

# LEAVING CERTIFICATE BIOLOGY HIGHER LEVEL EXAM PAPER SOLUTIONS

## Sample Paper 5

### Section A

#### Question 1

- (a) (i) A: Muscle; B: Patella; B: Synovial fluid; D: Cartilage; E: Femur. 5(1)  
(ii) Hinge (2); (iii) Prevents friction (2)
- (b) 3; 3; 5; 12; 2. 5(1)
- (c) (i) Biceps/Triceps 2(1)  
(ii) Biceps pull forearm up/closes the joint (flexor). Triceps lowers arm/opens the joint (extensor). 2(1)

#### Question 2

- (a) Diffusion: Movement of material from high conc. to low.  
Osmosis: Water from low conc. to higher conc.
- (b) Prokaryotic: no nucleus  
Eukaryotic: a nucleus
- (c) light stage: requires light  
dark stage: does not require light
- (d) Tissue: group of cells perform a function  
Organ: a group of tissues
- (e) Dominant: prevents recessive gene being expressed  
Recessive: prevented. 5(4)

#### Question 3

- (a) (i) Carbohydrates; (ii) Glycerol; (iii) Amino acids; (iv) Proteins; (v) Cellulose. 5(2)  
(b) (i) Brown/red; (ii) Red precipitates; (iii) Blue; (iv) Blue/black; (v) Purple. 5(2)

#### Question 4

- (a) A: Protein coat (2)  
B: Nucleic Acid (RNA or DNA) (2)
- (b) No cell organelles; do not respire, excrete – form crystals 2(2)
- (c) (i) General: protects against a wide range (2)  
Specific: protects against specific pathogen (by production of antibodies) (2)  
(ii) Skin: salt solution, oils; Digestive juices: stomach (HCl); White blood cells: phagocytic, engulf bacteria. 2(2)  
(iii) Active: antibodies produced, B lymphocytes, memory cells; Passive: Antibody given. (4)

#### Question 5

- (a) Produce Protein
- (b) C; D; A; E. 4(1)
- (c) 1) Nitrogen-fixing bacteria; 2) Bacteria of decay; 3) Nitrifying bacteria; 4) Denitrifying bacteria. 4(1)
- (d) Decay of plants and animals and their wastes into ammonia (4)
- (e) (i) Fixing bacteria (Rhizobium) (1)  
(ii) Swellings in the roots of leguminous plants that contain bacteria (1)  
(iii) Roots (1)  
(iv) Peas, clover, alfalfa (1)  
(v) Plant obtains ammonia compounds from bacteria. Bacteria gain energy in fixing nitrogen (1)
- (f) (i) Liver (1); (ii) Amino acids (1); (iii) Kidney (1)

#### Question 6

- (a) (i) Osmosis (2); (ii) Does not require energy (2)
- (b)  $0.12/4.8 = 2.5\%$  (4)
- (c) graph (4)
- (d) (4)
- (e) Use a number of pieces of potato cut at each concentration. (4)

## Section B

### Question 7

- (a) IAA (3); Cress seeds (3)
- (b) (i) Stem: 5 seeds – dish – 9cm  $10^{-2}$ ,  $10^{-1}$ ,  $10^0$ ,  $10^1$ ,  $10^2$ ,  $10^4$   
(ii) Seal: + leave stand upright for 3-4 days (30°C)  
(iii) Note length of each stem 4(3)  
seeds / acetate / filter paper / cotton wool
- Water/seeds  
 $10^4$  best increase,  $10^{-2}$  least inc.  
Control: no change. 3(2)  
Promoter: for stem (3)  
Selective Weed killer (3)

### Question 8

- (a) Centipede (3)  
Caterpillar (3)
- (b) Spider, Harvestman, mite  
No legs, not segmented, coiled shell 3(3)  
Pooter, pitfall trap, nets, tulgren funnel 2(3)  
Draw (3); Use (3)

### Question 9

- (a) Glycerol and fatty acids (3)  
Amino acids (3)
- (b) Protein      Biuret,  $\text{CuSO}_4 + \text{NaOH}$       Blue      Purple      No  
Reducing sugar      Benedict's/Fehling's solution      Blue      Brick red      Yes  
Starch      Iodine      Brown/red      Blue/black      No 12(2)

