

Paper Reference(s) 9BN0/03
Pearson Edexcel Level 3 GCE

Biology A (Salters Nuffield)
Advanced
PAPER 3: General and Practical Applications in Biology

Wednesday 21 June 2023 – Morning

Diagram Booklet

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.

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

Contents

Page

4	Question 2(a)
5	Question 2(b)
6	Question 3(a)
7–8	Question 3(b)
9	Question 4
10	Question 5
11	Question 5(b)
12	Question 6
13–14	Question 6(b)
15	Question 6(c)(i)
16	Question 6(c)(ii)
17	Question 6(c)(iii)
18–20	Question 7(b)(ii)
21	Question 8(j)

Spare Copies

22	Question 2(a)
23	Question 6(c)(i)
24	Question 8(j)

Question 2(a)

TABLE 1

Volume of a sphere $V = \frac{4}{3} \pi r^3$

Information	Neutrophil	Monocyte
Number of cells per mm ³ of blood	3000	400
Diameter of the cell / μm	10	20
Volume of each cell / μm ³		314

Question 2(b)**TABLE 2**

Property	Neutrophil	Monocyte
Material taken up by phagocytosis	Bacteria and fungi	Dead cell debris, bacteria and fungi
Antigen presentation	No	Yes
Production of cytokines	No	Yes

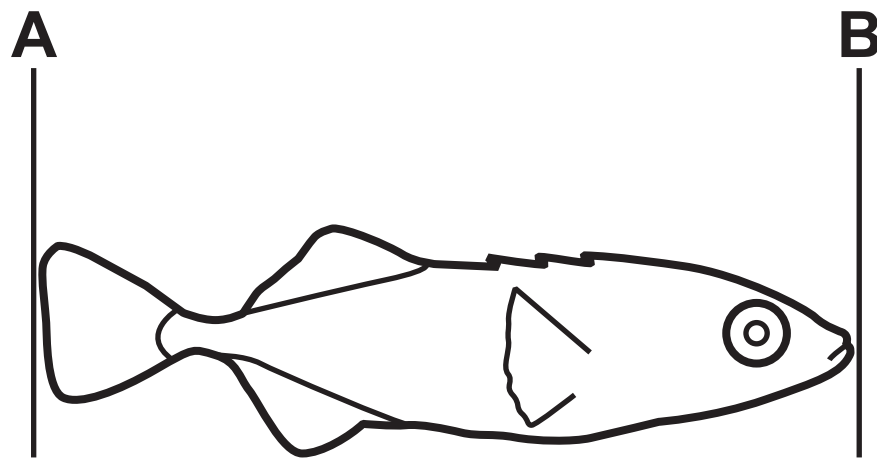
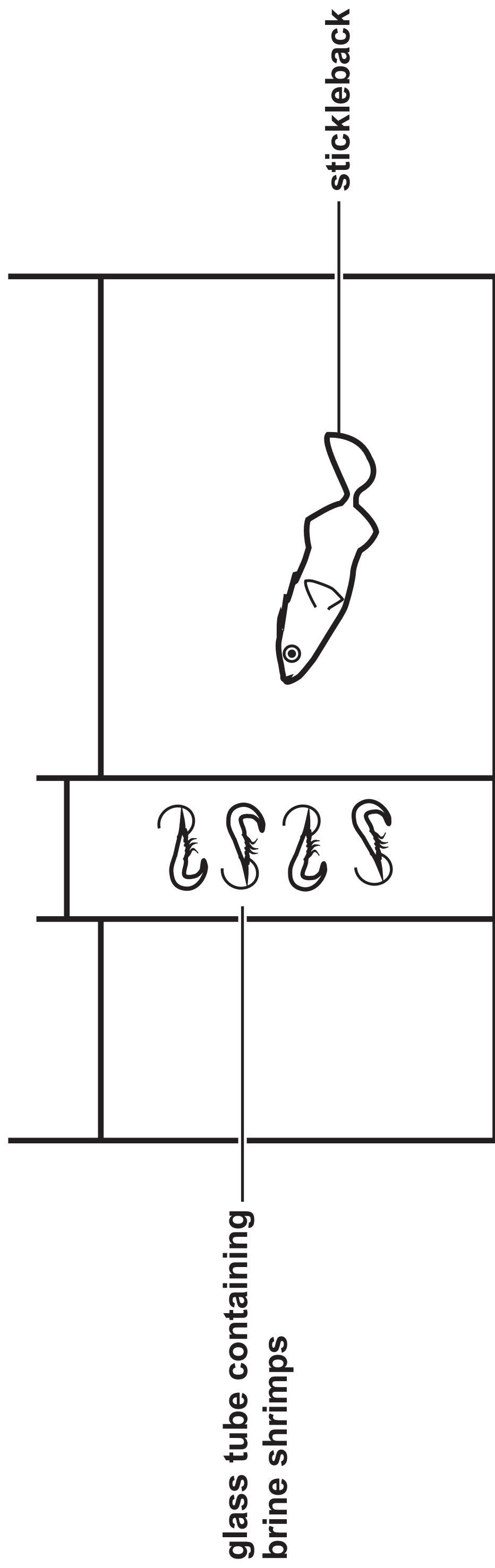
Question 3(a)**IMAGE 1****Magnification $\times 1.8$**

