National Qualifications 2016

X707/77/02

Biology
Section 1 — Questions

MONDAY, 9 MAY

9:00 AM – 11:30 AM

Instructions for the completion of Section 1 are given on *Page 02* of your question and answer booklet X707/77/01.

Record your answers on the answer grid on *Page 03* of your question and answer booklet.

Before leaving the examination room you must give your question and answer booklet to the Invigilator; if you do not, you may lose all the marks for this paper.

SECTION 1 — 25 marks

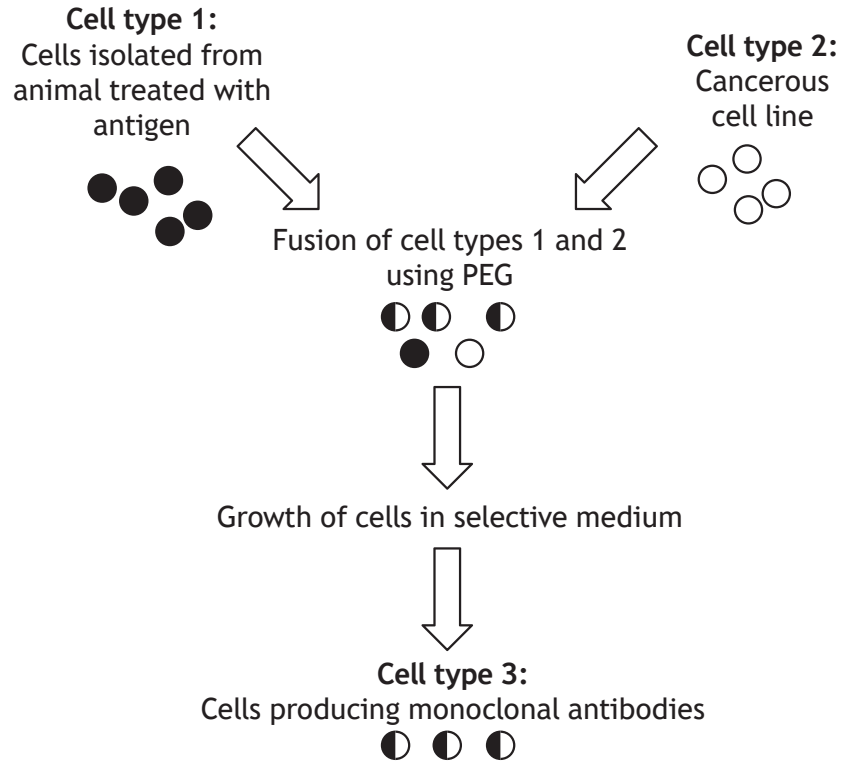
Attempt ALL questions

1. An experiment was set up to measure the activity of an enzyme using a substrate that produced a coloured product. The absorbance of the coloured product was measured using a colorimeter.

Which row in the table describes the variable being measured?

	discrete	*continuous*	*qualitative*	*quantitative*
A	✓		✓	
B	✓			✓
C		✓	✓	
D		✓		✓

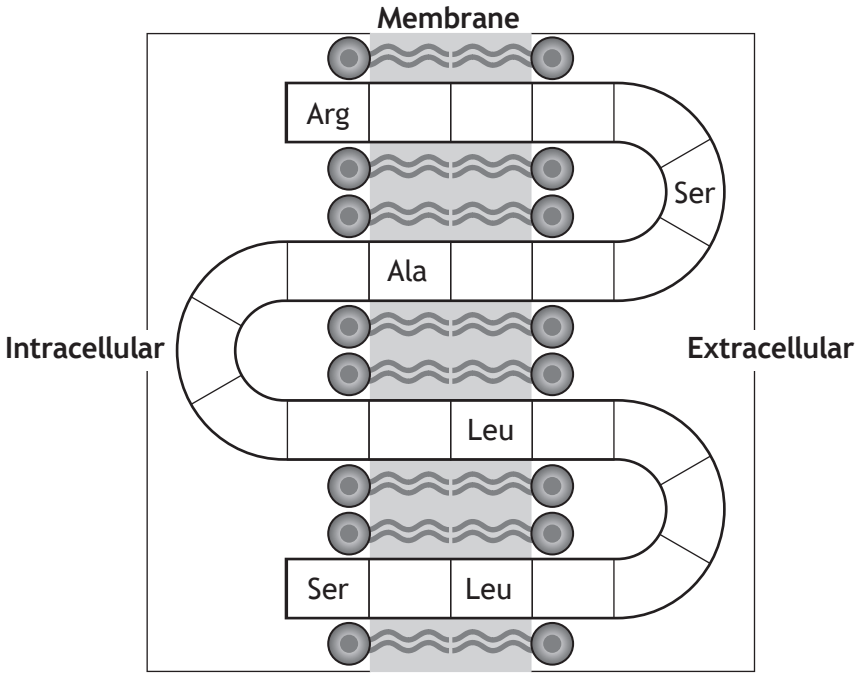
2. The diagram below shows the cell types used in the production of monoclonal antibodies.



Which row in the table identifies cell types 1, 2 and 3?

	Cell type 1	*Cell type 2*	*Cell type 3*
A	B lymphocyte	myeloma	hybridoma
B	myeloma	hybridoma	B lymphocyte
C	hybridoma	myeloma	B lymphocyte
D	myeloma	B lymphocyte	hybridoma

3. The diagram below represents a transmembrane protein. Some of the amino acids in the protein have been identified.



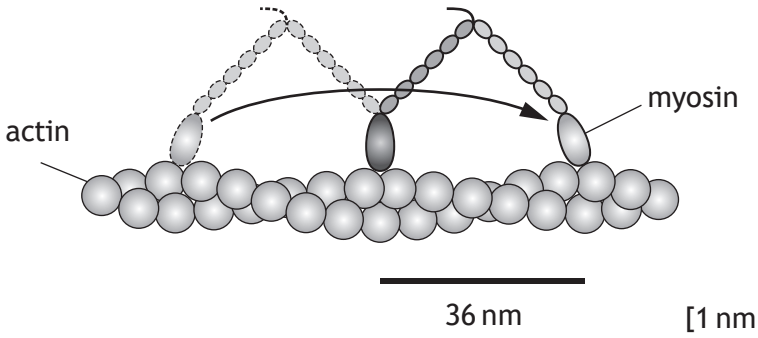
Which row in the table classifies the amino acids shown in this protein?

	Arginine (Arg)	*Alanine* (Ala)	*Leucine* (Leu)	*Serine* (Ser)
A	polar	hydrophobic	hydrophobic	polar
B	hydrophobic	polar	hydrophobic	polar
C	polar	hydrophobic	polar	hydrophobic
D	hydrophobic	polar	polar	hydrophobic

[Turn over

Questions 4 and 5 refer to the following information.

During muscle contraction, the protein myosin moves along an actin protein filament by the head of the myosin detaching from the actin, swinging forward and rebinding, as shown in the diagram.



[1 nm = 1×10^{-9} m]

4. This reversible conformational change can be brought about by binding of ATP to the myosin head followed by hydrolysis and release of phosphate and ADP.

