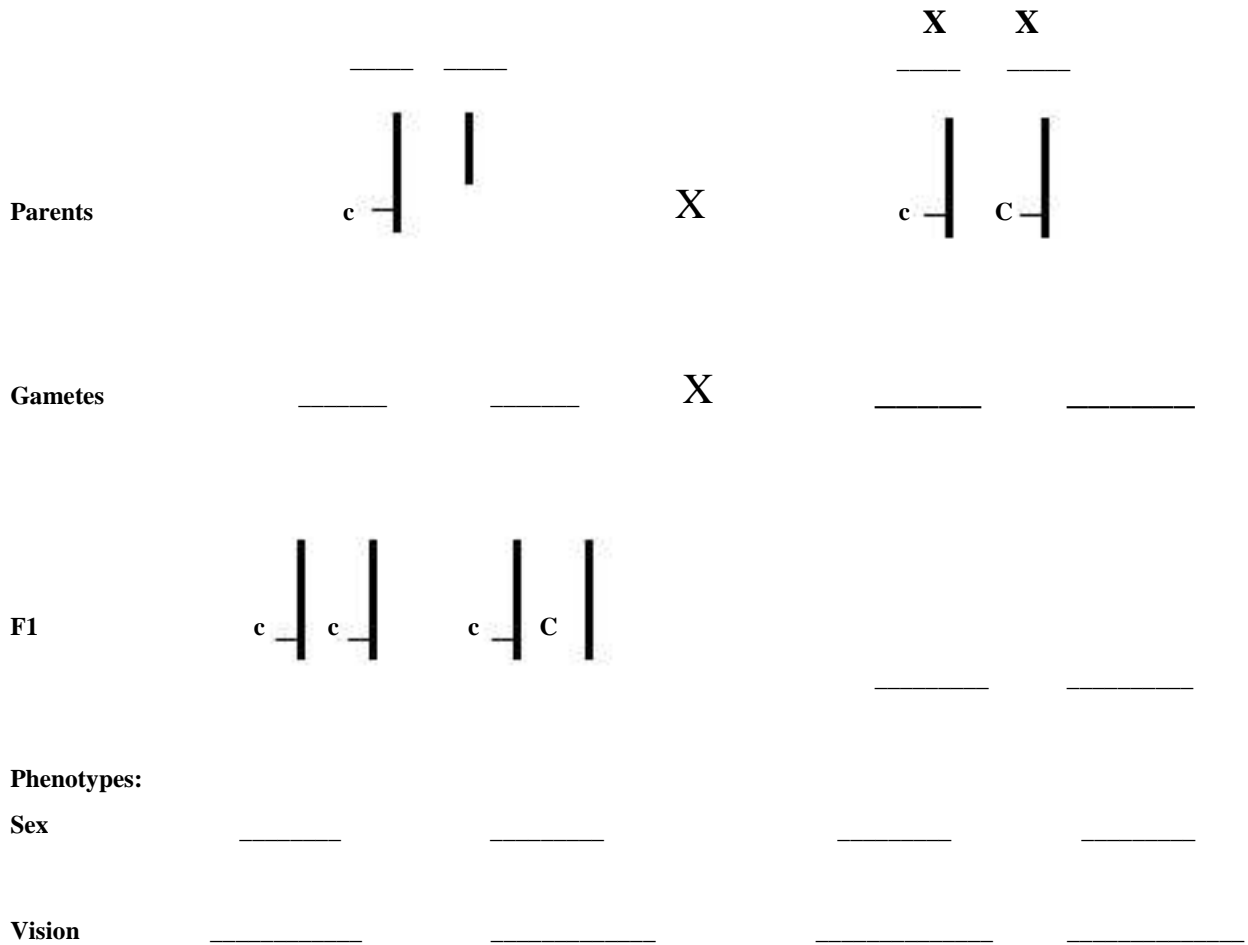
- (d) Which graph, A or B, represents the hormone secreted by the *corpus luteum* (yellow body)?
- (e) Draw a line graph in the space above A and B to illustrate the changes that take place in the thickness of the endometrium over the course of the cycle.

