

**5: Coordination, response and homeostasis – Topic questions****Paper 6**

The questions in this document have been compiled from a number of past papers, as indicated in the table below.

Use these questions to formatively assess your learners' understanding of this topic.

Question	Year	Series	Paper number
1	2016	June	63
1	2016	November	61

The mark scheme for each question is provided at the end of the document.

You can find the complete question papers and the complete mark schemes (with additional notes where available) on the School Support Hub at [www.cambridgeinternational.org/support](http://www.cambridgeinternational.org/support)

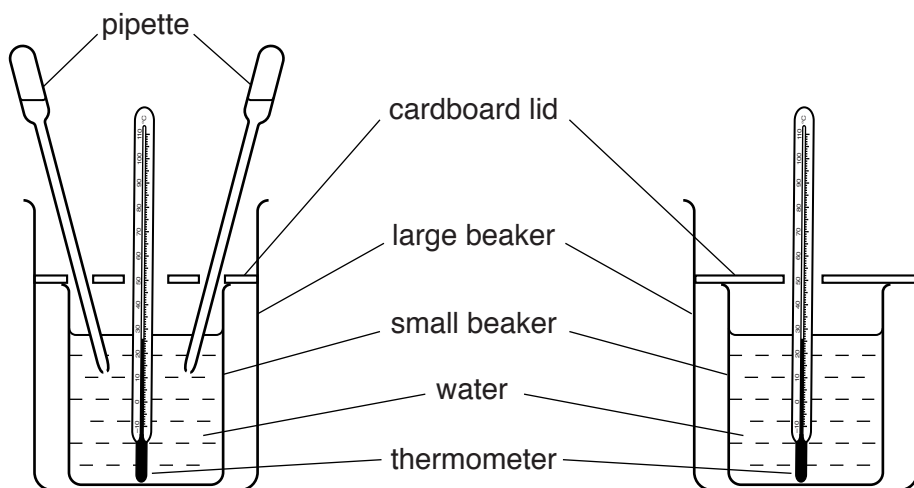
- 1 Fig. 1.1 shows an elephant, *Loxodonta africana*. They have large ears which help them to control their body temperature.



**Fig. 1.1**

When the elephant is too hot, more blood is pumped into the blood vessels in the elephant's ears. Increasing blood flow to the surface of the skin helps the elephant to cool down.

A student set up a model of what happens in the elephant's ears, as shown in Fig. 1.2.



**Fig. 1.2**

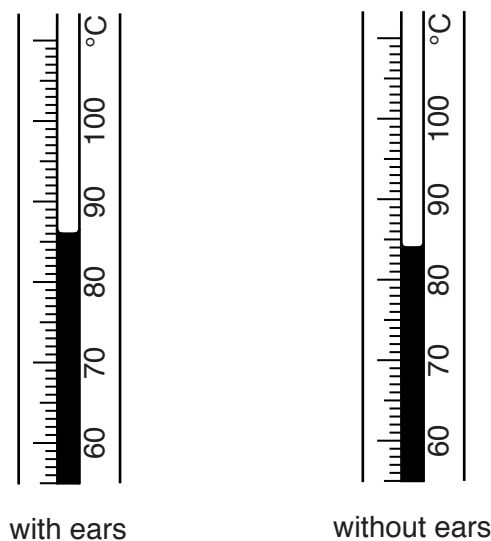
They placed hot water into two small beakers and stood each one in a larger beaker. One of the small beakers had 'ears' and the other did not.

The 'ears' were represented by two plastic dropping pipettes. The student squeezed and released the pipette ears throughout the experiment so that water continuously moved out of and into the pipettes.

The student placed a cardboard lid on top of each small beaker. They made holes in the cardboard lids so that a thermometer and the pipettes could pass through them.

**(a)** The student recorded the starting temperature of the water in both small beakers.

The thermometer readings are shown in Fig. 1.3.



