2017 GCE O Level Biology Suggested Answer

Paper 1

Questions to note: 6, 15, 20, 24, 35

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

Paper 2 (Section A)

Question to note: 3b, 5b, 7biv, 9b, 10

1 (a) **Define**

Homeostasis is the maintenance of a constant internal environment through the mechanism of negative feedback.

(b) **Explain the term**

Endocrine glands are ductless glands that secrete their hormones directly into the bloodstream [1].

The adrenal gland is an example of an endocrine gland. It secretes adrenaline directly into the bloodstream to be transported to target organs. [1]

Other endocrine glands and their secretions:

- Ovary → oestrogen and progesterone
- Testis → Testosterone
- Pituitary gland → ADH
- Pancreas → Islets of Langerhans secrete insulin and glucagon

(c) (i) **Name**
A: glycogen [1]
B: glucagon [1]

(ii) **Explain**
During exercise, muscle cells obtain energy through the processes of respiration (aerobic & anaerobic), where glucose is broken down to release energy [1].

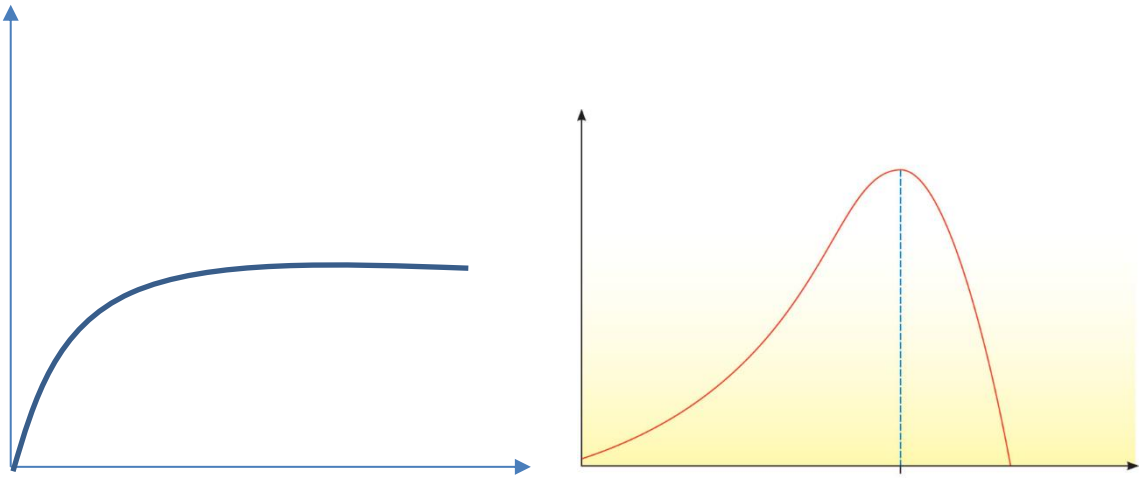
The supply of glucose is obtained from the bloodstream and hence this causes a fall in the blood glucose concentration [1].

2 (a) **Suggest**
C is the intercellular air space which allows air to be trapped so that the water lily is buoyant/can float on the water surface [1].

(b) **State reason**
The palisade cells are situated right below the upper epidermis so that they can capture maximum amount of sunlight for photosynthesis [1].

(c) **State role**
Chlorophyll absorbs light energy [1]
and converts it to chemical energy during photosynthesis [1].
The chemical energy formed is used to synthesise carbohydrates from carbon dioxide and water.[1]

(d)

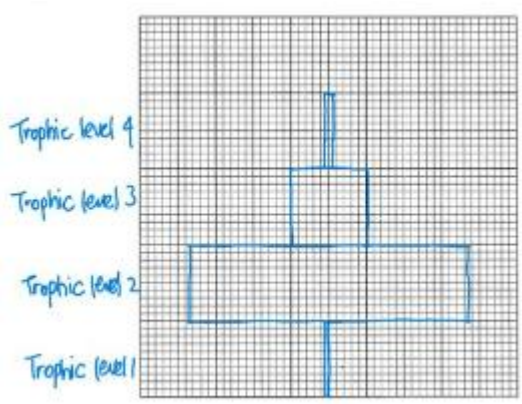


3 (a) **Explain**
The banana plant is the producer as it can make its own food via photosynthesis. It is also the first organism in the food chain and provide the rest of the organisms in the food chain with energy and oxygen [1].

(b)

trophic level	number of organisms
1	1
2	74
3	10
4	2

(c)



4 (a) **Describe**

The mass of each pot of plant should be measured at the start of the experiment using an electronic balance and then measured at the same time over the next 10 days [1].

The loss of mass is calculated by subtracting the current measured mass from the mass measured on the previous day [1].

(b) **Name**

Transpiration [1].

(c) **Suggest**

Plant D would lose the most mass.

Reason

Plant D has more leaves and therefore more stomata than plant F which allows for greater loss of water vapour to the environment [1].

Plant D is not enclosed in a plastic bag like plant E, so humidity is lower and rate of transpiration is higher. [1]

(d) **Suggest**

This is to prevent loss of water from the soil due to evaporation or respiration of organisms in the soil [1].

5 (a) **Define**

Asexual reproduction is the process resulting in the production of genetically identical offspring from one parent [1], without the fusion of any gametes [1].

