wjec cbac GCSE

3400U20-1

FRIDAY, 10 MAY 2024 – MORNING

BIOLOGY – Unit 2: Variation, Homeostasis and Micro-organisms

FOUNDATION TIER

1 hour 45 minutes plus your additional time allowance

Surname _____

First name(s) _____

Centre Number _____

Candidate Number 0 _____

ADDITIONAL MATERIALS

A calculator and a ruler.

ITEMS INCLUDED WITH QUESTION PAPER

A separate Diagram Booklet.

The Diagram Booklet MUST be handed in to the invigilators and sent for marking.

INSTRUCTIONS TO CANDIDATES

Use black ink, black ball-point pen or your usual method.

Write your name, centre number and candidate number in the spaces provided on the front cover.

Answer ALL questions.

Write your answers in the spaces provided in this booklet. If you run out of space, use the additional pages at the back of the booklet, taking care to number the question(s) correctly.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

Question 6 is a quality of extended response (QER) question where your writing skills will be assessed.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**5**	
2.	**4**	
3.	**13**	
4.	**17**	
5.	**15**	
6.	**6**	
7.	**10**	
8.	**10**	
Total	**80**	

Answer ALL questions

1 **IMAGES 1.1A and 1.1B in the separate diagram booklet show two types of micro-organism.**

Complete TABLE 1.2 in the separate diagram booklet by placing a tick (✓) in the correct column for each statement. [5 marks]

5

2 **IMAGE 2 in the separate diagram booklet shows two different sources of stem cells.**

(a) **<u>UNDERLINE</u> which ONE of the following statements is the correct definition of a stem cell. [1 mark]**

A stem cell is a differentiated cell that can become specialised.

A stem cell is a specialised cell that can become undifferentiated.

A stem cell is an undifferentiated cell that can become specialised.

2 (b) Name the TWO types of stem cell shown in IMAGE 2. [2 marks]

TYPE A _____

TYPE B _____

(c) State ONE reason why some people disagree with the use of embryos as a source of stem cells. [1 mark]

_____

_____

_____

4

3 (a) TABLE 3.1 in the separate diagram booklet shows the classification of THREE species of badger.

(i) State the TWO species of badger that are most closely related.
Explain your answer. [2 marks]

3 (a)(ii) Use TABLE 3.1 to state the scientific name of the honey badger. [1 mark]

(iii) State ONE reason why scientists use scientific names instead of common names for organisms. [1 mark]

3 (a)(iv)

The honey badger is a vertebrate. State what is meant by the term vertebrate. [1 mark]

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Adaptation 1
How it helps them to survive
Adaptation 2
How it helps them to survive

3 (b) IMAGE 3.2 in the separate diagram booklet is a fact file about the honey badger.

Use the information in IMAGE 3.2 to describe TWO adaptations of the honey badger. Explain on the opposite page how each helps them survive. [2 marks]

3 (c) Suggest what would happen to the number of honey badgers if the number of lions increased. Explain your answer. [2 marks]

3 (d)(i)

State what is meant by INTRASPECIFIC COMPETITION.

[1 mark]

3 (d)(ii) List THREE resources for which ALL animals compete. [3 marks]

1. _____

2. _____

3. _____

13

4 (a) In Type 2 diabetes the body tissues do not respond to insulin.

- The main risk factors are obesity, lack of regular exercise, family history and age.

- The condition can be diagnosed by blood tests to measure glucose levels or by testing urine for glucose.

- There are no drugs that can cure Type 2 diabetes.

- However, a drug called metformin improves the response of the body tissues to insulin.

(Turn over)

4 (a)(i) Choose words from the list below to fill in the gaps in the sentences. [4 marks]

liver pancreas stomach
glycogen hormone starch

Insulin is a _____ that is produced in the _____ . It travels in the blood to the _____ and causes glucose to be converted to _____ .

4 (a)(ii) Use the information provided to complete TABLE 4.1 in the separate diagram book by writing TRUE or FALSE next to each of the statements. [4 marks]

(iii) Doctors may prescribe metformin tablets to help treat Type 2 diabetes. Suggest TWO LIFESTYLE CHANGES the doctor may also advise. [2 marks]

1. _____

2. _____

4 (b) GRAPH 4.2 in the separate diagram booklet shows the number of people with Type 2 diabetes per 1000 of the population between 2014 and 2024.

(i) Describe the trend shown in GRAPH 4.2 between 2014 and 2024.

[1 mark]

4 (b)(ii)

Use the information in GRAPH 4.2 to calculate the difference in the number of people with Type 2 diabetes per 1000 of the population between 2014 and 2024. [1 mark]

Difference per 1000 of the population between 2014 and 2024 = _____

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TURN OVER

$$\text{Percentage change} = \frac{\text{(Difference in the number of people with Type 2 diabetes in 2024 and 2014)}}{\text{(Number of people with Type 2 diabetes in 2014)}} \times 100$$

4 (b)(iii)

Use your answer to part (b)(ii) and the equation on the opposite page to calculate the percentage change in the number of people that have Type 2 diabetes per 1000 of the population between 2014 and 2024. [2 marks]

Space for working

Percentage change = _____

4 (b)(iv)

Use GRAPH 4.2 to estimate the number of people per 1000 of the population that will have Type 2 diabetes in 2026 if the current trend continues. Show on GRAPH 4.2 how you arrived at your answer. [1 mark]

Number of people per 1000 of the population that will have Type 2 diabetes in 2026 = _____

4 (c)(i)

UNDERLINE the chemical solution that can be used to test for glucose in urine. [1 mark]

Biuret reagent

Benedict's reagent **Iodine**

(ii) State what colour the solution would turn if the person had diabetes. [1 mark]

(Turn over)

5 The rock pocket mouse lives in a sandy desert in the United States. The mouse may be either light or dark in colour. A volcano erupted 1.7 million years ago and turned large parts of the desert into dark coloured rock. IMAGE 5.1 in the separate diagram booklet shows how two locations (A and B) in the desert could have looked before the volcano erupted.

IMAGE 5.2 in the separate diagram booklet shows how the mouse population might have changed over time after the volcano erupted.

5 (a) CIRCLE the cause of the changed rock colour in location B from the list below. [1 mark]

flooding volcanic eruptions

human activities forest fires

5 (b) TABLES 5.3 and 5.4 in the separate diagram booklet show the number of light and dark coloured mice over time.

(i) Use IMAGE 5.2 to complete TABLE 5.4. [2 marks]

(ii) Use the information in TABLE 5.4 to complete GRAPH 5.6 in the separate diagram booklet for Location B by

I. adding the axes labels; [1 mark]

II. adding a scale to both axes; [1 mark]

III. drawing bars for each of the results. [2 marks]

Location A has been done for you on GRAPH 5.5 in the separate diagram booklet.

5 (b)(iii)

State what happened over time to the number of LIGHT COLOURED mice at

I. location A; [1 mark]

II. location B. [1 mark]

5 (c)(i) A mutation caused the dark-coloured mice to appear in a population of light coloured mice.
Define the term MUTATION. [1 mark]

5 (c)(ii) Suggest and explain why the dark coloured mice had an advantage in Location B. [2 marks]

5 (c)(iii)

Suggest what will happen to the number of light coloured mice in Location **B** in the future. [1 mark]

5 (c)(iv)

The change in colour over time is an example of natural selection or survival of the fittest.

