

Q1. Choose words from this list to complete the sentences below.

coal dinosaurs extinct fossils rocks

Many animals and plants which once existed have died out.

They are now

We know about them because their remains formed

..... which are found in

(Total 4 marks)

Q2. In sexual reproduction, an egg fuses with a sperm.

(a) (i) Draw a ring around the correct answer to complete the sentence.

An egg and a sperm fuse together in the process of

cloning. fertilisation. mitosis.
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(1)

(ii) Egg cells and sperm cells each contain the structures given in the box.

chromosome	gene	nucleus
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List these three structures in size order, starting with the smallest.

1 (smallest)

2

3 (largest)

(2)

(iii) The egg and the sperm contain genetic material.

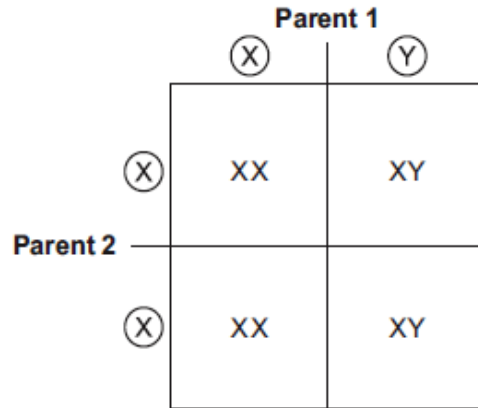
Draw a ring around the correct answer to complete the sentence.

The genetic material is made of

carbohydrate. DNA. protein.

(1)

(b) The diagram below shows the inheritance of X and Y chromosomes.



(i) Draw a tick (✓) on the part of the diagram that shows a sperm cell.

(1)

(ii) What is the chance of having a female child?

Give the reason for your answer.

.....

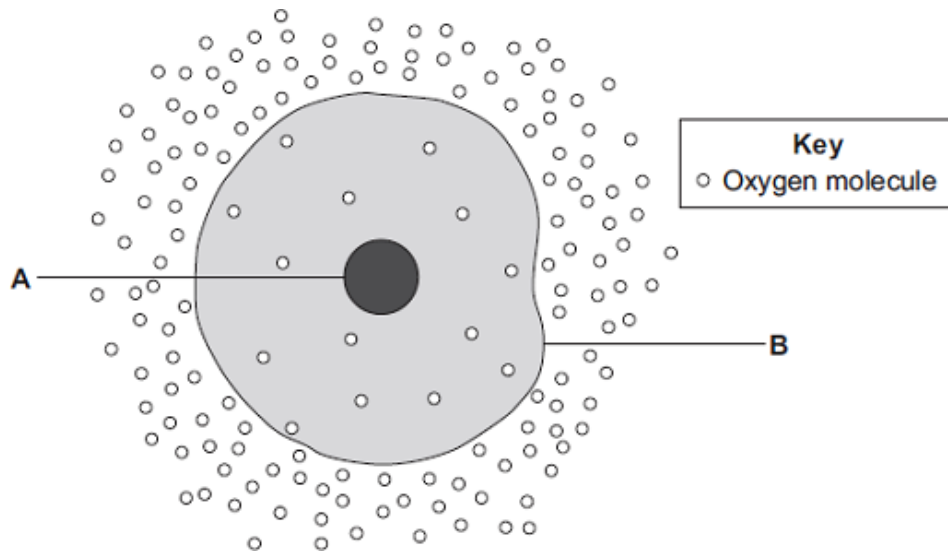
.....

.....

.....

(2)
(Total 7 marks)

Q3. The diagram shows a cell.



(a) (i) Use words from the box to name the structures labelled **A** and **B** .

cell membrane	chloroplast	cytoplasm	nucleus
---------------	-------------	-----------	---------

A

B

(2)

(ii) The cell in the diagram is an animal cell.

How can you tell it is an animal cell and **not** a plant cell?

Give **two** reasons.

