

LEAVING CERTIFICATE BIOLOGY HIGHER LEVEL EXAM PAPER SOLUTIONS

Sample Paper 6

Section A

Question 1

- a) Dermal, vascular, ground and meristematic. 2(2)
- b) A theory
- c) Tarsals
- d) Hyphae
- e) X chromosome, XY pair
- f) A double blinded test. 5 (4)

Question 2

A	B	
Connects bone to bone	Ligament	
Protein	Biuret Test	
Best guess based on observations	Hypothesis	
Stage 1 of respiration	Anaerobic	
Stirrup	Ossicles	5 (4)

Question 3

- a) **Lenticles** – Location: Stem
Function: Gas exchange
- b) **Cerebellum** – Location: Hind-Back of brain
Function Co-ordination/balance
- c) **Alveolus** – Location: End of Bronchioles
Function: Gaseous Exchange
- d) **Companion cell** – Location: Phloem
Function: They store food.
- e) **Semi-lunar valve** – Location: Aorta / Pulmonary Artery
Function: Prevents Back-flow of blood.

Question 4

The diagram represents part of the human digestive system.

- a) A Oesophagus B Stomach
C Pancreas D Bile duct
E Small int (duodenum) F Liver 6 (1)
- b) (i) pH2: Stomach
(ii) Deamination: Liver
(iii) Hormone production: Pancreas
(iv) Production of bile: Liver 4 (1)

c)	Type of enzyme	Named example	Site of Production	Substrate	
	Protease	Pepsin	Stomach	Protein	
	Lipase	Lipase	Pancreas/Duodenum	Fats	5 (2)

Question 5

- a) Contest: competition between two organisms for the same resource which is in short supply.
Scramble: all organism get some of the resource.
- b) Autotrophic: obtains energy by producing its own food.
Heterotrophic: breaks down food for energy.
- c) Ectoplasm is the outer cytoplasm in a cell (e.g. Amoeba);
Ectoderm is the outer germ layer in a developing embryo.
- d) Oil: Liquid lipid. Fat: Solid lipid.
- e) Exocrine glands: have ducts.
Endocrine glands: have no ducts (Secrete straight into blood) 5 (4)

Question 6

- a) Composed of nucleotides: DNA
- b) Stored in the liver: Glycogen
- c) Forms cell walls: Cellulose
- d) Made in response to an antigen: Antibody
- e) Disaccharide: Sucrose
- f) Testosterone: Hormone
- g) Turns red when tested with Fehlings solution: Glucose
- h) Speeds up reactions: Enzymes
- i) Present in all cell membranes: Lipid
- j) Found in RNA: Uracil 10(2)

Section B

Part (a) carries 6 marks and part (b) carries 24 marks in each question in this section.

Question 7

- a) Watson / Crick (3)
Nucleus / Mitochondrion / chloroplast. (3)
- b) (i) Name the plant you used. Onion/potato/radish
(ii) Causes DNA to clump.
(iii) (1) Kill enzymes that denature DNA.
(2) Speeds up clumping of DNA + breaking up of cell membrane.
(iv) To aid the release of DNA but not to damage it.
(v) Remove protein from chromatin.
(vi) Larger pores allow DNA to pass through. 6 (4)

Question 8

- a) (i) Ribosomes (3)
(ii) Nitrogen (3)
- b) (i) Enzyme: Catalase / Substrate: Hydrogen peroxide (3)
(ii) pH (3)
Use equal volumes of buffer solution 10 (3)
(iii) Labelled diagram: Water bath/graduated/cylinder/thermometer 3 (3)
(iv) Volume of foam in 2 minutes. (3)
(v) Use water instead of catalase solution. (3)

Question 9

- a) (i) Fungi (3)
Bread mould/mushroom (3)
(ii) Give a word equation for either type of anaerobic respiration.
Glucose → Ethanol + Carbon dioxide. 2(3)
- b) (i) Product: Ethanol
Substance used: Sodium hypochlorite / Potassium iodide / heat or Potassium dichromate/acid. Orange to green.
Result: Yellow crystals. 3 (3)
(ii) Plant used: Privot (3)
Medium: Malt organ (3)
Aseptic procedure: Wash dish with disinfectant/clean glass with Milton. (3)

Section C

Question 10

- (a) (i) Control + maintenance of the internal environment of the body e.g. temperature; CO₂; salt concentration. (3)
(ii) Body temperature is maintained at 37⁰C by the skin and circulatory system.
or
CO₂ level in the blood maintained by rate of breathing and heart rate. (3)
Rate of transpiration controls plant temperature. (3)
- b) Renal Arteriole
Nephron
Renal Venule
Glomerulus
Bowman's Capsule
Collecting duct
Proximal Convoluted tubule
Distal convoluted tubule
Loop of Henle
Capillary network

Diagram (4)

Labels 7 x (1)

Filtration: large proteins, cells and hormones filtered in the Bowman's capsule. The soluble material forms the filtrate.

