Coimisiún na Scrúduithe Stáit
State Examinations Commission

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Bitheolaíocht *Ardleibhéal*

Marking Scheme *Leaving Certificate Examination, 2004*

Biology *Higher level*

LEAVING CERTIFICATE EXAMINATION 2004

BIOLOGY – HIGHER LEVEL

SECTION A ***Answer any five questions***

Q 1. **2(7) + 3(2)**

(i.e. 7 marks for the first 2 correct points and 2marks for each subsequent correct point)

(a) Any named plant **or** named photosynthetic bacteria **or** cyanobacteria [*allow grass, seaweed, fern, moss*]

(b) Respiration **or** digestion **or** deamination **or** any correctly described reaction
e.g. protein → amino acids **or** equation

(c) (nitrogen) fixation

(d) 2:1 [*allow if correctly shown in formula e.g.* $C_6H_{12}O_6$]

(e) Mutualism **or** symbiosis

(f) Keratin **or** myosin **or** elastin **or** collagen **or** other correct example [*allow fibrin*]

Q 2. **2(4) + 6(2)**

(i.e. 4 marks for the first 2 correct points and 2marks for each subsequent correct point)

- Variation
- Genetic **or** examples / environment or examples / age /
  [NOTE – environment + food = 1 point] ***any two points***
- Yes **or** No **or** implied in text (on this line)

Explanation:

- Weight is also determined by genetic **or** environmental factors [*for 'yes' above]*
  or valid reason e.g. reference to eating habits or exercise [*if 'no' given above]*
  [Note: reason must match the Yes/No above]
- Change in genetic makeup (or in DNA, in gene, in chromosome, etc.)
- Radiation **or** chemical **or** viruses **or** carcinogens **or** named example of any one of these [*allow smoking*]
- Down's syndrome **or** other correct condition e.g. cancer or stripe in eye colour
  [*any spontaneous change - one incorrect does not cancel*]

Q 3.

PpCc	ppcc	**4 + 4**
Yes *[or implied in statement]*		**4**
Parentals and non-parentals (i.e. all possible phenotypes)		
or each allele can combine with either of the other pair /		**4**
in 1:1:1:1: ratio (or in equal numbers or some indication of this)		**4**

Q 4. **4 + 8(2)**

(i.e. 4 marks for the first correct point and 2 marks for each subsequent correct point)

(a)

A = stoma
B = guard cell
C = (epi)dermal cell

To allow movement (exchange) of gas (or air or water vapour) **or** transpiration
CO_2 (allow light **or** potassium ions **or** water)
Lenticels **or** stomata

(b)

Onion **or** tulip **or** daffodil **or** cabbage other correctly named plant
Starch **or** sucrose **or** cellulose **or** fructose **or** glucose [*not 'sugar']*
Rhizome **or** corm **or** tuber [*allow stolon]*

Q 5. (a) **2(5) + 5(2)**

- Any harmful (undesirable) (addition to) the environment (or named ecosystem)
- Any correct example of human activity
- Counteracting method (must relate to example given above) [*allow "clean up"]*
- ***Explain conservation:*** Retention of viable populations (e.g. stopping extinction) **or** their habitats **or** comment on management **or** any one explained [allow *'wise use of environment]*
  (i) and **(ii) NB** ***<u>any two reasons for conservation</u>*** aesthetic / recreational / food supplies / possible sources of drugs /source of other materials / species right to existence / prevent extinction / biodiversity **or** balance / **or** any 2 correct examples
  [*Note: group term + example = 1 point; 2 examples = 2 points]*
- ***One conservation practice:***

Control of fertiliser usage **or** control of mesh size **or** plant trees **or** any valid example explained

Q 6. **2(5) + 5(2)**

Muscular activity **or** description e.g. contractions to move food [*allow 'movement of food']*
Kills germs **or** optimal pH for enzymes **or** hydrolysis of starch **or** other correct reason
Peristalsis **or** explained (e.g. bulk for movement) [*accept reference to constipation or bowel cancer*]
Lipase
Fatty acids **or** glycerol
Emulsification (must imply smaller globules produced) **or** pH effect **or** explained
Production of vitamins **or** inhibition of pathogens **or (**aids) digestion **or** example