1

.....

2

.....

(2)

(b) Oxygen will diffuse into the cell in the diagram.

Why?

Use information from the diagram.

.....

.....

(1)

- (c) The cell shown in the diagram is usually found with similar cells.
 Draw a ring around the correct answer to complete the sentence.

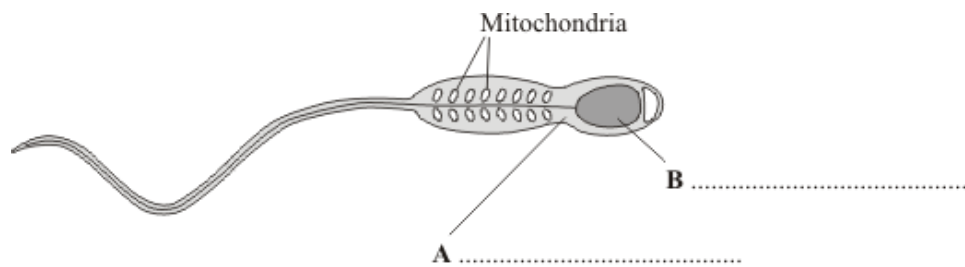
Scientists call a group of similar cells

- | |
|-------------------------------------|
| an organ.
a system.
a tissue. |
|-------------------------------------|

(1)
 (Total 6 marks)

Q4. This question is about cells.

- (a) (i) The diagram shows a sperm cell.

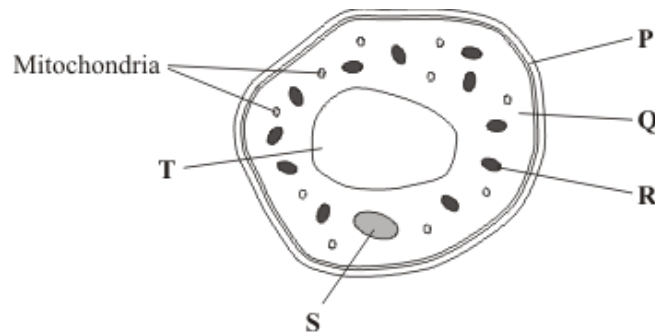


Use words from the box to label parts **A** and **B**.

- | | | |
|---------------|-----------|---------|
| cell membrane | cytoplasm | nucleus |
|---------------|-----------|---------|

(2)

- (ii) The diagram shows a cell from a leaf.



Give the letters of **two** parts of the leaf cell which would **not** be found in a sperm cell. and .

(1)

(b) Sperm cells have many mitochondria.

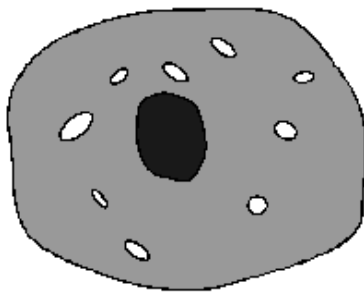
Why do sperm cells need many mitochondria?

Tick (✓) **one** box.

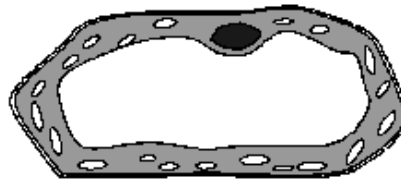
Sperm cells are involved in fertilisation.	<input type="checkbox"/>
Sperm cells are produced in very large numbers.	<input type="checkbox"/>
Sperm cells need a lot of energy to swim.	<input type="checkbox"/>

(1)
(Total 4 marks)

Q5. The diagrams show a cheek cell from a human and a leaf cell from a plant.



Cheek cell



Leaf cell

(a) The two cells have a number of parts in common.

(i) On the cheek cell, label **three** of these parts which both cells have.

(3)

(ii) In the table, write the names of the **three** parts you have labelled above and describe the main function of each part.

Part	Function
.....	
.....	
.....	

