

Biology B  
Advanced  
PAPER 1: Advanced Biochemistry, Microbiology and Genetics

Wednesday 5 June 2024 – Afternoon

Time: 1 hour 45 minutes

Diagram Booklet

THIS DIAGRAM BOOKLET MUST BE RETURNED WITH THE QUESTION PAPER AT THE END OF THE EXAMINATION.

In the boxes below, write your name, centre number and candidate number.

|                  |  |  |  |  |  |
|------------------|--|--|--|--|--|
| Surname          |  |  |  |  |  |
| Other names      |  |  |  |  |  |
| Centre Number    |  |  |  |  |  |
| Candidate Number |  |  |  |  |  |

## **INSTRUCTIONS**

**There may be spare copies of some diagrams in case you need them.**

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### **Spare Copies**

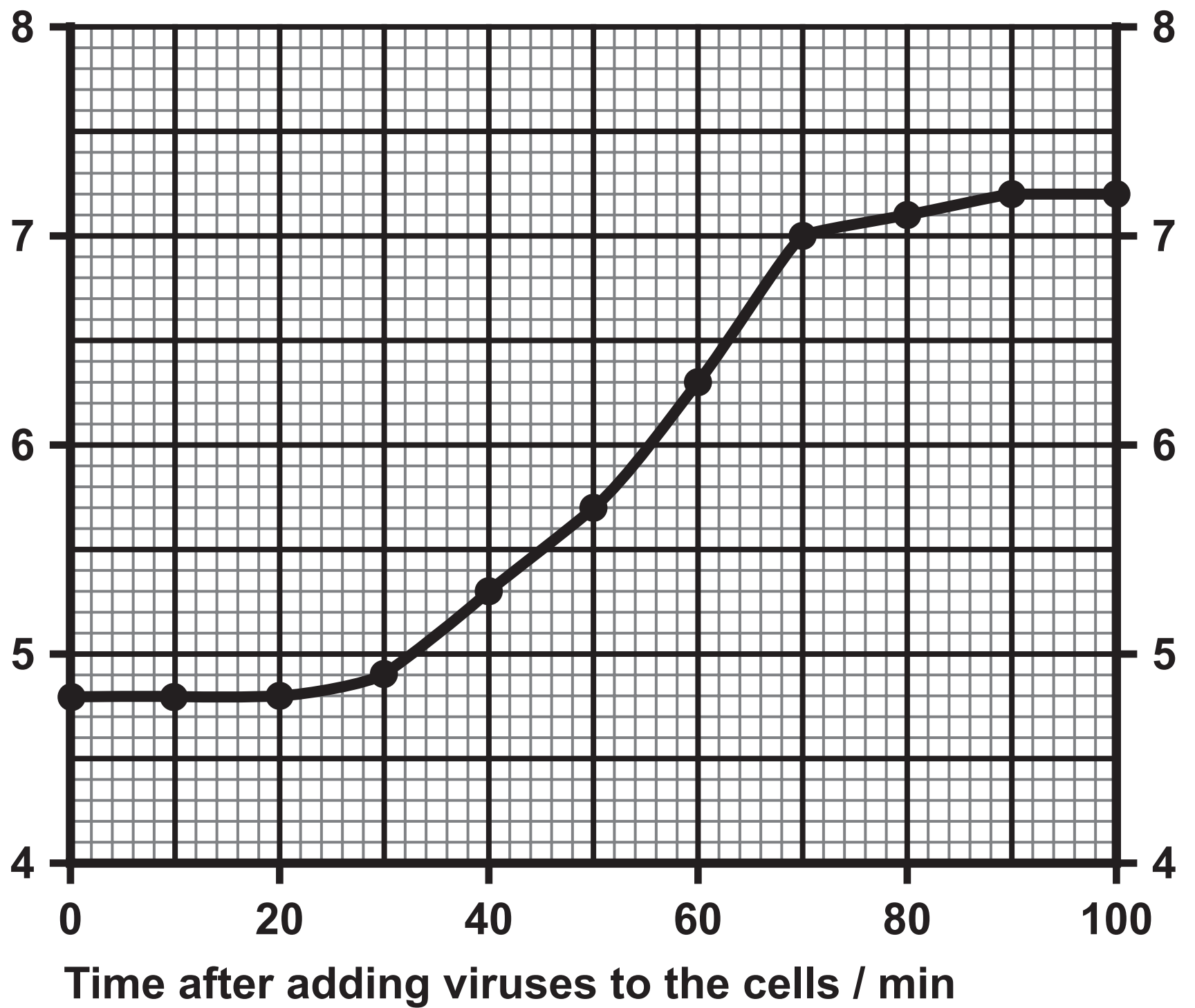
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Question 1(a)

| Features of blood vessels | Type of blood vessel       |                  |            |                               |
|---------------------------|----------------------------|------------------|------------|-------------------------------|
|                           | both capillaries and veins | capillaries only | veins only | neither capillaries nor veins |
| Endothelial cells         |                            |                  |            |                               |
| Valves                    |                            |                  |            |                               |