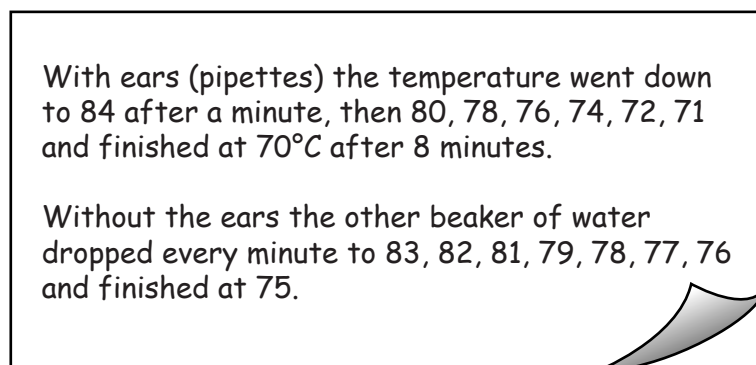
**Fig. 1.3**

Read the starting temperatures of the two thermometers shown in Fig. 1.3 and record the temperatures below.

with ears ..... without ears ..... [2]

- (b) The student measured and recorded the temperature of the hot water in both beakers every minute for a total of eight minutes.

The student obtained the results shown in Fig. 1.4.



**Fig. 1.4**

Prepare a table to record the observations shown in Fig. 1.4 **and** the starting temperatures from Fig. 1.3.

Complete the table by entering all of the results.

[4]

- (c) Suggest **one** safety precaution that should be taken during this experiment.

.....

.....

.....[1]

- (d) (i) A student repeated this experiment and calculated the change in temperature of the water each minute for eight minutes in both small beakers.

The change in temperature in the small beaker with pipette ears was 18 °C.

The change in temperature in the small beaker without pipette ears was 11 °C.

Explain why it is important to calculate the change in temperature in each beaker.

.....

.....

.....

.....

.....[2]

- (ii) Use the information in part (d)(i) to calculate the **rate** of temperature change in the small beaker with pipette ears for the student's experiment.

Show your working.

Give your answer to two significant figures.

rate of temperature change ..... °C per min  
[2]

- (e) (i) Suggest why the student used cardboard lids on top of each of the small beakers.

.....

.....

.....[1]

- (ii) Suggest and explain **one** source of error in the method as a result of using the cardboard lids.

.....  
.....  
.....[2]

- (iii) Suggest **two** improvements which could be made to the method, other than changing the cardboard lids.

1 .....  
.....  
.....  
2 .....  
.....  
.....[2]

- (f) Fig. 1.5 shows a different species of elephant, *Elephas maximus*, to the one shown in Fig. 1.1.



**Fig. 1.5**

- (i) State **one** visible difference between the ears of the elephant in Fig. 1.5 and those of the elephant shown in Fig. 1.1.

.....[1]

..

- (ii) Based on this difference and the results of the student's experiment in part (d)(i), what can you conclude about the environmental conditions that the elephant shown in Fig. 1.5 lives in compared to the elephant in Fig. 1.1?

.....  
.....  
.....[1]

**[Total: 18]**

- 1** Some animals have a body temperature that is higher than the temperature of the environment. As a result these animals lose heat to the environment, causing their body temperature to fall.

An investigation was carried out to find the effect of the volume of the body on the loss of heat to the environment.

The volume of the body of an animal and its temperature can be represented by hot water.

Step 1 Two 250 cm<sup>3</sup> beakers were labelled **A** and **B**.

Step 2 A line was drawn on beaker **A**, 6 cm up from the bottom of the beaker.  
A line was drawn on beaker **B**, 3 cm up from the bottom of the beaker.

Step 3 Hot water was added to both beakers up to these marks.