## Section C

### Question 10

- a) (i) All or nothing: once a nerve impulse has started it cannot be stopped once a threshold has been reached. Once the threshold is reached the impulse is carried. If the threshold is not reached the impulse is not carried. (4)
- (ii) Resting potential; threshold; movement of impulse one direction; speed of impulse; refractory period. (5)
- b) Electrical passes down neuron.  
Stimulates neurotransmitter swellings in Presynaptic Neuron.  
Produce Neurotransmitter (acetyl choline). Neurotransmitter contained in Presynaptic vessels.  
Neurotransmitter diffuses across the synapse. Causes next neuron to regenerate impulse. 9 x (3)  
An enzyme acetylcholine esterase is released. Digests the neuron transmitter, which is reabsorbed by presynaptic neuron and reformed into neurotransmitter. 2x(3)
- 3x(6)  
Botulinium: Prevents release of acetyl choline: no stimulation (3+3)  
Nicotine: Stimulates postsynaptic neuron – cause (3+3)  
Curone: Blocks action of a. c → no nerve stimulation.

### Question 11

- a) (i) Pollination: transfer of pollen from anther to stigma. (3)  
Fertilisation is the union of the male and female gametes to carry a diploid zygote.  
(ii) Self: Pollen from the same plant. (3)  
Cross: Pollen from a plant pollinated by a different plant of same species.
- b) (i) A = Stigma, b = Anther, C = stamen, D = ovary. 4 x (1)  
(ii) Wind (2)  
(iii) Anther outside; feathery stigma; stigma outside; reduced petals 3 x (2)  
(iv) Pollen light, large numbered. 2 x (2)  
(v) Tube nucleus develops. Grows down stigma to micro pyle. Nourished by stigma. Generate 2 sperm. 4 x (3)  
Pollen tube enters micro pyle / 2 sperm released. One fertilizing egg. Other polar nuclei.
- c) (i) One sperm fertilizes the egg to form a diploid zygote. The other fertilizes the polar nuclei to form a triploid endosperm nucleus.  
(ii) egg: 8 cotyledon 36; zygote 36; endosperm 54.

### Question 12

- (a) (i) Haploid: one set of chromosomes.  
Diploid: two sets of chromosomes. (3)  
(ii) Mitosis: Cell division in which one cell produces two identical cells containing identical sets of chromosomes. (3)  
Meiosis: Cell division in which daughter cells containing half the number of chromosomes.  
(iii) Biotechnology: The use of living organisms and their components to manufacture useful products.  
Genetic engineering: The artificial manipulation or alteration of genes. (3)

- b) (i) Wrinkled seed: r; round seed: R;  
(grey seed: G; white seed: g) 4x(1)  
(ii) Parents cross 2: GG and gg. 2x(2)  
Gametes G x g 2x(1)  
F1 Gg (grey coat) (2)

(iii) Pheno: Wrinkled x Round  
White Grey

Parents rrgg x RrGg 2 x (1)

Gametes rg x RG; Rg; rG; rg 5 x (1)

Cross rg RG; Rg; rG; rg  
RrGg Rrgg rrGg rrgg 4 x (1)

Results genotypes: RrGg; Rrgg; rrGg; rrgg.

Round Grey | Round white | Wrinkled grey | Wrinkled white  
Seed coat seed coat seed coat seed coat

1 : 1 : 1 : 1

**Expected results: 1 seed Round seed + Grey coat**

1 seed Round seed + White coat 4 x (1)

1 seed Wrinkled seed + Grey coat

1 seed Wrinkled seed + White coat

- c) (i) Period between mitotic division: Interphase (6)  
(ii) Replication is the process after mitosis. (3)  
Where the DNA of each chromosome forms an exact copy of itself (3)  
(iii) Significance: DNA produced is an exact copy of the original, thus it can be passed from generation to generation.