Tick (✓) the boxes next to the TWO scientists who developed the theory of natural selection. [2 marks]

- ☐ Gregor Mendel
- ☐ Charles Darwin
- ☐ Carl Linnaeus
- ☐ Alfred Wallace
- ☐ Alexander Fleming

15

6 **IMAGE 6 in the separate diagram booklet shows the stages of genetically modifying a soya bean crop plant to become herbicide resistant.**

Use IMAGE 6 to describe what is happening in each of the stages 1–7 during the process of genetic modification.
Include ONE advantage and ONE disadvantage of genetically modified (GM) crops in your answer.
[6 marks QER]

continue answer on next page

continue answer on next page

continue answer on next page

33

6

(Turn over)

7 IMAGE 7.1 in the separate diagram booklet shows a set of chromosomes from a human male body cell.

(a)(i) State the number of chromosomes in a human body cell. [1 mark]

(ii) Draw a CIRCLE around the sex chromosomes in IMAGE 7.1. [1 mark]

7 (b) IMAGES 7.2A and 7.2B in the separate diagram booklet show male and female lions.

(i) Complete the Punnett square below to show possible offspring when the male lion (XY) and the female lion (XX) mate. [2 marks]

(ii) State the expected ratio of male : female lions in the offspring. [1 mark]

_____ : _____

7 (b)(iii)

State whether it is the male or female lion that determines the sex of the offspring. Explain your answer.
[2 marks]

7 (c) Lions have 38 chromosomes in their body cells.

(i) State how many chromosomes there are in a SEX CELL of a lion. [1 mark]

(ii) State the scientific name for sex cells. [1 mark]

(iii) Name the type of cell division that produces sex cells. [1 mark]

10

8 A class of year 11 boys were investigating reaction time. The students suggested the following hypothesis:

"Year 11 students have faster reaction times than teachers"

A computer program was used to record the reaction time. Each individual had to press a button on the keyboard when the screen turned green (IMAGE 8.1 in the separate diagram booklet). Each individual had three attempts and the mean value was recorded.

(a)(i) State the stimulus and the receptor involved in this investigation.
[2 marks]

Stimulus: _____

Receptor: _____

8 (a)(ii) Describe how the information travels from the RECEPTOR to the CENTRAL NERVOUS SYSTEM. [2 marks]

8 (b) The results for the students are shown in TABLE 8.2 in the separate diagram booklet and the teachers in TABLE 8.3 in the separate diagram booklet.

(i) Complete TABLE 8.3 by calculating the mean reaction time for the teachers TO THE NEAREST WHOLE NUMBER. [2 marks]
Space for working.

8 (b)(ii)

Evaluate the extent to which the results in TABLES 8.2 and 8.3 support the students' hypothesis. [2 marks]

You should do this by giving:

- ONE piece of evidence that supports the hypothesis
- ONE piece of evidence that does not support the hypothesis

Evidence that supports hypothesis

question continues

8 (b)(ii) continued

Evidence that does not support the hypothesis

(iii) State ONE variable that should have been controlled in this investigation. [1 mark]

8 (b)(iv)

State ONE way that the students could have increased their confidence in their results. [1 mark]

10

END OF PAPER

Question number	Additional page, if required. Write the question numbers in the left-hand margin.

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FRIDAY, 10 MAY 2024 – MORNING

BIOLOGY – Unit 2: Variation, Homeostasis and Micro-organisms FOUNDATION TIER

1 hour 45 minutes plus your additional time allowance

DIAGRAM BOOKLET

This Diagram Booklet MUST be handed in to the invigilators and sent for marking.