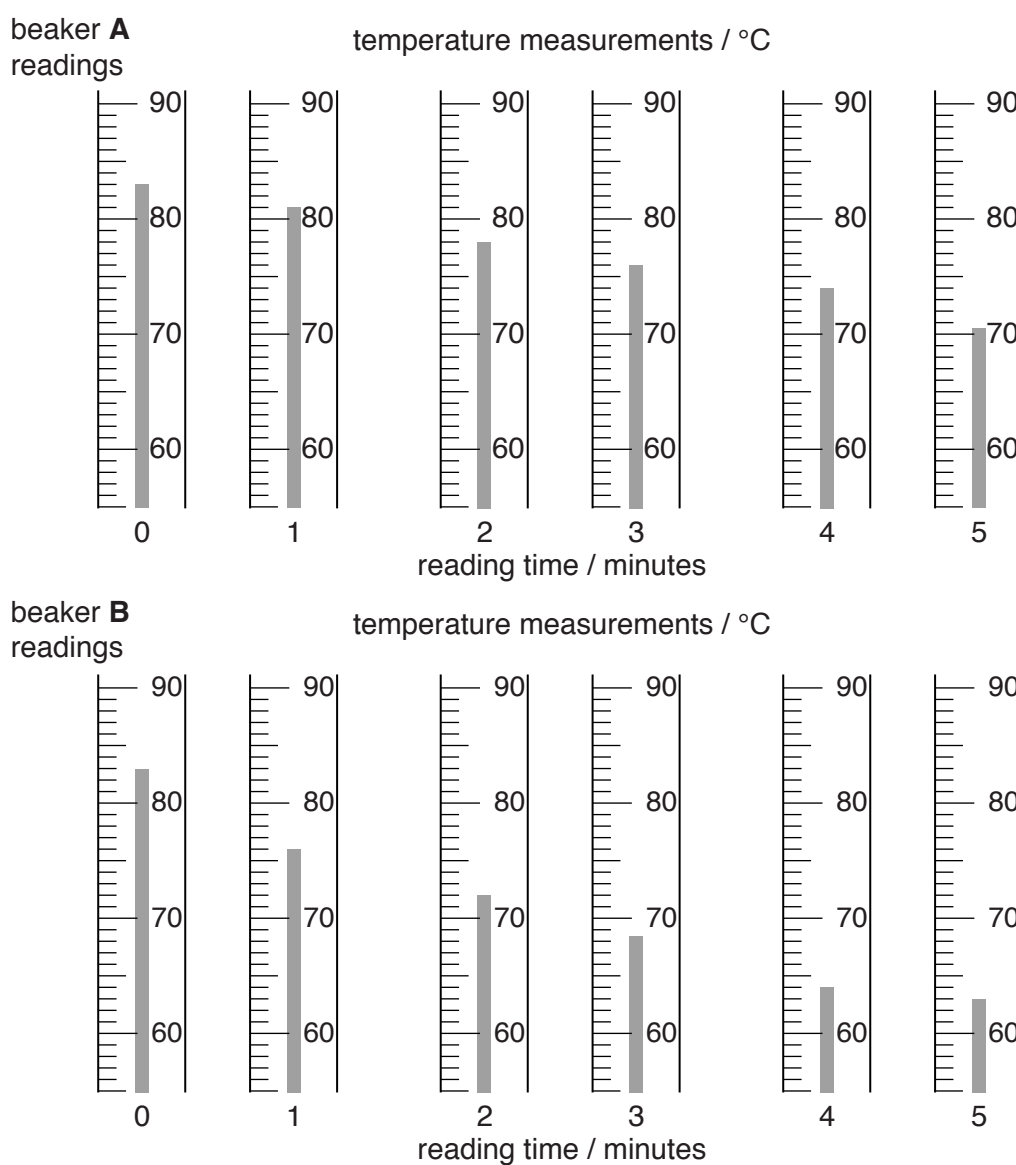
Step 4 A thermometer was placed in the water in each beaker and a timer started.  
The temperature of the water was measured immediately in both beakers and recorded in a results table.  
The thermometers were left in the water throughout the investigation.

Step 5 The temperature of the water in both beakers was measured and recorded every minute for five minutes.

**Fig. 1.1 on page 3 shows the results of this investigation**

- (a)** Prepare a table in the space provided to record these results. Use Fig. 1.1 to complete this table.





**Fig. 1.1**

- (b) (i)** The rate of heat loss is the fall in temperature per minute.

Calculate the rate of heat loss between 0 and 5 minutes for both beakers.

**Include the units.**

Show your working.

beaker A

.....

beaker B

.....

[4]

(ii) Using your results, suggest a relationship between the volume of the body and heat loss.

.....  
.....  
.....  
.....[2]

(c) (i) State **two** variables in this investigation that have been controlled.

1 .....  
2 ..... [2]

(ii) Suggest why the thermometer must be left in the water throughout the investigation.

.....  
.....[1]

(iii) There is a possible source of error in step 2 of the investigation.

Identify this source of error and describe how to modify step 2 to improve the investigation.

.....  
.....  
.....  
.....[2]

(iv) Suggest **one** safety precaution students should take while carrying out this investigation.