(b) **Describe sequence of events**

- After fertilisation, the zygote divides by mitosis to form an embryo which then becomes embedded in the uterine lining during implantation [1].
- The placenta forms from the embryo and allows protective antibodies to diffuse from the mother's blood to the fetus blood which protect the fetus against certain diseases [1].
- The placenta also produces progesterone which maintains the uterine lining and prevents a miscarriage [1].
- The umblical cord attaches the fetus to the placenta and contains blood vessels which allows for the diffusion of oxygen and nutrients from mother's blood into fetus blood and waste products from fetus blood to mother's blood.[1]
- Amniotic sac forms around fetus, which is filled with amniotic fluid to protect the fetus against shock. [1]

6 (a) (i) **State**

1400 cm^3 [1].

(ii) **State effect**

The volume of breathe increases as exercise intensity increases [1]

(iii) **Calculate**

Total volume of air breathed = 1700 x 26 = 44 200 cm^3 [1].

(b) **Name**

Aerobic respiration [1]

7 (a) **State name**

Cardiac muscle [1]

Function

contracts to generate a force to pump blood at high pressure out of the heart to the rest of the body

[1].

(b) (i) **State**

5.6 dm^3 per minute [1]

(ii) **Determine from graph**

12 minutes [1]

(iii) **Calculate**

percentage increase = (168 – 66) ÷ 66 x 100% ≈ 155% (nearest whole number) [3]

(iv) **Describe, with reference to graph**

- In the first 2 minutes of exercise, heart rate increases sharply from 66 beats per minute to 160 beats per minute [1].
- The increase in heart rate then slows down and then reaches a maximum of 170 beats per minute in the next two minutes [1]
- and stays constant at the maximum rate of 170 beats per minute in the final minute of the exercise [1].

Paper 2 (Section B)

8 (a) 1m – correct axes (with units)
1m – best fit line
1m – correct plots
1m – appropriate scale

(b)
- Lipase enzyme digests fats into fatty acid and glycerol [1].
- The fatty acids produced decreases the pH of the solution [1].
- When the pH of the solution drops below pH 8, phenolphthalein turns colourless [1].

(c) At 55 °C, lipases in the mixture would have denatured and would not be able to catalyse the digestion of fats. Thus, the solution remains alkaline and phenolphthalein did not change colour [1].

(d) Optimum temperature is the temperature at which the enzyme is most active and catalyses the reaction fastest [1].
35◦C is the optimum temperature of the enzyme as the time taken for phenolphthalein to turn colourless is the shortest. [1]

9 (a) Total water gain = 1600 + 700 + 200 = 2500 cm^3 per day [1]

(b) Metabolic water is the water that is formed as a product of metabolic reactions of cells [1] such as aerobic respiration[1].

(c)
- The sweat glands become less active; thus less water evapourates from sweat reducing water loss as sweat [1].
- less ADH is secreted by pituitary gland, collecting duct becomes less permeable to water and more water is lost in urine.[1]
- The loss of water in air breathed out remains the same[1]
- Water loss in faeces remains the same [1].

(d)
- When ADH is secreted, it increases the permeability of cells at the collecting ducts to water [1].
- More water is then reabsorbed from the collecting duct into the blood capillaries [1].
- This results in a smaller volume of urine to be excreted that is also more concentrated [1].

10 O (a)

- made up of two anti-parallel polynucleotide chains/strands [1]
- They twist to form a 3D double helical structure [1]
- Basic unit is nucleotide. Each nucleotide made of a phosphate group, deoxyribose sugar and a nitrogenous base. [1]
- The nitrogenous bases include adenine, thymine, cytosine and guanine.[1]
- Hydrogen bond forms between base adenine which complementary pairs with thymine and base guanine which pairs with cytosine[1]
- Backbone is made up of phosphate and sugar covalently bonded.[1]

(b)

- A desired segment of DNA is cut from an organism using a restriction enzyme to produce sticky ends. [1]
- The same restriction enzyme is used to cut the plasmid of a bacteria to produce complimentary sticky ends.[1]
- The desired gene and plasmid are mixed and DNA ligase added to seal the two together forming a recombinant plasmid.[1]
- This recombinant plasmid is mixed with the bacterium and heat shock applied to open the pores on the cell membrane of the bacterium to take up the recombinant plasmid producing a transgenic bacterium. [1]

10 E (a)

- Co-dominance results when two alleles controlling a trait both express themselves in the organism. [1]
- Neither allele is completely dominant over the other. [1]
- In the inheritance of ABO blood group phenotypes, the I^A and I^B alleles are both dominant to the I^O recessive allele. [1]
- Hence, in individuals with the I^AI^O or I^BI^O genotype, only the dominant allele is expressed and the individual will have a blood group A or blood grpoup B phenotype respectively. [1]
- However, the I^A and I^B alleles are co-dominant. [1]
- individuals with the I^AI^B genotype, will have a blood group AB as their phenotype. [1]

(b) A mutation is a sudden random change in the structure of a gene or in the chromosome number. [1]

- For example, the condition of sickle-cell anaemia is due to gene mutation[1]
- The mutated gene produces an abnormal haemoglobin which causes the red blood cells to be sickle shape [1]
- Down's syndrome is due to a chromosome mutation.
  Individuals with Down syndrome have an extra copy of chromosome 21 in their DNA which results in them having a total of 47 chromosomes instead of the normal 46 chromosomes. [1]