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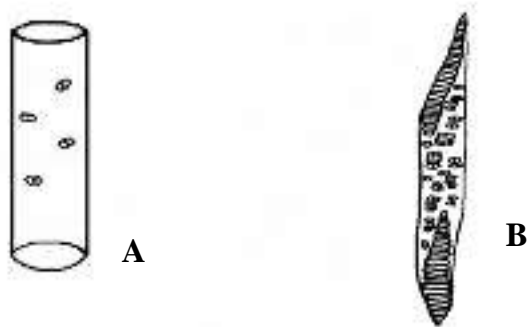
| | | | |
|-----------|------------|---|----------------------|
| 3. | | | |
| | (a) | A = chromosome [accept chromatid] B = centromere C = spindle | 3(2) |
| | (b) | <i>Stage:</i> metaphase <i>Reason:</i> chromosomes on equator | 2 3 |
| | (c) | four | 3 |
| | (d) | comment on inheritance e.g. to carry genes, genetic code, code for protein | 3 |
| | (e) | to produce gametes or to reduce or to halve chromosome number [<i>allow</i> variation] | 3 |

| | | | |
|-----------|------------|---|----------------------|
| 4. | | | 2(5)+5(2) |
| | (a) | oestrogen or progesterone | 3 |
| | (b) | ovulation or described | 3 |
| | (c) | (i) pituitary | 3 |
| | | (ii) production or development of follicle (egg) or (stimulate) oestrogen production | 3 |
| | (d) | B | 3 |
| | (e) | curve descending [days 1 – 5, <i>allow</i> up to day 9] curve ascending [after day 5] | 3 2 |

5. (a) In genetics, what is meant by sex linkage?
-
- (b) In humans a sex-linked recessive allele **c** is responsible for red-green colour blindness. Complete the blank spaces above the lines in the following cross.



6. The diagrams represent two forms of a vascular plant tissue, as seen under the microscope.



- (a) Name this vascular tissue
- (b) Identify the two forms of this tissue.
 A B
- (c) The walls of A and B are reinforced with a hard material. Name this material
- (d) Where precisely is this vascular tissue found in the stem of a young dicotyledonous plant?

- (e) Name another vascular tissue

| | | | | |
|-----------|------------|----------------|---|-------------|
| 5. | | | | |
| | (a) | | gene on sex chromosome or on X or on Y | 2 |
| | (b) | <i>Parents</i> | <u>XY</u> | 2 |
| | | <i>Gametes</i> | | 2+2 |
| | | <i>F1</i> | | 2+2 |
| | | <i>Sex</i> | <u>Female</u> <u>Female</u> <u>Male</u> <u>Male</u> | |
| | | <i>Vision</i> | <u>Colour blind</u> <u>Normal</u> [accept carrier] <u>Colour blind</u> <u>Normal</u> | 4(2) |

| | | | | |
|-----------|------------|--|--|-------------|
| 6. | | | | |
| | (a) | Xylem | | 2 |
| | (b) | A = vessel B = tracheid | | 2(6) |
| | (c) | Lignin | | 2 |
| | (d) | vascular bundle or next to phloem | | 2 |
| | (e) | phloem [<i>allow</i> animal example] | | 2 |

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) What is meant by an enzyme?
-
- (ii) Give an example of a protein that has a **structural** role.
- (b) Answer the following questions in relation to an investigation that you carried out to determine the effect of temperature on enzyme action.
- (i) Name the enzyme that you used.
- (ii) Name the substrate of the enzyme.
- (iii) State one factor that you kept constant during the investigation
-
- (iv) How did you keep this factor constant?
-
-
-
- (v) How did you vary the temperature?
-
-
-
- (vi) How did you measure the rate of activity of the enzyme?
-
-
-
-
-
- (vii) What was the result of your investigation?
-
-
-
-

| | | | |
|-----------|------------|--------------|---|
| 7. | | | |
| | (a) | (i) | biological or organic or metabolic or protein catalyst or explained 3 |
| | | (ii) | keratin or myosin or other correct 3 |
| | | | |
| | (b) | (i) | name of enzyme 3 |
| | | (ii) | name of matching substrate 3 |
| | | (iii) | pH or substrate concentration or enzyme concentration [<i>allow amount</i>] 3 |
| | | (iv) | buffer or same volume or same amount 3 |
| | | (v) | water baths or described or water bath at different temperatures or described 3 |
| | | (vi) | time / change e.g. colour, foam, etc or data logger / sensor named 2(3) |
| | | (vii) | activity varies with temperature or reference to activity at a particular temperature 3 |

| | | | | |
|-----------|------------|--------------|---|-------------|
| 8. | | | | |
| | (a) | (i) | <i>Rhizopus</i> or other | 3 |
| | | (ii) | multicellular or mode of reproduction or size or structure | 3 |
| | | | | |
| | (b) | (i) | material [or described] supplying food or material allowing growth | 3 |
| | | (ii) | (malt) agar | 3 |
| | | (iii) | free of (micro)organisms | 3 |
| | | (iv) | cut leaves / attach to lid / how attached / sealed dish / invert / incubate / any aseptic technique / control described | 4(3) |
| | | (v) | pink (colonies) or if negative, result must be qualified | 3 |