The myosin head is acting as

A a kinase

B an ATPase

C a proteinase

D a phosphatase.

5. When the myosin head detaches and swings forward it moves a distance of 36 nanometres (nm).

Myosin has been observed to move at a speed of 18×10^3 nm s^{-1}.

How many times will the myosin head detach and swing forward in one second?

A 50

B 200

C 500

D 2000

6. In animal rod cells rhodopsin absorbs a photon of light initiating the following cell events.

1 nerve impulse is generated
2 sufficient product formation is triggered
3 activation of hundreds of G-protein molecules
4 activation of hundreds of molecules of an enzyme

The correct order of events is

A 4, 2, 1, 3

B 3, 4, 2, 1

C 4, 3, 1, 2

D 3, 2, 4, 1.

7. In multicellular organisms, only target cells respond to a specific signal because

A signalling molecules only come into contact with target cells

B only target cells have receptor molecules for the signalling molecule

C non-target cells do not respond when the signalling molecule binds to its receptor

D receptor molecules in non-target cells do not change conformation when the signalling molecule binds.

8. The hormone thyroxine is

A hydrophobic and unable to pass through the cell membrane

B hydrophilic and unable to pass through the cell membrane

C hydrophobic and able to pass through the cell membrane

D hydrophilic and able to pass through the cell membrane.

9. Biological molecules move over short distances by diffusion. The time taken for diffusion can be calculated using the equation below.

$$t = \frac{x^2}{2D}$$

t = time taken (seconds)
x = distance travelled by the diffusing molecule (cm)
D = diffusion co-efficient (cm^2 per second)

Acetylcholine is a neurotransmitter with a diffusion co-efficient of $4 \times 10^{-6}\,cm^2$ per second. The gap across the synapse is 5×10^{-6} cm wide.

How many seconds would it take acetylcholine to cross the synapse?

A 1·250

B $6{\cdot}250 \times 10^{-6}$

C $3{\cdot}125 \times 10^{-6}$

D $1{\cdot}600 \times 10^{-6}$

10. Type 1 diabetes is caused by

A excessive production of insulin

B loss of insulin receptor function

C failure of GLUT4 to respond to insulin binding

D insufficient production of insulin.

[Turn over

11. An enzyme-controlled reaction is taking place in optimum conditions in the presence of a large surplus of substrate.

Conditions can be altered by

1 increasing the temperature
2 adding a positive modulator
3 increasing enzyme concentration
4 increasing substrate concentration.

Product yield would be increased by

A 1 and 2

B 2 and 3

C 2 and 4

D 3 and 4.

12. At which phase of the cell cycle is the retinoblastoma protein phosphorylated allowing progression to the next phase of the cycle?

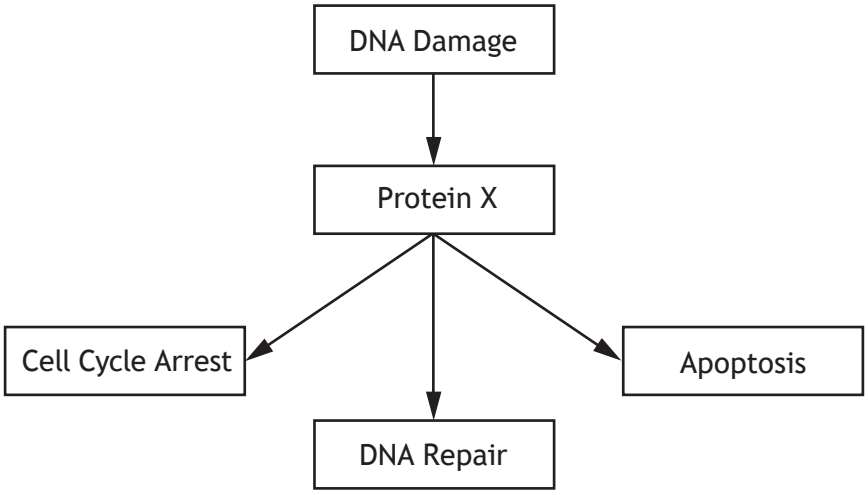
A G1

B S

C G2

D M

13. The diagram below shows possible outcomes for a cell following DNA damage. Protein X is involved in all three outcomes.



Protein X is

A Rb

B p53

C Cdk

D caspase.

14. Two reagents used in testing for the presence of carbohydrates are iodine solution, which turns blue-black in the presence of starch, and Benedict's solution, which turns brick red in the presence of maltose.

In an investigation of the breakdown of starch into maltose by the enzyme amylase, which of the following would be a positive control?

A Maltose alone turns Benedict's solution brick red.

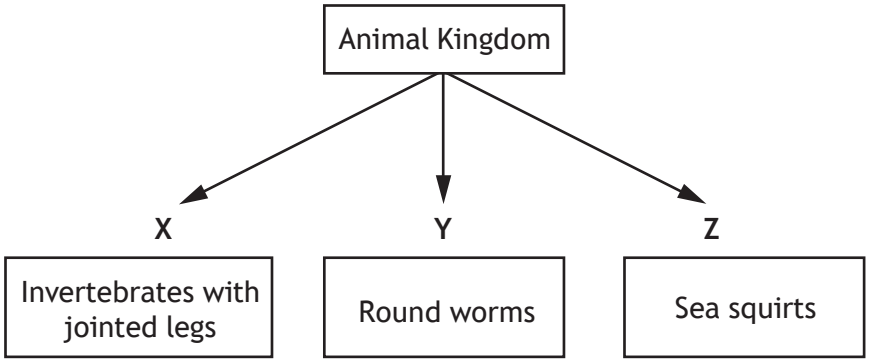
B Starch treated with amylase turns Benedict's solution brick red.

C Starch alone tested with Benedict's solution remains blue.

D Starch treated with amylase does not change the colour of iodine solution.

[Turn over

15. The diagram below shows some phyla in the animal kingdom.



Which row in the table identifies the phyla X, Y and Z?

	Phylum		
	X	*Y*	*Z*
A	Chordata	Nematoda	Arthropoda
B	Arthropoda	Nematoda	Chordata
C	Nematoda	Arthropoda	Chordata
D	Arthropoda	Chordata	Nematoda

16. Which of the following descriptions of animal behaviour avoids the use of anthropomorphism?

A In some primate species, alpha males often bully lower-ranking animals.

B In late summer, worker bees like to visit heather flowers.

C The grin on the chimpanzee's face showed that it was amused by the gesture.

D The male moth is attracted to the female by the scent molecules that she emits.

17. A population of chafer beetles were damaging the tees and greens of a golf course. Results from a mark and recapture study suggested a population size that was too small to account for the extent of the damage caused.

One possible reason for this is that the

A white paint used to mark the beetles washed off some of them before the recapture

B white paint used to mark the beetles made them more visible to predators than unmarked beetles

C total number of beetles in the recaptured sample was less than the number first captured and marked

D marked beetles did not have enough time, after release, to spread out and mix with the rest of the population.