Surname _____

First name(s) _____

Centre Number _____

Candidate Number 0 _____

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IMAGE 1.1A

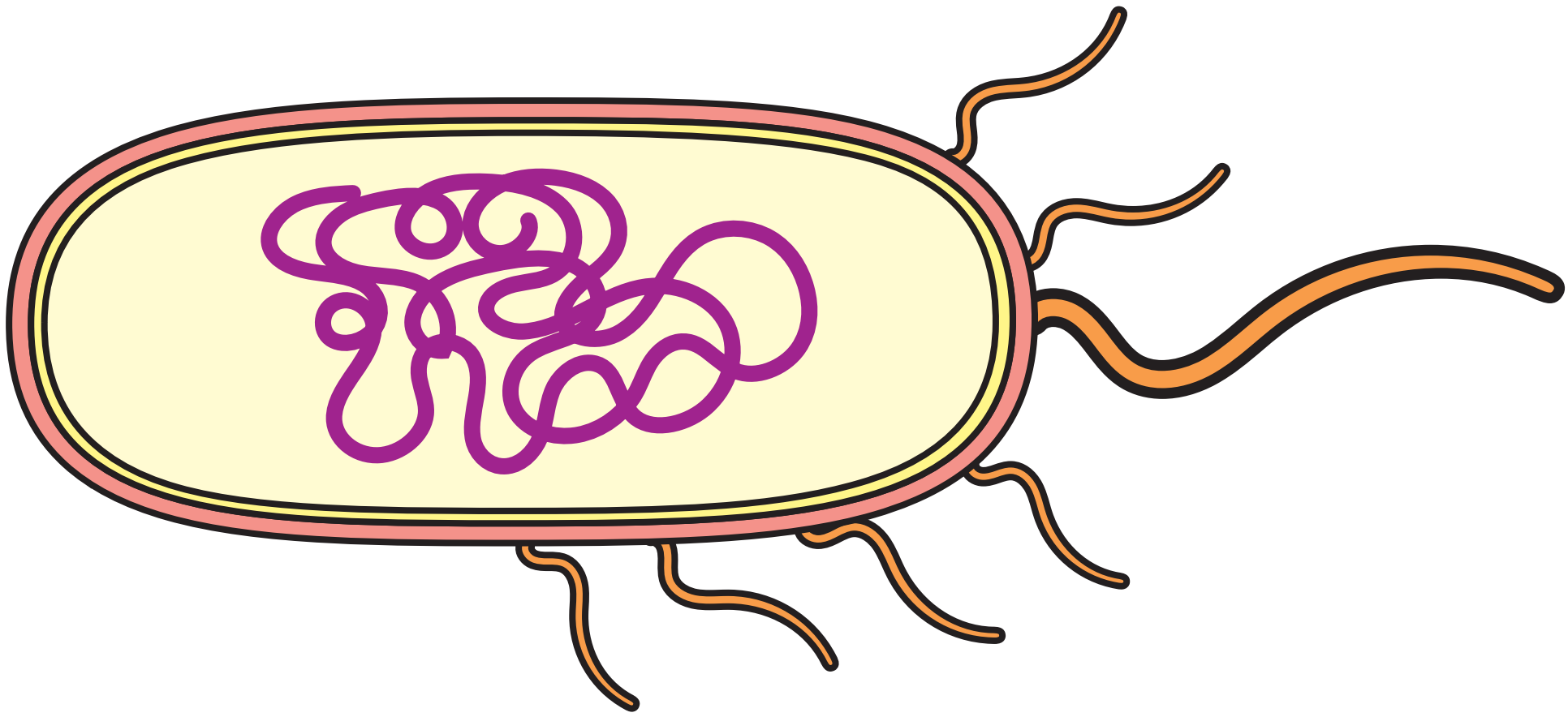


IMAGE 1.1B

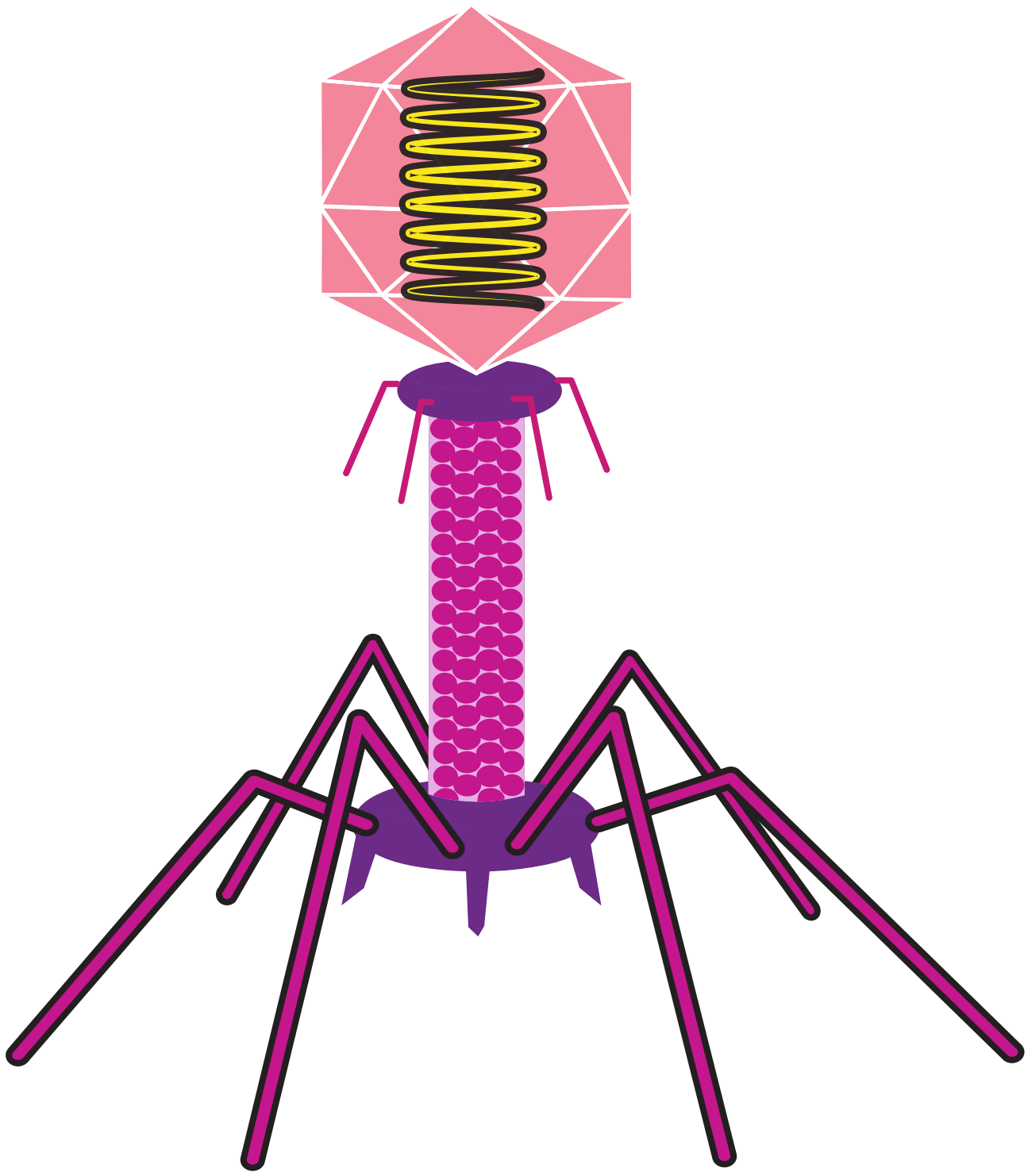
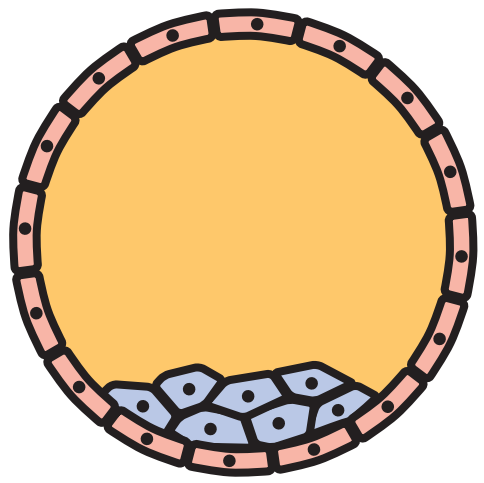


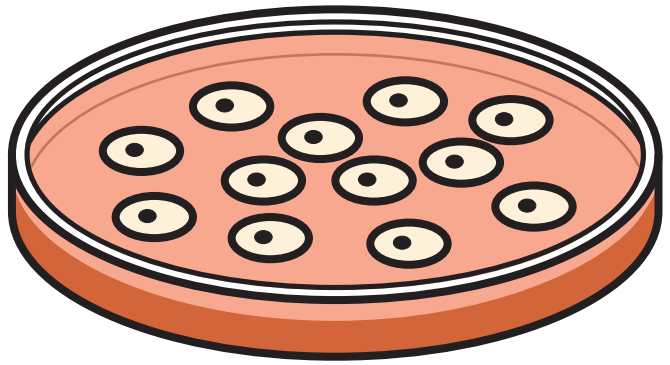
TABLE 1.2

Statement	Type of micro-organism	
	bacterium	virus
Type of micro-organism in IMAGE 1.1A		
Type of micro-organism in IMAGE 1.1B		
Type of micro-organism that causes chlamydia		
Type of organism that contains genes surrounded by a protein coat		
Type of organism that may be killed by antibiotics		
Type of micro-organism that causes AIDS		