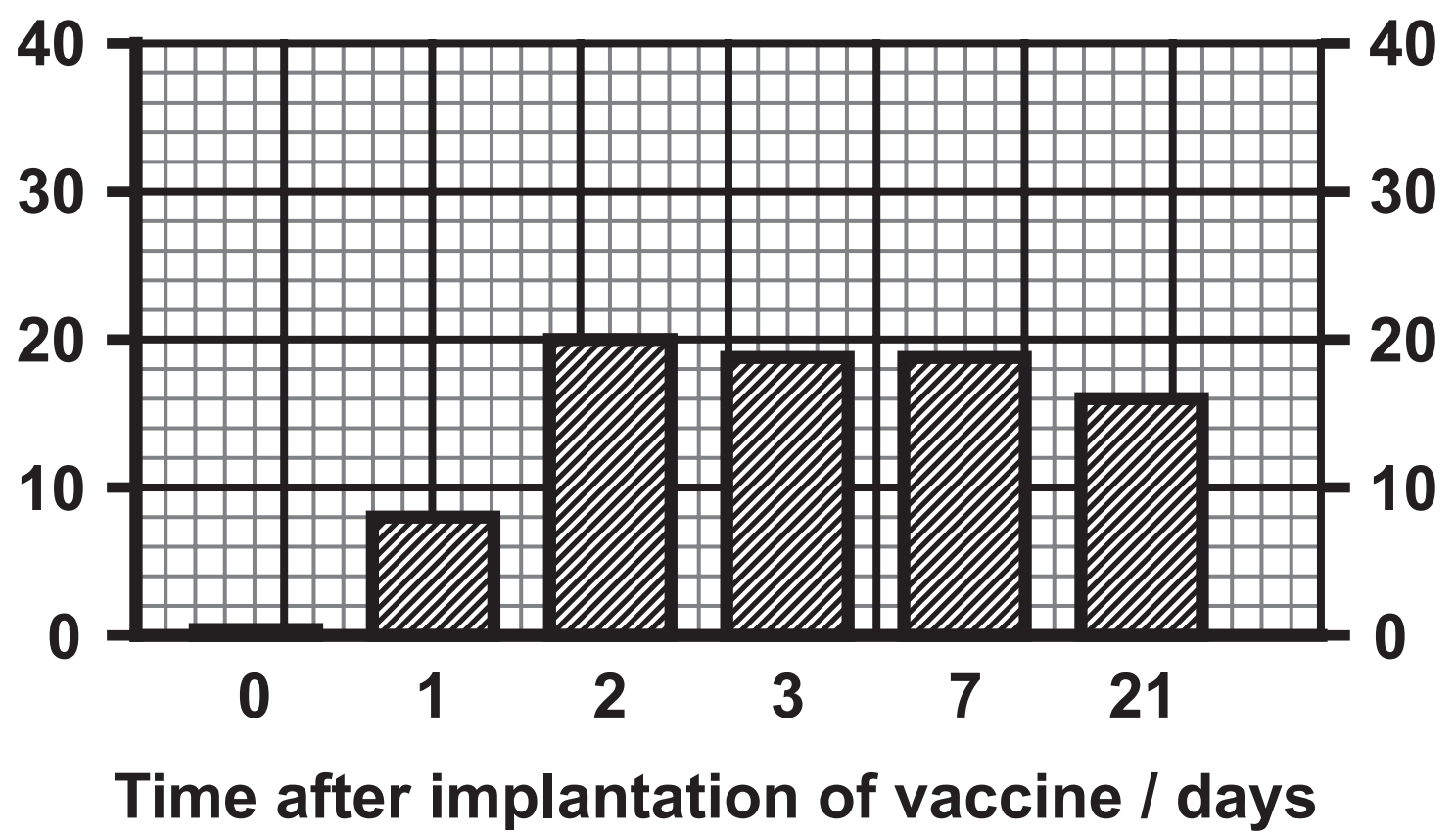
## Question 3(b)

$\text{Log}_{10}$  number of viruses



## Question 5(d)(i)

Number of T helper cells  
/  $\times 10^5$  cells per  $\text{cm}^3$



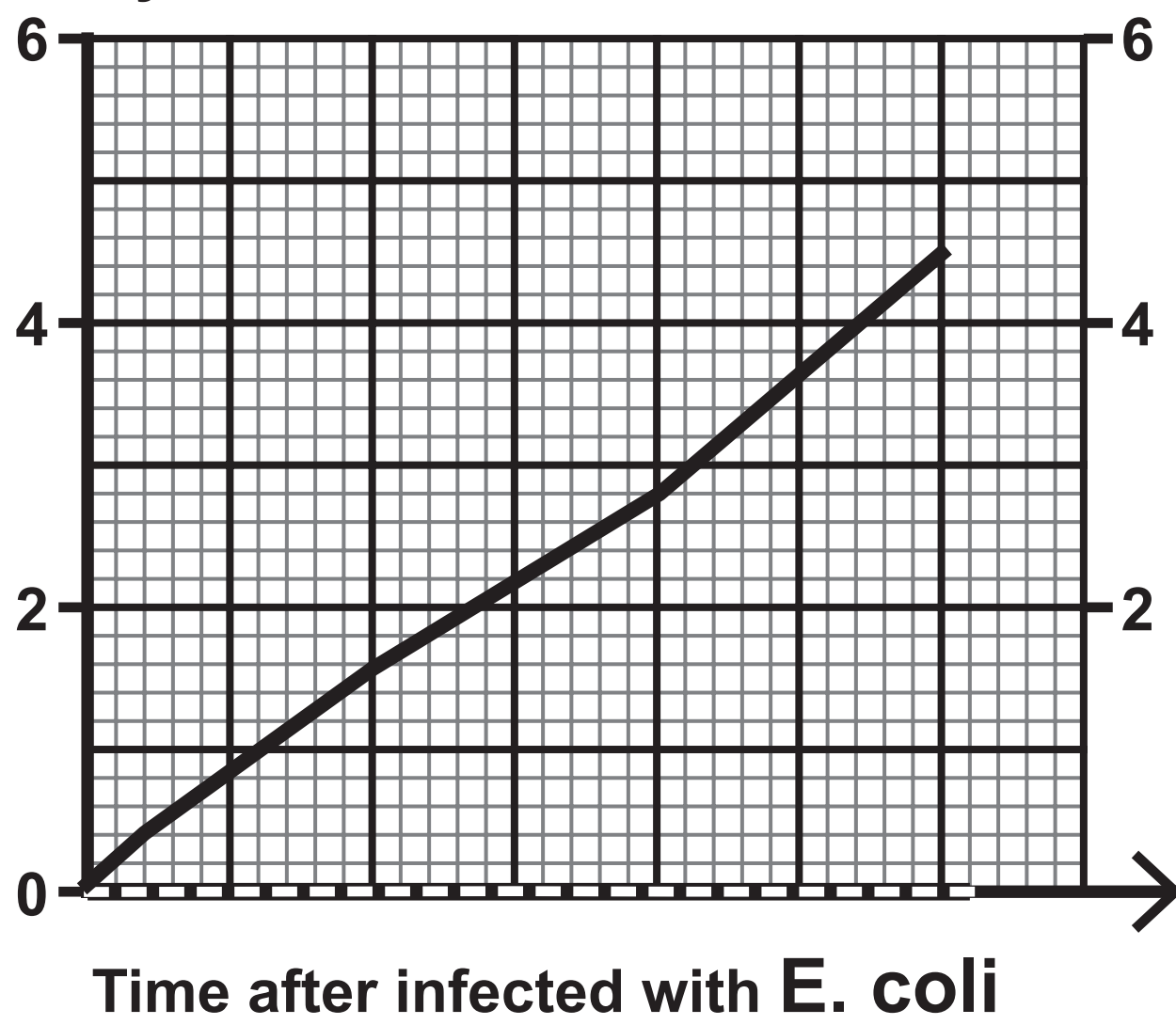
## Question 5(d)(ii)

