Unit 3 Biology

Revision Booklet 3 – Solutions

2012 – Question 8

Question 8ai.–ii.

Marks	0	1	2	Average
%	35	28	37	1

i. Input X: water or inorganic phosphate
ii. Compound Y: oxygen

Question 8b.

Marks	0	1	2	3	Average
%	17	15	23	45	2

Process	Name of process	Site of process
M	light-dependent reaction	grana of chloroplast
O	glycolysis	cytoplasm/cytosol
P	stages of cellular respiration	mitochondria

2008 – Question 4

Question 4

Question 4a.

Marks	0	1	Average
%	20	80	0.8

Either of:

- enzymes increase the rate of chemical reactions which would otherwise occur too slowly to sustain life
- enzymes lower the activation energy required for a reaction to proceed.

This question was well answered.

Question 4b.

Marks	0	1	2	Average
%	36	29	35	1.0

The active site is a particular position/specific site on an enzyme which attaches to a specific substrate.

Many vague statements were given which did not indicate the specificity of the active site with respect to its role.

Question 4c.

Marks	0	1	2	Average
%	65	20	15	0.5

Either of:

- rational drug design involves the analysis of a disease to determine a structure/aspect of the disease. A drug is then designed to mimic/block the action of the disease causing agent
- a drug is developed to act specifically on an infective agent/enzyme. This then binds and removes the capacity to cause disease.

Even though rational drug design has been part of the VCE Biology course for three years, this type of question is still poorly answered. Many vague comments were made. Students who gained full marks for this question often used a suitable example to explain their answer.

Question 4d.

Marks	0	1	2	3	4	Average
%	3	12	26	22	38	2.9

4di.

Designed drug two

4dii.

This drug has the most points which are complementary to the active site of the ACE.

4diii.

The use of the drug would block/inhibit the active site of ACE **or** compete with Angiotensin I. Angiotensin II would not be produced **or** would be produced in lesser amounts and lead to a reduced blood pressure.

This question was well answered as most students correctly identified that designed drug two would be most effective and many made a comparative statement as to why this was the best choice. It was pleasing to see the number of students who correctly applied their knowledge to part iii. and provided a well-reasoned response.

2007 – Question 3

Question 3
The standard of answers to this question showed a significant improvement on the quality of answers provided to similar questions in previous examinations.

Question 3a.

Marks	0	1	Average
%	30	70	0.7

Hydrogen peroxide

Many students did not seem to know what a substrate is and instead named the products, oxygen and water.

Question 3b.

Marks	0	1	Average
%	34	66	0.7

Agree

- As the carrot grows at a soil temperature of 16°C, it would be expected that the carrot's catalase optimum temperature would be around this temperature, not 37°C as for humans.

Disagree

- It would be expected that the enzyme is the same in both organisms and would therefore have the same optimum temperature.

Either of the above answers was acceptable.

When responding to the question 'Do you agree or disagree?', some students incorrectly answered 'yes'. Students who did not clarify this ambiguous response elsewhere in their answer were not awarded the mark. An explanation was required to gain the mark.

Question 3c.

Marks	0	1	2	3	Average
%	42	27	19	12	1.0

To gain three marks, the following points should have been included in students' responses.

- The use of at least two groups of identical pieces of carrot, placed at various temperatures (for example, 16°C and 37°C) in the same concentration of hydrogen peroxide. A specific number of carrot pieces could have been given (for example, 10). Students who mentioned the variable and other factors which were controlled adequately demonstrated their understanding of the experimental design and were awarded the first mark.
- For the second mark, students needed to discuss how catalase activity would have been measured. For example, collecting the gas to measure the production of oxygen gas, or observing the bubbles being produced.
- The third mark was awarded for a discussion of the expected results and a conclusion based on the student's prediction. For example, more oxygen gas produced at 16°C compared to 37°C would support the prediction that carrot catalase optimum temperature was 16°C.
- The idea of replicating the experiment could also have been mentioned.

If the experiment was feasible and followed correct experimental design, full marks were attainable. Common errors in the experiments described included growing carrots in hydrogen peroxide or adding catalase to the experiment. Some students failed to explain the results which would support or negate the student's prediction. Students must ensure that they answer all aspects of the question in order to gain full marks.

Experimental design is integral to science and this question exposed many deficiencies in students' knowledge and understanding of the process. Students need more practical experience with appropriate examples.