- (iv) Have same sequences of basis
- (v) Form a basis for normal growth

### Question 13

- (a) (i) Waste Management  
 Agriculture: Storing slurry in leak proof tanks. Slurry spread on dry land in summer.  
 Fisheries: Fish waste; pulped, dried and recycled as fertilizer.  
 Forestry: (i) Small branches spread on forest floors: rot naturally. (ii) Tops of trees and branches.
- (ii) Waste can contain micro-organisms. Must be treated to prevent disease/ toxic chemicals released from waste / nutrients released from waste can cause enrichment of water (Eutrophication) / waste can attract scavengers: gulls, rats / dumping at sea can cause water pollution.  
 (iii) Treat waste: - reduce micro-organisms.  
 Recycling waste: - water treatment to stop eutrophication.
- b) Answer with reference to a named ecosystem  
 Population: is all the members of a species in an area / habitat  
 Community: is all the population in an ecosystem  
 Food web: 2 or 3 food chains inter linked.  
 (i) Predation:- is the catching and killing of another organism for food. 4x(3)  
 (ii) War: cause a reduction due to death and emigration. They are usually temporary as an increase in birth rate usually follows.  
 Famine: death due to disease and starvation, emigration (migration).  
 Contraception: Reduction of population 3x(2 + 2 + 1)  
 Reduction of future population.  
 Causes stable population numbers.  
 Disease: Reduction in death rate and increase population numbers; higher average life span.
- c) (i) Loch Lomond has the biggest concentration of breeding ducks in Britain and 4,000 water birds. (3)
- (ii) Increase level of Nitrate and Phosphates due to human activity in surrounding areas. (3)  
 (iii) The organisms causing algal bloom release toxins into the water when they die and decompose. (3)  
 (iv) Phosphates appear in run-offs from local woollen mills; domestic effluent and local farm land. 2 x (3)  
 (v) Reduce level of phosphates in detergents or reduce use of detergents. (3)  
 (vi) Phosphates help in production of bone. ATP (3)  
 (vii) When sprayed on land the effluent flows into rivers and streams. (3)

### Question 14

- a) (i) It involves the production of glucose. (4)  

$$6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$$
 (3) equation  
 (3) balanced
- (ii) Light: Sun;  $\text{CO}_2$  – Air 3 x (3)  
 $\text{H}_2\text{O}$ : Soil
- (iii) Increase levels of  $\text{CO}_2$  e.g. (Burning Gas). Use of artificial light increases the period of light exposure of plants. 2 x (5)
- b) (i) Light stage requires light. Dark stage does not require light. 2x(2)  
 (ii) Chloroplast (2)  
 (iii) Increase  $\text{CO}_2$  levels: burn gas  
**Increase light exposure: use artificial light**

#### Pathway I

- (i) Light absorbed by chlorophyll.
- (ii) Cause the release of high energy electrons.
- (iii) These electrons are recycled back to chlorophyll.
- (iv) They lose energy and ATP produced
- (v) Cyclic photo phosphorylation. 5 x (2)

Pathway II

- (i) Light absorbed by chlorophyll.
- (ii) High energy electron released combines with  $\text{NADP}^+ + 2e^- \rightarrow \text{NADPH}$
- (iii) Water splits to form (a) NADPH, (b)  $\text{O}_2$  (released)
- (iv) Released electrons return to chlorophyll via carrier system.

- (v) ATP is formed.
- (vi) Non cyclic photo phosphorylation. 7 x (2)

- c) (i) Enzymes are biological catalyst. (5)  
Active site: part of the enzyme whose shape matches the substrate.  
Specificity: the active site of each enzyme matches a particular substrate.  
Optimum activity: highest rate of activity of the enzyme. 3 x (5)  
(ii) Induced Fit Theory. Explain with diagram.  
(iii) pH or temperature (5)  
A denatured enzymes in one whose active site has been altered. This process is non-reversible. (5)

**Question 15**

- (a) Diagram: (4)  
Labels 6 x (1)  
Valve  
Lymph vessel  
Capillary  
Tissue cells  
Blood flow  
Arteriole  
Venule

The lymphatic system helps to maintain

- (i) The volume of blood (plasma) (3)
- (ii) The volume of Lymph (ECF) (3)

(1) As blood exits the arterioles under pressure into the capillary network, fluid leaks out around the tissue cells.

(2) 90% of this fluid is drawn back from the tissue capillaries near the veins by osmosis.

(3) 10% enters blind ending lymph vessels.

(4) This fluid re-enters the blood via the thoracic duct. 4 x (4)

- (b) The skin controls body temperature.  
(i) In cold conditions the hair erector muscles contract, trapping air and insulating the skin. Layers of adipose tissue also help to reduce heat loss. (9)  
(ii) In warm conditions: we perspire losing salts and water and reduction in the body temperature.  
The circulatory system helps as follows: (9)  
(i) In warm conditions blood vessels dilate and blood vessels come closer to the surface of the skin causing a drop in blood and body temperature. (6)  
(ii) In cold conditions: blood vessels constrict and the blood goes to the vital internal organs. (6)
- (c) (i)  $\beta$  cells of the Islets of Langerhan located in the pancreas. (6)  
(ii) Concentration of glucose drops. (6)  
(iii) 80 minutes. (6)  
(iv) Stored as glycogen. (6)