IMAGE 2



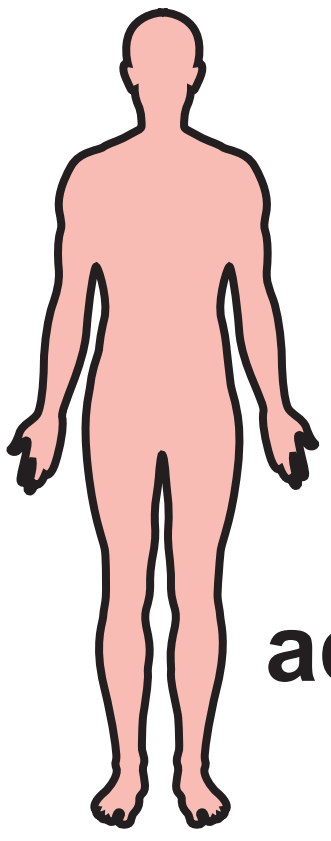
embryo



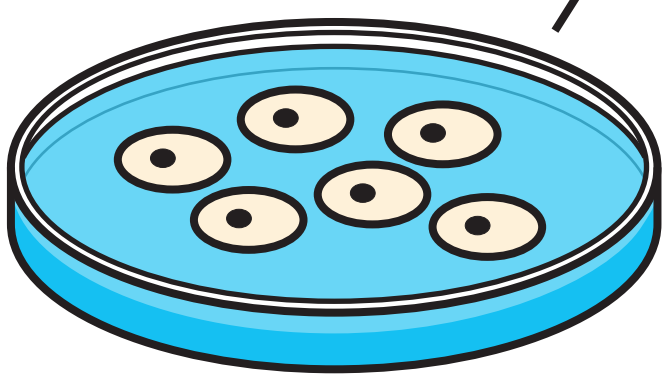
TYPE A stem cells

Differentiation

- liver
- lung
- intestines
- neurone
- skin
- heart
- muscle
- kidney



adult



TYPE B stem cells

TABLE 3.1

	Species of badger		
Classification	**European**	**Honey**	**Asian**
Kingdom	**Animal**	**Animal**	**Animal**
Phylum	**Vertebrate**	**Vertebrate**	**Vertebrate**
Class	**Mammal**	**Mammal**	**Mammal**
Order	**Carnivore**	**Carnivore**	**Carnivore**
Family	**Mustelidae**	**Mustelidae**	**Mustelidae**
Genus	**Meles**	**Mellivora**	**Meles**
Species	**meles**	**capensis**	**leucurus**

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IMAGE 3.2

Common names: honey badger, ratel, honey ratel

Body length: approximately 70 cm (males bigger than females)

Habitat: varies from desert to rainforest

Diet includes: insect larvae, scorpions, lizards, rodents, birds, snakes, foxes and wild cats

Predators include: lion, leopard, humans

IMAGE 3.2 continued

Other facts:

- **Their skin is very tough. This makes it hard for snakes to bite.**

- **They live on their own most of the time. This reduces intraspecific competition.**

- **They hunt for their own food but they will also steal prey from other carnivores.**

- **Their sharp teeth and long claws allow them to easily rip meat from bone.**

TABLE 4.1

Statement	True / False
Type 2 diabetes is caused by too much insulin being produced.	_____
Metformin works by reducing the response of the body tissues to insulin.	_____
Being overweight is a risk factor for Type 2 diabetes.	_____
Type 2 diabetes can be cured with medication.	_____
Only lifestyle choices affect the risk of developing Type 2 diabetes.	_____

GRAPH 4.2

Number of people with Type 2 diabetes per 1000 of the population

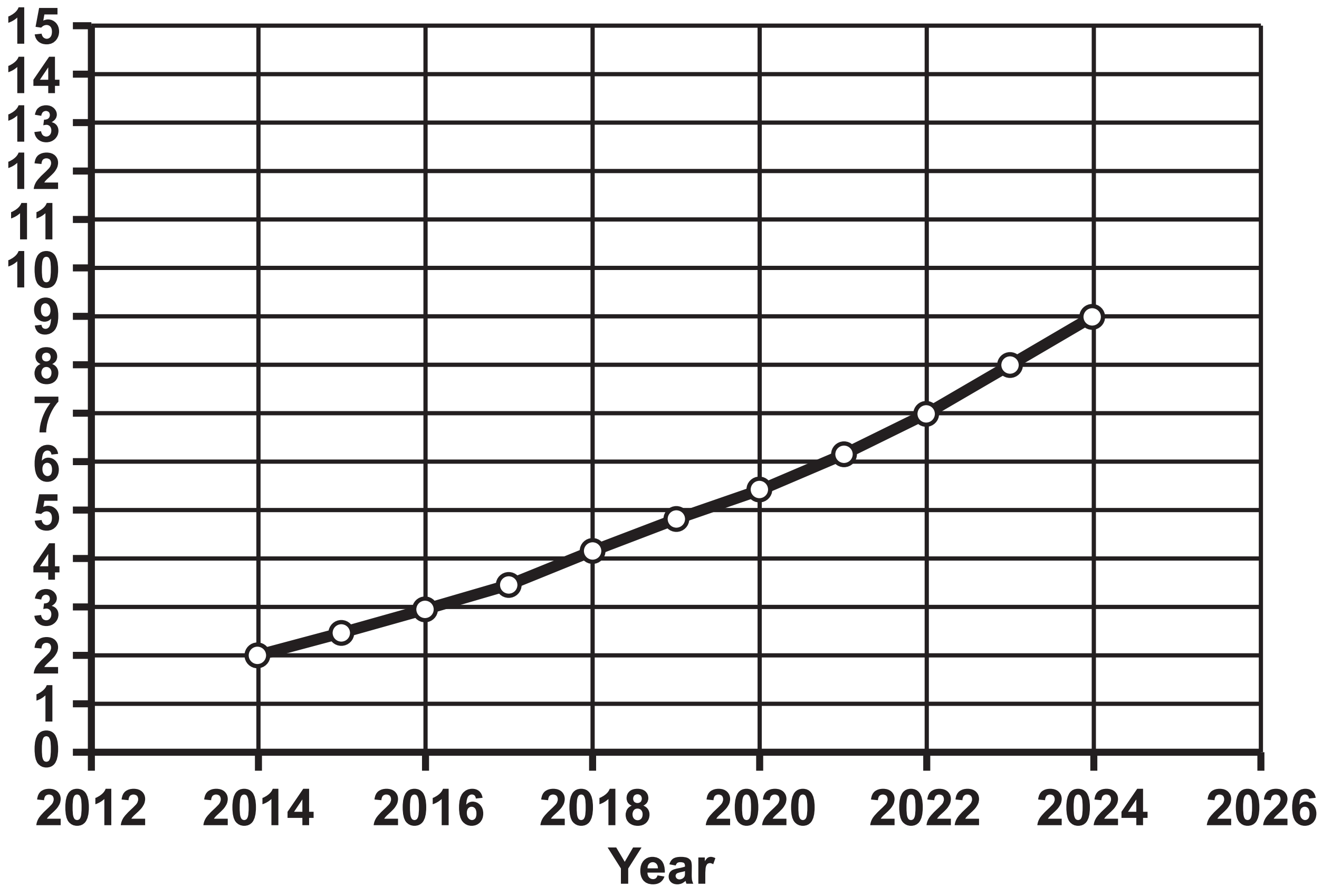
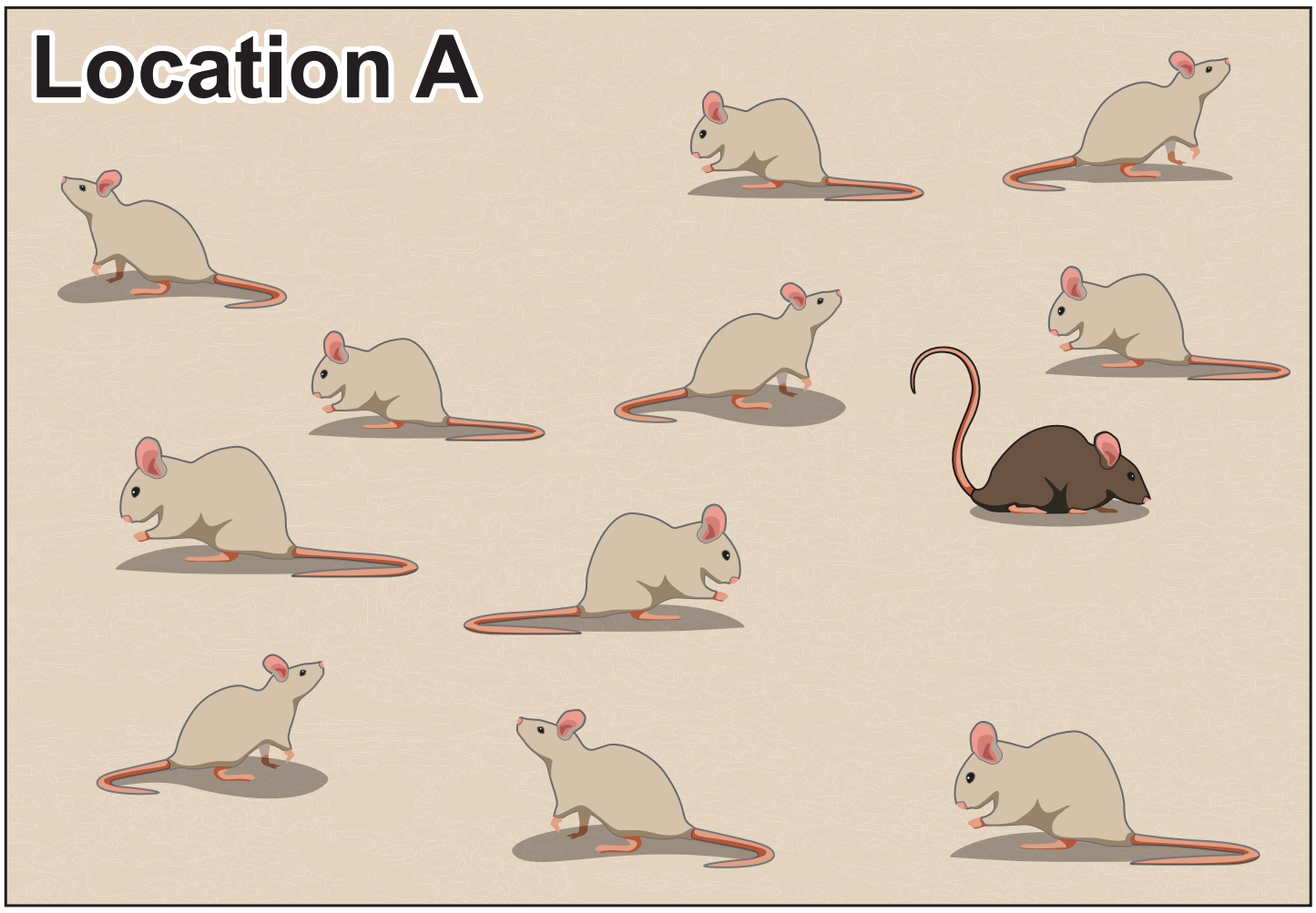