2006 – Question 4

Question 4

This question required students to have an understanding of the various types of respiration, in particular the different stages of aerobic respiration. Students demonstrated a poor understanding of these processes.

Question 4a.

Marks	0	1	Average
%	61	39	**0.4**

Acceptable answers were anaerobic respiration, glycolysis or fermentation.

The most common incorrect answers given were photosynthesis and aerobic respiration.

Question 4b.

Marks	0	1	Average
%	55	45	**0.5**

Cristae, inner membranes or membrane folds needed to be specified; simply stating 'membranes' was not sufficient.

A common incorrect response was grana.

Question 4c.

Marks	0	1	Average
%	25	75	**0.8**

Any of the following answers were accepted:

- field crickets eat crops
- the compound may be effective as a pesticide/insecticide against crickets
- the chemical may be used to get rid of crickets.

Question 4d.

Marks	0	1	Average
%	67	33	**0.4**

The presence of 2,4-dinitrophenol caused trial 1 to produce heat (instead of ATP). There was no chemical in the control group, therefore ATP was produced, not heat.

The two situations had to be compared in order to gain the mark.

Question 4e.

Marks	0	1	Average
%	78	22	**0.2**

The enzyme denatured, or an increase in heat killed/damaged the cells.

Students who gave poor expressions such as 'enzymes dying' or 'chemical is used up' received no credit.

Question 4f.

Marks	0	1	2	Average
%	11	59	30	**1.2**

Students needed to indicate an initial rise in the temperature occurring faster than in trial 1 and a decline that commenced no later than time interval 5. Two examples of appropriate sequences for trial 2 (from the commencement) include 28, 29 30, 36, 23, 21, 19 and 28, 29, 36, 30, 28, 24, 19.

This part of the question was generally well answered.

Question 4g.

Marks	0	1	Average
%	84	16	**0.2**

Various answers to this question were possible, depending on when the pyruvate was to be added.

- If it was added at the beginning of the experiment, there would be no effect because pyruvate is used before the electron transport process.
- If the pyruvate was added after the experiment, there would be no effect because the toxin has already destroyed the enzymes or cricket cells (many students wrote crickets in error).

- If the answer referred to Krebs Cycle, there may have some ATP as replacement by the addition of pyruvate.

Stating that some ATP would be produced independent of electron transport was also acceptable.

2005 – Question 3

Question 3

3a

Marks	0	1	2	Average
%	47	23	29	0.8

3ai.

Oxygen

3aii.

Either of following responses was accepted:

- the two hydrogens are removed from water and used to form $NADPH^+$, leaving the oxygen as an output product
- the breakdown of water into hydrogen and oxygen.

Many students had an understanding of the process of photosynthesis but fewer had a clear understanding of the two distinct phases that occur in photosynthesis.

3b

Marks	0	1	Average
%	56	44	0.4

A carbohydrate, **or** glucose **or** sugars.

Incorrect responses that were not awarded a mark included 'sucrose' and 'starch'.

3c

Marks	0	1	Average
%	42	58	0.6

Either of the following answers was accepted:

- oxygen is required for aerobic respiration. Oxygen in the atmosphere is generated as an output of photosynthesis
- glucose produced in photosynthesis is the substrate for cellular respiration.

Students had to relate aerobic respiration and photosynthesis. Stating that one was the reverse process of the other was not sufficient to be awarded a mark.

3d

Marks	0	1	Average
%	58	42	0.4

Aerobic respiration has a much greater yield of adenosine triphosphate (ATP) per molecule of carbohydrate than anaerobic respiration. For example, a net gain of 36 or 38 ATP compared with 2 ATP.

Year 12 Biology students should have a good understanding of the process of aerobic and anaerobic respiration. It was not sufficient to state that aerobic respiration produces more ATP if no indication was given as to how much more. An example of a typical response that was not awarded a mark was 'aerobic respiration produces more ATP molecules than anaerobic respiration'.

3e

Marks	0	1	2	3	Average
%	44	30	19	7	0.9

Conclusions and explanations

- The presence of the apical meristem inhibits the growth of lateral buds **because** when the apical meristem was removed the lateral buds grew, as evident from comparing group 1 with group 2.
- Auxin or its equivalent is produced in the apical meristem and inhibits the growth of lateral buds **because** when auxin was applied to the cut apical meristem no lateral buds grew, as evident from comparing group 2 with group 3.
- Auxin diffuses from the tip of the apical meristem **because** when a barrier stopped its flow lateral buds grew, as evident from comparing group 1 with group 4.