(3)

(b) Blood contains white cells and red cells. State the function of each type of cell in the blood.

White cells

.....

Red cells

.....

(2)
(Total 8 marks)

Q6. An animal called *Tiktaalik* became extinct about 360 million years ago.

The photograph shows the fossilised skeleton of *Tiktaalik* and a model of what scientists think *Tiktaalik* looked like.

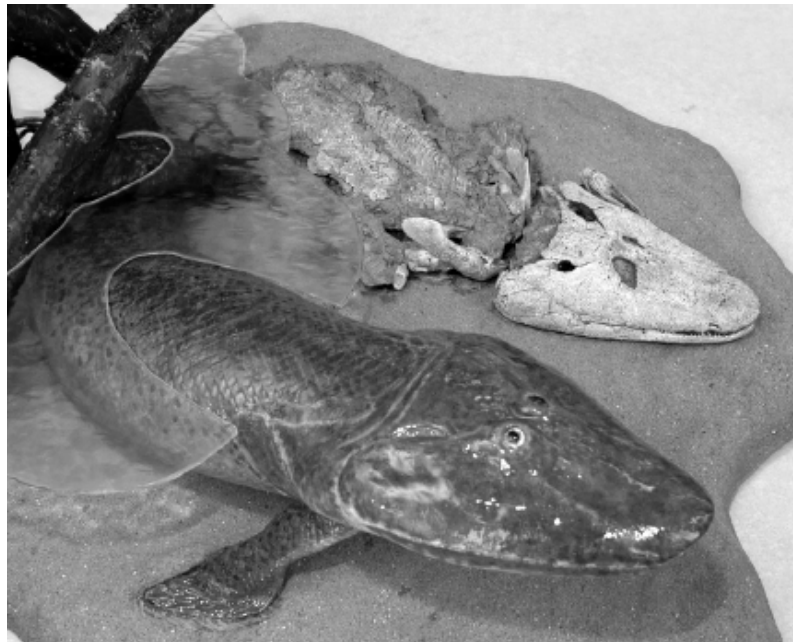


Image © University of Chicago, Shubin Lab. Model by Tyler Keillor

(a) Scientists found only the fossilised skeleton of *Tiktaalik*.

Explain why.

.....

.....

.....

.....

(2)

- (b) Scientists think that *Tiktaalik* lived mostly in water, but that it was one of the first animals to be able to move onto land.

Use evidence from the photograph to suggest why.

.....

.....

.....

.....

(2)
(Total 4 marks)

Q7. In the 1850s, Gregor Mendel carried out breeding experiments using peas.

- (a) The importance of Mendel's work was not recognised until the early 1900s.

Explain why.

.....

.....

