Marking Scheme

This document was prepared for markers' reference. It should not be regarded as a set of model answers. Candidates and teachers who were not involved in the marking process are advised to interpret its contents with care.

Paper 1

SECTION A

Question No.	Key	Question No.	Key
1.	D (64%)	21.	D (65%)
2.	C (32%)	22.	C (73%)
3.	D (59%)	23.	A (61%)
4.	D (41%)	24.	A (63%)
5.	B (41%)	25.	B (47%)
6.	A (70%)	26.	A (62%)
7.	A (74%)	27.	B (62%)
8.	B (47%)	28.	C (53%)
9.	B (70%)	29.	C (78%)
10.	A (50%)	30.	D (69%)
11.	A (31%)	31.	D (51%)
12.	B (80%)	32.	C (61%)
13.	C (83%)	33.	B (45%)
14.	A (45%)	34.	D (54%)
15.	D (35%)	35.	B (58%)
16.	A (71%)	36.	C (77%)
17.	B (81%)		
18.	A (31%)		
19.	C (14%)		
20.	D (78%)		

Note: Figures in brackets indicate the percentages of candidates choosing the correct answers.

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General Marking Instructions

1. In order to maintain a uniform standard in marking, markers should adhere to the marking scheme agreed at the markers' meeting.

2. The marking scheme may not exhaust all possible answers for each question. Markers should exercise their professional discretion and judgment in accepting alternative answers that are not in the marking scheme but are correct and well-reasoned.

3. The following symbols are used:

/	A single slash indicates an acceptable alternative within an answer.
*	Correct spelling required

4. In questions asking for a specified number of reasons or examples etc. and a candidate gives more than the required number, the extra answers should not be marked. For instance, in a question asking candidates to provide two examples, and if a candidate gives three answers, only the first two should be marked.

5. In cases where a candidate answers more questions than required, the answers to all questions should be marked. However, the excess answer(s) receiving the lowest score(s) will be disregarded in the calculation of the final mark.

6. Award zero marks for answers which are contradictory.

7. Where applicable, markers should put a tick (✓) against the answer which counts for a point of merit and the aggregated mark awarded for each question should be entered into the mark box of the OSM system in the right-hand side. If no marks are to be given, a cross (X) should be inserted there instead.

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Paper 1 Section B

Marks

1. B (1)
   D (1)
   A (1)

   3 marks

2. (a) * ciliated epithelial cell (1)
   * mucus-secreting cell (1) (2)

   (b) • mucus secreting cells secrete mucus to trap germs / pathogens / bacteria / microbes from the incoming air (1)
   • cilia sweep the trapped germs away to the throat for swallowing or coughing (1) (3)
   • closely packed epithelial cells prevent the entry of bacteria / form a physical barrier (1)

   5 marks

3. (a) • since each of the separated cells was able to develop into a complete organism, this implies a whole set of genetic material is present in each cell / there was no reduction in the quantity of genetic material during the first division (1) (1)

   (b)

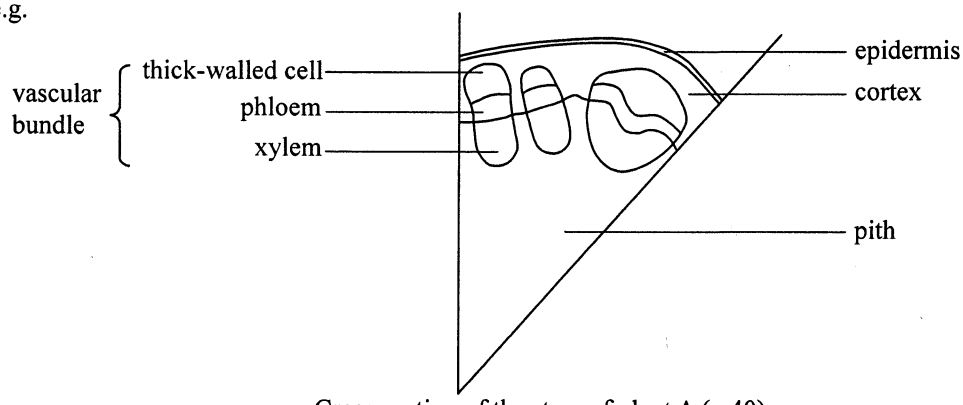
Science knowledge is tentative and subject to change.	Spemann's results disproved the general belief, showing that scientific knowledge will change when there is new evidence evolved (1) (1)
Interpretation of observation is guided by our prior understanding of other theories and concepts.	Scientist observed that cell division and believed that all the materials inside will be divided too without knowing that genetic materials will be duplicated (1) / Spemann thought that all genetic materials are required to form a whole organism, therefore, he interpreted that each cell contained a complete set of genetic material. (1)