Re-absorbtion: glucose and 80% water are reabsorbed in proximal tubule and returned to the blood. Glucose is reabsorbed passively, water by osmosis.

Secretion: Hydrogen ions are secreted into the distal tubule, replacing Na⁺ ions. 3x(2)

Reabsorbtion of glucose: Proximal convoluted tubule

Secretion: tubule

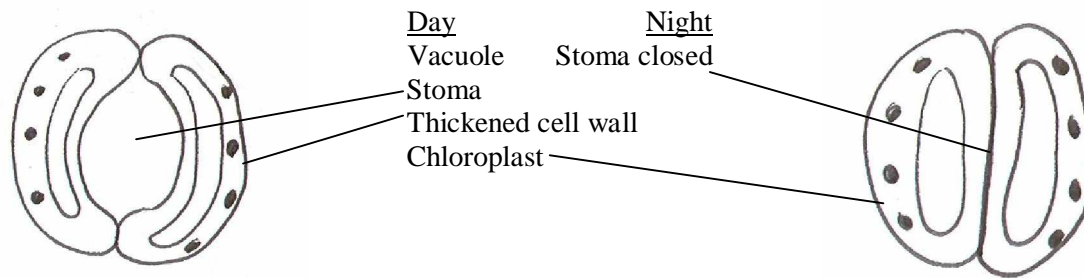
ADH: Formation/pituitary gland

ADH: Action collection duct

Urine storage: Bladder 5 (2)

- c) Diagram (0 – 3 – 6)
 Z
 X
 Y
 Labels 3x(2)

- (ii) At night high level CO₂/stomata close due to respiration and no photosynthesis. (3)
 Guard cells flaccid (3)
 In daytime CO₂ is used up due to photosynthesis. (3)
 Turgor increases in the guard cell due to osmosis and stomata open. (3)



Question 11

- a) In humans, sex is determined by the sex pair: Female XX, Male XY (3)
 Whereas in birds, sex determination is the opposite: XX Male, XY Female (3)
- b) (i) Law of segregation
 Inherited characteristics are controlled by a pair of factors (genes)
 On gamete formation these split so that each gamete contains one of the pair. 3x(2)
 In Heterozygous Ss. On segregation 50% of the gametes have S gene. (3)
 And the other 50% have the s gene. (3)
 (ii) Law of Independent assortment: (3)
 When gametes form either of a pair of factors (alleles) may combine (reassort) themselves with either of another pair. (3)
 For a cell Ss Tt: the allele S can be combined with T or t in a gamete and s can be combined with T or t. (3)
 (2)
 Gametes ST; St; sT; st. 4 x (1)

If dominant genes are linked gametes produced will be: ST; st

- c) (i) Gene expression: is the physical appearance or production of a chemical product e.g. enzyme, brought about by the presence of a gene. Or how a gene interacts with its environment. (3)
 Transcription: Is the process involving the transfer of the DNA code onto a new form of mRNA. (3)
 Translation: Is the process of assembling protein and takes place in the Ribosomes. (3)
 (ii) Original DNA A T T G G C T T
 1 Complimentary strand T A A C C G A A (3)
 2 mRNA (U replaces T) U A A C C G A A (3)
 (iii) Genetic screening: is the testing of a persons DNA to find the presence of altered or defective genes. (3)
In favour: It may help in the location and early detection of defective genes which cause diseases like cancers, which on early detection can receive gene therapy to prevent. (3)
Against: Widespread use could mean that insurance companies could use this information to determine the level of life insurance they are willing to give a person. (3)