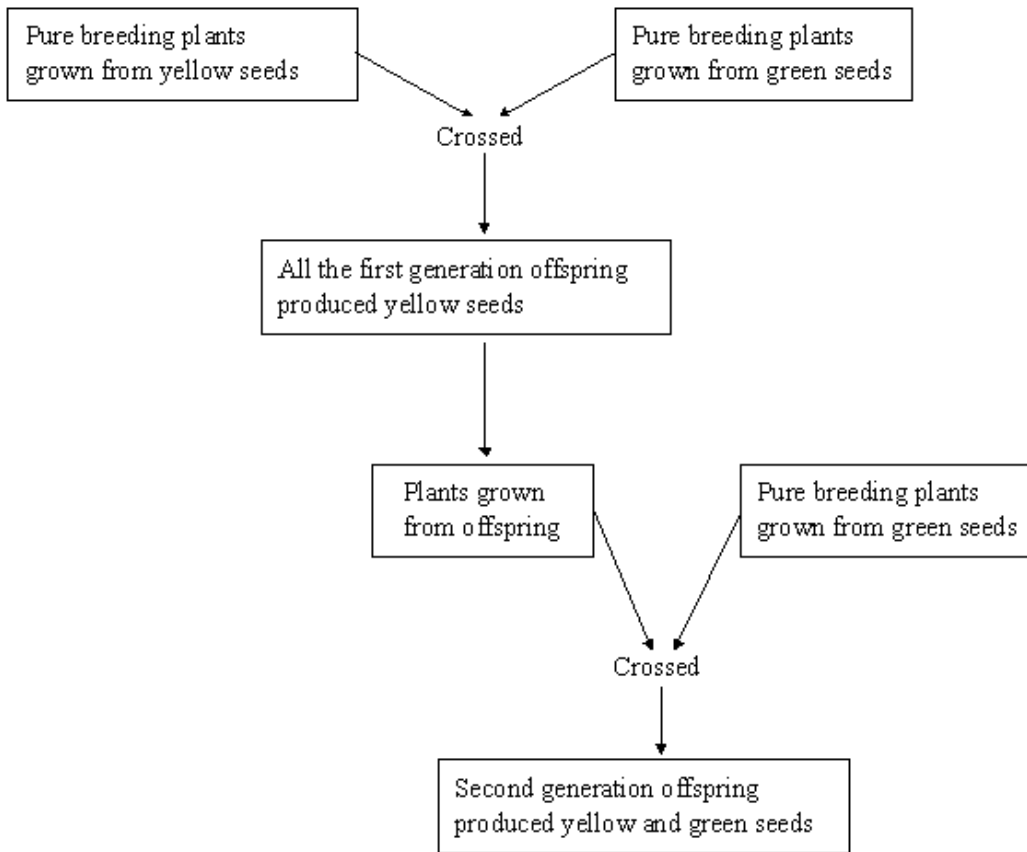
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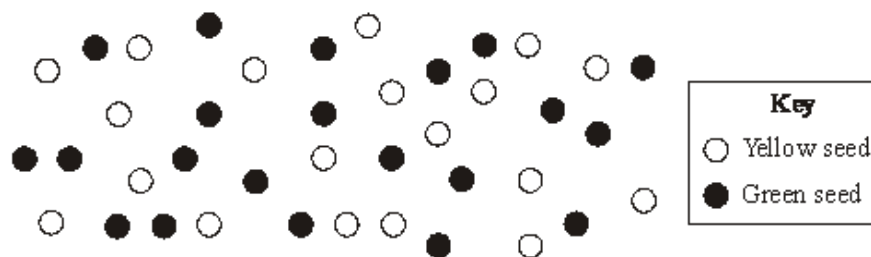
(2)

(b) A student repeated one of Mendel's experiments.

The flow chart shows her procedure.



The diagram shows a representative sample of seeds produced by second generation plants.



(i) Describe how the student could obtain a sample that is representative of seeds produced by the second generation.

.....
.....

(1)

(ii) What was the approximate ratio of yellow seeds to green seeds in the seeds produced by the second generation?

.....

(1)

(iii) Seed colour in peas is controlled by a single gene which has two alleles.

Use a genetic diagram to show why this ratio of yellow seeds to green seeds was produced by the second generation.

Use the symbol **A** to represent the dominant allele, and **a** to represent the recessive allele.

(4)
(Total 8 marks)

##

Many islands in the Indian and Pacific oceans have or used to have large flightless birds like the dodo on Mauritius and the kiwi on New Zealand.



- * Scientists think that birds on these islands came from elsewhere.
- * Birds were able to fly to the islands.
- * Birds living on islands may get blown out to sea and drown.
- * Flying uses up lots of energy.
- * Large birds find it difficult to fly.
- * Islands in the middle of oceans had no mammal predators.

(a) Use this information to suggest how flightless birds evolved on different islands.

.....

.....

.....

.....

.....

.....

.....

.....

(6)

- (b) This evolution of the kiwi could not have occurred unless there was some variation between the birds.

Suggest **two** factors which could produce this range of variation.

1

.....

2

.....