SECTION B ***Answer any two (2) questions***

Q7. (a) Yes **3**
(Rate of) enzyme reaction (affected by temperature) **3**

(b) Diagram **3, 0**
[*must include evidence of anaerobic conditions and two correct labels for 3 marks*]

- Sugar **or** named sugar **or** starch **3**
- Carbon dioxide **or** any product of glycolysis **3**
- Yeast absent (or dead) in same set up **3**
- Comparison **or** purpose described **3**
- No more gas given off (no more bubbles) **3**
- ***NB -** To test for alcohol – **All candidates who attempt Q** **3**
- Water (allow other correct product from Kreb's cycle) **3**

Q 8. (a) dermal / ground / meristematic ***any two*** **2(3)**
[allow correctly named tissue e.g. cambium]

(b) Why:
Easier to cut (thin) sections **or** relevant comment on tissue arrangement (e.g. easier to see vascular bundles) **3**

Method described:
Cut thin / named instrument e.g. blade, microtome, scalpel / between nodes / named support e.g. pith, carrot, wax / at right angle (across) / any safety procedure stated / ***any two*** **2(3)**

To ensure light can pass through **or** to see (cells) clearly **3**

Diagram **3, 0**
[Diagram - *section with vascular bundles in ring (4)* ***or*** *at least one bundle divided]*
Labels: xylem and phloem in correct position **labels** **3**

Functions:
Phloem:– transport of food (or minerals or auxins) **3**
Xylem:– transport of water **or** minerals **3**

Q 9. (a) **(i)** it can shorten or contract **3**
(ii) left ventricle **3**

(b)
Dissection:
Identify sides (or front/back) / how identified / ventral side uppermost /
/ on board **or** dish /named cutting instrument / described (location of) cut /
/ any safety procedure stated e.g gloves, goggles, white coat ***any three*** **3(3)**

Diagram **3, 0**
[*4 chambers + indication of 2 valves*]
labels (bicuspid and tricuspid valves in correct position) **3**

Expose semilunar valve:
Cut aorta **or** cut pulmonary artery **3**
Function semi lunar valve:
Stops back flow of blood (into ventricle or from artery) **3**
Origin of coronary artery:
aorta **or** near semilunar valve **3**

SECTION C ***Answer any four questions***

Q 10.

(a) **Biosphere**: Parts of the earth that support life **3**
Habitat: Place where organism(s) live(s) **3**
Niche: Role of organism (in an ecosystem) **or** explained e.g. 'how it fits' **3**

(b)

(i) Abiotic factors are non-living **and** biotic factors are living **3**
(ii) Example of abiotic factor named or group e.g. climatic **3**
Named plant **3**
(iii) Example of biotic factor named **3**
Named animal **3**

*[If ecosystem not named or incorrectly named can only get **either** animal **or** plant mark, NOT both]*

(iv) Pyramid of numbers:
Shows numbers of different organisms in a food chain (**or** in trophic levels **or** named trophic levels) **3**
Pyramid **3**
(v) Producers **or** autotrophs **3**

(c) **(i)** 3.5 – 4.5 years **3**
(ii) 33 – 39 **3**
(iii) Predator: an animal (or organism) that eats another animal **3**

Graph: showing lower numbers **and** out of phase **3 + 3**

(iv) Why decline: food shortage / disease / migration/ correct climatic change **or** example /decrease in reproductive rate / other correct reason e.g. lack of space, competition, **or** human activity e.g. trapping, poisoning etc
any two **2(3)**

(v) Why increase: (increased) food supply/ decline in predator numbers/ increase in reproductive rate / correct climatic change **or** example / migration / other correct example e.g. more space ***any two*** **2(3)**

Q 11.

