2007 National Qualifying Exam – Biology
Solutions

Section A

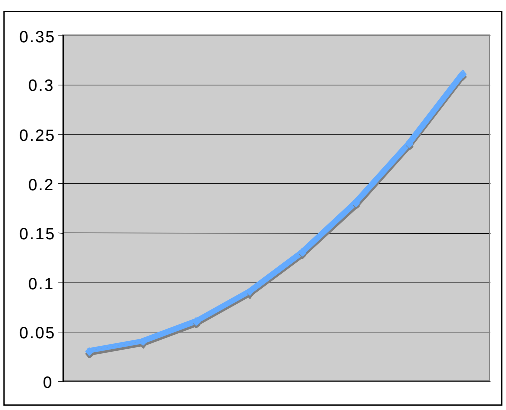
Question #	Answer	Question #	Answer	Question #	Answer
1.	D	18.	C	35.	D
2.	E	19.	A	36.	E
3.	D	20.	B	37.	A
4.	C	21.	D	38.	A
5.	E	22.	D	39.	C
6.	A	23.	A	40.	B
7.	C	24.	E	41.	D
8.	E	25.	E	42.	C
9.	A	26.	E	43.	D
10.	E	27.	E	44.	A
11.	B	28.	E	45.	A
12.	A	29.	D	46.	D
13.	A	30.	E	47.	B
14.	C	31.	D	48.	C
15.	B	32.	D	49.	A
16.	D	33.	B	50.	C
17.	C	34.	A		

Questions 7, 8, 9, 12, 14, 17, 18, 19, 22, 26, 28, 29, 31, 34, 35, 43, 46 and 47 were the lowest scoring questions.

Section B

51a The graph needs to be a reasonable size, the axes should be labelled, with units and be drawn with the dependent variable on the vertical axis. *Too many graphs were incorrectly drawn, units missing from the axes, 0, 0 used as a point to be included on the graph. If the axes were drawn incorrectly, a max of 3 marks were awarded.*

51a



51b Between 31 and 33 ^{o}C. Many students found answers of below 0^{o}C. *Students should be encouraged to use their graph to arrive at an answer – draw on the graph to find the intersect with the line of best fit and then to the horizontal axis.*

51c 3.6 mL/h/m^2 with 1 mark for correct units, one for the correct answer

51d 2.16 mL *ditto*

51e Transpiration would **decrease** as humidity increases (1 mark). Appropriate explanation such as reference to the concentration gradient being lower at high humidity (1 mark). No mark for stating that water could be taken in from the air.

51f *A smooth curve was expected, showing gradual increase from about 8, peaking between 12 and 16, gradually falling after that returning to the same level as the beginning of the day.. Some wrote at length how this was impossible to tell. Some drew a curve starting at point 0, some a straight-line graph, showing an increase throughout the day, some added in their units (so the term' arbitrary unit's was confusing) and others drew three separate curves. Where a graph was drawn that showed the typical response of a plant exposed to very high temperatures and low water availability, credit was given.*

51g Starch, cellulose (1 mark each) but also allowed: sucrose, pectin etc. *with many students writing chlorophyll and chloroplast*

52a Temperate: 18,800 and tropical;: 128 000 kJ/m/y

52b Temperature and water availability, *not just 'sunlight' but other reasonable responses credited*

52c Tropical (1)with higher NPP (1)

53a Half a point for each correct answer: 4, 3, 2, 6

53b Endoenzyme produces more ends or a larger surface area (1 mark) for the exoenzyme to work on, making the process more efficient (1 mark); increases rate of reaction produces more substrate for the exoenzyme (1 mark). *Few answers showed understanding of basic enzyme kinetics or collision theory. No marks for repeating/rewording the information given in question*

53c Location: transcription in nucleus, translation in cytoplasm (extra mark for translation on ribosomes); both use nucleic acid (1/2 mark, full mark for mRNA); both require enzymes; both require energy/ATP; differences: tRNA, amino acids, different templates, polymerase etc. *Many students did not draw up a table or the headings were transcription and translation instead of similarities and differences. Tabulating is a skill that merits developing.*

54a I^A I^A and I^A *i*

54b I^A I and I^B *i*

54c *A Punnet square would have been appropriate, but students were inventive in their choice of diagram*.

54d 0.04 or 4% full marks. *Credit was given to a worked answer showing steps even if the answer was incorrect. There appears to be considerable variation in the understanding or confidence students have wrt genetics. We will expect students to have a working knowledge of Mendelian genetics and apply this to problem solving, using the nomenclature given in the question.*

55 When the first pesticide was introduced there was a small proportion of the population that naturally contained a genetic variation **(1)** (would have arisen due to a random mutation) that made them less susceptible to the insecticide (resistance phenotype) **(1)**. The pesticide therefore acted as a selective pressure, killing individuals without the resistance phenotype. As a result more resistant individuals were able to survive to produce offspring than the non-resistant individuals **(1)**. Over numerous generations of breeding under this selective pressure the proportion of resistant individuals within the population increased to dominate the population**(1)**. As a result the insecticide would no longer be effective against this population of head lice, meaning an insecticide that kills the head lice via a different mechanism would be needed **(1)** *where the explanation given using different terminology, marks were awarded. Students seem to be familiar with the concept of micro-evolution although did not use the example given to frame their response; there was confusion between the inheritance of resistance – some wrote that these were acquired characteristics; some wrote about bacterial resistance to antibiotics and used this as an explanation for the evolution of resistance to insecticide; some wrote about immunity and how this could be acquired and passed on to future generations.*

<u>General recommendations from the examiners</u>
1. Look at as many graphs, tables as possible to try and interpret and explain the data. Develop skills around graphing, using graphs to determine data points and make predictions about what may occur;
2. An understanding of classical Mendelian genetics is assumed at this level so familiarise yourself with pedigrees, Punnet squares, ratios, % and probabilities.