9. (a) State a precise role for each of the following in photosynthesis:
- (i) Carbon dioxide
 -
 -
 - (ii) Water
 -
 -
- (b) Answer the following questions in relation to an activity that you carried out to investigate the influence of light intensity OR carbon dioxide concentration on the rate of photosynthesis.
- (i) Name the plant that you used.
 - (ii) How did you vary light intensity OR carbon dioxide concentration?
.....
.....
.....
 - (iii) State a factor that you kept constant during the investigation.
.....
 - (iv) How did you ensure that the factor that you mentioned in (iii) remained constant?
.....
.....
.....
 - (v) How did you measure the rate of photosynthesis?
 -
 -
 -
 -
 -
 -
 - (vi) Using labelled axes, sketch a graph to show how the rate of photosynthesis varied with the factor mentioned in (ii) above.

| | | | |
|----|-----|-------|---|
| 9. | | | |
| | (a) | (i) | supplies carbon or correct comment related to CO ₂ 3 |
| | | (ii) | supplies hydrogen or protons (H ⁺) or electrons or photolysis or described [<i>allow</i> formation of carbohydrate or named once] 3 |
| | (b) | (i) | <i>Elodea</i> or other correctly named aquatic plant 3 |
| | | (ii) | lamp distance or wattage or quantity of NaHCO ₃ 3 |
| | | (iii) | carbon dioxide or light or temperature 3 |
| | | (iv) | water bath or described or lamp distance or wattage or NaHCO ₃ 3 |
| | | (v) | bubbles or volume / time or data logger / sensor named 2(3) |
| | | (vi) | vertical axis labelled rate + horizontal axis labelled [light or CO ₂] 3 curve matching axes labels 3 |

Section C

Answer any **four** questions.

Write your answers in the answer book.

10. (a) (i) The DNA molecule is composed of two strands held together by paired bases.
1. Which base can link only to thymine?
2. Which base can link only to cytosine?
(ii) Name the type of bonding which occurs between members of a base pair. (9)
- (b) (i) Explain what is meant by the term DNA profiling.
(ii) Give a brief account of the stages involved in DNA profiling.
(iii) Give **two** applications of DNA profiling.
(iv) What is genetic screening? (27)
- (c) "The same amount of DNA is present in nuclei of cells taken from the liver, heart, pancreas and muscle of a rat."
(i) Use your knowledge of DNA and mitosis to explain this statement.
(ii) Name a cell produced by the rat which will contain a different amount of DNA in its nucleus to those mentioned above.
(iii) Briefly outline how you isolated DNA from a plant tissue. (24)
11. (a) (i) For what is ATP an abbreviation?
(ii) What is the role of ATP in cells? (9)
- (b) (i) What name is given to the first stage of respiration?
(ii) Where in a cell does this first stage take place?
(iii) To what substance is glucose normally converted in this first stage of respiration?
(iv) Is oxygen required for this conversion?
(v) Name a compound to which the substance that you have named in (iii) may be converted, in the absence of oxygen.
(vi) In aerobic respiration, the product of the first stage moves to the mitochondrion. Outline subsequent events in the total breakdown of this product. (27)
- (c) Enzymes can be immobilised and then used in bioprocessing.
(i) What is meant by immobilisation?
(ii) Name a substance that is used to immobilise enzymes.
(iii) Give **two** advantages of using immobilised enzymes.
(iv) Give **one** application of a named immobilised enzyme. In your answer, refer to substrate, enzyme and product. (24)
12. (a) Explain the following terms that are used in ecology: niche, edaphic factor, symbiosis. (9)
- (b) (i) What is the function of the nitrogen cycle?
(ii) What is meant by nitrogen fixation?
(iii) What is meant by nitrification?
(iv) Describe, using words and/or labelled diagrams, the events of the nitrogen cycle. (27)
- (c) (i) What term do ecologists use to describe an animal which kills and eats other animals?
(ii) What term is used to describe the animal that is killed and eaten?
(iii) If the population of the animals in (ii) declines suggest **two** possible consequences for the animals in (i).
(iv) Give **four** factors that influence the size of the human population. (24)