IMAGE 5.1



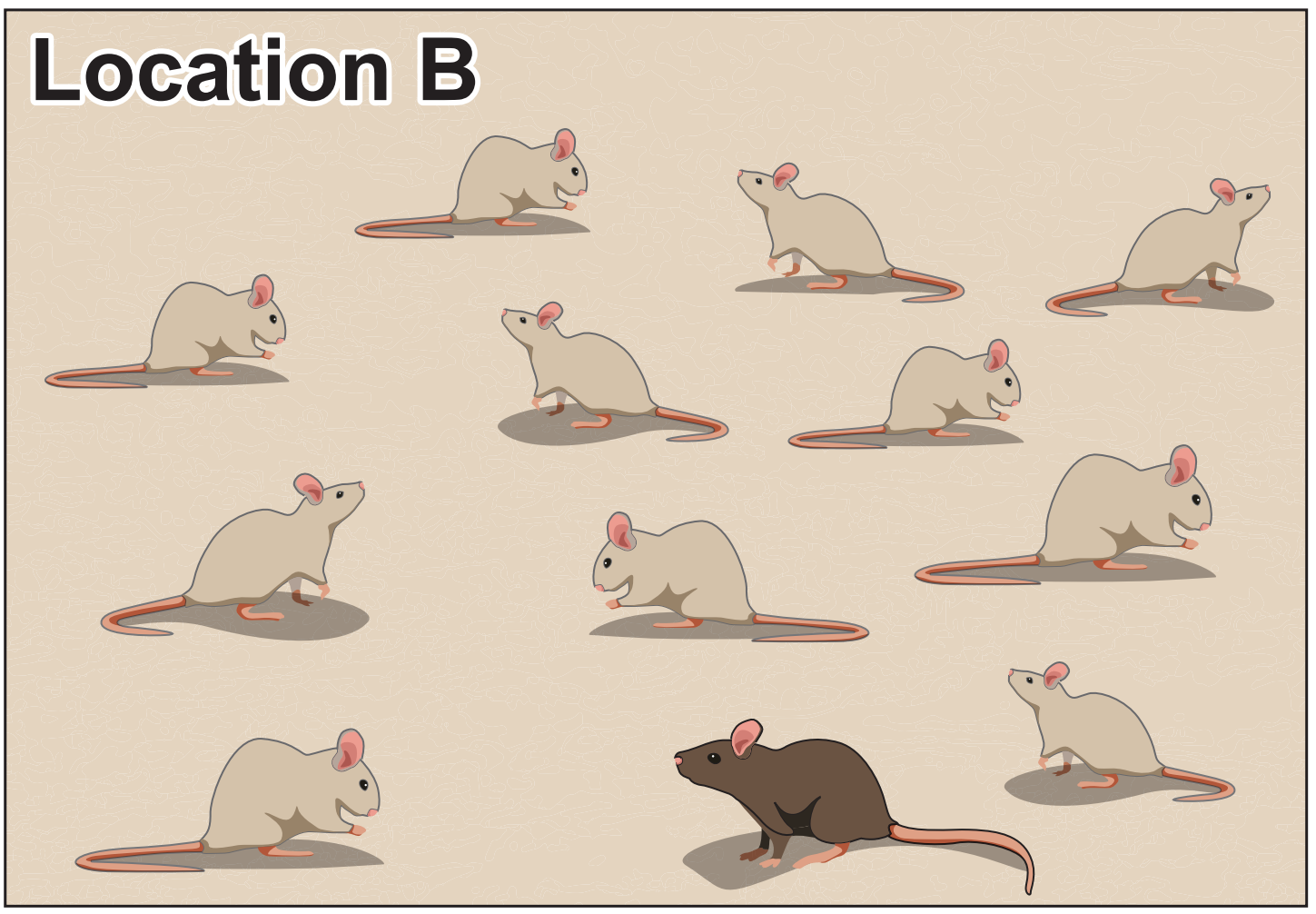


IMAGE 5.2

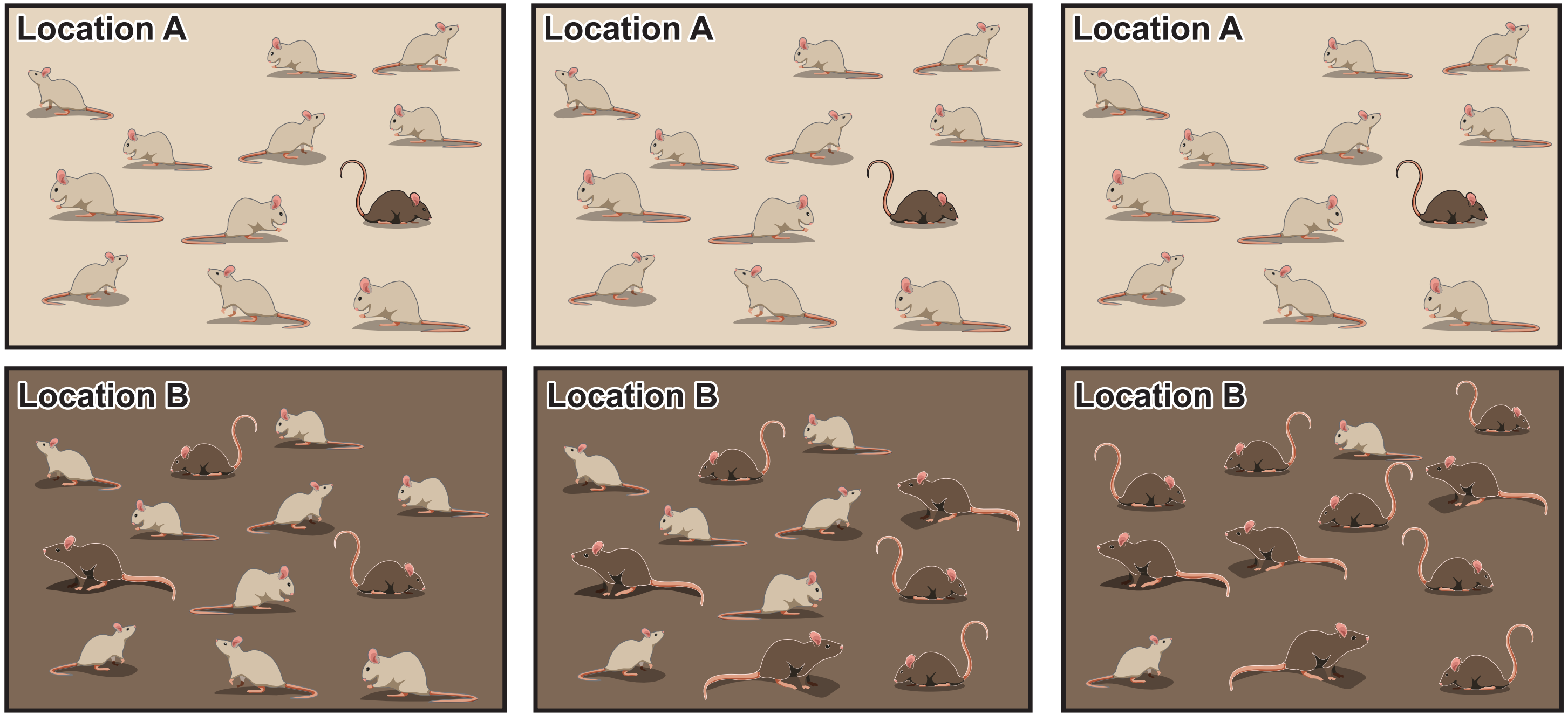

Location A
Location A
Location A
Location B
Location B
Location B
1.7 million years ago
1.6 million years ago
1.5 million years ago

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TABLE 5.3 – Location A

	Number of mice in Location A		