18. Ellis-van Creveld syndrome is a rare genetic condition. It is much more common in an isolated population in North America, which was founded by a small number of individuals, than in the general population.

The most likely explanation for this is

A natural selection

B sexual selection

C random mutation

D genetic drift.

19. The frequency of a given allele in a population is a measure of how common that allele is as a proportion of the total number of copies of all alleles at a specific locus. For a locus with one dominant allele (A) and one recessive allele (a), the frequency of the dominant allele (p) and the frequency of the recessive allele (q) can be used to calculate the genetic variation of a population using the equations below.

$p + q = 1$	p = frequency of A allele q = frequency of a allele
$p^2 + 2pq + q^2 = 1$	p^2 = frequency of homozygous (AA) individuals q^2 = frequency of homozygous (aa) individuals $2pq$ = frequency of heterozygous (Aa) individuals

If the allele frequency of the recessive allele is 0·7, the proportion of individuals that would be heterozygous is

A 0·09

B 0·21

C 0·42

D 0·49.

[Turn over

20. In the fruit fly *Drosophila melanogaster* the gene for eye colour is sex-linked. The allele for red eye (R) is dominant to the allele for white eye (r).

A cross between two flies produced the offspring shown in the table below.

Sex of offspring	*Number with white eyes*	*Number with red eyes*
female	23	22
male	21	22

The genotypes of the parents in this cross were

A X^rX^r and X^RY

B X^RX^r and X^rY

C X^RX^r and X^RY

D X^RX^R and X^rY.

21. Which row in the table best describes r-selected species?

	Number of offspring	*Offspring survival rate*	*Parental care*
A	many	low	little
B	few	high	extensive
C	many	high	extensive
D	few	low	little

22. Shags and cormorants both belong to the genus *Phalacrocorax*. They look very similar and nest near each other on the same cliffs. The table below shows the main components of each bird's diet.

Prey	*Percentage composition of diet*	
	Shag (Phalacrocorax aristotelis)	*Cormorant (Phalacrocorax carbo)*
sand eels	33	0
sprats	49	1
flatfish	1	26
shrimps	2	33
gobies	4	17
other fish	4	18

The data in the table show

A competitive exclusion

B competition within each species

C resource partitioning

D the fundamental niche of each species.

[Turn over

23. A species of parasitic wasp (*Nasonia vitripennis*) lays its eggs in the larvae of flies where the eggs develop. This species displays a behaviour called "*superparasitism*" where, following the laying of eggs by one wasp, a second wasp may superparasitise the same host by also laying its eggs.

Researchers investigated the effects of superparasitism on the brood size and sex ratio of offspring in this species. Results were compared to a control that had been parasitised only once. Researchers were able to distinguish between the offspring of the first and second wasp.

Results are shown in the table below.

Offspring	*Degree of parasitism*		
	Superparasitism		*Single parasitism control*
	Wasp 1	*Wasp 2*	
brood size	18 ± 3	17 ± 4	20 ± 2
percentage of males	7 ± 2	22 ± 4	6 ± 1

The following statements refer to the data in the table.

1 Superparasitism significantly increased the percentage of males produced by both wasp 1 and wasp 2.

2 Superparasitism significantly increased the percentage of males produced by wasp 2 only.

3 Superparasitism had no significant effect on brood size.

4 Superparasitism significantly decreased the brood size produced by wasps 1 and 2.

Which of these statements are valid conclusions supported by the data?

A 1 and 3

B 1 and 4

C 2 and 3

D 2 and 4

24. The statements below describe events that occur following the engulfing of a pathogen by a phagocyte of the mammalian immune system.

P long term survival of lymphocytes
Q antigen presentation to lymphocytes
R antibody production by lymphocytes
S clonal selection of B lymphocytes

The correct sequence in which these events occur is

A Q, R, S, P
B R, Q, P, S
C S, Q, P, R
D Q, S, R, P.

25. Florida scrubjays have evolved a co-operative breeding system in which helper birds assist breeding pairs in raising young. The table below compares the effect of helpers on the breeding success of birds that are either experienced or inexperienced breeders.

Breeding experience of breeding pairs	*Average number of offspring reared*	
	Without helpers	*With helpers*
inexperienced	1·24	2·20
experienced	1·80	2·38

Helpers increase the average number of offspring reared by inexperienced breeding pairs compared to experienced breeding pairs by

A 19%
B 23%
C 45%
D 60%.

[END OF SECTION 1. NOW ATTEMPT THE QUESTIONS IN SECTION 2 OF YOUR QUESTION AND ANSWER BOOKLET]

[BLANK PAGE]

DO NOT WRITE ON THIS PAGE

[BLANK PAGE]

DO NOT WRITE ON THIS PAGE

[BLANK PAGE]

DO NOT WRITE ON THIS PAGE

FOR OFFICIAL USE

National Qualifications 2016

Mark

X707/77/01

Biology
Section 1 — Answer Grid and Section 2

MONDAY, 9 MAY

9:00 AM – 11:30 AM

X7077701

Fill in these boxes and read what is printed below.

Full name of centre

Town

Forename(s)

Surname

Number of seat

Date of birth

Day Month Year

Scottish candidate number

Total marks — 90

SECTION 1 — 25 marks

Attempt ALL questions.

Instructions for completion of Section 1 are given on *Page 02*.

SECTION 2 — 65 marks

Attempt ALL questions.

A Supplementary Sheet for Question 1 is enclosed inside the front cover of this question paper. Write your answers clearly in the spaces provided in this booklet. Additional space for answers and rough work is provided at the end of this booklet. If you use this space you must clearly identify the question number you are attempting. Any rough work must be written in this booklet. You should score through your rough work when you have written your final copy.

Use **blue** or **black** ink.

Before leaving the examination room you must give this booklet to the Invigilator; if you do not you may lose all the marks for this paper.

SQA ©

X707770101

SECTION 1 — 25 marks

The questions for Section 1 are contained in the question paper X707/77/02.

Read these and record your answers on the answer grid on *Page 03* opposite.

Use **blue** or **black** ink. Do NOT use gel pens or pencil.

1. The answer to each question is **either** A, B, C or D. Decide what your answer is, then fill in the appropriate bubble (see sample question below).

2. There is **only one correct** answer to each question.

3. Any rough working should be done on the additional space for answers and rough work at the end of this booklet.

Sample Question

The thigh bone is called the

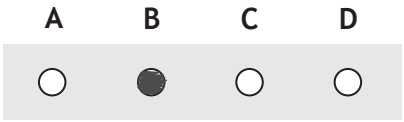
A humerus

B femur

C tibia

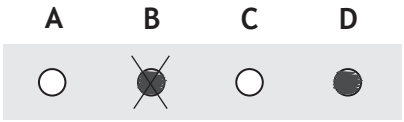
D fibula.

The correct answer is **B** — femur. The answer **B** bubble has been clearly filled in (see below).