| | | | | |
|-----|-----|-------|---|--------|
| 10. | (a) | (i) | 1. adenine* 2. guanine* | 2(3) |
| | | (ii) | hydrogen (bonding) | 3 |
| | (b) | (i) | examining DNA / for a pattern or band / to compare | 2(3) |
| | | (ii) | DNA extracted or explained / DNA cut into fragments / using enzymes / fragments separated / on basis of size / pattern analysed | 4(3) |
| | | (iii) | forensic science or explained / relationships or explained / medical or explained | 2(3) |
| | | (iv) | to establish presence or absence of gene(s) | 3 |
| | (c) | (i) | chromosome contains DNA mitosis maintains same chromosome number or cells derived from mitotic division | 3 3 |
| | | (ii) | gamete or sex cell or named | 3 |
| | | (iii) | chop plant into small pieces / add salt / add detergent / warm to 50 – 60 degrees / then cool / blend / any one correct time point / filter / add protease / add cold ethanol | 5(3) |

| | | | | |
|-----|-----|-------|--|-------------|
| 11. | (a) | (i) | Adenosine Triphosphate | 3 |
| | | (ii) | stores or provides or described / energy | 2(3) |
| | (b) | (i) | glycolysis* | 3 |
| | | (ii) | cytoplasm* or cytosol | 3 |
| | | (iii) | pyruvate* or pyruvic acid | 3 |
| | | (iv) | no* | 3 |
| | | (v) | lactic acid or ethanol | 3 |
| | | (vi) | (begins with) acetyl co-enzyme A / Krebs cycle / release of carbon dioxide / H release / transport system / ATP formed / O ₂ required / H ₂ O produced | 4(3) |
| | (c) | (i) | attached or fixed or trapped / how or explained | 2(3) |
| | | (ii) | (calcium or sodium) alginate or other correct | 3 |
| | | (iii) | enzyme can be reused / can be recovered / pure product / comment on cost or efficiency or stability or longer lasting | 2(3) |
| | | (iv) | enzyme name [<i>allow yeast</i>] matching substrate name matching product name or application | 3 3 3 |

| | | | | |
|-----|-----|-------|---|------|
| 12. | (a) | | <i>niche</i> : – role of organism or explained | 3 |
| | | | <i>edaphic factor</i> : – soil factor | 3 |
| | | | <i>symbiosis</i> : – (close) relationship between two species involving benefit | 3 |
| | (b) | (i) | to make (nitrogen) available or described / for use by organisms or described | 2(3) |
| | | (ii) | N ₂ converted to compound or named | 3 |
| | | (iii) | ammonia to nitrites or to nitrates or nitrites to nitrates | 3 |
| | | (iv) | fixation / lightning / plant protein / animal protein / death or excretion / decomposition / ammonia produced / ammonia to nitrites / one role of bacteria / denitrification or explained | 5(3) |
| | (c) | (i) | predator* | 3 |
| | | (ii) | prey* | 3 |
| | | (iii) | starvation or death / migration / decline in population / change food source/ [<i>allow increased competition</i>] | 2(3) |
| | | (iv) | famine or food availability / birth control / war / disease / birth rate / death rate or longevity / degree of medical care / natural disaster or example | 4(3) |

13. (a) (i) Name the blood vessel that returns blood to the heart from the lungs.
(ii) Name the main gas transported in the blood vessel that you have named in (i).
How is this gas transported? (9)
- (b) (i) Draw a large diagram of the human breathing system. Label the trachea, bronchus and lung.
(ii) State the function of the following: epiglottis, larynx.
(iii) Describe briefly the role of the diaphragm and intercostal muscles in inhalation.
In your answer refer to volume and thoracic air pressure. (27)
- (c) (i) Give **three** ways in which an alveolus is adapted for efficient gas exchange.
(ii) Name the process involved in the passage of gas between the alveolus and the blood.
(iii) Name a breathing disorder.
(iv) In the case of the breathing disorder that you have named in (iii) state:
1. a cause,
2. a means of prevention,
3. a treatment. (24)

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

- (a) (i) From what structure in the carpel does the seed develop?
(ii) State **two** locations in the seed where food may be stored.
(iii) The embryo plant within the seed has a number of parts. List **two** of these parts, apart from food stores, and give a role for each of them.
(iv) Following dispersal, the seed undergoes a period of dormancy. What is dormancy?
(v) Suggest **two** advantages of dormancy.
- (b) (i) Comment on the difficulty of defining viruses as living organisms.
(ii) What are the two main biochemical components of a virus particle?
(iii) Name **two** diseases caused by viruses.
(iv) Give an example of a beneficial application of a virus.
(v) What is an antibiotic?
(vi) Antibiotics should not be prescribed for a person suffering from a viral infection.
Suggest a reason for this.
- (c) (i) What is meant by the term immunity?
(ii) Outline briefly the role of B lymphocytes in the human immune system.
(iii) Distinguish between active and passive immunity.
(iv) "Vaccination gives rise to active immunity". Explain this statement.
(v) In certain situations a person is given a specific antibody rather than being vaccinated.
1. Is this an example of active or passive immunity?
2. Under what circumstances might an antibody, rather than a vaccination, be given?
3. Comment on the duration of immunity that follows the administration of an antibody.

