1(a). Maintaining a constant body temperature is important.
Sweating is one method that our body uses to maintain a constant temperature.

Complete these sentences to show the response of the body if body temperature gets **too high**.

If the body temperature gets **too high** the amount of sweat produced will

_____ .

This causes the body temperature to _____ .

[2]

(b). Sunita runs a marathon.
The weather is very hot.
She does not drink enough water during the race.

What effect could this have on Sunita's body temperature? Explain your answer.

---

[2]

(c). Sunita's body temperature is controlled by receptors, effectors and a processing centre.

Draw straight lines to join each **structure** to its correct **description**.

structure	description
temperature detector in skin	effector
brain	processing centre
sweat gland	receptor

[2]

2(a). An incubator for a premature baby has three parts to monitor and control temperature.

A a thermometer to detect changes in air temperature
B a computer to receive and coordinate data about temperature changes
C a heater to warm up the incubator if it gets too cold

Which part of the incubator, **A**, **B** or **C**, is …

… a processing centre? _____
… an effector? _____
… a receptor? _____

[2]

(b). A similar process takes place in the human body for monitoring and maintaining water levels.

(i) Name the process that maintains a constant internal environment in the human body.

_____ **[1]**

(ii) Write down the names of the two coordination systems used in the human body.

_____ and _____ **[2]**

(iii) The organs that control water balance in the human body are the two kidneys.
Ranjit donated one of his kidneys to save the life of his brother.
Suggest how this will affect the activity of Ranjit's one remaining kidney.

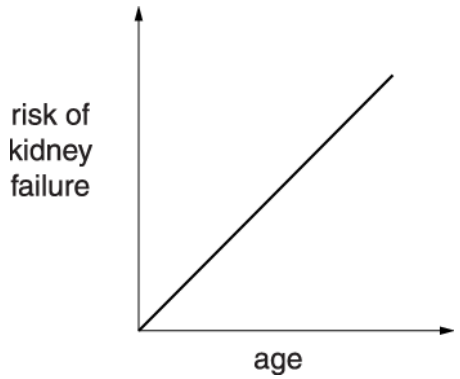
_____

_____

_____

_____ **[2]**

(c). Look at the graph of the age of a person and the risk of kidney failure.



(i) Draw **one** straight line to join the two correct statements that, when taken together, describe the correlation between the **factor** and the **outcome**.

factor	**outcome**
As age increases …	… the risk decreases at a faster rate.
At a certain age …	… the risk stays the same.
The younger you are …	… the risk increases.

[1]

(ii) Ranjit's brother was 55 years of age when he had kidney failure.
Explain why this does not provide convincing evidence for or against a correlation.

---

[1]

3. Mammals such as seals maintain a constant body temperature.

Seals live in cold water.

They have a thick layer of body fat and spend several hours each day lying in the sunshine.

Seal

Suggest how seals manage to maintain a constant body temperature even though they live in cold water.

Use ideas about body temperature control, insulation, respiration and bloodflow in your answer.

The quality of written communication will be assessed in your answer.

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[6]

4. Temperature control is very important in mammals.
Explain how the human body maintains a constant core temperature and suggest why this process may differ from a mammal that lives in cold water.

The quality of written communication will be assessed in your answer.

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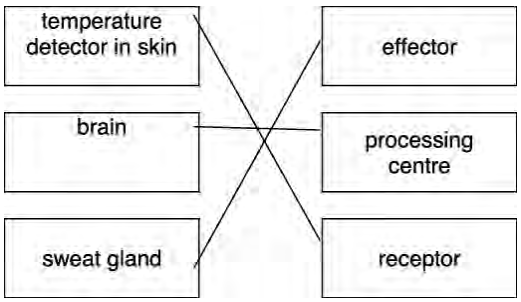
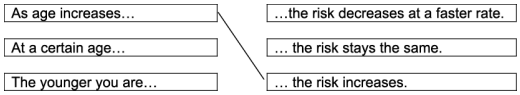
[6]

END OF QUESTION PAPER

Question			Answer/Indicative content	Marks	Guidance
1	a		Increase; Decrease / Reduce;	2	 **accept** cools down **Examiner's Comments** Well answered question, many candidates gaining both marks.
	b		*Any two from:* Dehydration; Reduced sweating; Increase in body temp / hyperthermia;	2	 **Examiner's Comments** Many candidates showed that they had a good knowledge of thermoregulation and gained both marks.
	c			2	3 lines correct = 2 1 or 2 lines correct = 1 **Examiner's Comments** This good knowledge continued here again with most candidates achieving both marks.
			Total	**6**	
2	a		B; C; A;	2	3 correct = 2 marks 2 or 1 correct = 1 mark **Examiner's Comments** Was very well answered, with many of those who did not gain both marks picking up at least 1 mark. This suggests that Centres have done a good job preparing candidates to use and interpret scientific models.
	b	i	homeostasis;	1	 **Examiner's Comments** Was in contrast very poorly answered. Only a small number of candidates were able to name homeostasis as the process, and many responses named an organ of the body rather than any process.