DIAGRAM 1

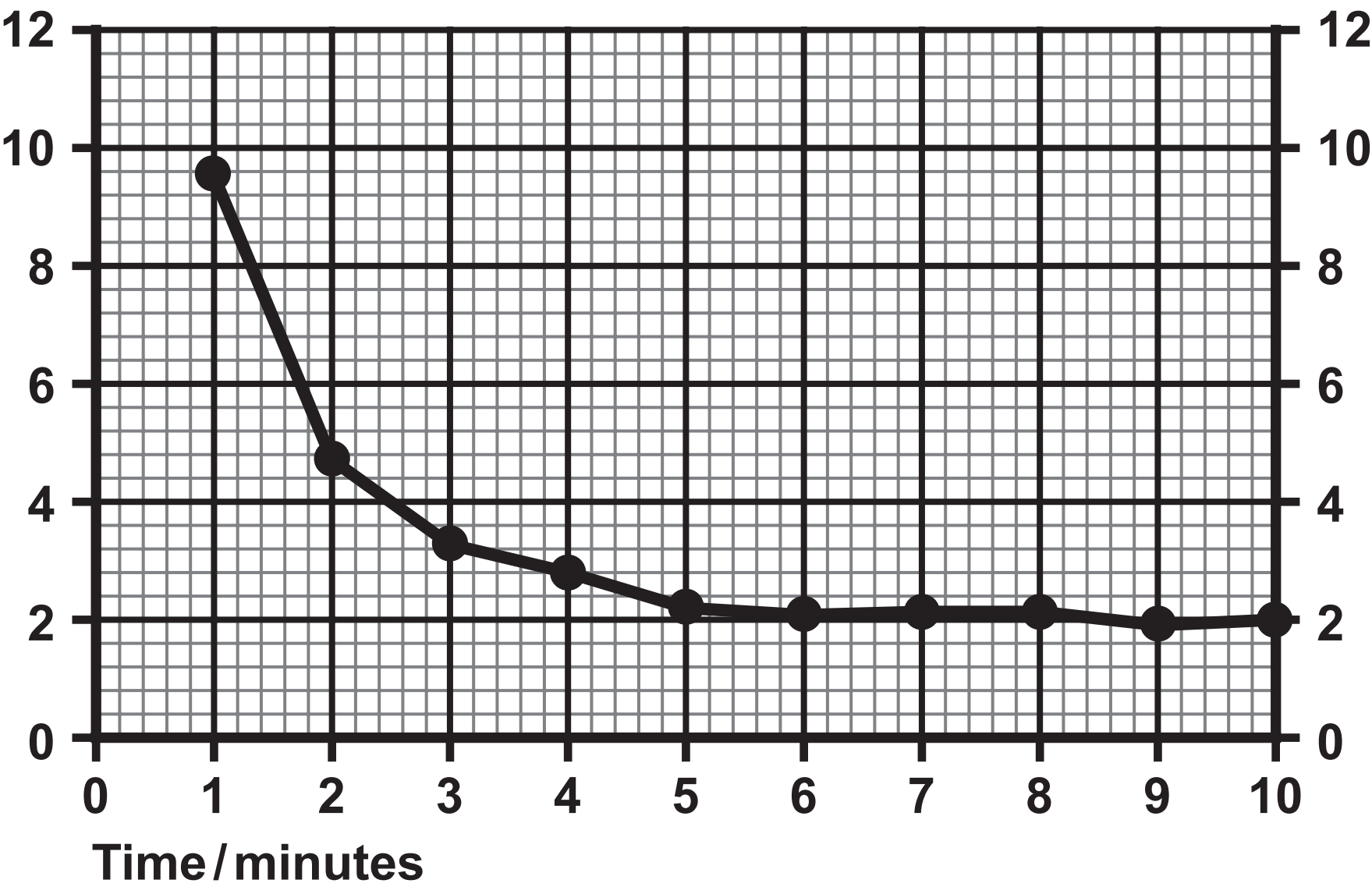


(continued on the next page)

Question 3(b) continued.