.....  
.....[1]

**(d)** Some students were asked to test the hypothesis:

**The colder the surroundings, the faster a small mammal's temperature will drop.**

Describe how the students could modify the investigation described in steps 1–5 to test this hypothesis.

[6]

- (e) Humans sweat when they get too hot.

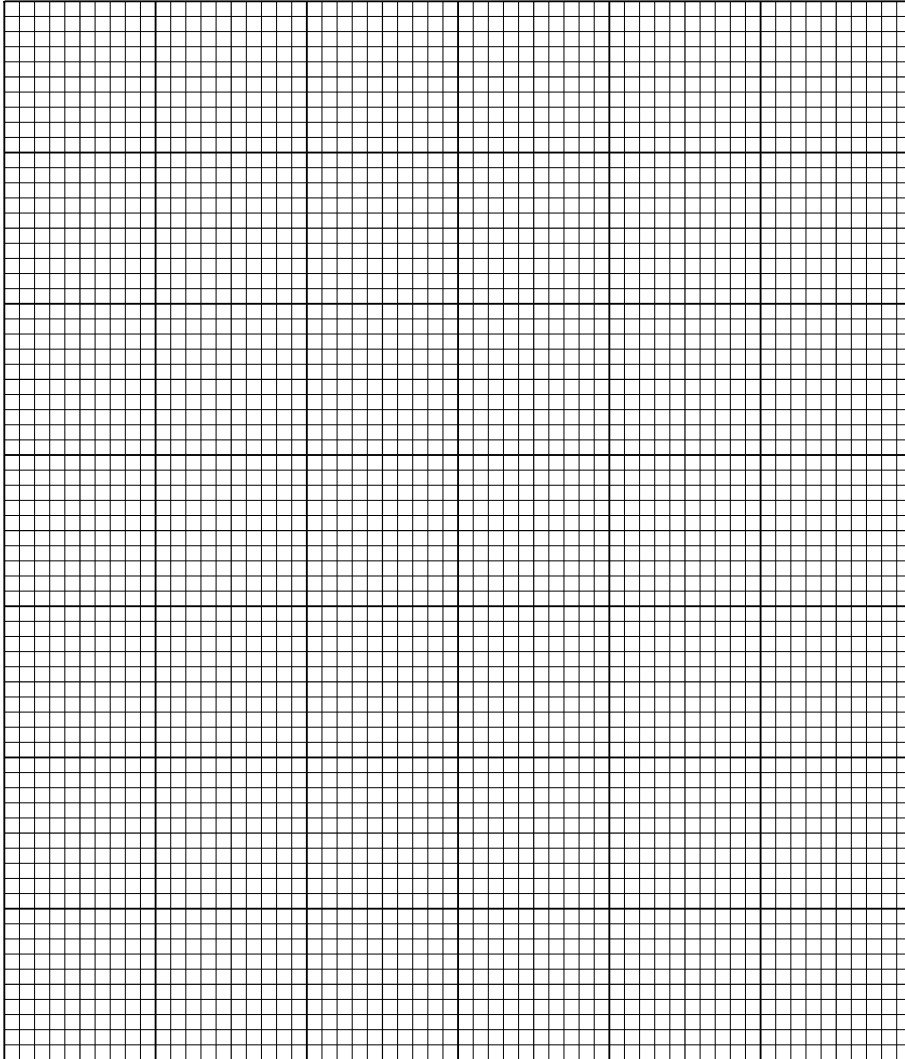
The effect of the temperature of the room on the average rate of sweating was investigated.

The results are shown in Table 1.1.

**Table 1.1**

temperature of the room/°C	average rate of sweating /cm <sup>3</sup> per hour
13	10
22	40
30	320
36	740
40	1180

- (i) Plot a graph, using the data in Table 1.1, on the grid.



[4]

- (ii) Describe the effect of the temperature of the room on the average rate of sweating.

.....

.....

.....