(a) Adenosine triphosphate **3**
Role: P – P bond / holds or stores (energy) / passes on **or** releases (energy)
or *ATP ------ ADP + P / + energy (**or** the reverse reaction)*
any two **2(3)**

(b) (i) Pathway 1.
Light energising electrons **or** light into chlorophyll / (e^-) from chlorophyll / ATP formed / (e^-) returned to chlorophyll
Pathway 2.
(e^-) to NADP / photolysis (or H_2O split) / H^+ (protons) to NADP / NADPH formed / ATP formed / O_2 formed / different electrons / (e^-) back to chlorophyll/ **6(3)**
[*maximum 4 points from either pathway*]

(ii) Product	**Fate**
ATP	for dark phase **or** explained or any metabolic reaction
NADPH	for dark phase **or** explained
O_2	respired or released (into atmosphere)

any three **3(3)**

(c) **(i) Why *Elodea?:*** ease of measurement of rate **or** explained **3**
(ii) How temp constant: water bath **or** described **3**
(iii)Sources of CO_2 : animal respiration / plant respiration / from air /
/ bacterial respiration **or** decomposition / **2(3)**
[Note: respiration alone = 1 point]
(iv) How varied: lamp / different distances (**or** different wattage) **OR**
sodium hydrogen carbonate / different amounts **3 + 3**
(v) Precaution at each change:
Allow time (before counting bubbles) **3**
Reason:
Plant adjusting **or** equilibration **or** explained **3**

Q 12.

(a) Maintaining (a constant) internal environment **or** described **3**
Role of kidneys: Maintaining salt balance **or** explained / **3**
Maintaining water balance **or** explained / **3**
*[Note: **Osmoregulation** = 2 points]*

(b) **(i)** **Diagram** of nephron **3, 0**
Diagram of blood supply **3, 0**
labels **3(1)**

(ii) **Filtration:**
Blood in arteriole / under pressure/ plasma (accept blood) **or** small molecules **or** named from (**or** in) glomerulus /in **or** into (Bowman's) capsule /large molecules **or** named **or** cells **or** named cells cannot pass
any three **3(3)**

Reabsorption:
Substance (or named) from (**or** in) tubule (or named part or from filtrate) /
/ into blood / active transport / diffusion / osmosis / mention of hormonal control
any three **3(3)**

(c) **(i)** **Source:** respiration **or** named site e.g. muscle, liver, kidney,
brain **or** named food e.g. carbohydrate or named **3**

(ii) **Two methods of insulation:** fat (adipose tissue) / (trapped) air **or** hair **2(3)**

(iii) **When temp high:** vasodilation (or explained) / (secretion of) sweat /
hairs lie flat **or** less air trapped ***any two*** **2(3)**

(iv) **Response when temp drops:** receptor (or detection) / receptor in skin /
receptor in medulla **or** brain / shiver / generates heat / hairs stand up
or goose bumps / air trapped / vasoconstriction (or explained) / increased
metabolic rate or increased respiration / any relevant comment on named
hormone e.g. thyroxine increases metabolic rate or increases respiration
any three **3(3)**

Q 13.

(a) Completed **diagram** showing two additional sugar molecules and two more bases

diagram completed correctly or shapes of bases **or** show bonding **3, 0**

new bases named and matched 3, 0

deoxyribose or phosphate labelled 3, 0

(b) mRNA(messenger RNA) **3**

rRNA (ribosomal RNA) **3**

tRNA (transfer RNA) **3**

Functions:

mRNA: mRNA formed to match DNA (or transcription or explained) / leaves nucleus **or** into cytoplasm / (carries instructions) to ribosomes **or** for translation

rRNA: rRNA binds (holds) mRNA in place / for translation (**or** explained) / structure of ribosome

tRNA: tRNA carries an amino acid / complementary to mRNA / to ribosomes

any five functions **5(3)**

[***must be at least one point from each RNA type]***

(c) **(i) Difference:** egg cell is haploid **or** somatic cell is diploid **or** quote from passage line **6 and 7** **3**

(ii) Advantage: any valid example e.g. same wool quality **3**

(iii) Disadvantage: any valid example e.g. lack of variation **or** consequence e.g. prone to disease **3**

(iv) Comment: valid / mitosis yields genetically identical nuclei / not all genes switched on / genetic potential to produce new organism or explained / comment on significance e.g. forensics

[*If 'not valid' stated for one point, second point got from a reason why not e.g. not sex cells]*

any two **2(3)**

(v) Implanted: attached (embedded) *[allow inserted, placed or put]* to the endometrium [*allow uterus or womb*] **or** explained **3**

(vi) Why electric pulse: any reasonable suggestion e.g**.** to initiate cell division, keep alive, boost viability, energise. **3**

(vii) Artificially fertilised: (diploid) nucleus / into ovum without nucleus / rather than from fusion of haploid nuclei (**or** gametes)