Time period (million years ago)	light coloured	dark coloured	Total
1.7	11	1	12
1.6	11	1	12
1.5	11	1	12

TABLE 5.4 – Location B

	Number of mice in Location B		
Time period (million years ago)	light coloured	dark coloured	Total
1.7	9	3	_____
1.6	_____	6	12
1.5	2	_____	12

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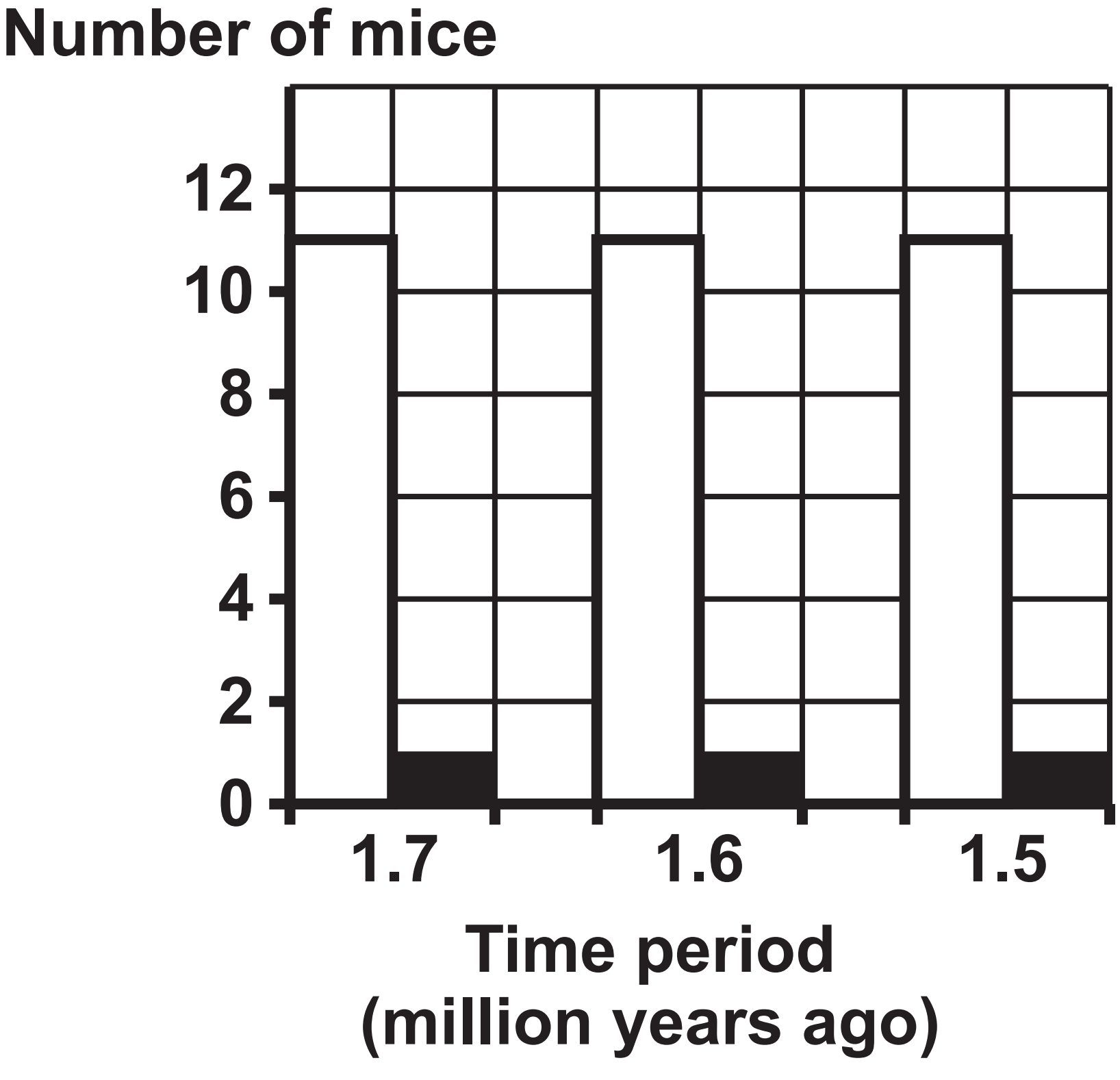
GRAPH 5.5 – Location A