Question 12

- a) (i) $6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$ (3)
(ii) Produces O_2 for respiration (2)
Produces glucose for food (3)
- b) (i) Light requires light (2)
Dark does not require light. (2)
- 1 ATP is produced from ADP (2)
- 2 Source: Sun. Light energy is absorbed by chlorophyll causing the release of 'excited' electrons. The energy released from these electrons is used in the following reaction
 $\text{ADP} + \text{P}_i \rightarrow \text{ATP}$ (3)
- 3 Pathway I
- (i) Light absorbed by chlorophyll
 - (ii) Caused release of 'excited' electrons
 - (iii) These electrons are recycled back to chlorophyll
 - (iv) They lose energy to produce ATP: Cyclic photo phosphorylation
- Pathway II
- (i) Light energy absorbed by chlorophyll
 - (ii) High energy electrons released combines with NADP^+ to form NADP^-
 - (iii) Water splits O_2 is released NADPH formed.
 - (iv) Released electrons return to chlorophyll via carrier system.
 - (v) ATP formed
 - (vi) Non cyclic photo phosphorylation. 9 x (2)
- c) (i) Brightness of light (light intensity) (4)
(ii) Move the lamp from 100 cm \rightarrow 80 cm \rightarrow 60 cm (4)
(iii) Carbon dioxide / concentration use a constant volume and concentration of sodium bicarbonate solution e.g. 20 cm³; 1% NaHCO_3 solution. (4+4)
(iv) Count number of bubbles of O_2 produced per minute. (4)
(v) *Elodea* (Canadian pondweed) (4)

Question 13

- a) Name of habitat e.g. Seashore, hedge grow, bog etc. (3)
Abiotic factors temp, wind velocity, humidity, ph of soil etc.
State how you measured the abiotic factors. 2 x (3)
- b) (i) Plants
- Gridded Quadrat
- (i) Place gridded quadrat on ground; (ii) Using a knitting needle and priding at the equivalent corner.
- Note the number of squares the needle touches a plant.
- (iii) % Cover = $\frac{\text{no. of hits} \times 100}{\text{no. of squares}}$ e.g. $\frac{10 \times 100}{25}$ 40%
 - (iv) Repeat this process along a line transect. 4 x (3)
- or throw quadrat randomly 10 times.

(ii) 1) Average number of Buttercup / quadrat

$$\frac{0.6+0.4+4+0+8+8+3+4+3+0}{10}$$

$$\frac{40}{10} = 4/0.25\text{m}^2 = 16/\text{m}^2 \quad (3)$$

$$\begin{aligned} \text{No in field} &= 16 \times 200 \times 150 \text{ Buttercups} \\ 30,000 \times 16 &= 480,000 \text{ buttercups} \quad (3) \end{aligned}$$

$$2) \text{ Frequency: no of quadrats with buttercups} = \frac{8}{10}$$

$$\% = 80\% \quad (6)$$

(c) (i) Mice / Rats $2 \times (3)$

(ii) Destroy the trophic level below and cause an increase in the next level below that i.e. cause imbalance in ecosystem (6)

(iii) 1) Capture – Re Capture (3)

$$2) \frac{\text{no. cap 1} \times \text{no. cap 2}^{\text{nd}}}{\text{no recaptured}} = \frac{20 \times 20}{8} = 50 \quad (3)$$

$$\frac{\text{no cap 1} \times \text{no cap 3}^{\text{rd}}}{\text{no recaptured}} = \frac{20 \times 20}{4} = 100 \quad (3)$$

$$\text{Range of population} = 50 - 100 \quad (3)$$

Question 14

(a) (i) Mitosis

2 identical nuclei Diploid or Haploid

Genetically identical

in sexual reproduction: meiosis produces

(1) haploid gametes: when these fuse the diploid number is restored.

(2) The random splitting of pairs of chromosomes forms a base for evolution where each member of the species shows slight variations from the next. $2 \times (2)$

(ii) Diagram to include: ovaries, fallopian tubes (oviducts), uterus (womb), cervix, vagina $5 \times (1)$

Diagram (4) J = ovaries

k = oviduct

L = oviduct m = uterus

4 x (1)

+ 1

(iii) As a barrier it prevents the blood of mother and child mixing i.e. (a) keeps mother's red blood cells and baby's from mixing. (b) It also prevents the pressure of the mother's blood causing damage to the baby's blood vessels.

As an organ of exchange (a) It removes waste material like urea and CO_2 from the body.