[*These 2 points will be got by quoting from last paragraph]*

any two **2(3)**

Q 14. Answer <u>any two</u> of (a), (b), (c). (30, 30)

(a)

(i) **A** = stigma **or** style **2**
B = ovary **2**
C = embryo sac (*allow nucellus*) **2**
D = polar nuclei **2**
E = ovule (allow integuments) **2**

(ii) **What happens to D:**
Fuse / form diploid (or primary endosperm) / (then fusion) to triploid **or** fertilisation / endosperm nucleus **2(3)**

(iii) **E** becomes the seed **or** testa **2**
B becomes the fruit **2**

(iv) **Diagram** **6, 3, 0**
2 named nuclei labels **2(2)**

(b)

(i) **Diagram female:** **6, 3, 0**
labels **3(2)**

(ii) **Fertilisation:** <u>fusion</u> of gametes **3**
Indicate on diagram: *location indicated correctly on diagram* **3**

(iii) **Female infertility:** any named pathological condition e.g. hormonal **or** blockage **or** failure to ovulate **3**
Male infertility: low sperm count or reason for / named pathological condition / hormonal **3**

(iv) ***In vitro:*** fertilisation outside the body **or** description **3**
Fate: implanted in a womb **or** stored for future use **or** destroyed **3**

(c)

(i) **Germ layer:**
Layer of cells / in the blastula (embryo) / (potential to) give rise to (specific) tissues (or organs) ***<u>any two</u>*** **2(2)**
Name 3 germ layers: ectoderm **2**
endoderm **2**
mesoderm **2**

(ii) **Fate of 3 germ layers:**
ectoderm – skin **or** nails **or** hair **or** nervous system **2**
endoderm – (inner lining of) gut **or** named part of **or** liver **or** pancreas **2**
mesoderm – muscles **or** skeleton **or** excretory system **or** respiratory system **or** circulatory system (or blood) **2**

(iii) **Placenta origin:** uterine tissue **and** embryonic tissue *[allow from mother **and** baby]* **2**
3 Functions:
produces hormones (or named) / allows passage of food (or named) / / and oxygen / antibodies / waste (or named) / acts as a barrier **or** explained ***<u>any three</u>*** **3 (2)**

(iv) Progesterone **2**

(v) **Amnion:** **s**ac or membrane **2**
holds **or** produces fluid **or** protects embryo (or foetus) **2**

Q 15. Answer any <u>two</u> of (a), (b), (c). (30, 30)

(a)

(i) Diagram of synaptic cleft: **6, 3, 0**
3 labels **3(2)**

(ii) Transmission of impulse: arrival of impulse / synaptic bulbs (or vesicles) / **(**secretes) transmitter (substance) / passage of neurotransmitter / impulse starts in next neuron / neurotransmitter broken down / by enzymes
<u>any five</u> **5(3)**

(iii) A drug may be used to inhibit **or** enhance transmission of impulse **or** similar comment
[*any reasonable suggestion]* **3**

(b)

(i) Auxin: a (growth) regulator in <u>plants</u> **3**
Site: tip of shoot **or** buds **or** meristem / developing leaves **or** seeds **or** other correct location **3**
Action similar to hormone:
Made in one place **/** transported to other part / causes response / slow acting /long lasting ***<u>any two</u>*** **2(3)**

(ii) Tropism: <u>growth</u> response (of plant to a stimulus) **3**
Types of tropisms:
thigmotropism/ phototropism/ geotropism (gravitropism) / hydrotropism / chemotropism ***<u>any three</u>*** **3(3)**

(iii) Role of auxin: unequal distribution / caused by light **or** gravity / unequal growth / results in bending **or** direction
<u>any two</u> **2(3)**

(c)

(i) ***Rhizopus*** **diagram** **6, 3, 0**
3 labels **3(1)**
Why a fungus: stolon **or** rhizoids **or** mycelium **or** hyphae **or** sporangium **or** spores ***<u>any one</u>*** **3**

(ii) Diagram sexual reproduction: **6, 3, 0**
(series of diagrams **or** 3 stages in one diagram)
3 labels **3(1)**

(iii) Fate of zygospore:
meiosis / hypha grows / sporangium (produces) / (asexual) spores / released / spores germinate ***<u>any three</u>*** **3(3)**