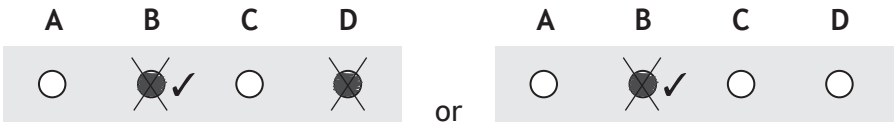


Changing an answer

If you decide to change your answer, cancel your first answer by putting a cross through it (see below) and fill in the answer you want. The answer below has been changed to **D**.



If you then decide to change back to an answer you have already scored out, put a tick (✓) to the **right** of the answer you want, as shown below:



SECTION 1 — Answer Grid

0BJ25AD1

	A	B	C	D
1	○	○	○	○
2	○	○	○	○
3	○	○	○	○
4	○	○	○	○
5	○	○	○	○
6	○	○	○	○
7	○	○	○	○
8	○	○	○	○
9	○	○	○	○
10	○	○	○	○
11	○	○	○	○
12	○	○	○	○
13	○	○	○	○
14	○	○	○	○
15	○	○	○	○
16	○	○	○	○
17	○	○	○	○
18	○	○	○	○
19	○	○	○	○
20	○	○	○	○
21	○	○	○	○
22	○	○	○	○
23	○	○	○	○
24	○	○	○	○
25	○	○	○	○

[BLANK PAGE]

DO NOT WRITE ON THIS PAGE

[Turn over for next question

DO NOT WRITE ON THIS PAGE

MARKS DO NOT WRITE IN THIS MARGIN

SECTION 2 — 65 marks

Attempt ALL questions

It should be noted that question 11 contains a choice.

1. Read through the Supplementary Sheet for Question 1 before attempting this question.

(a) **Refer to Figure 2 in the Supplementary Sheet for Question 1.**

(i) Use the data to describe the egg-laying of uninfected mosquitoes. **2**

(ii) If the box plots were perfectly symmetrical, mean values for egg-laying would be very close to median values.

State what can be deduced about the **mean** number of eggs laid by infected mosquitoes in relation to the median value. **1**

(iii) Describe the effect that *Plasmodium* infection has on the fecundity of mosquitoes used in the study. **1**

(b) **Refer to Figure 3 in the Supplementary Sheet for Question 1.**

(i) The data shows that infection by *Plasmodium* appears to increase the longevity of female mosquitoes.

Explain why the difference between the two groups can be regarded as significant. **1**

(ii) Suggest a benefit to the parasite of its vector living longer. **1**

1. (continued)

(c) **Refer to Figure 4 in the Supplementary Sheet for Question 1.**

(i) Explain what the lines of best fit indicate about the relationship between longevity and fecundity in both infected and uninfected mosquitoes. **2**

(ii) State, with justification, whether or not this data is reliable. **1**

[Turn over

2. Scientists have reported that neurons produced in cell culture from human stem cells have the potential to function when grafted into the site of a spinal injury in rats.

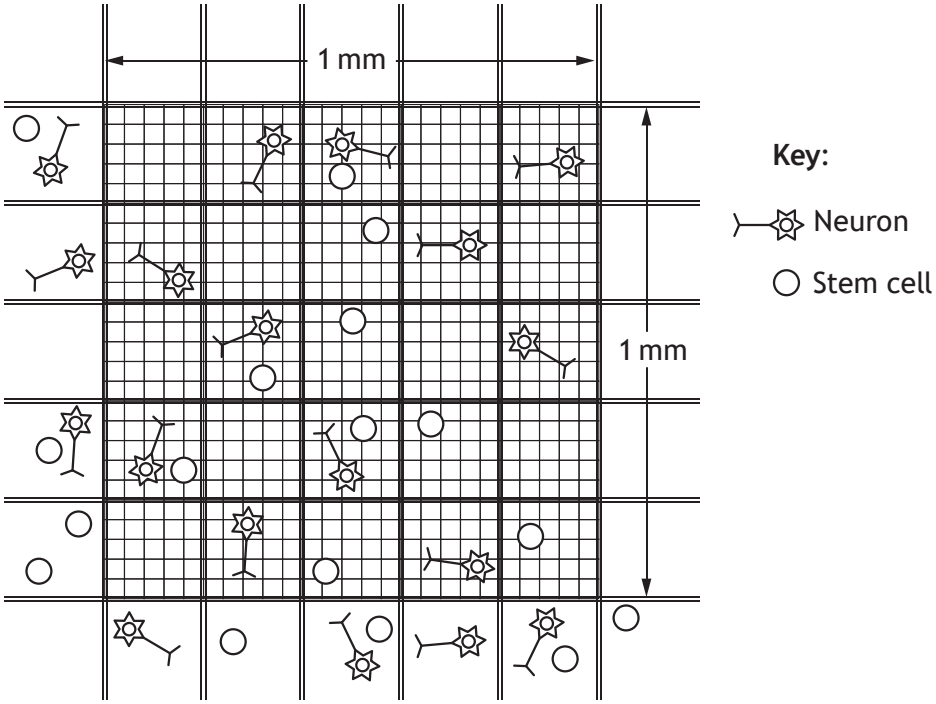
(a) State why the cell culture medium in which the neurons were cultured should contain serum. **1**

_____

(b) Scientists used a haemocytometer to perform a cell count to calculate the number of stem cells that developed into neurons.

The diagram below represents a sample from a culture placed in a haemocytometer and viewed under a microscope.

The grid is **0·1 mm** in depth.



(i) Calculate the number of **neurons** in 1 cm^3 of the culture. **1**

Space for calculation

_____ neurons

(ii) Suggest **one** disadvantage of cell counts performed using the haemocytometer. **1**

_____

2. (continued)

(c) Bright field microscopy was used to view the cells grafted into the site of spinal injury.

State another type of biological material that can be viewed using bright field microscopy. **1**

_____

(d) In studies involving animals, state **one** way in which harm to the animals can be minimised. **1**

_____

[Turn over

3. Multiple sclerosis (MS) is a neurological condition in which the body's immune system destroys the myelin sheath that surrounds and insulates nerve axons.

A clinical study was carried out into the effects of a new drug *interferon beta-1b* for this condition. A randomised trial, with a negative control group (placebo), was carried out across four different health centres. During the study patients were given one of three treatments: 0·00 mg (placebo), 0·05 mg or 0·25 mg interferon. The patients administered the drug themselves at home.

The study measured how effective the drug was by asking patients to record any worsening of symptoms after 2 years of treatment. The study involved 372 patients aged 18-50 years. Fourteen patients dropped out before completing the trial.

Patients' results are shown in Table 1.

Table 1

Level of interferon beta-1b in treatment (mg)	*Proportion of patients reporting no worsening of symptoms after 2 years of treatment* (%)
0·00	16
0·05	18
0·25	25

At one health centre 52 patients were MRI scanned every 6 weeks to monitor any new damage to nerve tissue. The results are shown in Table 2.

Table 2

Level of interferon beta-1b in treatment (mg)	*Proportion of patients showing new nerve damage* (%)
0·00	29
0·05	no data recorded
0·25	6

(a) Identify the independent variable in this trial. **1**

(b) This trial was carried out *in vivo*.