   (c) • DNA / genetic material is duplicated right before cell division (1) (1)
   • the duplicated chromosomes will line up at the middle part of the cell for separation (1) (1)
   • each member of the duplicated chromosomes will then separate and eventually divide equally into each daughter cell (1) (1)

   6 marks

4. (a) Title (1)
   Resemblance of drawing (1)
   Labels, any three (1, 1, 1) (5)

   e.g.



Cross section of the stem of plant A (x 40)

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				Marks
4.	(b)	•	the stem of plant A has a large proportion of thin-walled cells (1), • therefore plant A is mainly supported by turgidity of the thin-walled cells (1) • while the stem of plant B has a large proportion of xylem / thick-walled cells / woody tissues (1) • therefore it is mainly supported by mechanical or physical strength / rigidity of the thick-walled cells / xylem / woody tissues (1)	(4)
				9 marks
5.	(a)	•	secondary succession (1) • because it involves the restoration of the community after a major disturbance, i.e. fire (1)	(2)
	(b)	(i)	• from year 0 to 3, herbs are the dominant vegetation (1) • from year 3 to 8, woody plants are the dominant vegetation (1)	(2)
		(ii)	• underground vegetative organs and seeds were not damaged in the fire (1), • herbs generally germinate and grow faster than woody plants (1) • hence the percentage cover of herbs increased rapidly at first (1) and become the dominant vegetation in the first three years • as woody plants continue to grow and over-shadow the herbs / out-compete the herbs for light (1), they replace herbs as the dominant vegetation	(4)
				8 marks
6.	(a)	•	dogs have many more copies of gene A in the genome than wolves (1) • these gene copies will be transcribed into mRNA which, in turn, translated into amylase (1) • more amylase will be produced in dogs (1), resulting in higher amylase activity	(3)
	(b)	•	the human food wastes usually contain carbohydrates / starch (1) • variations in copy number of gene A may exist in the ancient wolf population (1) • those with higher gene copy numbers could produce more amylase and were more adapted to a starch-rich diet of human food waste (1) • as wolves got used to feeding on human food wastes and gradually domesticated, they could then grow better & reproduce more/have more offspring than those with smaller gene copy number (1) • their genes, including multiple copies of gene A could be passed to the next generation (1), resulting in the selection of multiple copies in the dogs' genome	(5)

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Marks

6. (c)

Concepts of mark award:
- source of digestive juice (1)
- mixing of digestive juice with starch (1)
- appropriate test method (1), to detect either an increase in reducing sugar or a decrease in starch content
- description and interpretation of results (1)

(4)

e.g. Measuring a decrease in starch content:
- obtain digestive juice from the mouth / intestine / pancreas of a wolf and a dog (1)
- mix 1 mL of digestive juice with 5 mL of starch solution (1)
- at regular time intervals, remove a fixed amount of the mixture for iodine test and record the time taken for the tested mixture to stay in brown colour (1)
- the shorter the time, the faster the digestion of starch, i.e. higher amylase activity (1)