DIAGRAM 2

Bites at brine shrimp per minute

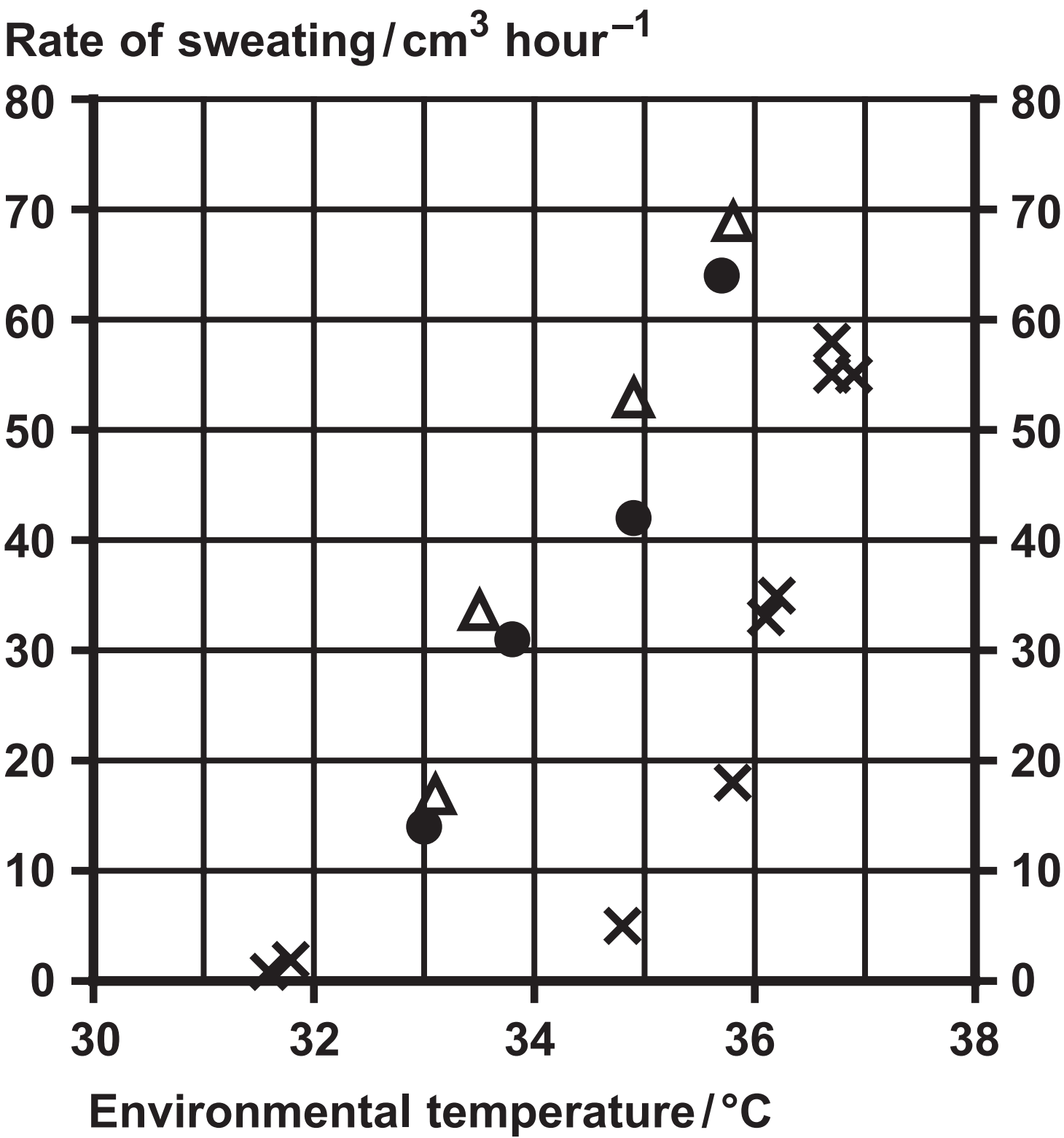


Question 4

DIAGRAM 3