State **one** advantage of this type of trial. **1**

3. (continued)

(c) Explain why a placebo group was included in this trial. **1**

(d) Suggest **one** way in which the results of the trial may not be reliable. **1**

(e) Describe an ethical issue that the researchers would need to consider before this trial. **1**

(f) Suggest **two** conclusions that can be drawn from the results of this trial. **2**

Conclusion 1

Conclusion 2

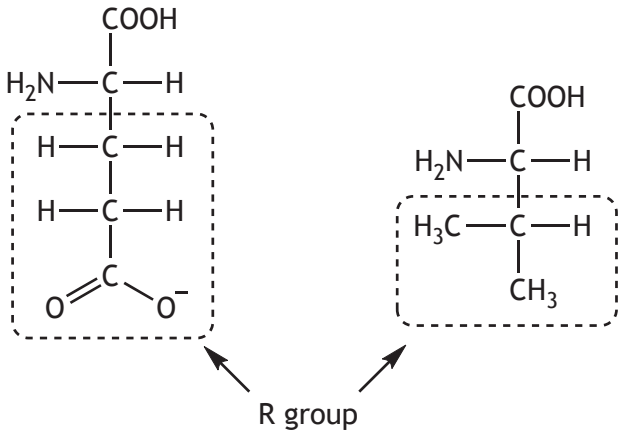
[Turn over

4. Sickle cell anaemia is an inherited blood disorder that reduces the ability of red blood cells to transport oxygen round the body by changing the structure of haemoglobin.

In sickle cell anaemia, the primary structure of a haemoglobin subunit is altered; the amino acid glutamic acid is substituted by the amino acid valine.

The structures of glutamic acid and valine are shown below.

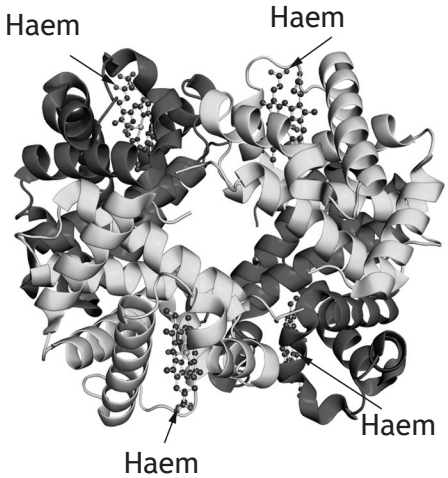
Glutamic acid **Valine**



(a) State the class of amino acids to which valine belongs. **1**

_____

(b) Identify **one** type of secondary structure shown in the haemoglobin molecule in the figure below. **1**

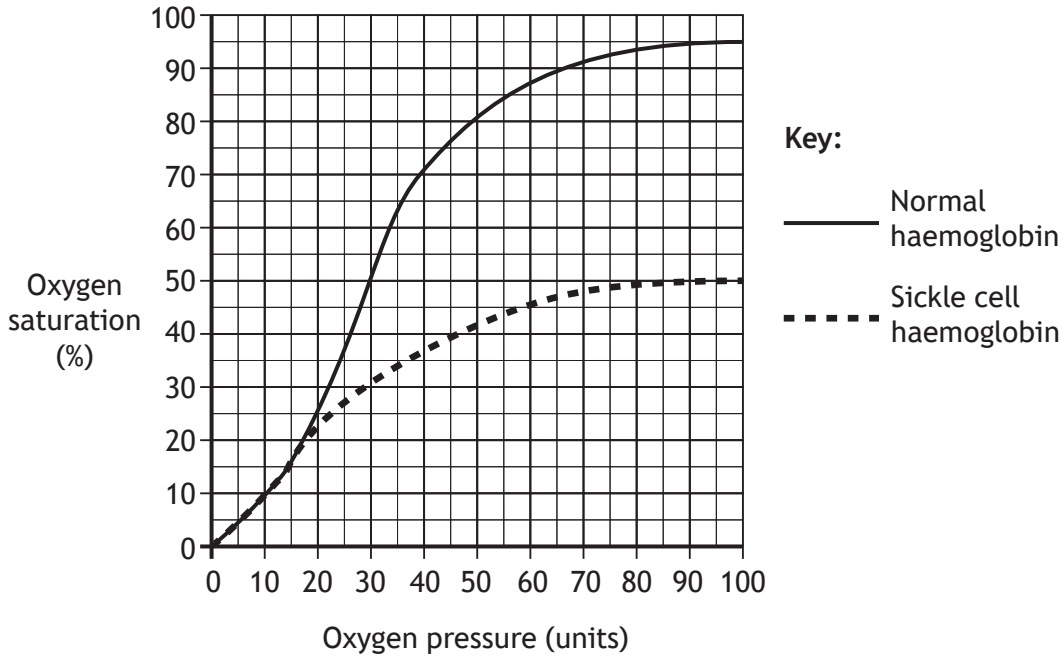


_____

4. (continued)

(c) Explain the term cooperativity in relation to oxygen binding to haemoglobin. **1**

(d) The graph below shows the oxygen saturation of haemoglobin at different oxygen pressures for an individual with normal haemoglobin and for another individual with sickle cell haemoglobin.



Use the graph to compare the oxygen saturation of normal and sickle cell haemoglobin as oxygen pressure increases. **2**

(e) Molecules of sickle cell haemoglobin clump together preventing access to oxygen binding sites.

Suggest why this is a result of the substitution of glutamic acid by valine. **1**

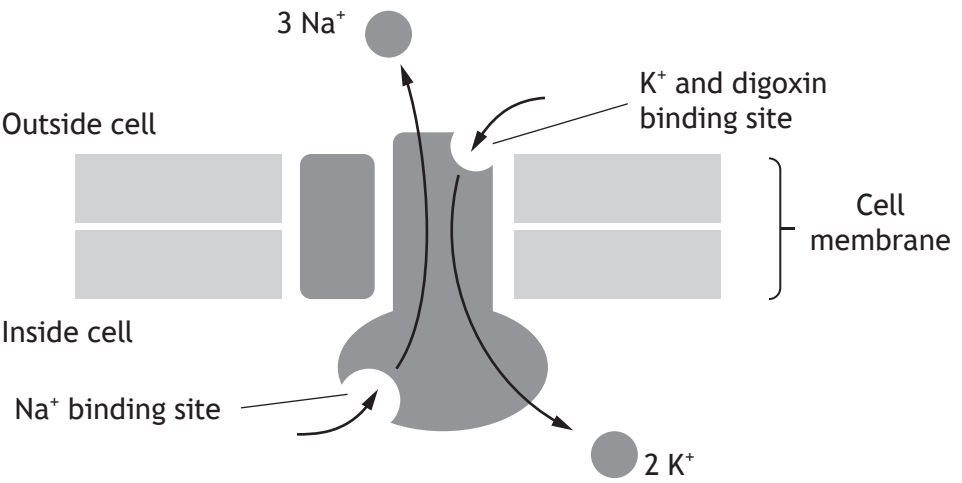
5. Describe the structure of spindle fibres and explain their role in the movement of chromosomes during cell division. **4**