(2)
(Total 8 marks)

- Q9.** (a) Mice with black fur can have the genotype **BB** or **Bb**, whilst mice with brown fur have the genotype **bb**.

- (i) Use a genetic diagram to show what fur colours you would predict in the F1 offspring produced by two mice who are both **Bb**.

(3)

- (ii) Why might your prediction of fur colour in the F1 generation **not** be proved right?

.....

.....

(1)

- (b) Using the example in part (a) to help:

- (i) describe the difference between dominant and recessive alleles;

.....

.....

.....

.....

(2)

(ii) describe the difference between alleles and genes;

.....
.....
.....
.....

(2)

(iii) describe the difference between homozygous and heterozygous chromosomes.

.....
.....
.....
.....

(2)

(Total 10 marks)

M1. fossils

gains 1 mark

but

extinct

gains 2 marks

fossils
rocks/coal

each for 1 mark

[4]

M2. (a) (i) fertilisation

1

(ii) in sequence:

accept 1 next to gene, 2 next to chromosome and 3 next to nucleus in box

1 gene
2 chromosome
3 nucleus

*allow 1 mark for smallest **or** largest in correct position*

2

(iii) DNA

1

(b) (i) On diagram:

tick drawn next to **X** and / or **Y** from Parent 1

tick(s) must be totally outside grid squares

allow ticks around "parent"

extra ticks elsewhere cancel

1

(ii) 0.5 / ½ / 50% / 1:1 / 50:50 / 1 in 2

allow 2/4 / 2 in 4 / 2 out of 4 / 'even(s)' / 'fifty – fifty'

*do **not** allow 1:2 or '50 / 50' or '50 – 50'*

1

2 (out of 4) boxes are **XX**

or

half of the sperm contain an **X**-chromosome

*allow **XY** is male and 2 (out of 4) boxes are **XY***

1

[7]

- M3.** (a) (i) A = nucleus 1
- B = (cell) membrane 1
- (ii) any **two** from:
ignore shape
- no (cell) wall
 - no (large / permanent) vacuole
 - no chloroplasts / chlorophyll 2
- (b) because high to low oxygen / concentration **or** down gradient
allow 'more / a lot of oxygen molecules outside'
ignore along / across gradient 1
- (c) a tissue 1
- [6]**

- M4.** (a) (i) A cytoplasm
accept clear indications 1
- B nucleus 1
- (ii) any **two** from:
two required for 1 mark
- P
 - R
 - T
accept lower case letters 1
- (b) sperm cells need a lot of energy to swim 1
- [4]**

- M5.** (a) (i) the three features correctly labelled on cheek cell (which are referred to in part (ii))
label lines should touch or end very close to part no marks if leaf cell labelled

nucleus

cytoplasm

cell membrane

mitochondrion

accept mitochondria or one of these could be labelled vacuole

3

- (ii) any **three** from

feature	function
nucleus	controls cell <i>accept contains genetic material or genes or chromosomes or stores information do not credit the brain of the cell</i>
cytoplasm occurs	where respiration occurs <i>accept contains food or mitochondria or reactions occurs</i>
membrane chemicals	less water or <i>accept surrounds the cell or lets some things in but not others do not credit keeps things out or protection in and or out</i>
mitochondria	where energy released <i>ecf from leaf cell labelling accept chloroplasts make sugar or glucose accept vacuole contains sap accept if cell wall mis labelled on cheek cell, support or hold together</i>

3

(b) fight **or** ingest **or** kill bacteria **or** germs **or** viruses **or** microbes
accept produce antitoxins or antibodies fight disease (organisms)
do not credit fungus

1

(transport) oxygen **or** carry haemoglobin
*accept transport carbon dioxide **or** helps form scabs*

1

[8]

M6. (a) (soft) body parts / other parts / named parts
accept flesh

1

decayed / decomposed / rotted / eaten

or

bones do not decay / decompose / rot / get eaten
ignore disintegrated / dissolved
ignore microorganisms