Or
- obtain digestive juice from the mouth / intestine / pancreas of a wolf & a dog (1)
- drill two holes on a starch agar plate, add the digestive juices to the holes of starch agar plate (1) respectively
- incubate the plate for 30 minutes, add iodine solution to the plate and rinse, compare the brown / clear zones appeared (1)
- the one with bigger brown / clear zone shows more starch digestion, i.e. higher amylase activity (1)

Measuring an increase in the amount of reducing sugar:
- obtain digestive juice from the mouth / intestine / pancreas of a wolf & a dog (1)
- mix 1 mL of digestive juice with 5 mL of starch solution (1)
- After 10 minutes, boil the mixture with excess Benedict's solution, and record the amount of red precipitate formed (1)
- the one with more red precipitate shows more maltose formation, i.e. a higher amylase activity (1)

12 marks

7. (a) X: * protein (1)
Y: * phospholipid (1)

(2)

(b) (i)
- tube D should have the highest concentration of alcohol (1)
- this is because the phospholipids of the membrane dissolve in alcohol (1)
- the cell membrane and vacuole membrane of the beetroot tissue bathing in the test tube with highest concentration of alcohol would be most damaged (1)
- the amount of pigment released to the bathing solution would be the highest, as indicated by the highest colour intensity (1)

(4)

(ii)
- when the cell membrane and vacuole membrane are damaged, the pigment leaks out of the vacuole by diffusion (1)
- as time passes, it allows the diffusion of the red pigment in all 4 tubes to reach an equilibrium state at which the same concentration of red pigment are found in the bathing solutions / the bathing solution contains the same amount of red pigment in all 4 tubes, i.e. same colour intensities (1)

(2)

8 marks

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				Marks
8.	(a)	•	coloured / large petals (1) and anther within the flower tube (1)	(2)
	(b)	(i) •	middle part (1)	(1)
		(ii) •	type Q flower (1) • because its stigma is located at the middle level of the flower tube (1) which is at the same position where the middle part of the sucking tube will touch upon	(2)
		(iii) •	this ensures that pollination is done between different individuals / avoids self-pollination (1) • so that the genetic variation of the offspring can be increased (1)	(2)
				7 marks
9.	(a)	heart diseases > colon cancer > diabetes mellitus (1)		(1)
	(b)	number of death increases with age groups (1) / age		(1)
	(c)	Heart disease: • heart disease kills more male than females (1) • more male were (daily) smokers (1) • nicotine of cigarette smoke increases the chance of blocking the blood vessel (1)		(3)
		Colon cancer: • colon cancer kills more males than females (1) • more male consume processed meat (1) • processed food contains chemicals that may stimulate mutations/ which are mutagens (1) of colon epithelium		(3)
				8 marks
10.	(a)	•	yellow spot contain a high density of cones cells (1) • and there are three types of cones for colour perception (1), • as a result, there are more sensory nerve impulses coming from the yellow spot (1) • hence more neurones are allocated to analysis of the nerves impulses from the yellow spot (1)	(4)
	(b)	•	impulses received from the visual cortex will be interpreted at the association area (1) • where relevant information about the image will be retrieved from the previously stored information (1)	(2)
				6 marks

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Marks

11. Lose weight and build muscle (max. 4 marks)
- lean meat does not contain much fat and carbohydrates, this reduces the energy intake (1)
- when the energy intake is lower than the energy expenditure (1), our body will utilise food reserve, body fat in this case, to support our daily activities (1)
- protein in the lean meat will be digested to form amino acids (1)
- amino acids will be assimilated to form muscle fibres (1) according to the needs of the body

Health problems associated with the unbalanced diet (max. 2 marks)
- such diet may lack other essential nutrients which are also important for our health (1) such as certain mineals and vitamins
- insufficient intake of minerals and vitamins leads to deficiency diseases (1) (may cite specific examples)

Health problems associated with protein metabolism (max. 3 marks)
- excess amino acids will be deaminated in the liver forming urea (1)
- and the urea will be excreted through the kidney (1)
- this creates heavy workload to both the liver and the kidney (1) and may lead to failure of their functioning (1)

C=max. 3

12 marks

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.

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