2013 GCE O Level Biology Suggested Answer

Paper 1

Questions to note: 15, 21, 25, 35, 36, 37

1	2	3	4	5	6	7	8	9	10
B	C	C	D	D	A	D	C	D	C
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
C	D	A	A	D	B	C	C	B	D
21	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
D	B	A	C	B	B	B	A	B	B
31	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
B	B	D	C	C	D	C	B	B	A

Paper 2 (Section A)

Question to note: 1ai, 3, 5a, 5b, 6bii, 8bii, 9, 10, 11O

1 (a) (i) P: Right atrium [1]
Q: Chordae tendineae [1]

(ii) Correctly labelled [1]

(b) Blood from the pulmonary vein enters the left atrium of the heart as the muscle of the left atrium relaxes [1]. The muscles of the left atrium then contracts and blood is pushed through the bicuspid valve into the left ventricle [1]. The muscles of the left ventricle then contracts, causing an increase in the pressure of the ventricles. This causes the bicuspid valves to close to prevent the backflow of blood and the semi-lunar valves in the aortic arch to open [1]. This forces blood from the left ventricle and out of the heart into the aorta [1].

(c) (i) 0.3 seconds [1]

(ii) Line 2 [1]

2 (a) Translocation is the transport of manufactured food substances like sugars and aminio acids [1] in the phloem of plants. [1]

(b) (i) Correctly labelled (recognise thicker walls lined with lignin) [1]

(ii) Correctly labelled (phloem on outer ring) [1]

(c) As weedkillers are applied to the soil, they can dissolve in soil water surrounding the root hair cells of the weeds [1]. The weedkiller then diffuses into the root hair cells of the plant, increasing the concentration of weedkiller in the cell sap of the root hair cells [1]. The weedkiller then diffuses from cell to cell in the roots until it reaches the xylem vessel [1]. The weedkiller is then transported up the xylem to the leaves of the plant and finally diffuses into mesophyll cells containing chloroplasts, which is the site of action of the weedkillers [1].

3 (a) Branch of renal artery/ arteriole

(b) (i) Protein: 0.0
Glucose: 0.1

(ii) Proteins are large molecules transported in blood and unable to pass through the basement membrane during ultrafiltration [1]. Hence, there is an absence of proteins in R which is the collecting duct as proteins are not filtered into the nephrons [1].

(iii) Glucose are small molecules that pass into the nephron during ultrafiltration hence it is present at Q which is the Bowman's capsule. However, all glucose molecules are selectively reabsorbed into the bloodstream at the proximal convoluted tubules. Thus, there is no glucose present at R [1].

(c) ADH increases the permeability of walls of the collecting ducts to water [1]. This causes more water to be reabsorbed into the bloodstream during selective reabsorption [1]. This results less water passing through region R as urine; with a smaller volume of urine, the urine also becomes more concentrated [1].

4 (a) Activation energy is the minimum energy required to start a chemical reaction. [1]

(b) (i) Boiling tube 1:
The optimum pH of protease is pH 2 [1]. Hence, the protease in boiling tube 1 provided a suitable pH for protease to digest the gelatine layer, releasing the silver particles into the water and forming a suspension [1].
Boiling tube 2 and 3:
The protease enzyme is denatured at pH 7 and pH 10 conditions in boiling tubes 2 and 3 respectively [1]. When the active site of the protease is destroyed due to denaturation, it cannot digest the gelatine layer, causing it to be intact on the backing layer [1].

(ii) 1. Temperature of solutions [1]
2. Length of photographic film [1]
3. Incubation time [1]
Any two

5 (a) Microscopic green plants → zooplankton → small fish → carnivorous fish → large carnivorous birds [2].

(b) (i) Water plants and microscopic green plants [1]

(ii) Producers are organisms at the first trophic level [1] capable of making food by converting light energy to chemical energy via photosynthesis [1]. Consumers depend directly or indirectly on producers, who are first organisms in a food wed, for food as they cannot produce their own food [1].

6 (a) Individual 1
The genotype of individual 1 is Bb [1]. For individuals 1 and 2 to have an offspring with blue eyes and genotype of bb (individual 5), each parent must have passed a b allele to that offspring. Hence, individuals 1 and 2 must be heterozygous with genotype Bb [1].

Individual 10
The genotype of individual 10 is Bb [1]. Individual 4 has blue eyes and genotype of bb. Hence, individual 10 must have inherited one b allele from individual 4. Since individual 10 has brown eyes, he must have at least one B allele. Thus, his genotype is Bb [1].