1

(b) any **one** aquatic feature from: eg

- streamlined body shape
- long tail
- eyes on top of head
- scales
- fins / paddles / flippers / webbed feet
ignore gills

1

any **one** terrestrial feature from:

- (front) legs / limbs / hands
- could lift front end upwards
ignore feet
accept for 2 marks eg fin / flipper can be used for walking
***or** fins like legs*

1

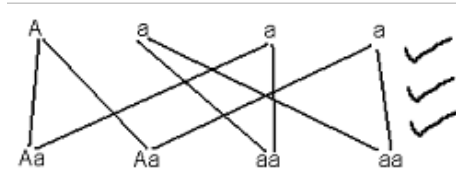
[4]

- M7.** (a) any **two** from:
accept other logical / reasonable ideas
- other scientists not aware of his work
 - chromosomes / DNA / genes not seen / discovered / known
do not accept there was no interest in genetics
 - other theories accepted at the time
 - not considered to be a scientist / not eminent / respected
allow 'he was just / only a monk'
- 2
- (b) (i) random selection
accept a method of achieving random selection
eg "take a handful"
if number given, minimum 20
- 1
- (ii) any **one** from:
- 1:1 / one to one
 - 19:21
accept any ratio to give correct answer, eg "50:50"
do not accept 21:19 unqualified
- 1
- (iii) A + a as gametes from 1st parent
- 1
- a + a as gametes from 2nd parent
allow a alone
- 1
- (offspring / 2nd generation) Aa aa
offspring must be derived from correct gametes
- correct identification of yellow (Aa)
other symbols correctly used can gain full marks
- 1
- or**
- green (aa) (if both given, both must be correct)
ignore references to previous generations
if no other marks awarded, both correct parental genotypes given
gains 1 mark

examples of award of first three marks

	a	a	✓ ✓ ✓
A	Aa	Aa	
a	aa	aa	

	A	a	✓ X X
A	AA	Aa	
a	Aa	aa	



	B	b	✓ ✓ ✓
b	Bb	bb	
b	Bb	bb	

1

[8]

- M8.** (a) *ideas that*
- birds reached islands by flying
 - some variation between these birds
 - flight not needed to escape predators
 - flight uses energy
 - flight could result in death by drowning
 - so non-flying birds favoured by natural selection or better chance to survive and breed
 - so larger birds at an advantage
 - any six for 1 mark each

6

(b) *idea*

- large number of genes per characteristic
- large range of alleles/large gene pool

(credit for these points not to be given if they are made in (a))

- mutation(s)

(credit idea of inheritance and environment as the two factors with 1 mark)

any two for 1 mark each

2

[8]

M9. (a) (i) gametes i.e. B b and B b

1

correct combination of genotypes i.e. BB, Bb, Bb, bb

1

correct analysis of phenotypes i.e. 3 black fur 1 with brown fur

1

- (ii) award one mark for the recognition that it is down to chance (which two gametes fuse) and not simply 'because it's a prediction'

*do **not** accept mutation*

1

(b) (i) **B** is dominant/ an allele is dominant if it is expressed in the heterozygous phenotype
candidates are likely to use a variety of ways of expressing their ideas

1

b is recessive/ a recessive allele is not expressed in the presence of its contrasting allele

*do **not** accept powerful*

*do **not** accept stronger*

1

- (ii) alleles are different forms of a gene controlling a characteristic and occupying the same site on homologous chromosomes (e.g. B or b)

1

genes are the units of DNA/sites on chromosomes carrying the information that determines characteristics (e.g. bB)

1

(c) homozygous: BB / bb / possessing a pair of identical alleles for a character/true breeding

give credit to an explanation using a diagram

1

heterozygous: Bb / carrying a pair of contrasting/different alleles for a characteristic

do **not** accept references to xx, xy

do **not** accept gene by itself

1

[10]