## KEY

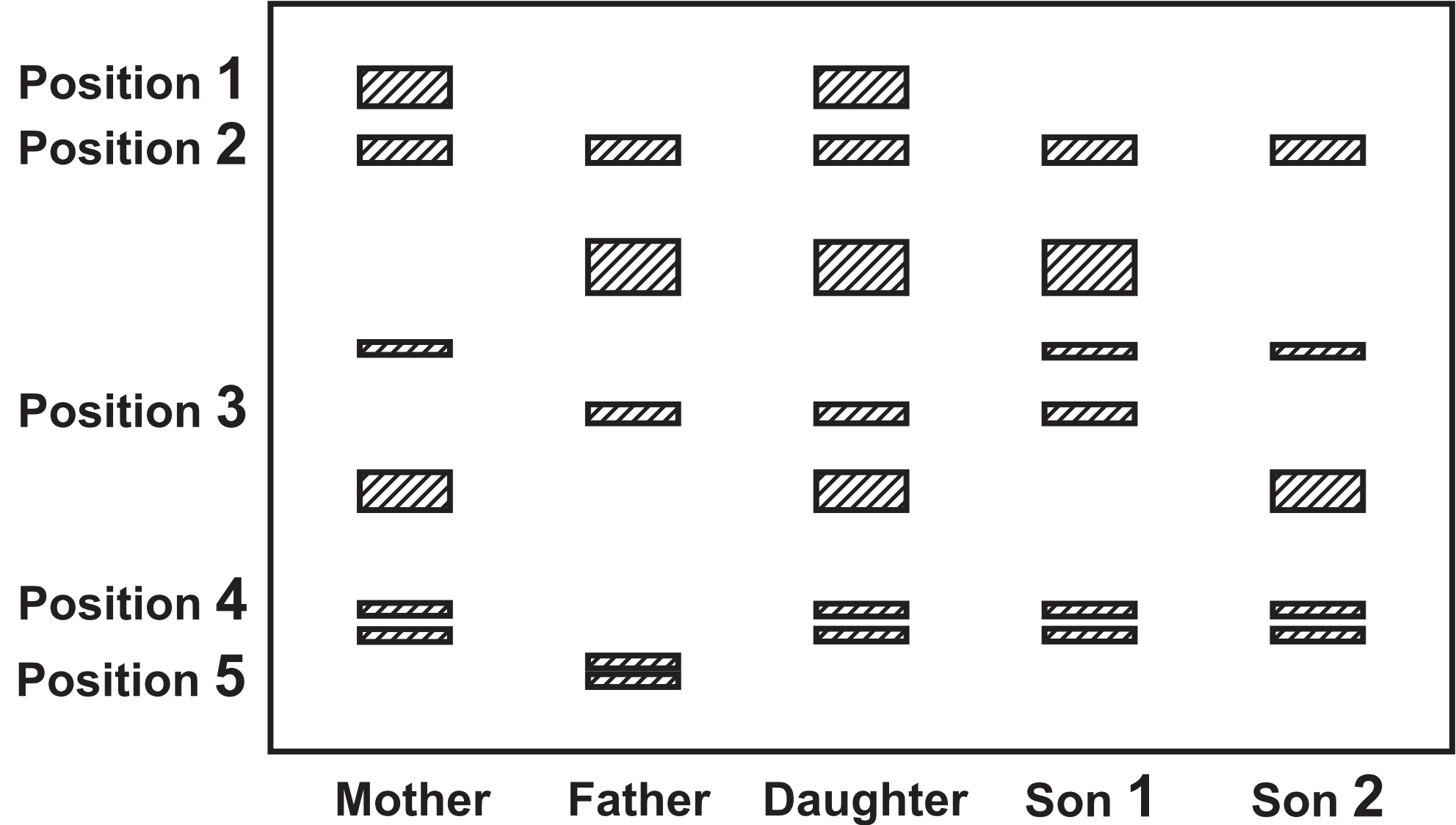
———— mice with vaccine implanted

----- control group of mice

Concentration  
of antibody / a.u.