(b) Individuals 2, 6, 8 and 10 [1]

(c) Discontinuous variation [1]

7 (a) (i) Hormones are chemical substances produced in minute quantities by endocrine glands [1]. It is directly secreted into the bloodstream and transported in blood to target organs where they exert their effect [1]. They influence growth, development and activity of organisms and are then eventually destroyed by the liver [1].

(ii) It is a milk duct that allows milk produced by mammary glands to be brought to the nipples.

8 (a) 1m – correct fully labelled axes (with units)
1m – correct plots
1m – best fit line (curve)
1m – appropriate scales, no extrapolation

(b) (i) 700 mm

(ii) 14 kJ per kg per hour

(iii) The larger the mean body length of an organism, the lower the mean rate of heat production [1]

(c) Cellular respiration [1]

(d) When the temperature of our body rises above the normal, thermoreceptors in the skin detect the change and the hypothalamus is stimulated to put in place corrective mechanisms to decrease body temperature back to normal and prevent over heating [1]. There is vasodilation of skin arterioles and constriction of shunt vessels to allow more blood to flow through the blood capillaries under the skin. This allows more heat to be lost through the skin by radiation, convection and conduction [1]. There is also decreased metabolic rate to reduce the amount of heat released within the body [0.5]. Sweat glands also become more active to increase production of sweat so that more latent heat of vaporisation is lost when sweat evaporates from the skin surface [1]. Behavioural responses that help to prevent over heating include taking off thick clothing or switching on the fan or air-conditioner [0.5].

9 (a) A transgenic organism is one that acquires a foreign gene [1].
This is done by the artificial technique of genetic engineering to insert a modified gene or gene from another organism into an organism of the same or different species [1].
An example of a transgenic organism is *E. coli* bacterium that acquires a human insulin gene so that it can produce human insulin [1].

(b) 1. To increase yield of crops and produce crops of better quality and increased nutritional value.
2. To produce crops that are resistant to pesticides or can grow in extreme conditions to increase food production.
3. To produce human insulin that can be harvested and used for the treatment of diabetic patients with minimal risk of allergic reactions.

(c) 1. Temperature of broth
2. pH of broth
3. Amount of oxygen and nutrients in the broth

Paper 2 (Section B)

10 E (a) Asexual reproduction results in the production of genetically identical offspring while sexual reproduction results in the production of genetically dissimilar offspring [1]. Asexual reproduction requires a single parent while sexual reproduction requires two parents [1]. Asexual reproduction occurs without the fusion of gametes while sexual reproduction involves the fusion of two gametes to from a zygote [1]. Asexual reproduction occurs through mitosis while sexual reproduction requires meiosis to produce haploid gametes [1].

(b) Pollination is the transfer of pollen grains from the anther of a plant to the stigma of a plant of the same species.

(c) 1. Insect-pollinated flowers have brightly coloured large petals while wind-pollinated flowers have dull coloured flowers without petals. This is because the large conspicuous flowers of insect-pollinated flowers are required to attract insects. However, petals are not essential for wind-pollinated flowers.

2. Insect-pollinated flowers have nectar while wind-pollinated flowers do not have nectar. The presence of nectar is important to attract insects for insect-pollinated flowers but are not essential for wind-pollinated flowers.

3. Insect-pollinated flowers have large, rough pollen grains so that they can adhere to the body of the insects while wind-pollinated flowers have small, smooth pollen grains so that they can be carried easily by wind.
(Any two)

10 (a) Transpiration is the loss of water vapour from a plant, through the stomata of the leaves [1]. The thin film of moisture surrounding the spongy mesophyll cells in leaves evaporate to form water vapour in the intercelullar air spaces in the leaf [1]. This water vapour then diffuses out of the leaves through the stomata. Water in the mesophyll cells then move out of the cells by osmosis to replace the thin film of moisture surrounding the mesophyll cells [1]. This draws water up the xylem vessels in the leaf. Hence, the loss of water vapour from the leaf results in a suction force to draw water up for the roots of the plant to the leaves called the transpiration pull [1]. Water is absorbed from the soil into the root hair cells by osmosis and moves cell to cell until it reaches the xylem vessel.

(b) (i) When there is high humidity in the atmosphere, it means that there is a high concentration of water vapour in the atmosphere [1]. Thus, the concentration gradient of water vapour between the intercellular air spaces of the leaf and the atmosphere decreases, thus increasing rate of water vapour diffusing out of the leaf [1]. Hence, rate of transpiration decreases [1].

(ii) When there is an increase in the temperature of the air, there is an increase in the rate of evaporation of water from the cell surfaces [1]. This increases the concentration of water vapour in the intercellular air spaces of the leaf, thus increasing the water vapour concentration gradient between the intercellular air spaces of the leaf and the atmosphere [1]. Thus, rate of transpiration increases [1].