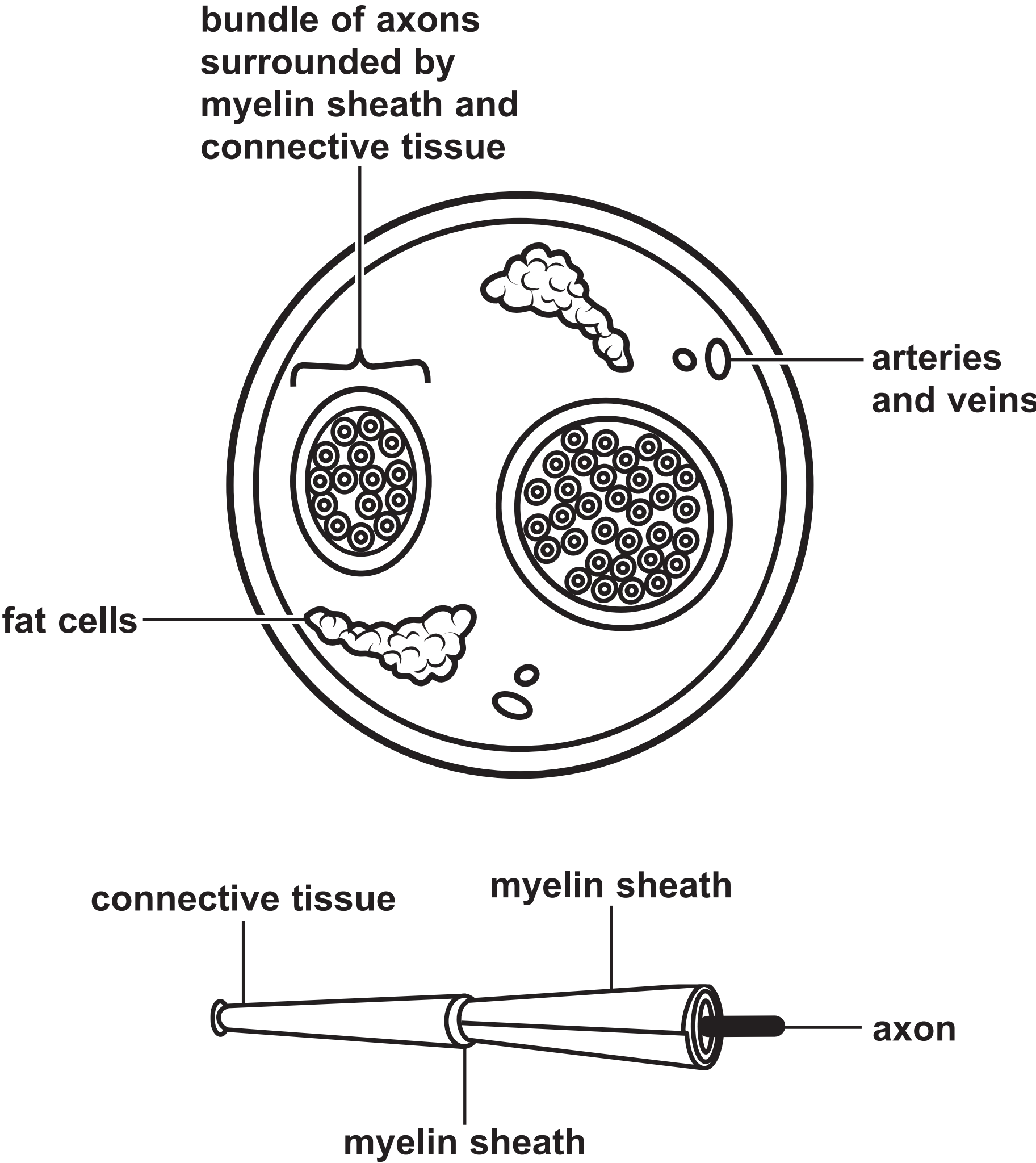
KEY

- ✕ resting
- exercising
- △ exercising twice as vigorously



Question 5

DIAGRAM 4



Question 5(b)