6. The sodium potassium pump (Na/KATPase) is a membrane protein found in animal cells.

(a) Give **one** function of sodium potassium pumps. **1**

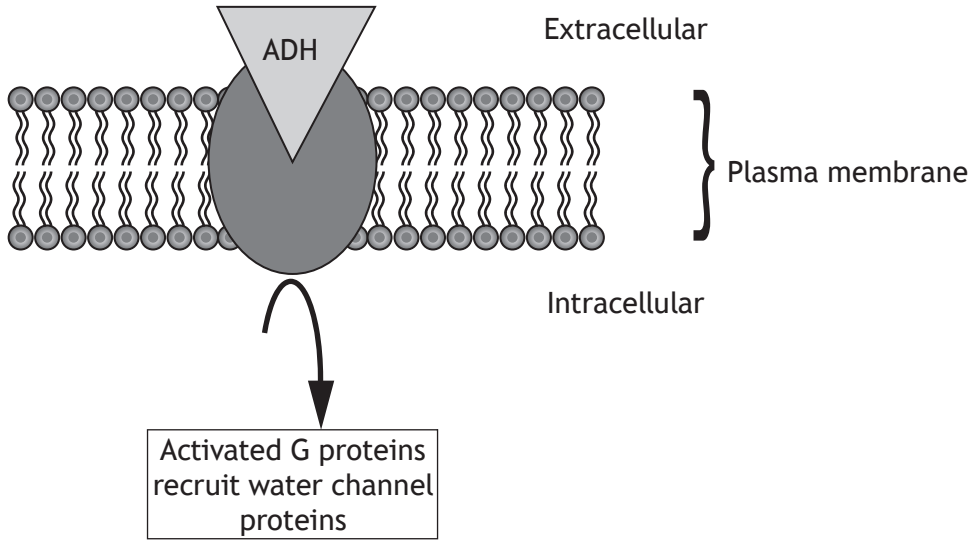
(b) Describe the role of ATP in altering the affinity of the pump for sodium ions (Na^+). **2**

(c) Digoxin is a chemical that inhibits the sodium potassium pump by binding to the potassium ion (K^+) binding site as shown in the diagram below.



Explain why binding by digoxin prevents further binding of sodium (Na^+) ions by the pump. **2**

7. Binding of antidiuretic hormone (ADH) to its receptor on the plasma membrane of kidney collecting duct cells triggers the recruitment of water channel proteins as shown below.

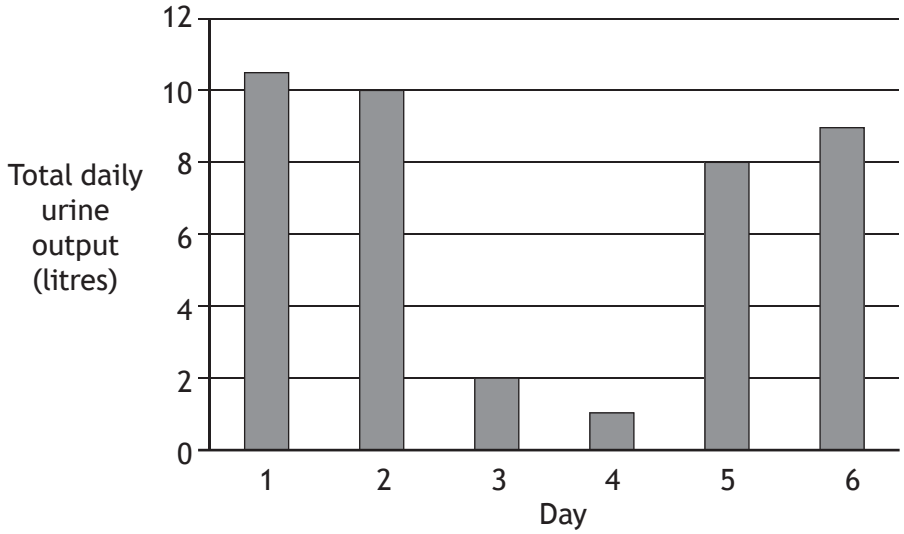


(a) (i) Name the water channel protein involved in this process. **1**

(ii) Name the process by which a response within the cell is triggered by the binding of ADH to its cell surface receptor. **1**

7. (continued)

(b) A urine output of greater than 0·05 litres per kg body mass per day is considered diagnostic of diabetes insipidus. The bar chart below shows the urine output over 6 days of a 70 kg individual being investigated for diabetes insipidus. During days 3 and 4 the individual was treated with the drug *desmopressin*, a synthetic form of ADH.



(i) Use the data to confirm that a diagnosis of diabetes insipidus is correct for this individual. **1**

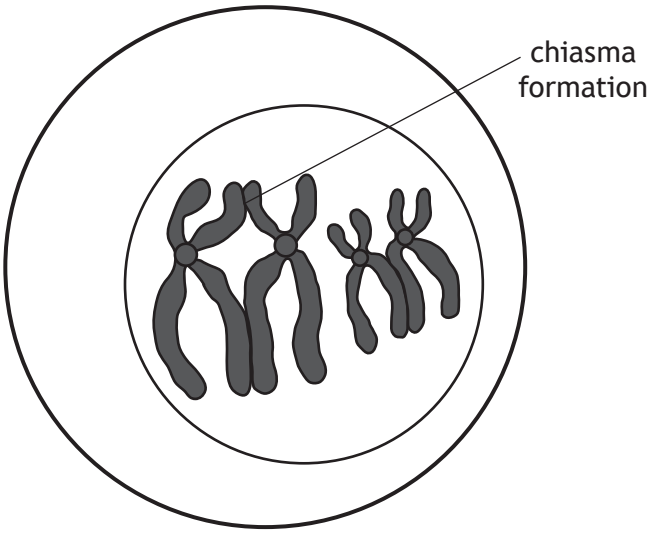
Space for calculation

(ii) Give evidence from the graph that supports the conclusion that *desmopressin* is an effective treatment. **1**

(iii) Diabetes insipidus results from failure to recruit water channel proteins to the cell membrane.