KEY:

light coloured mice

dark coloured mice



GRAPH 5.6 – Location B

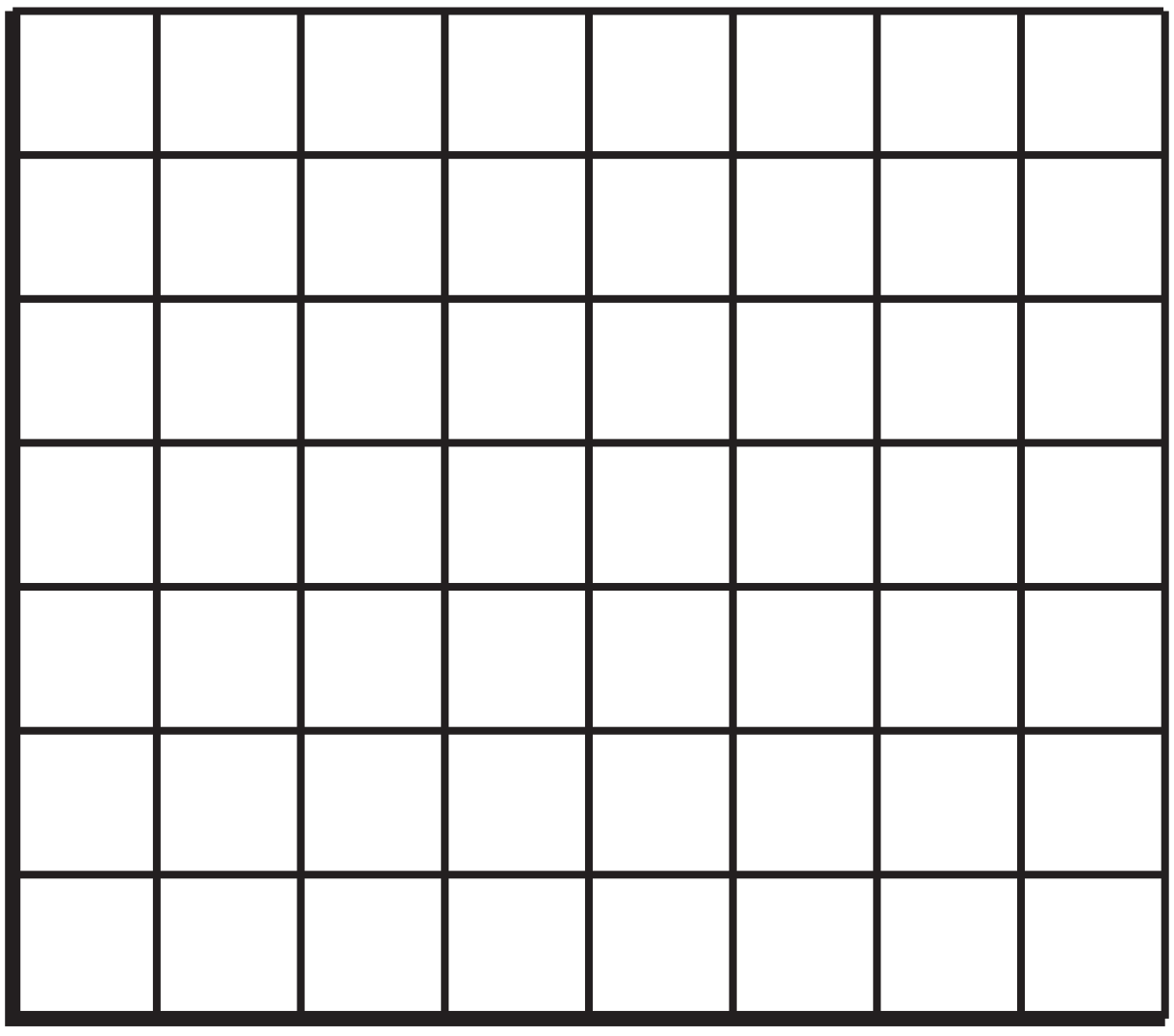


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IMAGE 6

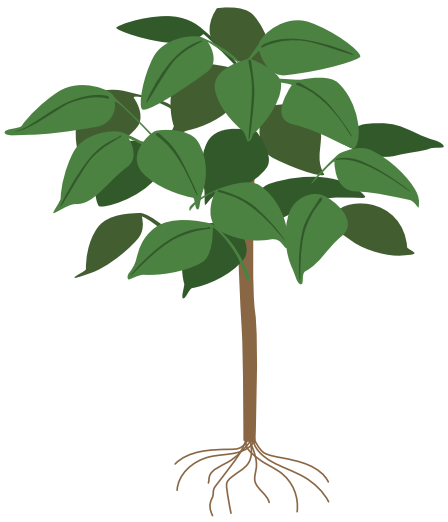
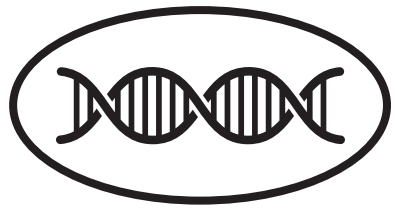
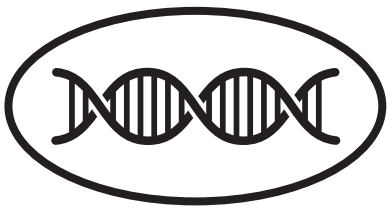
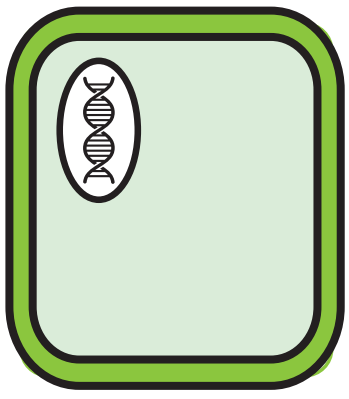
Stage 1	herbicide resistant plant  →  cell
Stage 2	 cell →  extracted DNA
Stage 3	 extracted DNA →  →  herbicide resistant gene
Stage 4	 soya bean plant cell →  DNA from soya bean plant