TABLE 3

Risk factor	Increase in risk (%)
High triglycerides	100
Smoking	42
High LDL to HDL ratio	67

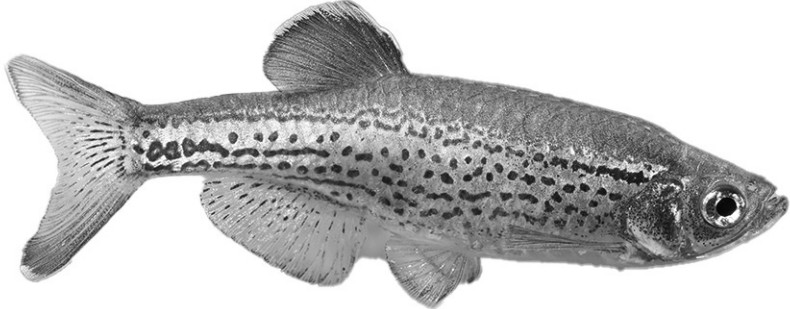
Question 6

IMAGE 2



Question 6(b)

TABLE 4

Phenotype name	Photograph	Description
spots		melanin produced in spots instead of stripes
long fin		long fins instead of short fins

Question 6(b) continued.

TABLE 5

Cross	Genotype of parent 1	Genotype of parent 2	Phenotype of the offspring
1	homozygous for stripes and short fins	homozygous for spots and short fins	all had stripes and short fins
2	homozygous for stripes and short fins	homozygous for stripes and long fins	all had stripes and long fins

Question 6(c)(i)

TABLE 6

Parent 1 gametes			
DN	Dn	dN	dn

Genotypes and phenotypes of offspring

Parent 2 gametes	DN	DDNN	DDNn	DdNN	DdNn
		stripes and long fins	stripes and long fins	stripes and long fins	stripes and long fins
	Dn	DDNn	DDnn	DdNn	Ddnn
		stripes and long fins	stripes and short fins	stripes and long fins	stripes and short fins
	dN	DdNN	DdNn	ddNN	ddNn
		stripes and long fins	stripes and long fins	spots and long fins	spots and long fins
	dn				

Question 6(c)(ii)

TABLE 7

Phenotype	Observed number	Expected number
stripes and long fins	270	288
stripes and short fins	87	96
spots and long fins	115	96
spots and short fins	40	32
Total	512	512

Question 6(c)(iii)

TABLE 8

degrees of freedom	Critical value	
	P = 0·05	P = 0·01
1	3·84	6·64
2	5·99	9·21
3	7·82	11·35
4	9·49	13·28
5	11·07	15·09

Question 7(b)(ii)

TABLE 9

SNP	Bases present in each allele	Chance of this SNP in a person with TB compared with a healthy person
SNP1	AA	increased chance
	AG or GG	same chance
SNP2	TT	increased chance
	TC or CC	same chance

(continued on the next page)