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| | | | | |
|-----|-----|-------|---|-----------------|
| 13. | (a) | (i) | pulmonary vein* | 3 |
| | | (ii) | oxygen* by (oxy)haemoglobin or by iron | 3 3 |
| | (b) | (i) | diagram [trachea, bronchus, alveoli, diaphragm or ribs] [any one missing 3 marks] labels [trachea, bronchus, lung] | 6, 3. 0 3(1) |
| | | (ii) | epiglottis: to close off trachea or described larynx: to make sound | 3 3 |
| | | (iii) | diaphragm contracts / lowers / intercostal muscles contract / rib cage up / #volume of chest (cavity) increased / #decreased pressure / air in / to equalise pressure [# points compulsory] | #2(3) 2(3) |
| | (c) | (i) | capillary network / moist surface / thin walled / elastic wall [allow large surface area or one cell thick or thin membrane] | 3(3) |
| | | (ii) | diffusion or passive transport | 3 |
| | | (iii) | asthma or bronchitis | 3 |
| | | (iv) | 1. cause: 2. prevention: 3. treatment: | 3 3 3 |

| | | | | | |
|-----|------------------------------------|--|--|-------------------------------|---|
| 14. | Any two of (a), (b) or (c). | | | | |
| | (a) | (i) | ovule* | 3 | |
| | | (ii) | cotyledon / endosperm | 2(3) | |
| | | (iii) | radicle / plumule develops root / develops shoot | 2(3) 2(3) | |
| | | (iv) | when it does not germinate (despite favourable conditions) or period of low metabolism or explained | 3 | |
| | | (v) | germination at suitable time / time for embryo to develop / survival of plant during unfavourable conditions / increased dispersal | 2(3) | |
| | (b) | (i) | obligate parasite or explained / non-cellular / can be crystallised / no metabolism / one nucleic acid | 2(3) | |
| | | (ii) | DNA or RNA or nucleic acid / protein | 2(3) | |
| | | (iii) | smallpox / chicken pox / measles / polio / 'flu / common cold / leaf mosaic / others [allow AIDS or HIV] | 2(3) | |
| | | (iv) | bacteriophage or used in genetic engineering or vaccine production or vector (in disease treatment) | 3 | |
| | | (v) | substance produced by micro-organisms / that kills (some) microorganisms or bacteria or fungi | 2(3) | |
| | | (vi) | (antibiotics) have no effect (on viruses) or promote resistant bacteria | 3 | |
| | (c) | (i) | resistance to infection or to antigens [allow disease] | 3 | |
| | | (ii) | recognition / produce antibodies / specific to antigens or in response to antigens [allow memory cells] | 2(3) | |
| | | (iii) | active immunity: | body produces antibodies | 3 |
| | | | passive immunity: | antibodies introduced to body | 3 |
| | | (iv) | vaccination introduces antigen or explained / causes antibody production | 2(3) | |
| | (v) | 1. passive* | | 3 | |
| | | 2. infection may already have occurred or possibility of dangerous infection or example or no vaccine available or vaccine too expensive | | 3 | |
| | | 3. short | | 3 | |

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

(30, 30)

- (a)
 - (i) Draw a detailed diagram of the reproductive system of the human male. Label the following parts on your diagram: testis, seminal vesicle, urethra, sperm duct (vas deferens), epididymis, prostate gland.
 - (ii) Place an X on your diagram where meiosis occurs.
 - (iii) Place a Y on your diagram where sperm are stored.
 - (iv) State **two** functions of testosterone.
 - (v) Give a cause of male infertility and suggest a corrective measure.