(b) It transfers over antibodies and nutrients and oxygen. $2 \times (3)$

- b) Swelling (diagram labels)
 Progametangium
 Gametangium
 Zygosporangium

- (i) Two strands + and – lie side by side
 (ii) Swelling develops and nuclei move into the swelling progametangium.
 (iii) A cross wall develops gametangium.
 (iv) The walls dissolve and a zygosporangium is formed by the fusion of the haploid nuclei. (n)
 (v) When conditions are favourable the zygosporangium germinates (divides by meiosis) to form a haploid hypha. 6 x (2)

- 1) Gametes move from each strand into the zygosporangium. (3)
 2) Fertilization is internal (3)
 3) A zygosporangium is a protective capsule containing a number of zygotes which were formed by the fusion of the gametes. (3)
 4) Meiosis occurs in the zygosporangium during germination. (3)

- (i) Nutrition = heterotrophic (saprophytic) (3)
 Normal reproduction = Asexual. 3x(2)
 Habitat = Bread/carbohydrate.

- c) (i) Corms; Bulbs; Stolons; tubers etc 2x(2)
 (ii) Pollen tube: After pollination the tube nucleus produces the pollen tube / This grows down the stigma of the ovary and / is nourished by the ovary as it grows / when the tube reaches the Micropyle / the front of the tube dissolves and the two sperm cells enter the embryo sac / The pollen tube is a method where by the flowering plant does not need surrounding water to complete its life cycle. 3x(2)

Dormancy: Is a period/ after germination/ when the seed undergoes only a very small amount of metabolic activity / This allows the plant embryo / (i) To avoid germination in harsh conditions / (ii) Time for the embryo to grow fully. / Dormancy can be caused by plant hormones. 3x(2)

Dispersal: Seed may be dispersed in a number of ways: (i) Wind, (ii) Insect, (iii) Water, (iv) Self. Dispersal is important as it / reduces competitions / allows for colonisation of new habitats by the plant. 3x(2)

Germination: Is the growth of the plant embryo / Conditions necessary are heat, moisture, oxygen. / There are two types of germination / hypogeal where the cotyledons remain below the soil / and epigeal where the cotyledons move above the soil/. 3x(2)

- (iii) (1) Egg 15 (211) (2)
 (2) Nucleus of embryo 30 (211) (2)
 (3) Endosperm 45 (311) (2)

Question15

- a) (i) Immunity is the ability of the body to resist the pathogens. (disease causing organisms) (3)
General defence: acts as a defence against all pathogens e.g. skin, digestive fluids, clothing, sebaceous glands. (3)
Specific immunity: Defence against a specific pathogen brought about by the production of antibodies or white blood cells that destroy infected cells. (3)
(ii) Activity immunity: involves the body producing its own antibodies in response to antigens that enter the body. It occurs after the person has been infected by the pathogen or vaccination. (3)
Active is preferable to passive as it is long lasting / and the presence of memory T + B lymphocytes causes a rapid response should the same pathogen attack the body again. (3)
(iii) B lymphocytes / the antigen is located on the protein coat of the virus. (3)
(iv) Plants protect themselves (I) from water loss by having a cuticle on the leaf upper surface / stomata on lower surfaces of leaves. (3)
(II) From physical damage the xylem becomes highly lignified and woody and so protects the plant against physical damage. (3)
- b) (i) Tissue Fluid is the fluid surrounding cells in a tissue. It is formed from fluid that leaks out of the capillaries at the arteriole end and in the tissue. / It is also referred to as ECF, extra cellular fluid and helps to maintain / the osmotic balance of the cells of the tissue. (3) (3)
Build up is prevented by the fluid re-entering the blood at the venous end of the capillary or carried in the lymph and re-circulated around the body by the circulatory system.
(ii) Lymph: is tissue fluid that has drained from the blood into the vessels of the lymphatic system. (3)
Production of lymph Lymph is produced by tissue fluid being forced into the lymph vessels under pressure. Fats enter the lymph system through the villus in the small intestine into the lacteals. (3)
(iii) When lymph is formed it moves up the lymph vessels. / It moves in one direction only by a system of valves. / The lymph enters the circulatory system via the thoracic duct. 2 x (3)
(iv) Collects fluids and return to the circulatory system.
Absorbs and transports fats.
It aids in hearing and balance in the ear.
Lymphocytes destroy invading microorganisms. 3x(2)
- c) (i) A = optic nerve; B = lens; C = retina; D = yellow spot (Fovea). 4x(2)
(ii) (1) Suspensor ligaments and ciliary muscles. 2x(2)
(2) Iris (3)
(3) Sclera (sclerotic layer) (3)
(iii) Eye defect = short / long sight (3)
Remedy (3)
Ear glue ear; vertigo (3)
Remedy (3)