SPECIFIC INFORMATION

Section 1

Multiple choice

This table indicates the approximate percentage of students choosing each distractor. The correct answer is the shaded alternative.

Question	A	B	C	D	Question	A	B	C	D
	%					%			
1	67	7	13	13	**14**	4	4	6	86
2	62	8	15	15	**15**	10	76	8	6
3	6	18	34	43	**16**	3	85	7	4
4	69	5	15	11	**17**	6	3	89	3
5	9	7	26	57	**18**	4	73	16	7
6	11	49	2	39	**19**	7	20	62	11
7	56	6	34	5	**20**	4	3	9	85
8	19	30	43	8	**21**	9	81	3	7
9	8	10	2	80	**22**	18	7	64	11
10	17	48	31	4	**23**	12	8	9	71
11	6	7	23	64	**24**	12	69	12	7
12	3	8	86	3	**25**	87	6	5	2
13	77	6	9	8					

Section 2

For each question, an outline answer (or answers) is provided. Each answer is broken into parts to give an indication of the allocation of marks shown on the paper. In some cases, the answer provided is not the only answer that could have been awarded marks.

Question	Marks	%	Comments
Question 1	**ai-v**		**ai.** Mitochondrion – production of ATP.
	0/5	16	**aii.** Ribosome – site of protein synthesis.
	1/5	12	**aiii.** Endoplasmic reticulum OR rough endoplasmic reticulum – transport channel.
	2/5	15	
	3/5	14	**aiv.** Golgi complex or Golgi apparatus – modifies and packages material for transport from cell.
	4/5	23	
	5/5	21	**av.** Chloroplast – site of photosynthesis.
	b		Structure **A** Protein channel
	0/2	28	Structure **B** Phospholipid bilayer
	1/2	27	
	2/2	45	Student responses that were precise were awarded full marks in this question. Responses for structure B such as lipid layer or phospholipid were not awarded marks.
	c		Sodium ions are pumped out of the cell against a concentration gradient
	0/2	75	**and**
	1/2	13	This transport is active transport and hence requires energy.
	2/2	12	
			Most students recognised that there was a membrane separating the sodium in the plasma and the sodium within the cytosol of the cell. Fewer students could explain how the difference in concentration of sodium is maintained.
	d		Osmosis.
	0/1	13	
	1/1	87	
	e		A plant cell has a cell wall outside the cell membrane that **limits the expansion of the cell membrane**.
	0/1	91	
	1/1	9	
			Student responses that only stated that the plant cell had a cell wall without any further explanation were not awarded a mark (this was very common). Students must be made aware that a question that requires an explanation must contain more than a statement of fact in the answer.

Question 2	**a** 0/1 1/1	 87 13	The cyst stage decreases the chance of dehydration after being passed out in the faeces and before transmission to another host **or** The cyst can lie dormant for some time between the infection of one host and transmission to another host. The question asked for an advantage of the cyst stage to the survival of the species. Answers that make no reference to species survival could not be awarded marks. Examples of such incorrect responses included 'acts as a protective barrier' or 'reduces the chance of it being harmed'.
	b 0/2 1/2 2/2	 15 39 46	Any **TWO** of: • sucker to attach to the lining of the intestine • flagella to move to new sites within the gut of infected person • flattened (or small) body increases surface area to volume ratio and hence maximises absorption of nutrients. Most students could correctly identify two features of the adult Giardia. Fewer could go on and correctly describe how each feature would assist in the Giardia's survival in the upper intestine.
	c 0/1 1/1	 30 70	Adults develop immunity after an earlier infection **or** Children may eat food that is more likely to be infected with cysts **or** Children, being less hygienic, often forget to wash their hands after going to the toilet.
	d 0/1 1/1	 72 28	Binary Fission Examples of incorrect responses given to this question included 'asexual reproduction', 'biological fission' and 'binary fusion'. Students need to be reminded to take care when answering questions making sure that they read over their answers to avoid making careless mistakes.
	e 0/2 1/2 2/2	 24 48 28	Any **TWO** of: • unlimited food source available or nutrients readily available • optimal or appropriate temperature • sufficient moisture available • appropriate pH.
	f 0/1 1/1	 40 60	If bacteria are on raw food, the preparation area is most likely contaminated. Although bacteria may be killed in cooking, **food is at risk of recontamination** if given further handling in the contaminated area. Many students could identify that cooking food may kill bacteria but fewer could make the point that cooked food may become recontaminated when placed in the raw food preparation area.
Question 3	**a** 0/1 1/1	 24 76	Phototropism
	bi-ii 0/2 1/2 2/2	 33 42 25	**bi.** A, E, F and G **bii.** In each case the tip of the coleoptile is exposed to light. Part i. was well answered by many students. In part ii, an example of a typical response that was **not** awarded a mark included 'The coleoptile on each of these is exposed to a light source'.

