Section A answers

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

Section B answers:

Question	Answer	Marks
37	343 Daltons/AMU	2
38	a	1
39	b	1
40	F	0.5
41	T	0.5
42	F	0.5
43	F	0.5
44	T	0.5
45	T	0.5
46	T	0.5
47	T	0.5
48	F	0.5
49	F	0.5
50	T	0.5
51	F	0.5
52	T	0.5
53	F	0.5
54	T	0.5
55	F	0.5
56	T	0.5
57	T	0.5
58	F	0.5
59	B	0.5
60	D	1

Section C answers

1. (5 marks)

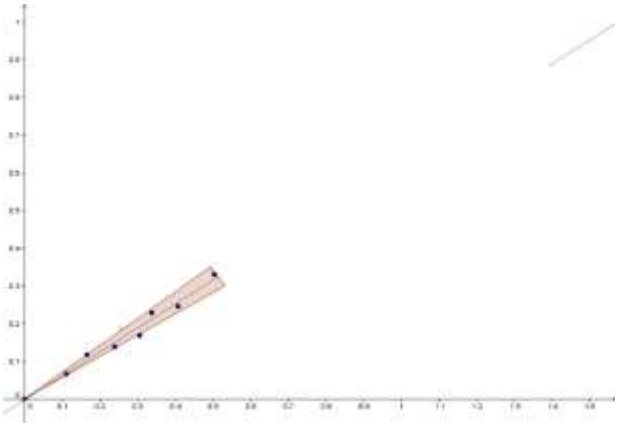
	Biological chemical			
	RNA	**Starch**	**Protein**	**Lipid**
Used for growth and repair			√	
Contains nitrogen	√		√	
Contains carbon, oxygen and hydrogen	√	√	√	√
Made from amino acids			√	
Reacts with iodine to form a blue black complex		√		
Insoluble in water				√
Contains uracil	√			

2. **a.** 5 marks → 1 for title, 2 for titles/scales/units on each axis, 1 for each line of best fit
b. 2 marks Concentration= the concentration of this unknown sample (answer to 1 decimal place). Concentration= 0.4 ± 0.1 mg/ml

c. 2 marks Elements of the buffer will also absorb light at 280nm, in a different buffer a different amount of the absorbance reading will be attributable to the buffer, hence a standard curve generated in the second buffer would need to be generated.

d. Larger absorbance readings mean that small errors in readings/graphing are proportionally smaller compared to the values obtained, hence smaller %error.

What the curve should look like:



3. **a.** 1 mark Starchy

b. 2 marks 3:1 ratio

4. **4 marks** 1 mark

a. 1 mark dominant

b. 1 mark Tt only exclude all others

c. 1 mark tt

d. 1 mark 2

5. **4 marks**

a. 1 mark In the cell cytoplasm/nucleoid region

b. 1 mark Hydrogen bonds

c. 2 marks 32%

6. 8 marks

a. 2 marks ggIi all; cobalt phenotypes

b. 2 marks GGII and GgIi in ratio of 1:1; half dark green, half olive phenotypes

c. 4 marks GgIi, GgII, ggIi, Ggii, ggii ratio of 2:1:1:2:1:1; dark green, olive, mauve, cobalt, pale green and sky blue in a ratio of 2:1:1:2:1:1

7. 9 marks

a. 2.5 marks

	Numbers of base pairs per band			
EcoR1	40			
BamH1	24	12	4	
EcoR1 and BamH1	16	12	8	4

b. 0.5 marks 40

c. 6 marks needs to be circular with 3 sites cut with BamH1and 1 EcoR1. Make sure that the lengths of DNA in-between the cut sites match up with the table data. Generally, students either knew how to do this question completely or did not know at all. Given this technology is widespread now and there have been many opportunities for schools to participate in workshops, read about the mechanism of mapping, and exposure to DNA fingerprinting and mapping on tv, the internet, etc., we expect that questions like this could be attempted by the most able and interested

students. The basic principle once understood can be applied in novel situations. Carolina is a good source of materials to teach about this topic http://www.carolina.com/pdf/activities-articles/plasmid-mapping-exercises-2008.pdf even if the kits are expensive for schools, the principles are well explained here with examples for students to learn about and how to map.

8. 6 marks

a. 1 mark eukaryotic

b. 1 mark Cilia and function

c. 1 mark rate would decrease; as environmental salinity increased, closer to osmolarity of the paramecium; less water going in/ more slowly / less need to pump out as quickly

d. 3 marks 5200 / 100 = 52 ind / mL. Use $c_1v_1=c_2v_2$ to calculate volumes required. Water 21.31 mL and stock of 7.7 mL

e. 1 mark 40 individuals / mL

f. 4 marks 2 for titles/scales/units on each axis, 1 for line of best fit, title etc. Sigmoid curve

g. 2 marks 0 – 24 hours: not many reproducing; still equilibrating to environment / starting to express genes for division. 48 - 72 hours: exponential growth as genes switched on and environment favourable / more individuals to reproduce.

h. 3 marks rate of growth decreases / carrying capacity of culture reaches / fewer resources available , so lower rate of reproduction; could add more resources / nutrients / remove some individuals etc …

General comments from examiner

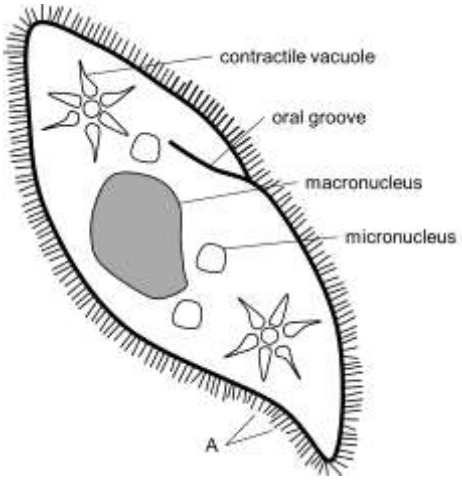
We expect all students to be able to plot data on a graph in a suitable format and interpret the graphs to interpolate / extrapolate / identify a data point given the value of one variable etc.

Mendelian genetics as a topic is included in the syllabus across Australia, and the most able students are able to answer questions that use the same principles taught in earlier years such as solving challenging dihybrid crosses.

Biology can be a content rich subject and in the top group of students each year are students who do not take this subject at school. We have been trying to include large numbers of questions that test reasoning rather than memory and encourage preparation

of future students to focus more on problem solving than the acquisition of factual material.

4. A diagram of *Paramecium*, a unicellular aquatic organism, is shown below:



a. Is the *Paramecium* prokaryotic or eukaryotic? (**1 mark)**

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b. Name the structures labelled A in the diagram. What is their purpose? (**2 marks)**

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c. The *Paramecium* regulates its water content using an organelle called a contractile vacuole. As water enters by osmosis, this organelle fills up and pumps water out into the external environment. As the salinity of the environment increases, predict how the rate of pumping would change. Explain why. (**3 marks)**

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