.....[2]

[Total: 29]

### Abbreviations used in the Mark Scheme:

;	separates marking points
/	alternatives
I	ignore
R	reject
A	accept (for answers correctly cued by the question, or guidance for examiners)
AW	alternative wording (where responses vary more than usual)
AVP	any valid point
ecf	credit a correct statement / calculation that follows a previous wrong response
ora	or reverse argument
( )	the word / phrase in brackets is not required, but sets the context
<u>underline</u>	actual word given must be used by candidate (grammatical variants excepted)
max	indicates the maximum number of marks that can be given

Question	Answer	Marks
1 (a)	86 and 84 ; °C ;	[2]
1 (b)	one table drawn with rows and (3) columns ; appropriate column headings with units (°C and min) ; table shows starting temperatures ; correct completion of the table ;	[4]
1 (c)	wear goggles / gloves / method to reduce spillages / stand up when working ;	[1]
1 (d) (i)	may have different starting temperatures ; enables results to be compared / AW ; allows calculation of rate ;	[2]

Question	Answer	Marks
1 (d) (ii)	2.3 ; working $18 \div 8$	[2]
1 (e) (i)	to reduce heat loss from beaker (other than via the pipettes) ;	[1]
1 (e) (ii)	suggest do not fit snugly on the beaker / holes made in the cardboard / more holes in the lid with the ears ; explain heat may be lost through gaps / more holes so greater heat loss ;	[2]
1 (e) (iii)	improve insulation of beaker ; start temperatures the same ; measure volume of water in beakers ; squeezing regularly / force of squeezing ; stir water ; use digital thermometer ; tape holes ; sequential experiments ;	[max 2]
1 (f) (i)	smaller ears	[1]
1 (f) (ii)	cooler temperature	[1]
<b>[Total: 18]</b>		
1 (a)	one table drawn with lines ; column / row headings (time and temperature); appropriate units ( $^{\circ}\text{C}$ and minutes) in the header only; temperatures recorded for beaker <b>A</b> ; temperatures recorded for beaker <b>B</b> ;	[5]
1 (b) (i)	temperature differences: Beaker <b>A</b> = $12.5^{\circ}\text{C}$ , Beaker <b>B</b> = $20^{\circ}\text{C}$ ; divide both temperature differences by 5 (minutes); <b>A</b> = 2.5, <b>B</b> = 4; correct units ( $^{\circ}\text{C} / \text{min}$ );	[4]
1 (b) (ii)	the greater the volume of the body, the smaller the rate of heat loss / ref to speed (e.g. slower) / <b>ora</b> ; rate of heat loss in <b>A</b> is less than beaker <b>B</b> / <b>ora</b> ; appropriate data quote comparing <b>A</b> and <b>B</b> ; the greater the volume of the body, the greater the (total) heat loss / <b>ora</b> ;	[2]
1 (c) (i)	<i>any 2 from:</i> temperature of environment; size / volume of beaker; starting temperature of water; time intervals / 1 minute to record temperature ; total time / 5 minutes for investigation;	[2]
1 (c) (ii)	<i>idea</i> of time taken for the thermometer to reach the water temperature is longer;	[1]
1 (c) (iii)	<i>error:</i> drawing the line accurately / judging the water level against the line / measuring height (rather than volume); <i>improvement:</i> measure the volumes of water / AW ;	[2]

Question	Answer	Marks
1 (d)	<p><i>any 6 from:</i></p> <p>1 identical containers / containers of equal volume / containers of equal size;</p> <p>2 same volume of water in each container;</p> <p>3 same starting temperature for the water;</p> <p>4 idea of placing (containers) in 2 or more different temperatures; 5 detail of method to keep external temperature constant, e.g. use of water-bath or a fridge and explanation;</p> <p>6 measure temperature in each container for the same time / measure temperature in each container at set intervals;</p> <p>7 repeat and calculate an average / mean;</p> <p>8 calculate / compare rate of heat loss (for each temperature);</p>	[6]
1 (e) (i)	<p><b>A</b>(xes) – labelled with units;</p> <p><b>S</b>(cale) – even scale and plots to fill half or more of the printed grid ;</p> <p><b>P</b>(lot) – all points plotted accurately <math>\pm \frac{1}{2}</math> square ;</p> <p><b>L</b>(ine) – line joining all the points <math>\pm \frac{1}{2}</math> square ;</p>	[4]
1 (e) (ii)	<p>as temperature increases (rate of) sweating increases / <b>ora</b>;</p> <p>idea of increasing rate of increase as temperature rises / not a linear relationship / not directly proportional;</p>	[2]
[Total: 29]		