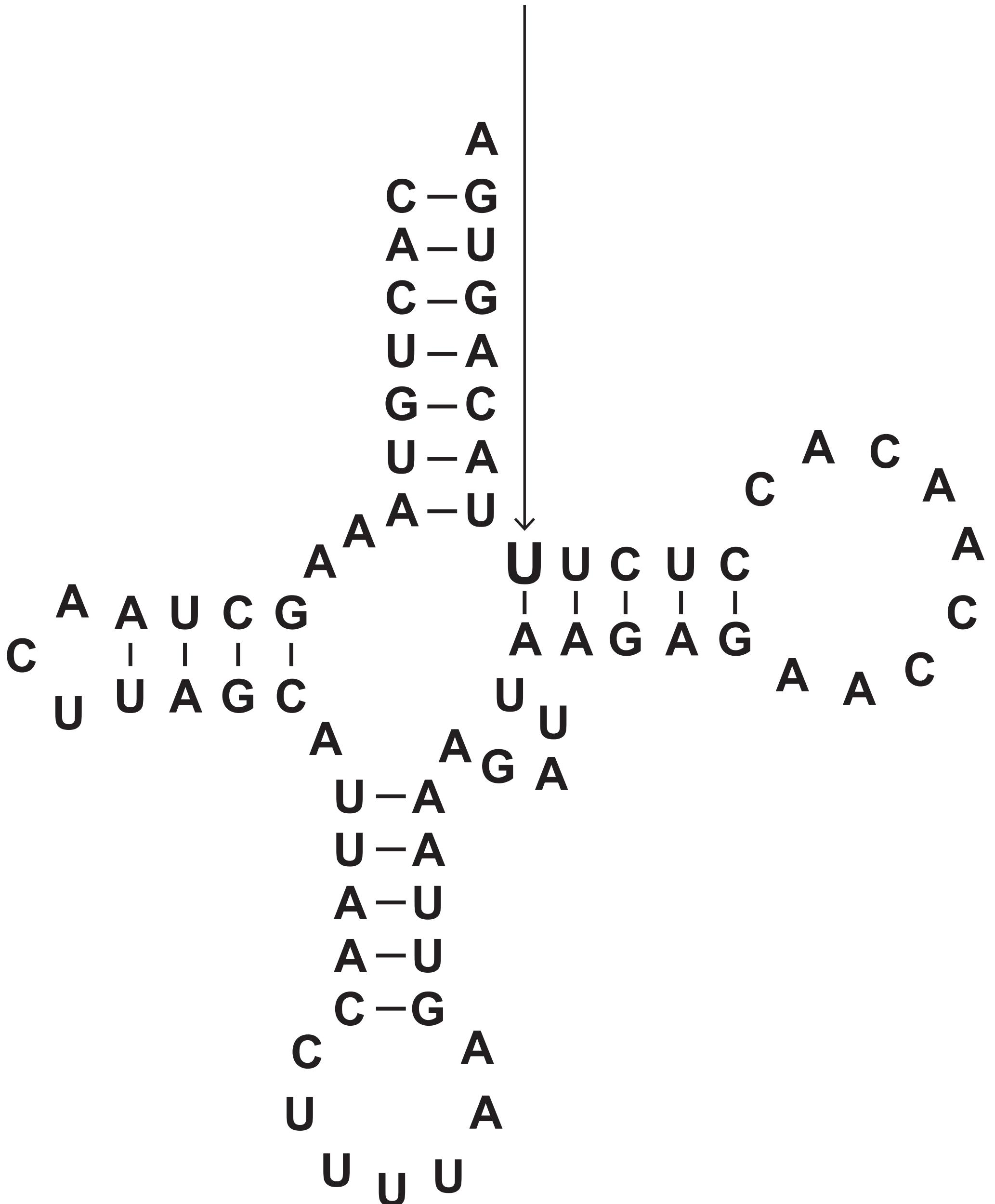


Question 6(c)



### Question 6(d)

**uracil replaced with cytosine**

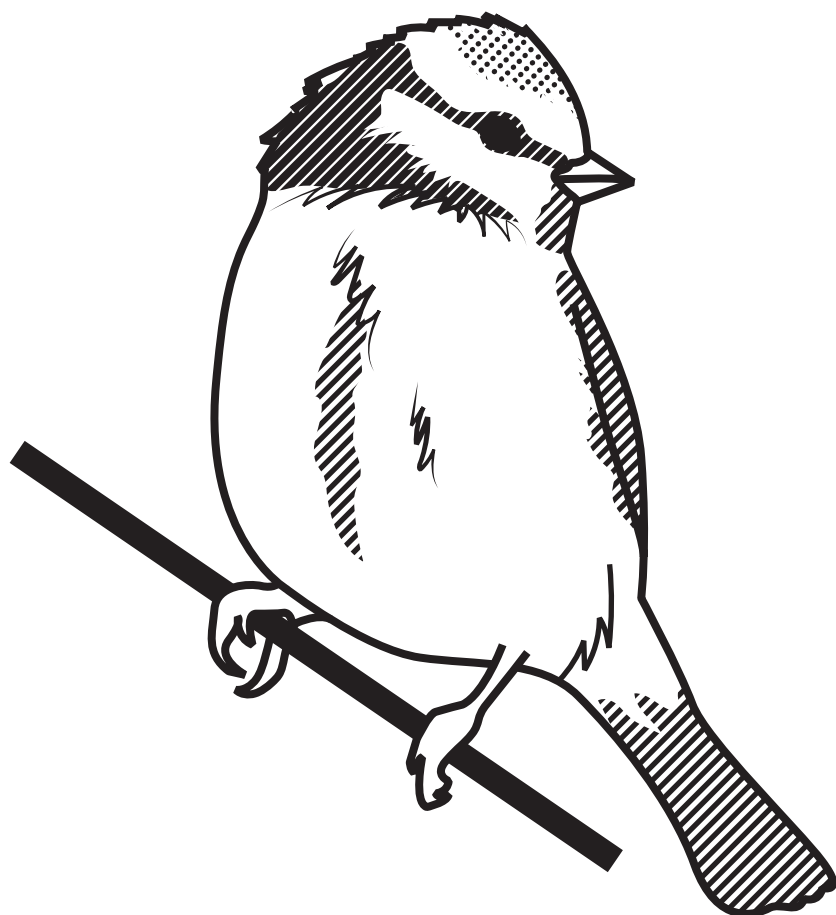


## Question 7

### PHOTOGRAPH OF BLUE TIT



### LINE DRAWING OF BLUE TIT



Question 7(b)

| Species of bird | Length from head to tail / cm | Wing span / cm | Mass / g |
|-----------------|-------------------------------|----------------|----------|
| Coal tit        | 11                            | 19             | 11       |
| Blue tit        | 12                            | 18             | 11       |
| Great tit       | 14                            | 24             | 18       |

**Question 7(c)**

**Bird feeders containing nuts were set up  
and refilled each day**



**Birds were caught daily in a two-week period  
in both autumn and winter. They were ringed,  
measured and a blood sample taken before  
they were released**