- (b)
 - (i) Other than the secretion of hormones, how does an endocrine gland differ from an exocrine gland?
 - (ii) State **two** ways in which hormone action differs from nerve action.
 - (iii) Copy the following table into your answer book and fill each of the empty boxes.

| Endocrine Gland | Location | Hormone | Role of Hormone |
|-----------------|----------|---------|-------------------|
| | Pancreas | Insulin | |
| Thyroid Gland | | | |
| | | | "fight or flight" |

- (iv) In the case of a **named** hormone give:
 - 1. a deficiency symptom,
 - 2. a corrective measure.

- (c)
 - (i) What is homeostasis? Note **one** reason why it is important in the human body.
 - (ii) Draw a diagram of a section through human skin to show **two** structures involved in temperature regulation. Label each of these structures.
 - (iii) For one of the structures that you have labelled in your diagram briefly describe its role in temperature regulation.
 - (iv) What is meant by an ectotherm?

| 15. | Any two of (a), (b) or (c). | | | | | | | | | | | | | | | | | | | |
|----------------------|------------------------------------|---|---|------------------------------------|----------|---------|-----------------|----------------------|--|--|------------------------------------|--|-------------------|-----------|---|---------|-----------|--------------|--|-------------|
| | (a) | (i) | diagram [penis, urethra, sperm duct, testis] labels | 6, 3, 0 6(1) | | | | | | | | | | | | | | | | |
| | | (ii) | X on testis | 3 | | | | | | | | | | | | | | | | |
| | | (iii) | Y on epididymis | 3 | | | | | | | | | | | | | | | | |
| | | (iv) | growth / development of primary sex characteristics or example / development of secondary sex characteristics or example / sperm production / comment on male behaviour | 2(3) | | | | | | | | | | | | | | | | |
| | | (v) | low sperm count or low sperm motility or hormonal imbalance or explained or named chemical or smoking or drug abuse or erectile dysfunction [<i>accept</i> unsuitable temperature (of testes) or cause described] corrective measure matched | 3 3 | | | | | | | | | | | | | | | | |
| | (b) | (i) | ductless or secretes into blood stream | 3 | | | | | | | | | | | | | | | | |
| | | (ii) | chemical transmission / slower action / longer lasting effect / many target organs | 2(3) | | | | | | | | | | | | | | | | |
| | | (iii) | <table border="1"> <thead> <tr> <th>Endocrine Gland</th> <th>Location</th> <th>Hormone</th> <th>Role of Hormone</th> </tr> </thead> <tbody> <tr> <td>Islets of Langerhans</td> <td></td> <td></td> <td>regulates blood sugar or explained</td> </tr> <tr> <td></td> <td>neck or described</td> <td>thyroxine</td> <td>growth in young or (rate of) metabolism</td> </tr> <tr> <td>adrenal</td> <td>on kidney</td> <td>adrenalin(e)</td> <td></td> </tr> </tbody> </table> | Endocrine Gland | Location | Hormone | Role of Hormone | Islets of Langerhans | | | regulates blood sugar or explained | | neck or described | thyroxine | growth in young or (rate of) metabolism | adrenal | on kidney | adrenalin(e) | | 8(2) |
| Endocrine Gland | Location | | Hormone | Role of Hormone | | | | | | | | | | | | | | | | |
| Islets of Langerhans | | | | regulates blood sugar or explained | | | | | | | | | | | | | | | | |
| | neck or described | thyroxine | growth in young or (rate of) metabolism | | | | | | | | | | | | | | | | | |
| adrenal | on kidney | adrenalin(e) | | | | | | | | | | | | | | | | | | |
| | (iv) | <i>Named hormone:</i> 1. <i>deficiency symptom:</i> 2. <i>corrective measure:</i> | 1 2 2 | | | | | | | | | | | | | | | | | |
| | (c) | (i) | <i>Homeostasis:</i> maintenance / of constant internal environment or two named factors constant <i>Reason:</i> allows normal metabolic activities or example or keeps temperature suitable for enzyme reactions | 2(3) 3 | | | | | | | | | | | | | | | | |
| | | (ii) | diagram [top layer, hair follicle or sweat gland + 1 other] labels [sweat gland, hair, arteriole, fat] [allow temperature receptor] | 3, 0 2+1 | | | | | | | | | | | | | | | | |
| | | (iii) | temperature drop / hair erects / traps air as insulator [or opposite] or temperature drop / arteriole constricts / keeps heat [or opposite] or temperature rises / sweat produced / sweat evaporates causing cooling or fat / insulates / from outside or inside | 3(3) | | | | | | | | | | | | | | | | |
| | | (iv) | body temperature varies / with environmental temperature [allow 'cold-blooded' or explained for 3 marks] | 2(3) | | | | | | | | | | | | | | | | |

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