



Exampro GCSE Biology

B2.5 Inheritance
Foundation tier

Name:

Class:

Author:

Date:

Time: 76

Marks: 76

Comments:

Q1. (a) (i) Mitosis and meiosis are types of cell division.

For each feature in the table, tick (✓) **one** box to show if the feature occurs:

- only in mitosis
- only in meiosis.

Feature	Only in mitosis (✓)	Only in meiosis (✓)
Produces new cells during growth and repair		
Produces gametes (sex cells)		
Produces genetically identical cells		

(2)

(ii) Name the organ that produces gametes (sex cells) in:

a man

a woman.

(2)

(b) **X** and **Y** chromosomes are the sex chromosomes. They determine a person's sex.

What sex chromosomes will be found in the body cells of:

(i) a man

(1)

(ii) a woman?

(1)

(c) A man and a woman decide to have a child.

What is the chance that the child will be a boy?

(1)

(Total 7 marks)

Q2. In each question, draw a ring around the correct answer to complete the sentence.

(a) Our understanding of how genes are inherited is mostly because of

the work of

Darwin.

Lamarck.

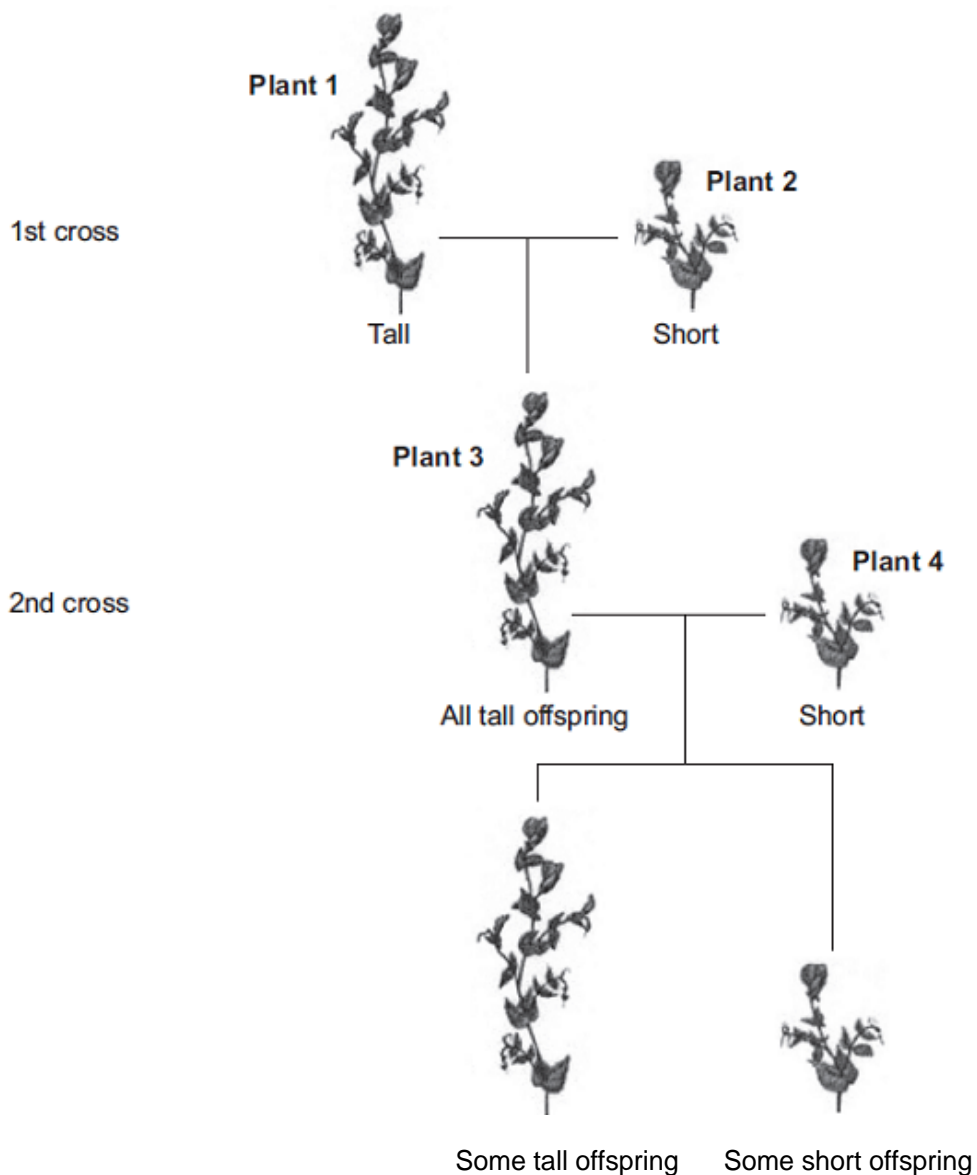
Mendel.

(1)

(b) A scientist investigated inheritance in pea plants.

The scientist crossed tall pea plants with short pea plants. **Diagram 1** shows the results.

Diagram 1



In the rest of this question, the following symbols are used to represent alleles.

T = allele for tall

t = allele for short

- (i) The 1st cross in **Diagram 1** produced 120 offspring. All of these offspring were tall.

This shows that **plant 1** contained the alleles

TT.
Tt.
tt.