**Samples of intact red blood cells and  
red blood cell mitochondria were  
separated from the blood**

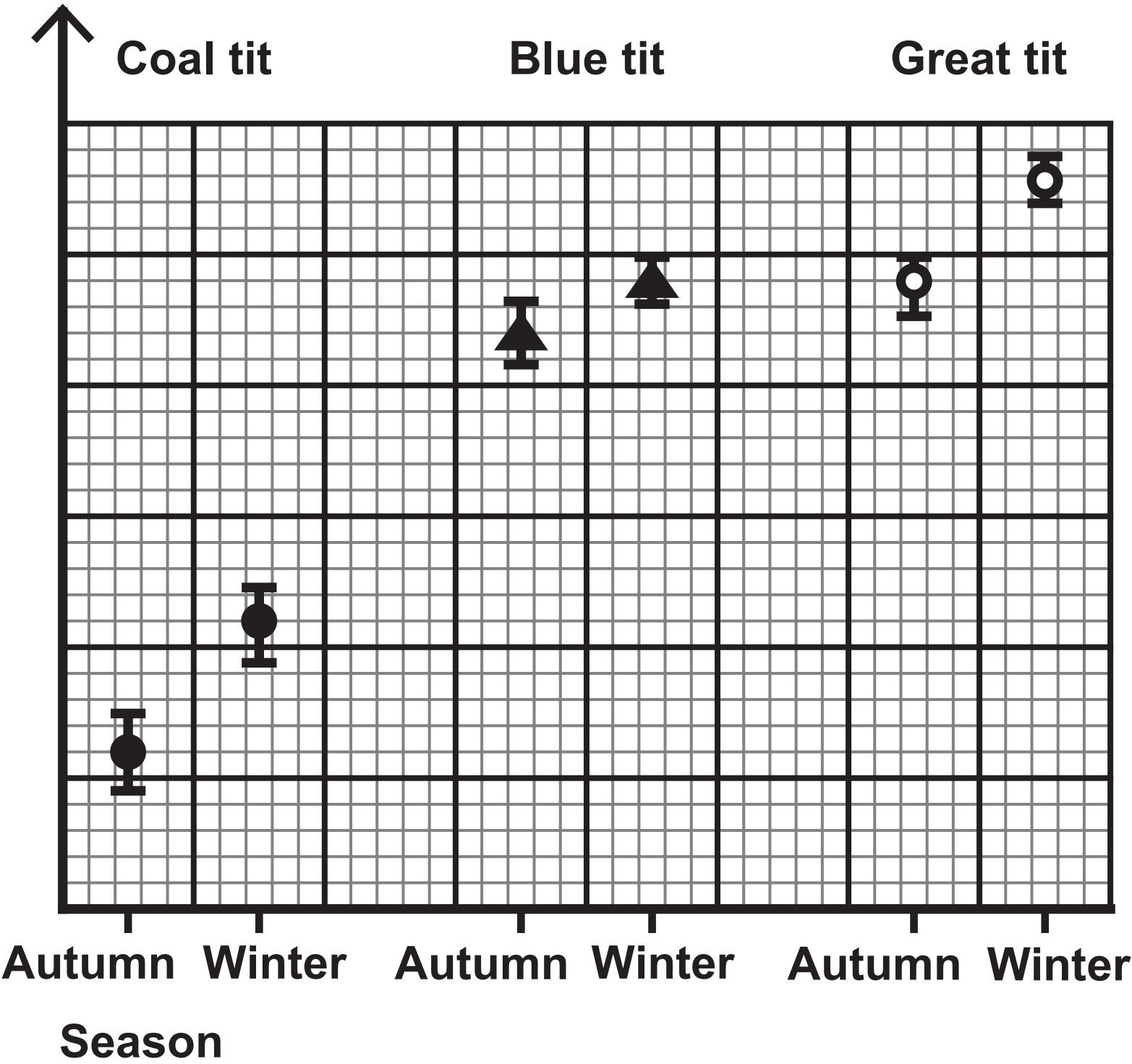


**Leaked respiration and the volume of  
mitochondria were measured**

Question 7(c)(ii)

GRAPH 1: VOLUME OF MITOCHONDRIA

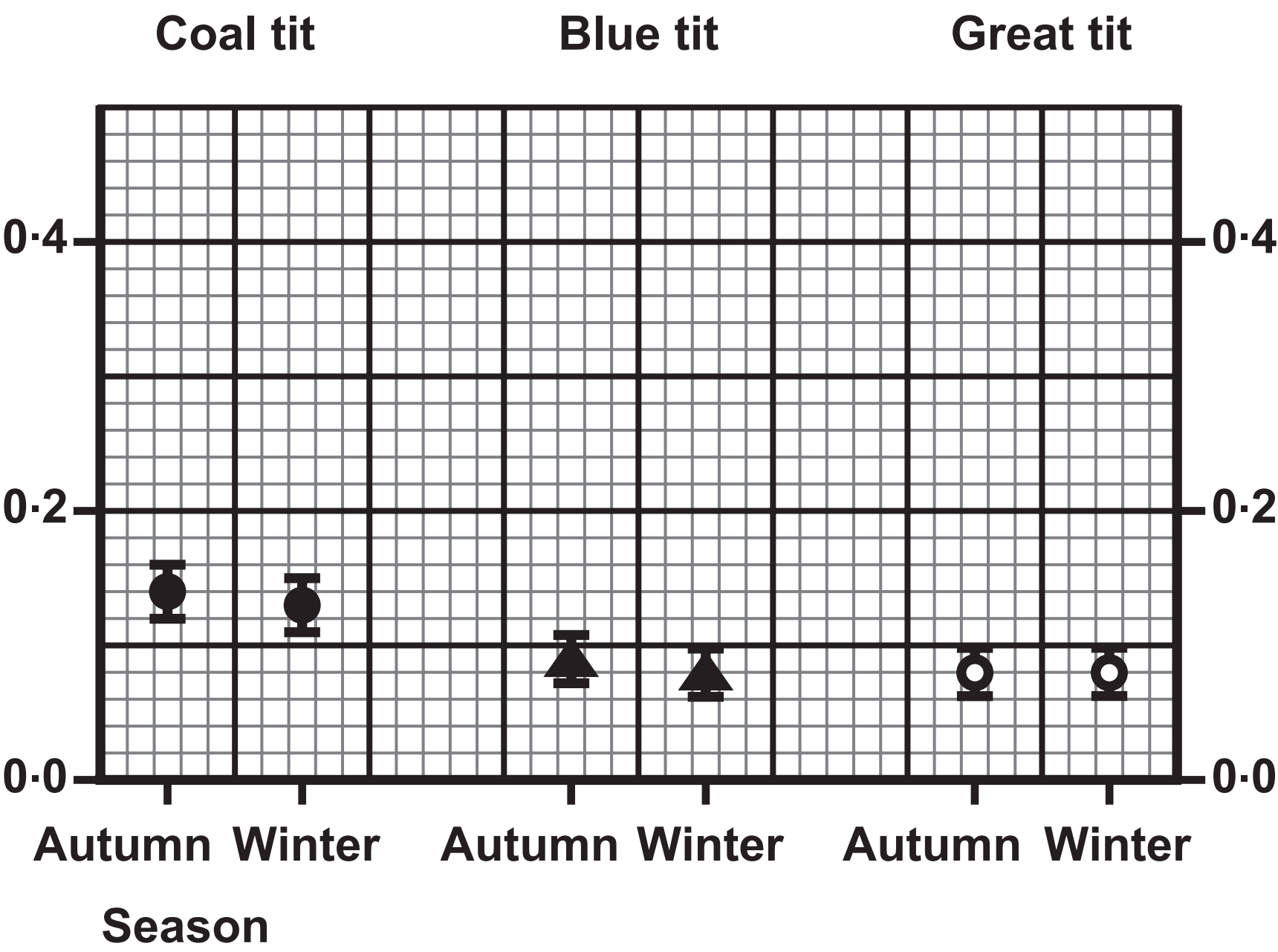
Mean volume of mitochondria  
in red blood cells



