St. Stephen's Girls' College
Biology Final Examination 2016-2017
Suggested Solutions

SECTION A

1	2	3	4	5	6	7	8	9	10
C	D	A	A	A	A	C	C	B	D

11	12	13	14	15	16	17	18	19	20
D	B	D	A	B	D	C	D	D	B

21	22	23	24	25	26	27	28	29	30
B	C	A	B	C	B	C	A	C	D

31	32	33	34	35	36				
C	B	D	C	B	A				

SECTION B

1. C B D

2.

(a) Structure A mainly consists of nerve fibres. (1)
The myelin sheaths surrounding the nerve fibres give rise to a lighter appearance. (1)
Structure B mainly consists of the cell bodies. (1)
The nuclei of the cell bodies give rise to a darker appearance. (1)

(b) D: sensory neurone (1)
E: motor neurone (1)

3.

(a) Breast-feeding: (natural) passive immunity (1)
Vaccination: (artificial) active immunity(1)

(b) Through breast-feeding, the babies get the antibodies against diseases that the mother has had or has been vaccinated in the past. There may be some diseases that the mother doesn't have immunity against.(1)
This type of passive immunity is short-lived as the babies do not develop memory cells. The blood concentration of the antibodies will gradually fall as the antibodies are used up or broken down. The child will soon be left without protection. (1)

(c) No. The memory cells produced after receiving Hepatitis B vaccine are specific to the Hepatitis B virus only. (1)
Other types of influenza are caused by other influenza viruses whose antigens are different. (1)
The memory cells for Hepatitis B virus cannot recognise other Hepatitis viruses. (1)

(d) Wear gloves when handling wounds)
Do not share toothbrush/ nail cutter/ razor etc.) any TWO 1,1
Use condom during sexual intercourse)
Screen the blood used in blood transfusion)
[The following is NOT accepted : Don't eat together/wash hand/ sweat/ isolation education/ cure]

(e) Hepatitis causes inflammation of liver tissues / damage to liver cells, thus the production of bile by the liver is greatly reduced. (1)
There is less bile salt to emulsify fat into oil droplets. (1)
The surface area of fat for lipase to carry out chemical digestion decreases. (1)
Hence, the efficiency of fat digestion is lowered.

4.

(a) Green plants and decomposers in the soil carry out respiration and produce carbon dioxide. (1)
Carbon dioxide is absorbed by the green plants for photosynthesis (2) while oxygen is released in photosynthesis as a by-product, (1)
which replenishes the oxygen content in the container.

(b) (i) Water is lost through the surfaces (mainly leaves) of the green plants via transpiration as water vapour. (1)
The water vapour condenses on the inner wall of the container and is eventually returned to the soil. (1)
(ii) Decomposers / saprophytic fungi / bacteria in the soil (1) break down the organic matter in fallen leaves into inorganic nutrients (1)
which are returned to the soil.

(c) The biomass of small green plant is limited in the ecosphere (1)
Energy is lost along food chain (1)
and cannot support more trophic levels

5.

(a)

DNA bases	*T*	*G*	*A*	*G*	*G*	*A*	*C*	*T*	*C*	*C*	*T*	*C*	*T*	*T*	*C*
mRNA bases	A	C	U	C	C	U	G	A	G	G	A	G	A	A	G
Amino acids	Thr			Pro			Glu			Glu			Lys		

(1)

(1)

(b) Val (1)

(c) TTT in DNA are transcribed into AAA in mRNA. (1)
Both AAG and AAA code for the same amino acid, Lys. (1)

(d) Individual 7 has sickle-cell anaemia, therefore she must have at least one allele for sickle-cell anaemia which (1)
must come from individual 3 and/or individual 4. (1)
Since individuals 3 and 4 have normal phenotype, (1)
the allele for sickle-cell anaemia must be recessive otherwise it will be expressed in individual 3 and/or individual 4. (1)

(e) Let **T** represent the allele for normal condition, and **t** represent the allele for sickle-cell anaemia. (1)
The genotype of individual 2 is Tt. (1)

(f) Sickle-shaped red blood cells have a smaller surface area to volume ratio for the diffusion of oxygen. This results in a reduced oxygen-carrying and delivery capacity of the blood. (1)
Sickle-shaped red blood cells form blockage in arterioles / blood capillaries and slows / reduces blood flow. (1)

6.