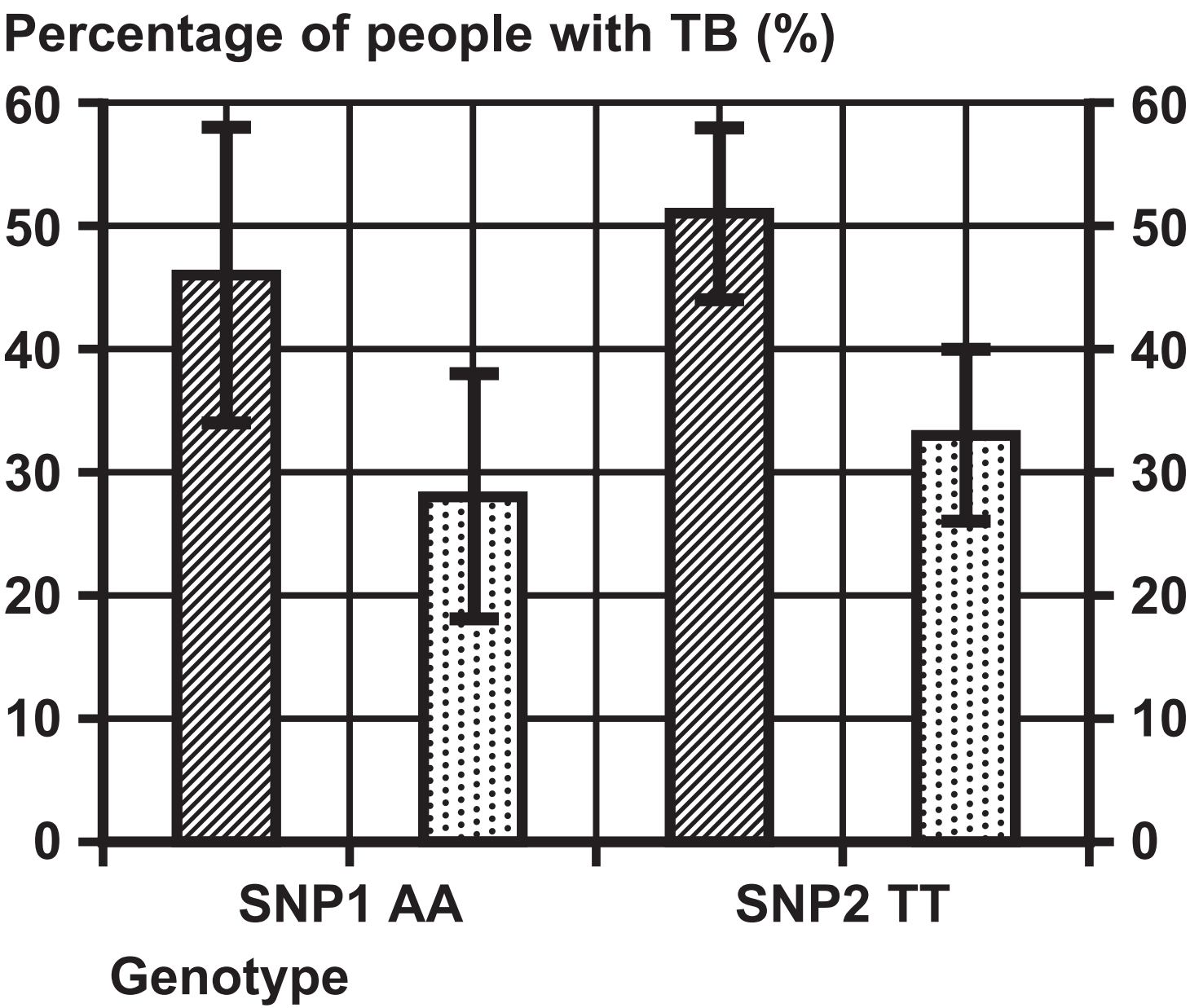
Question 7(b)(ii) continued.