Question 7(c)(ii) continued

GRAPH 2: RESPIRATION PRODUCING ATP

Mean rate of  
respiration / a.u.

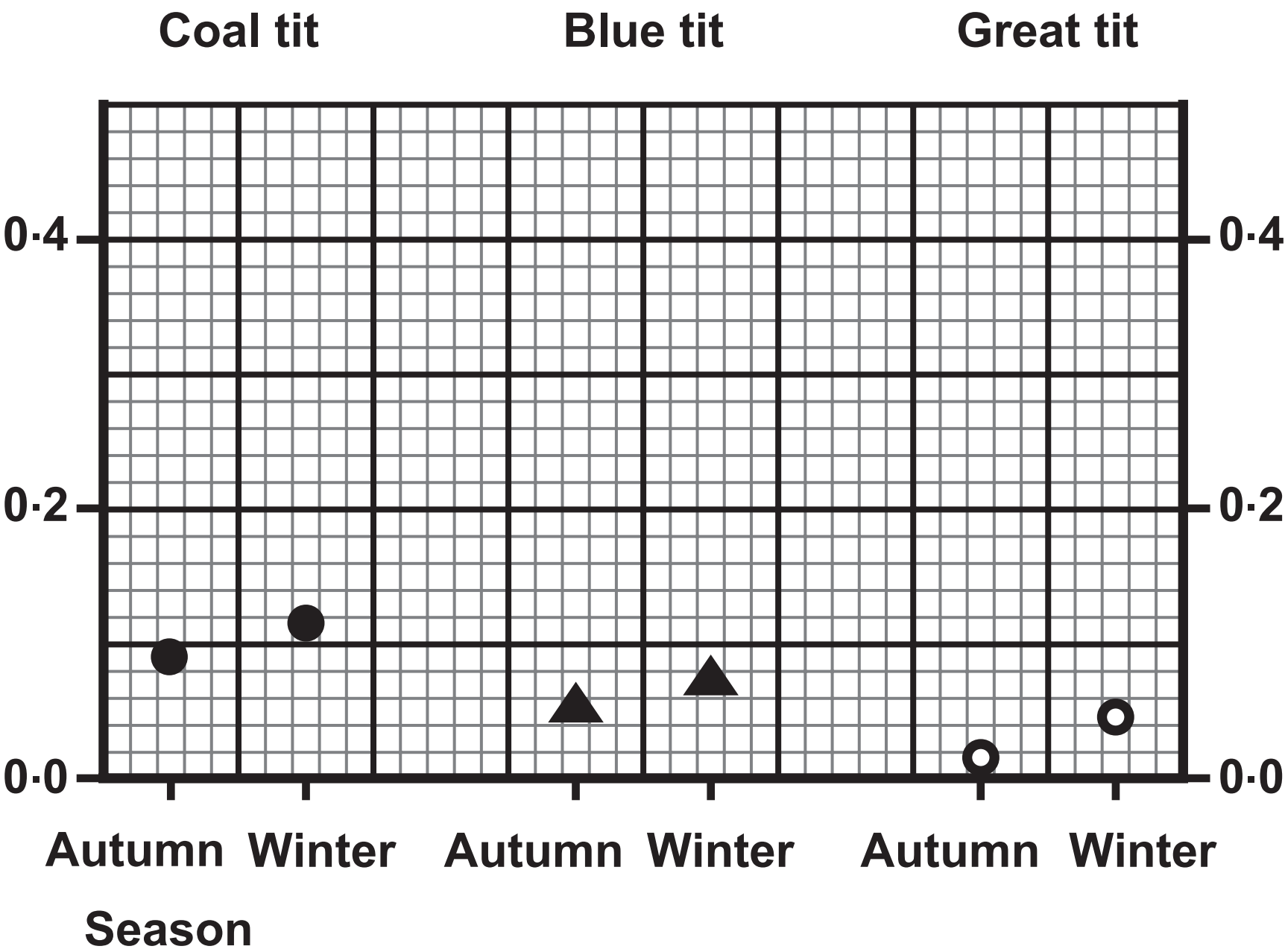


(continued on the next page)