(a) Cell A: Sperm 1
Cell B: Pollen grain 1

(b) Meiosis 1

(c) Cell A is moved by the muscle contraction of the epididymis in the male reproduction organ of human body. (1)
Cell B is moved by the explosive force caused by breaking open the anthers / is carried away by attaching to an insect's body. (1)

(d)

Cell A	Cell B	
• with a tail to swim and reach the female gamete.	• No tail to swim	1
• No further growth of cell A	• by growing a pollen tube to carry the male gamete to the female gamete.	1
• active movement of male gametes involved	• passive transfer of male gametes by pollen tube	1
• no digestion of tissues during the movement of cell X up the female tract	• tissue of style is digested during the growth of the pollen tube from cell Y	1
• Cell X fused with female gamete directly	• male gametes are transferred by pollen tube grow into the ovule (1) containing the female gamete	1

Any 4 pairs

7.

(a) Ivan Wallin developed his idea based on previous findings of other scientists (e.g. Paul Portier) / ideas from other scientists (e.g. Konstantin Mereschowsky). (1)
This illustrates the principle of NOS that scientists develop their theories based on the works of other scientists. (1)

(b) Electron microscopes have a very high magnification and resolution (1)
which enable scientists to observe the detailed structure of chloroplasts, (1)
and find out that the chloroplasts contain DNA which is similar in appearance to that in cyanobacteria. (1)

(c) Compare the genetic compositions / biochemical compositions (1)
between certain prokaryotes and organelles. (1)

Total: 7 marks

8.

(a) Sieve tube of phloem 1
It has a sieve plate. 1

(b) Cell type Y contains sucrose. 1
Aphids use their mouthparts to suck in sugary solution from cell type Y. 1
They break down sugar obtained for releasing energy by respiration. 1

(c) Carbohydrates are immediately converted into starch for storage. 1
Carbohydrates are immediately broken down to release energy by respiration. 1
Carbohydrates are converted to cellulose for making cell walls. 1 Any two

9.

(a) Concentration of the washing powder solutions / water temperature / material of the cloth / time of washing (1)

(b) Any two of the following:

Biological washing powders are more effective than non-biological ones in removing blood stains. (1)
Brand F is the most effective washing powder in removing blood stains. / Brand B is the least effective washing powder in removing blood stains. (1)
No washing powder can completely remove the blood stains. (1)

(c) (i) Peptides / amino acids (1) (1)

(ii) Repeat the experiment using boiled solution of Brand D washing powder. (1)
The percentage of blood stain remaining will be greater /
The washing powder becomes less effective / loses its ability to remove blood stains after boiled, showing that it is heat sensitive / denatured at high temperatures. (1)
Therefore, it probably contains enzymes.

10.

Krebs cycle	Calvin cycle	
• occurs in mitochondria (1) / all living cells	• occurs in chloroplasts (1) / photosynthetic cells	1+1
• involves decarboxylation (1) / CO2 is removed from the substrate	• involves carboxylation (1) / CO2 is fixed by a 5-C compound	1+1
• catabolic reactions (1) / organic substrate is broken down into inorganic CO2 in the cycle	• anabolic reactions (1) / inorganic CO2 is built up into organic molecules of triose phosphate	1+1
• oxidative in nature (1) / generates reducing power such as NADH and FADH2 (1)	• reductive in nature (1) / uses reducing power in the form of NADPH (1)	1+1 1+1
• ATP is produced (1)	• ATP is consumed (1)	1+1

Max. 10

Communication (C) max.3

Mark award for communication:

Mark	Clarity of expression and relevance to the question	Logical and systematic presentation
3	• Answers are easy to understand. • They are fluent showing good command of language. • There is no or little irrelevant material.	• Answers are well structured showing coherence of thought and organisation of ideas.
2	• Language used is understandable but there is some inappropriate use of words. • A little relevant material is included, but does not mar the overall answer.	• Answers are organised, but there is some repetition of ideas.
1	• Markers have to spend some time and • effort on understanding the answer(s). • Irrelevant material obscures some minor ideas.	• Answers are a bit disorganised, but paragraphing is evident. Repetition is noticeable.
0	• Language used is incomprehensible. • Irrelevant material buries the major ideas required by the question.	• Ideas are not coherent and systematic. Candidates show no attempt to organise thoughts.