IMAGE 6 continued

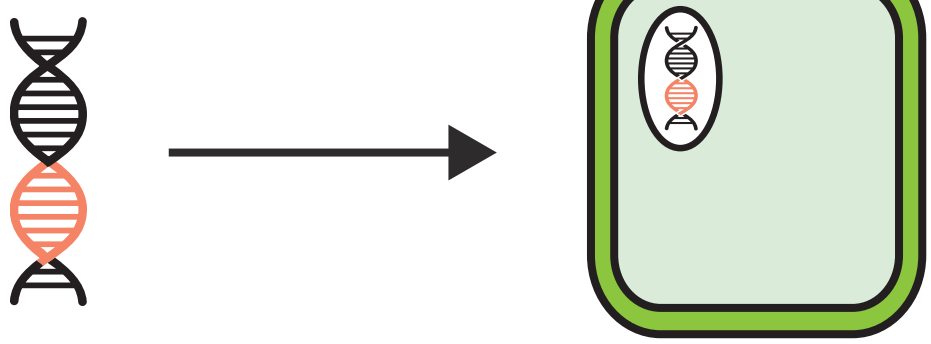
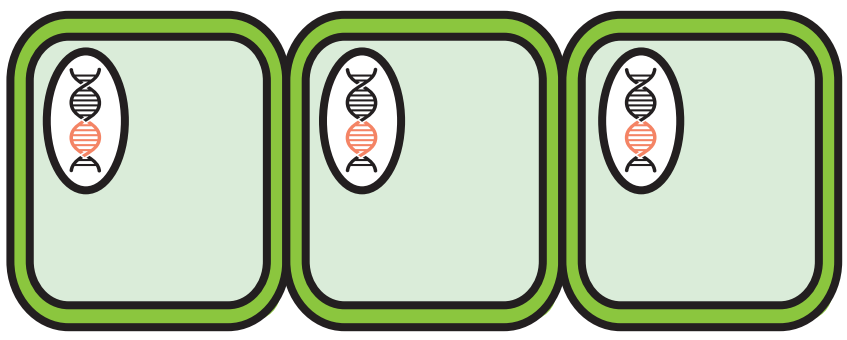
Stage 5	herbicide resistant gene  DNA from soya bean plant
Stage 6	 genetically modified soya bean plant cell
Stage 7	 cell division  genetically modified soya bean plant cell

IMAGE 7.1

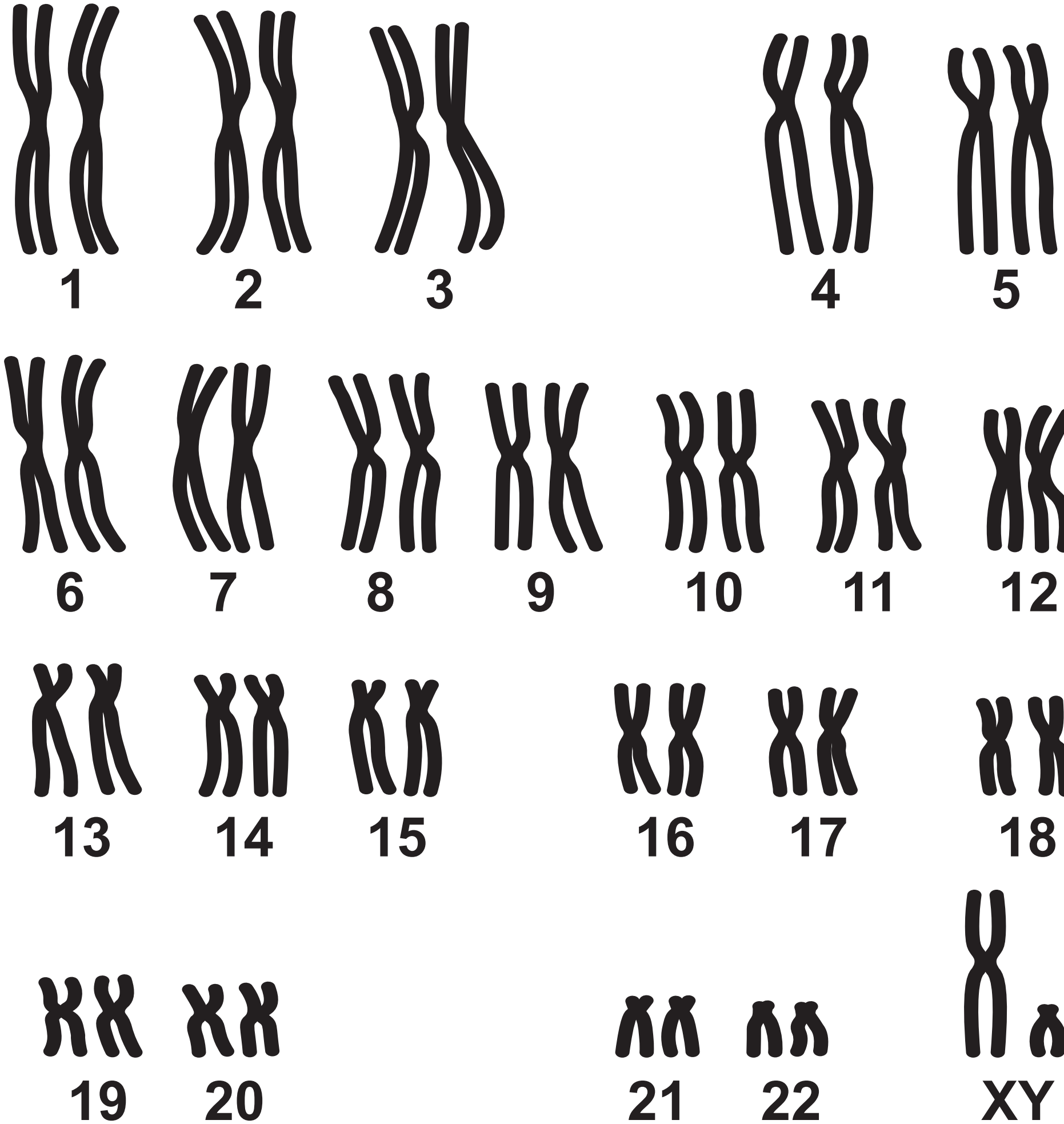


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IMAGE 7.2A

IMAGE 7.2B

IMAGE 8.1

TABLE 8.2

Name	Age	Reaction time (ms)
Rhidian	15	382
Iestyn	15	412
Reuben	15	375
James	15	399
Harvey	15	401
		Mean reaction time = 394

TABLE 8.3

Name	Age	Reaction time (ms)
Miss Williams	42	479
Mr Davies	32	391
Mrs Wilcox	37	415
Mr Jones	55	475
Mrs Evans	48	431
		Mean reaction time = _____