Question 7(c)(ii) continued

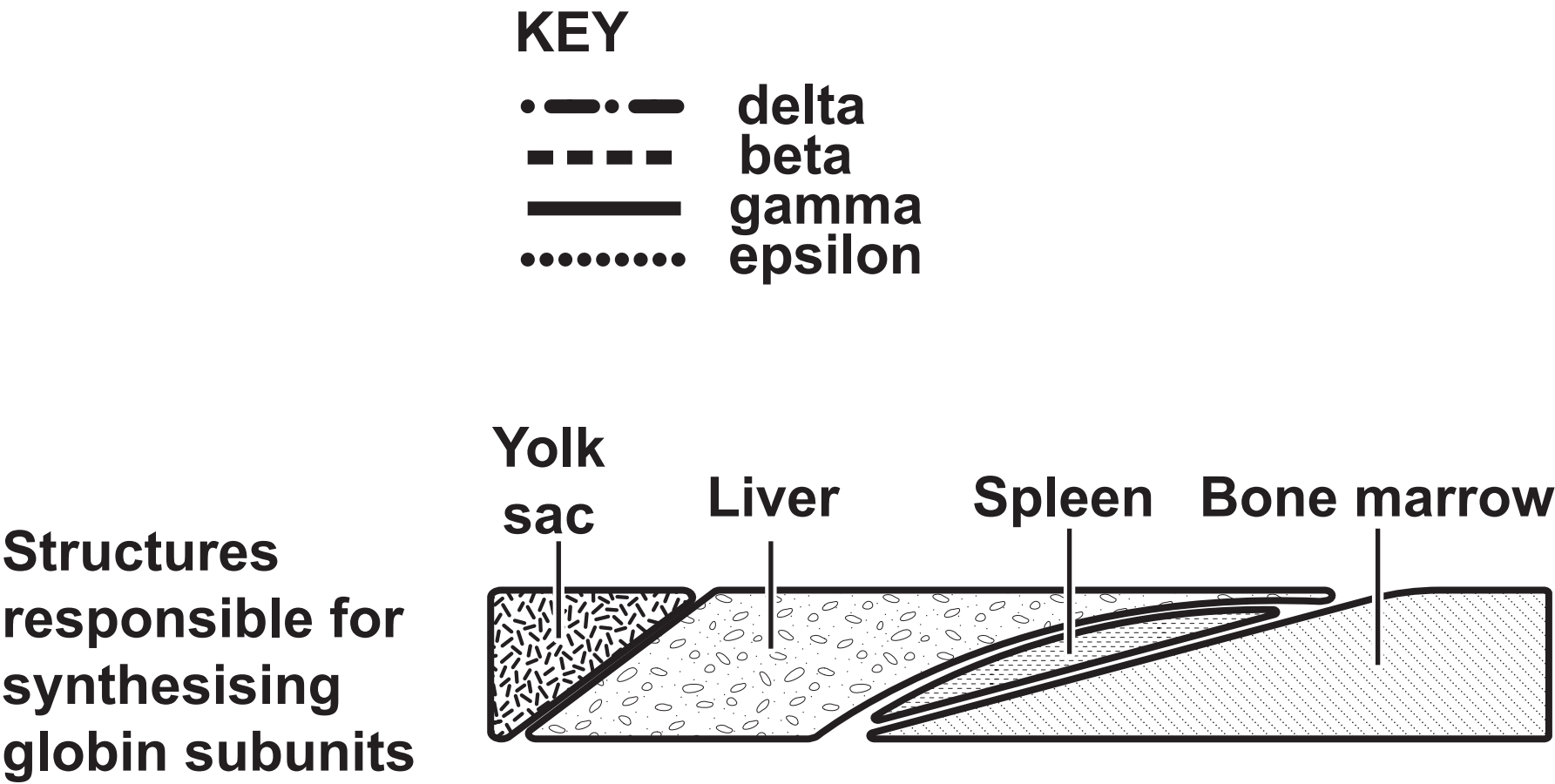
GRAPH 3: LEAKED RESPIRATION

Mean rate of leaked  
respiration / a.u.