Question			Answer/Indicative content	Marks	Guidance
		ii	nervous; hormonal / endocrine;	2	**accept** either way round **Examiner's Comments** Was also very poorly answered, with such marks as were scored being for nervous system; hormonal system was almost never mentioned. It was particularly disappointing to see so many candidates either fail to offer a response, or to offer the name of an organ or even two organs in response to a question that asked them to name systems, and perhaps the hierarchy of tissues, organs and systems needs to be emphasised to future candidates.
		iii	*any two from:* it will have to filter more blood; it will produce urine twice as quickly / take longer; it will produce urine at the same rate as two kidneys; it will need to produce more urine; it will grow bigger;	2	**Examiner's Comments** Was not well answered, largely because candidates seemed to ignore the question about what the effect would be on the remaining kidney and give answers about the implications for Ranjit. Such credit as could be given was mainly for a generalisation that the kidney would need to work harder rather than making any of the specific points listed in the mark scheme.
	c	i		1	Do not give the mark if more than 1 line is drawn. **Examiner's Comments** Very often had the correct response of the top left box joined to the bottom right box, and nearly as often did not score the mark since other boxes were joined by lines despite the clear instruction to draw **one** line. Candidates might be encouraged to read questions carefully for this type of instruction.

Question			Answer/Indicative content	Marks	Guidance
		ii	it is only an isolated / single case;	1	Examiner's Comments Was looking for a generalisation that a single case is not evidence of a trend. This was very poorly answered as candidates made specific points rooted in the scenario e.g. “Ranjit's brother was 55 his age made him likely to have kidney failure.”
			Total	9	

Question			Answer/Indicative content	Marks	Guidance
3			[Level 3] Comments refer to some processes and some ideas. Quality of written communication does not impede communication of the science at this level. (5–6 marks) [Level 2] Comments refer to a process and ideas. Quality of written communication partly impedes communication of the science at this level. (3–4 marks) [Level 1] Comments refer only to processes or to ideas. Quality of written communication impedes communication of the science at this level. (1–2 marks) [Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	This question is targeted up to grade E Ignore any reference to cooling or lowering body temperature. Ideas may include: • cold water causes heat loss • heat less should equal heat gain • heat released from respiration / shivering • thick fat layer • thick fur • basking • vasoconstriction Process may include: • brain / hypothalamus monitors (core) body temperature • brain / hypothalamus acts as processing centre • skin sensors monitor external temperature • brain sends impulses to effectors eg muscles • activity increases respiration, increases heat released • lots of insulation (to prevent heat loss) • mentions negative feedback / homeostasis • sun warms / heats seal up • reduces blood flow to surface / less heat lost from blood Use the L1, L2, L3 annotations in Scoris; do not use ticks. Examiner's Comments This extended writing question was well answered by many candidates with approximately 70% being awarded a level 2 or 3 mark.
			Total	6	

Question			Answer/Indicative content	Marks	Guidance
4			**Level 3 (5–6 marks)** Includes detailed explanation of both heating **and** cooling, **OR** homeostasis **and** correct difference(s) from aquatic mammal. Quality of written communication does not impede communication of science at this level. **Level 2 (3–4 marks)** Includes explanation of either heating **or** cooling **and** correct difference(s) from aquatic mammal **OR** explanation of heating **AND** cooling **OR** Homeostasis but no correct differences with aquatic mammal Quality of written communication partly impedes communication of science at this level. **Level 1 (1–2 marks)** Includes limited explanation of either heating OR cooling Quality of written communication impedes communication of science at this level. **Level 0** Insufficient or irrelevant science. Answer not worthy of credit.	6	This question is targeted at grades up to C **Relevant points include:** *General* • should include too hot, too cold and how aquatic mammals may differ *Specific* **Homeostasis** • hypothalamus / receptors / effectors **Too hot** • vasodilation / blood flow near surface of skin increases • more heat radiated away • sweating • heat lost by evaporation / latent heat **Too cold** • vasoconstriction / blood flow near surface of skin decreases • heat stored in body core / less heat radiated away • shivering / increased respiration rate • generates heat **Differences** • e.g. aquatic mammal lives in water so sweat will not work / has (thick) fur / hair / waterproof do not look for layer of fat / blubber as this is not on the specification. **Use the L1, L2, L3 annotations in Scoris; do not use ticks.** **Examiner's Comments** In this six-mark extended-writing question most candidates managed to relate some ideas about temperature control in

Question			Answer/Indicative content	Marks	Guidance
					humans. However many misconceptions were apparent, such as blood vessels moving up and down in the skin. Very few candidates were able to make comparisons with aquatic mammals and again a number of candidates thought that these were cold blooded and that fish were mammals.
			Total	6	