Identify the cause of recruitment failure in this individual. **1**

8. The diagram below shows the pairing of homologous chromosomes in a cell undergoing meiosis.



(a) Name the type of cell that undergoes meiosis. **1**

(b) (i) Explain how the chiasma formation between the paired homologous chromosomes shown in the diagram leads to variation. **2**

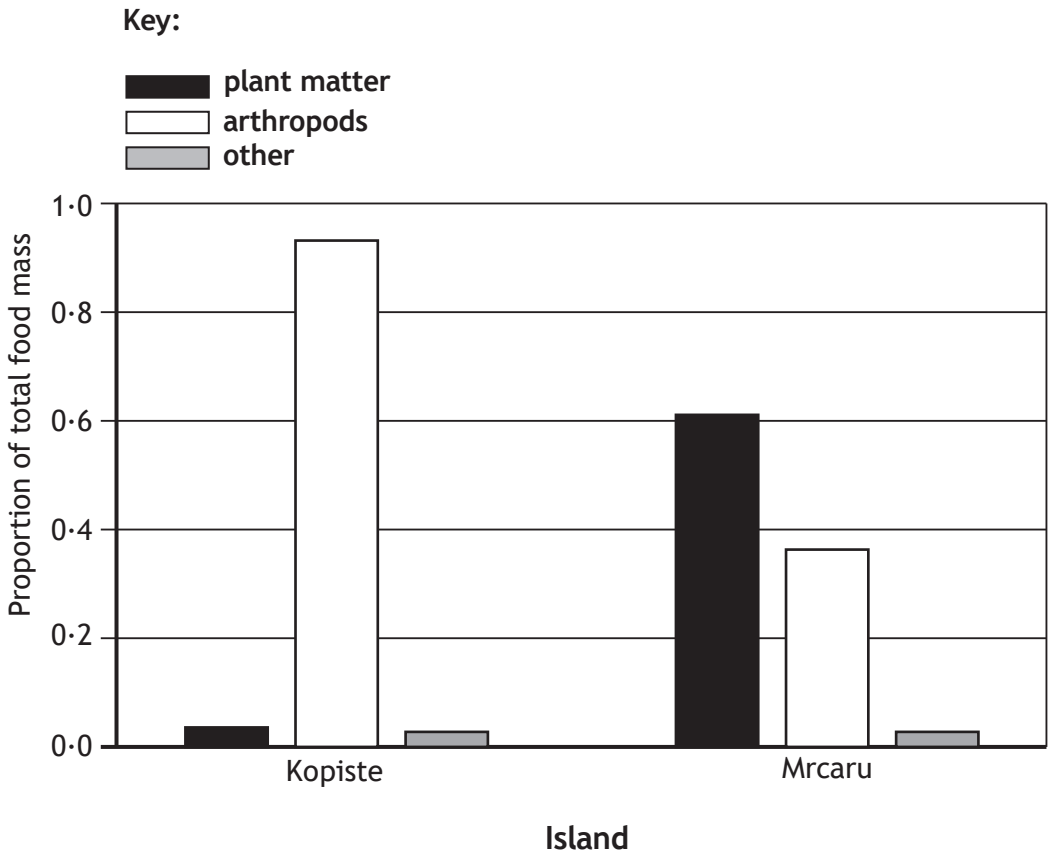
(ii) Name the process that ensures haploid gametes produced by meiosis contain a mixture of chromosomes of maternal and paternal origin. **1**

[Turn over for next question

DO NOT WRITE ON THIS PAGE

9. In 1971, biologists moved five adult pairs of Italian wall lizards (*Podarcis sicula*) from their small home island of Kopiste to the neighbouring small island of Mrcaru, which did not have a lizard population. On their return in 2005 Mrcaru was found to have a large population of *P. sicula* (confirmed by genetic analysis) with significantly larger heads and a greater bite force than the lizards from Kopiste. Their digestive systems were also found to contain microorganisms that assist in the breakdown of plant cell walls.

The summer diets of the two lizard populations are shown below.



(a) Describe the most significant change in the summer diet of the lizards on Mrcaru. **1**

_____

_____

9. (continued)

(b) (i) Explain how the information supports the conclusion that the changes to the lizard population on Mrcaru were the result of natural selection. **2**

(ii) Evolution of the lizards on Mrcaru occurred very rapidly.

State **one** factor that can increase the rate of evolution. **1**

(c) This study involved taking representative samples of the lizard populations on the two islands.

State **one** feature of a representative sample. **1**

[Turn over

10. The Figures below show male and female capercaillies (*Tetrao urogallus*) which are found in some Scottish pine forests. Males are much larger and darker than females and the breast feathers of the male have a metallic green sheen.

male capercaillie

female capercaillie

(a) State the term used to indicate the different body forms of males and females belonging to this species. **1**

_____

(b) Capercaillies are a lekking species. Males perform displays during which they fan their tails, hold their wings down and make a variety of sounds. These features, which are attractive to females, are thought to serve as honest signals.

(i) Explain what is meant by a lekking species. **1**

_____

_____

(ii) Explain why this display is often given as an example of sexual selection. **1**

_____

_____

(iii) If the display provides honest signals, state the benefit that may be obtained by females receiving these signals. **1**

_____

_____

10. (continued)

(c) Peacocks are the males of another lekking bird species, *Pavo cristatus*, whose natural habitat is the dense forests of South-East Asia. As well as the visual stimulus of a tail-feather display, peacocks, during mating, can emit a distinctive "hoot". These hoots are loud enough to be heard by other females, out of sight of the lek, who may be attracted by the calls and provide the dominant males at the lek with additional mating partners.

(i) Suggest why auditory stimuli are advantageous to species inhabiting forest ecosystems. **1**

(ii) Recent research has found that some peacocks emit hoots in the complete absence of females at the lek. Females are still attracted to the lek by these sounds. Such "solo" hoots have been described as "dishonest signals".

Explain what is meant by a "dishonest signal" in this behaviour. **1**

[Turn over for next question

MARKS | DO NOT WRITE IN THIS MARGIN

11. Answer **either A or B** in the space below and on *Page 25*.

A Discuss reproduction under the following headings:

(i) costs and benefits of sexual reproduction; **4**

(ii) asexual reproduction as a successful reproductive strategy. **5**

OR

B Discuss endoparasitic infections under the following headings:

(i) difficulties involved in their treatment and control; **7**

(ii) benefits of improved parasite control to human populations. **2**

Labelled diagrams may be used where appropriate.

MARKS | DO NOT WRITE IN THIS MARGIN

SPACE FOR ANSWER FOR QUESTION 11

[END OF QUESTION PAPER]

MARKS | DO NOT WRITE IN THIS MARGIN

ADDITIONAL SPACE FOR ANSWERS AND ROUGH WORK

MARKS | DO NOT WRITE IN THIS MARGIN

ADDITIONAL SPACE FOR ANSWERS AND ROUGH WORK

ACKNOWLEDGEMENT

Question 4(b) - petarg/shutterstock.com

Question 10 – Bildagentur Zoonar GmbH/shutterstock.com

Bildagentur Zoonar GmbH/shutterstock.com

National Qualifications 2016

X707/77/11

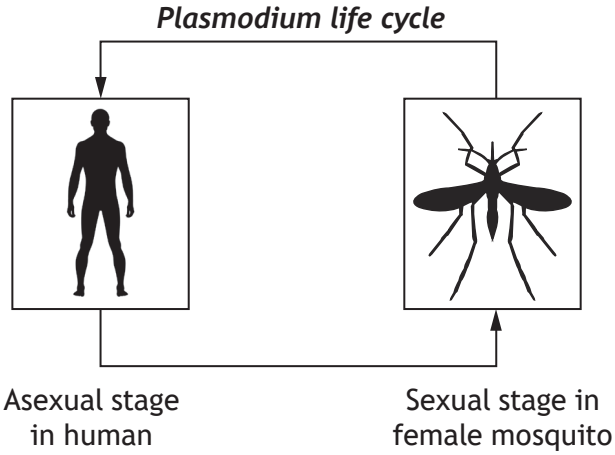
Biology
Supplementary Sheet

MONDAY, 9 MAY
9:00 AM – 11:30 AM

Supplementary Sheet for Question 1

1. Malaria is caused by unicellular parasites in the genus *Plasmodium*. Figure 1 shows the life cycle of the parasite with respect to its human and mosquito hosts.