	c 0/3 1/3 2/3 3/3	 40 22 28 11	Events that must be indicated by labels on a diagram/s were: • auxin is produced in the tips of the coleoptiles **and** • light coming from one direction results in auxin moving to side away from light **and** • results in elongation of cells on the shaded side which results in bending towards the light. Part c was well answered by many students. Diagrams were often clearly drawn and showed expected detail.
Question 4	**a** 0/1 1/1	 73 27	Negative feedback is a process in which a change in a variable is detected **AND** a response occurs within the body to reverse the direction of change. There were some excellent answers to this question. Some students demonstrated a clear understanding of the concept and could clearly express their knowledge.
	bi-ii 0/3 1/3 2/3 3/3	 44 23 19 14	**bi.** Smooth muscle relaxes and the peripheral blood vessels dilate **and** This increases the volume (or surface area) of blood close to the skin surface and results in an increase in heat loss. Many students referred to the increase in heat loss caused by the increase in volume of blood closer to the skin. Fewer students mentioned the change that occurred within the effector. **bii.** Sweat glands **or thyroid** gland. In some cases students tried to describe a response that occurred rather than name one other effector organ. Marks could only be awarded if the effector organ was named.
	c 0/1 1/1	 23 77	285 mOs/kg. Answers that included the unit of plasma solute concentration were awarded full marks.
	d 0/1 1/1	 60 40	Posterior pituitary gland **or** pituitary gland. **Note:** the hypothalamus was also accepted because the question did not state that the antidiuretic hormone was being released into the bloodstream. Antidiuretic hormone is made in neurosecretory cells of hypothalamus and flows to the posterior pituitary gland and is released into the bloodstream when required.
	e 0/2 1/2 2/2	 59 24 17	• antidiuretic hormone increases the permeability of kidney tubules/collecting duct to water **and** • therefore greater reabsorption of water. Most answers mentioned that antidiuretic hormone increased the reabsorption of water although in some cases incorrectly referred to the process as absorption. Fewer responses included the effect of the hormone on the kidney tubules.
	f 0/2 1/2 2/2	 80 14 7	**NPH** insulin: 13 hours **LANTUS** insulin: 22 hours **OR** 22.5 hours This question was poorly answered. Students did not take into account that neither insulin was effective in the first hour. Common incorrect answers included 14 hours for NPH insulin or 23 hours for LANTUS insulin.

	g 0/1 1/1	 30 70	Steady level of activity over a longer period gives better control of blood glucose levels **or** Since the effect lasts longer a person may be able to survive on fewer injections or even one only per day **or** Steady level of activity over a longer period may reduce chance of a person having too much or too little blood sugar (OR having hypo- or hyper-glycaemia).
Question 5	**ai-aii** 0/3 1/3 2/3 3/3	 16 11 21 53	**ai.** $6CO_2 + 6H_2O \xrightarrow[\text{radiant energy}]{} C_6H_{12}O_6 + 6O_2$ **or** $6CO_2 + 12H_2O \xrightarrow[\text{radiant energy}]{} C_6H_{12}O_6 + 6O_2 + 6H_2O$ **aii.** As oxygen is a byproduct of photosynthesis, its rate of production reflects the rate of photosynthesis **or** Because the amount of oxygen produced is related to the rate of photosynthesis **or** Because oxygen is a product of photosynthesis.
	b 0/1 1/1	 80 20	Oxygen being used by the plant for respiration was replaced by oxygen moving into the plant from surrounding atmosphere **or** Oxygen is used for respiration – plant was in dark for 10 minutes so photosynthesis did not occur. Many students could identify that during the first 10 minutes photosynthesis was not occurring and therefore oxygen was not being produced. This alone will not account for a decrease in oxygen concentration. Students had to mention that the process of respiration was occurring and using up oxygen.
Question 6	**a** 0/2 1/2 2/2	 54 33 13	The nervous system, as messages for eye movement would need to be rapidly transferred from the brain to the muscles of the eye to ensure continual changing movement **and** Hormonal system would probably be too slow as it involves release of hormones into the blood and generally brings about a slower sustained response **or** We can control the movement of our eyes during reading and so the action must be under control of part of peripheral nervous system **and** Endocrine system not under voluntary control so cannot be responsible for the rapid eye movement during reading.
	b 0/2 1/2 2/2	 92 4 4	Hormones will be transferred in the blood in both situations. All body cells must have receptors that respond to the hormones involved in the control of blood glucose levels **and** In situation 2, only cells in the thyroid gland have receptors that are responsive to TSH. Most students are aware that hormones act on target organs or cells. Few students could identify that the presence of particular receptors on the target organ make it responsive to the hormone.
Question 7	**a** 0/1 1/1	 94 6	Mast cells are located around blood vessels. Some answers were very general and could not be awarded marks. The most common incorrect response was 'in the bloodstream'.

	b 0/2 1/2 2/2	 38 16 46	Structure **X** antibody (**OR** immunoglobulin). Structure **P** antigen (**OR** pollen, dust, spores, food particle).
	c 0/1 1/1	 58 42	Histamine.
	d 0/1 1/1	 62 38	The increased blood flow brings cells and compounds of the immune system close to the site of an infection **or** The increased blood flow brings phagocytes close to the site of an infection. Students should be aware that inflammation is a non-specific response to an infection. Therefore, answers that referred to the production of antibodies could not be awarded marks.
	e 0/1 1/1	 94 6	The injected antigens react with particular antibodies already present in an individual. Removal of these antibodies means they are unavailable for involvement in an allergic reaction should the person come into contact with the allergen again **or** The injections could stimulate the production of new (circulating) antibodies. At a later stage, if the person encounters the allergen again, the antibodies would react with the allergen and hence the allergen could not react with mast cells **or** The injected antigen reacts with existing antibodies. This reduces the severity of future encounters with the antigen because there are fewer antibodies for immediate reaction.