DIAGRAM 5

KEY

 severe TB

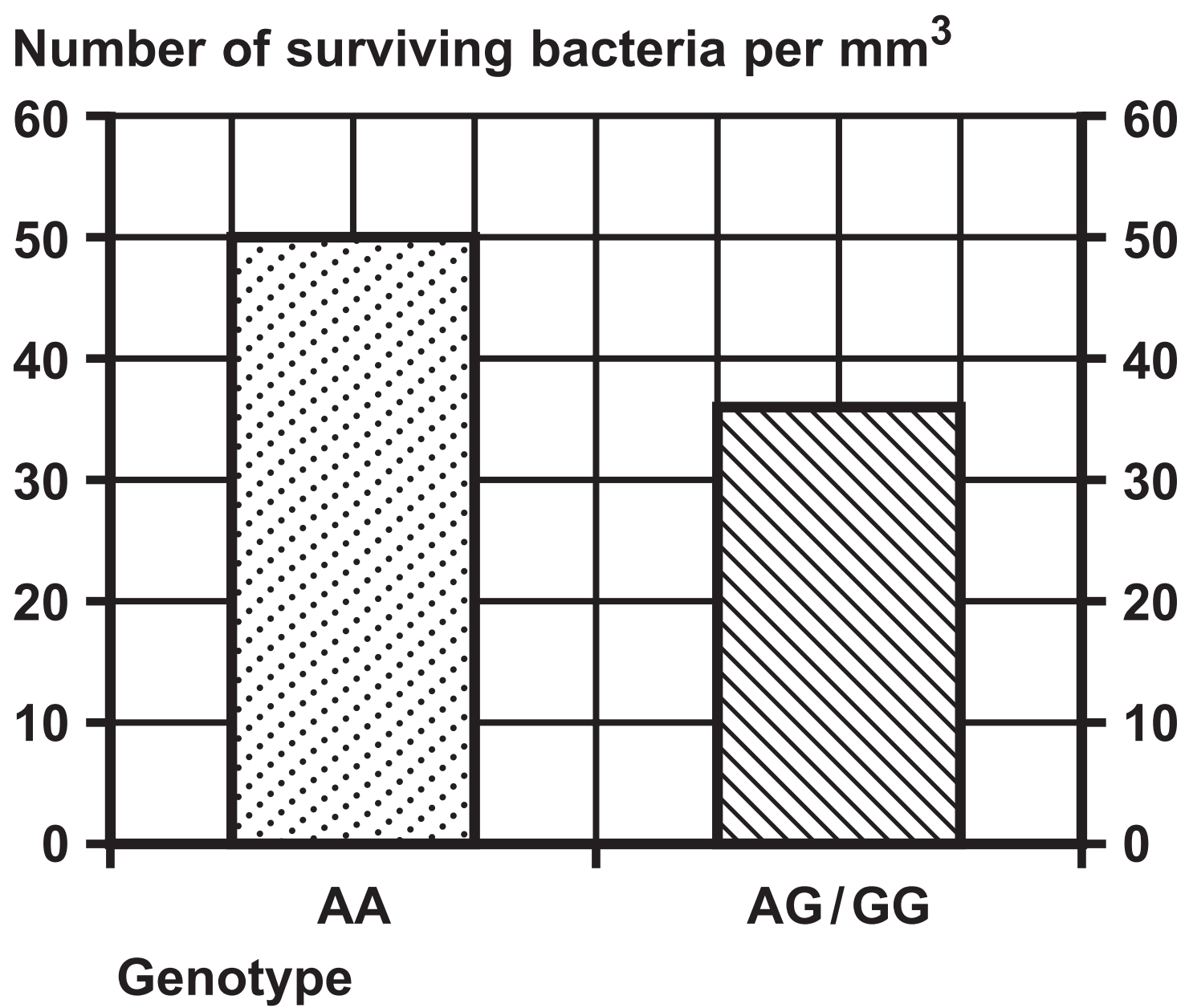
 mild Tb



(continued on the next page)

Question 7(b)(ii) continued.

DIAGRAM 6



Question 8(j)**DIAGRAM 7**

Question 2(a)

TABLE 1

Volume of a sphere $V = \frac{4}{3} \pi r^3$

Information	Neutrophil	Monocyte
Number of cells per mm ³ of blood	3000	400
Diameter of the cell / μm	10	20
Volume of each cell / μm ³		314

Question 6(c)(i)

TABLE 6

Parent 1 gametes			
DN	Dn	dN	dn
Genotypes and phenotypes of offspring			
DDNN	DDNn	DdNN	DdNn
stripes and long fins	stripes and long fins	stripes and long fins	stripes and long fins
DDNn	DDnn	DdNn	Ddnn
stripes and long fins	stripes and short fins	stripes and long fins	stripes and short fins
DdNN	DdNn	ddNN	ddNn
stripes and long fins	stripes and long fins	spots and long fins	spots and long fins

Parent 2 gametes	DN
	Dn
	dN
	dn
	DN
	Dn
	dN
	dn

Question 8(j)

DIAGRAM 7



SOURCE INFORMATION

Question 3(a)

Source: adapted from © ABS Natural History/Shutterstock

Question 6

Source: © Mirko_Rosenau/Shutterstock

Question 6(b)

Source: © Grigorev Mikhail/Shutterstock