Figure 1

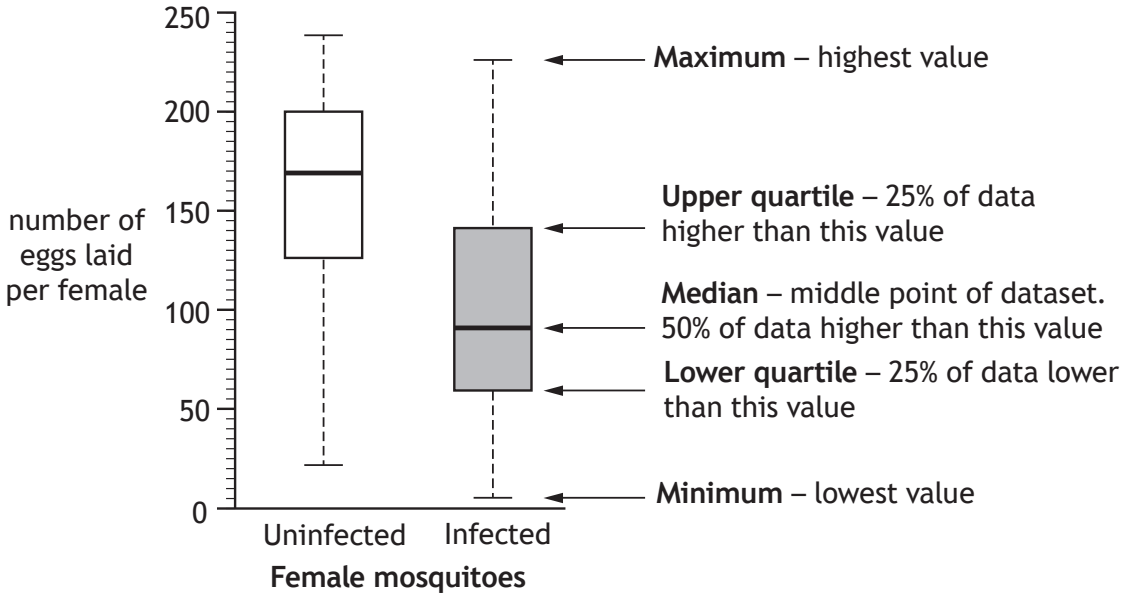


Malaria is a well-researched tropical disease of humans, but less is known about the effects of the parasite on its mosquito vector.

The parasite *Plasmodium relictum* causes malaria in birds. A recent study has been carried out to investigate the effects of this parasite on the mosquito *Culex pipiens*. In particular, two aspects were investigated: fecundity (number of eggs laid) and longevity (measured as survival after egg laying) of the mosquitoes.

In Figure 2, box-and-whisker plots show the total egg production by large numbers of uninfected and infected female mosquitoes.

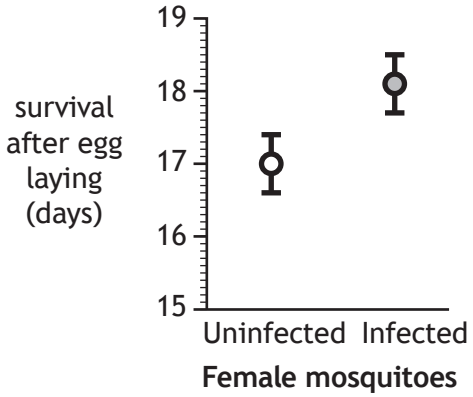
Figure 2



1. (continued)

Figure 3 shows mean survival times after egg laying for uninfected and infected female mosquitoes.

Figure 3

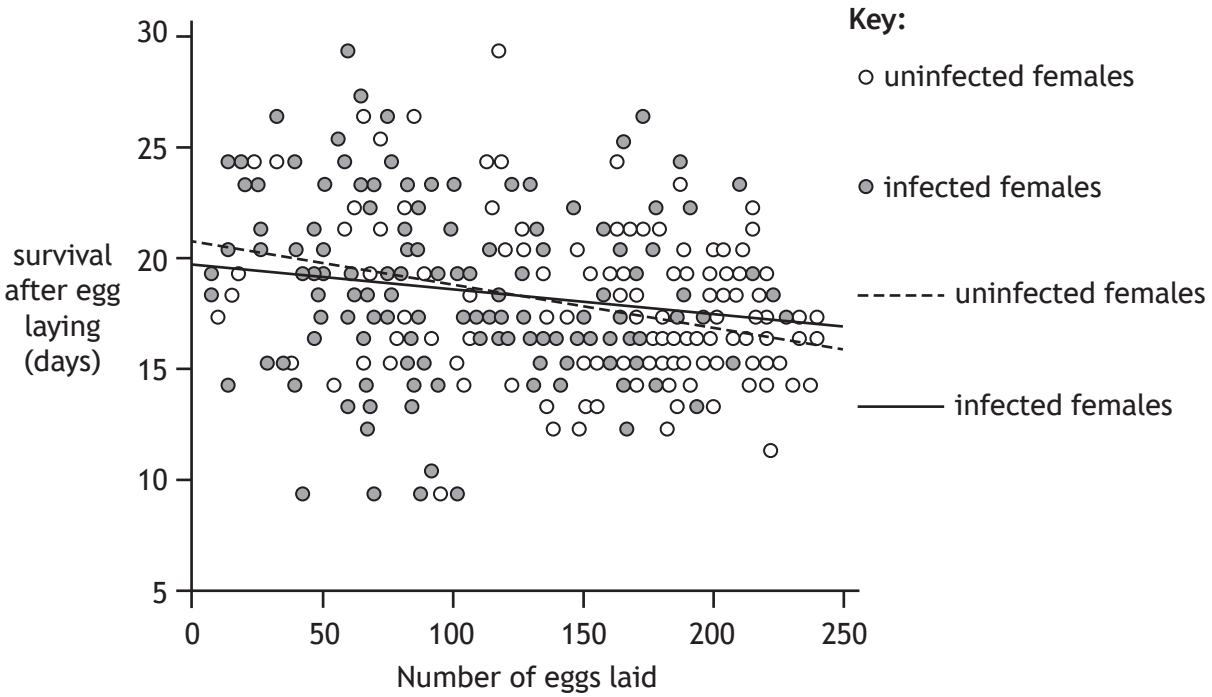


Fecundity and longevity were measured in the same individual female mosquitoes to see if there was a relationship between the two variables.

The lines of best fit for mosquito survival against the number of eggs each female laid were plotted for uninfected females and infected females.

This data is shown in Figure 4.

Figure 4



ACKNOWLEDGEMENT
Anna Rassadnikova/shutterstock.com
agongallud/shutterstock.com