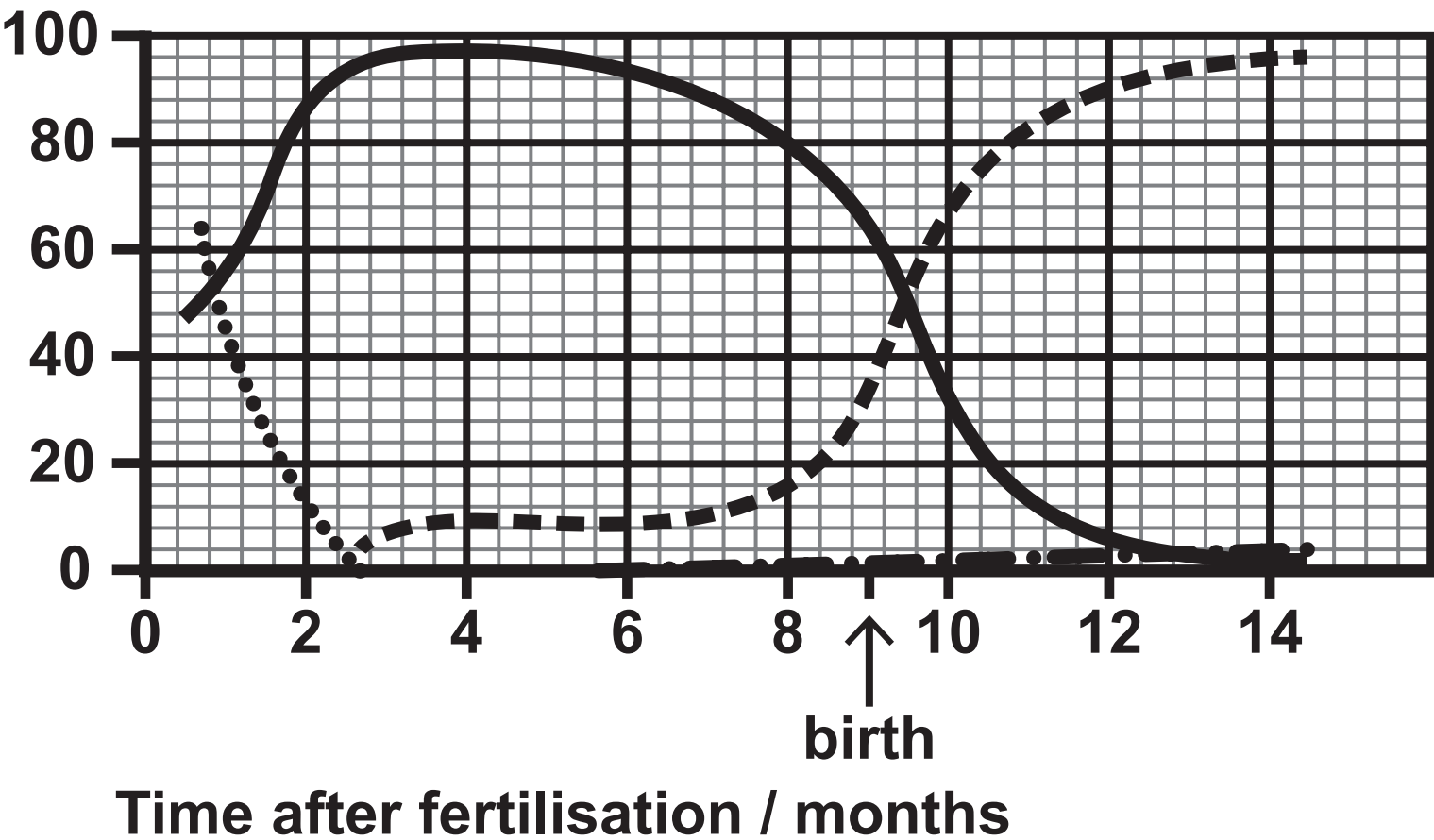


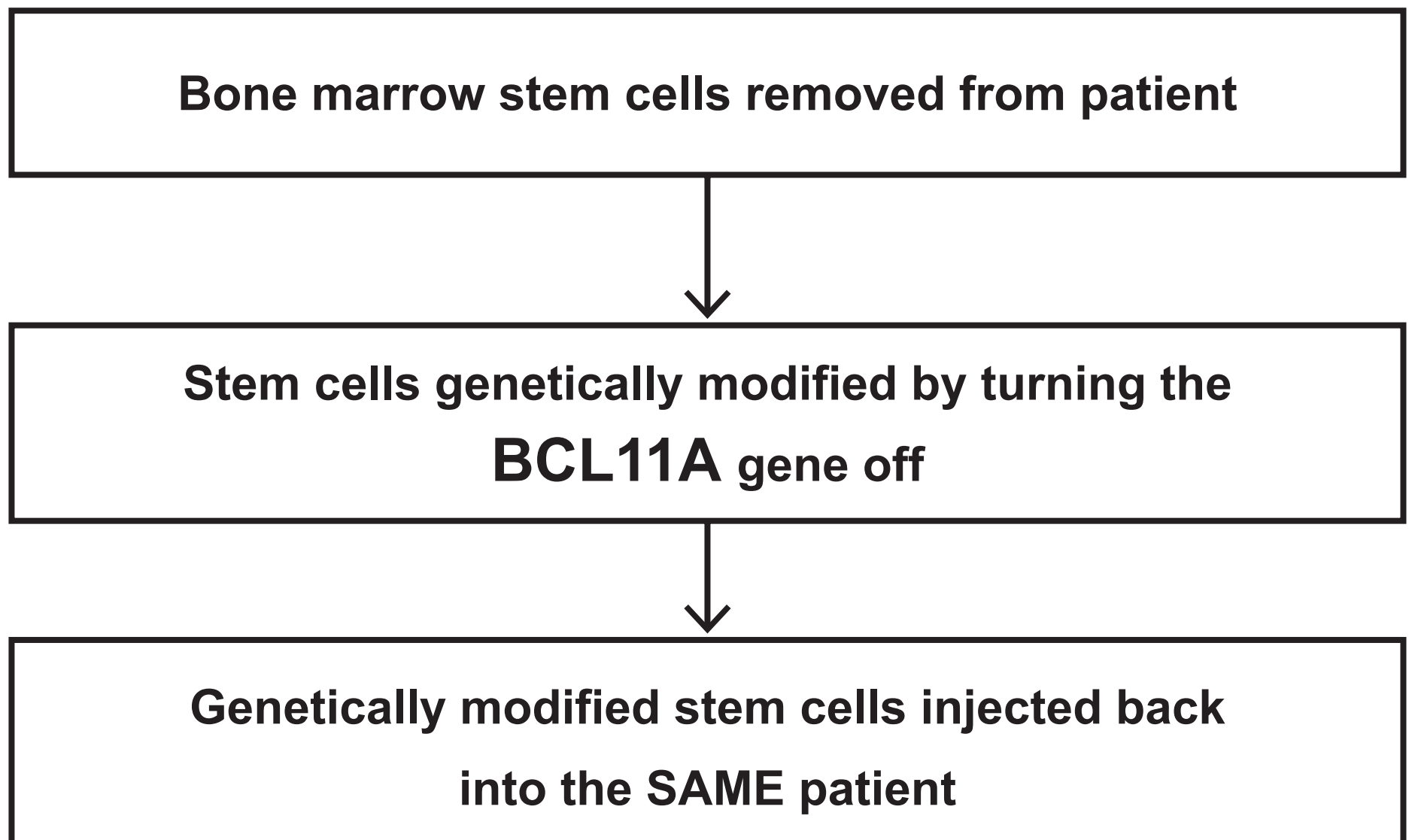
| Event                    | Presence of protein G |                        | Presence of protein G-P |                        |
|--------------------------|-----------------------|------------------------|-------------------------|------------------------|
|                          | Head region           | Midpiece and flagellum | Head region             | Midpiece and flagellum |
| Just before capacitation |                       |                        |                         |                        |
| During capacitation      |                       |                        |                         |                        |
| Just before the AR       |                       |                        |                         |                        |

Question 9(a)



Percentage of globin subunits synthesised (%)



**Question 9(b)**

| Features of blood vessels | Type of blood vessel       |                  |            |                               |
|---------------------------|----------------------------|------------------|------------|-------------------------------|
|                           | both capillaries and veins | capillaries only | veins only | neither capillaries nor veins |
| Endothelial cells         |                            |                  |            |                               |
| Valves                    |                            |                  |            |                               |

Question 8(b)

| Event                    | Presence of protein G |                        | Presence of protein G-P |                        |
|--------------------------|-----------------------|------------------------|-------------------------|------------------------|
|                          | Head region           | Midpiece and flagellum | Head region             | Midpiece and flagellum |
| Just before capacitation |                       |                        |                         |                        |
| During capacitation      |                       |                        |                         |                        |
| Just before the AR       |                       |                        |                         |                        |

## Source Information

### Question 7

(Source adapted from: © Andrew\_Howe/Getty Images)