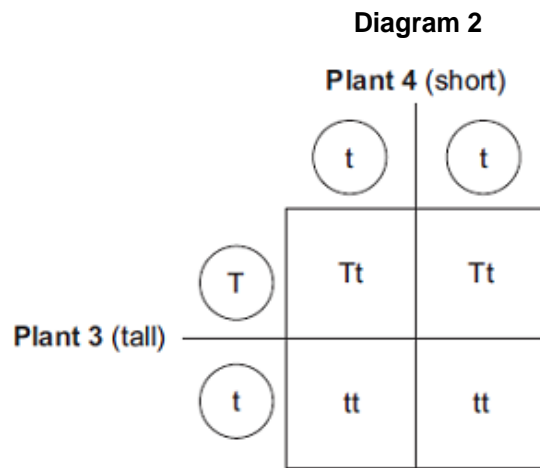
(1)

- (ii) **Plant 3** is tall because of

a dominant allele.
the environment.
a recessive allele.

(1)

- (c) **Diagram 2** gives more information about the cross between **plant 3** and **plant 4**.



This cross produced some tall offspring and some short offspring.

The ratio of tall to short offspring in **Diagram 2** is

1:1.
2:1.
3:1.

(1)

(d) Two short plants were crossed. This cross produced 100 offspring.

The expected offspring would be

- 100 short plants.
- 50 tall plants and 50 short plants.
- 75 tall plants and 25 short plants.

(1)
(Total 5 marks)

Q3. Humans reproduce sexually.

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

(i) At fertilisation

chromosomes

genes

gametes

join together.

(1)

(ii) At fertilisation a single cell forms. The cell has new pairs of

chromosomes.

nuclei.

gametes.

(1)

(b) A child inherits cystic fibrosis. The child's parents do **not** have cystic fibrosis.

(i) What does this information tell us about the cystic fibrosis allele?

Tick (✓) **one** box.

The allele is dominant.

The allele is recessive.

The allele is strong.

(1)

(ii) How many copies of the cystic fibrosis allele does the child have?

Draw a ring around your answer.

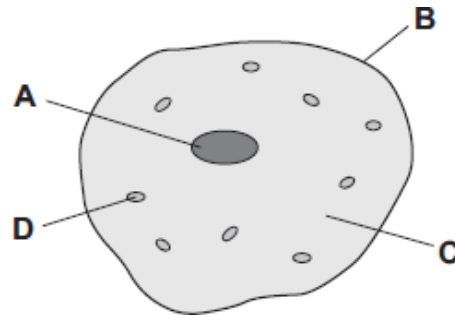
one

two

four

(1)

(c) The diagram shows a human body cell.



Which part of the cell, **A**, **B**, **C** or **D**:

(i) contains the allele for cystic fibrosis

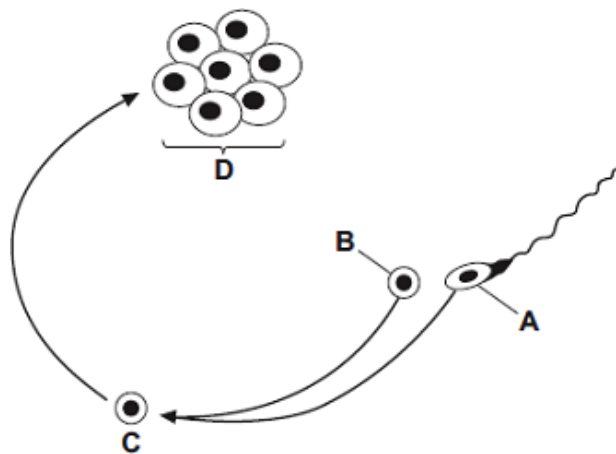
(1)

(ii) is affected by cystic fibrosis?

(1)

(Total 6 marks)

Q4. The diagram shows some of the stages in IVF (in vitro fertilisation).



(a) Use words from the box to name structures **A**, **B**, **C** and **D**.

egg	embryo	fertilised egg	ovary	sperm
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Structure **A**

Structure **B**

Structure **C**

Structure **D**

(4)

(b) What do doctors do next with structure **D**?

.....

.....

.....

.....

(2)

(c) The table gives statistics for an IVF clinic.

	Age of women treated			
	Below 35 years	35 – 37 years	38 – 39 years	40 – 42 years
Number of women treated	414	207	106	53
Number of women who produced one baby	90	43	17	1
Number of women who produced twins	24	8	4	1
Number of women who produced triplets	1	0	0	0

(i) About what proportion of the treated women aged 35 – 37 years produced one or more babies?

Draw a ring around your answer.

one quarter one third half

(1)

(ii) This clinic does **not** give IVF treatment to women over 42 years of age.

Use data from the table to explain why.

.....

.....

.....

.....

(2)

- (iii) The committee which regulates IVF treatment now advises that only one embryo is used in each treatment.

Suggest **one** reason for this.

.....
.....

(1)
(Total 10 marks)

Q5. When humans reproduce, chromosomes and genes are passed on to the next generation.

In each of the following questions, draw a ring around the correct answer to complete the sentence.

- (a) A gene is a small section of

cellulose.
DNA.
protein.

(1)

- (b) The sex chromosomes in the human male are

X and X.
X and Y.
Y and Y.

(1)

- (c) (i) Most human body cells contain

23 chromosomes.
46 chromosomes.
92 chromosomes.

(1)

- (ii) The number of chromosomes in a human gamete (sex cell)

is

the same number as
half the number
twice the number

 in body cells.

(1)

(d) Gametes are produced by

- fertilisation.
- meiosis.
- mitosis.

(1)
(Total 5 marks)

Q6. 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.

(1)

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

- | | | |
|-------------------|-------------|----------------|
| chromosome | gene | nucleus |
|-------------------|-------------|----------------|

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.

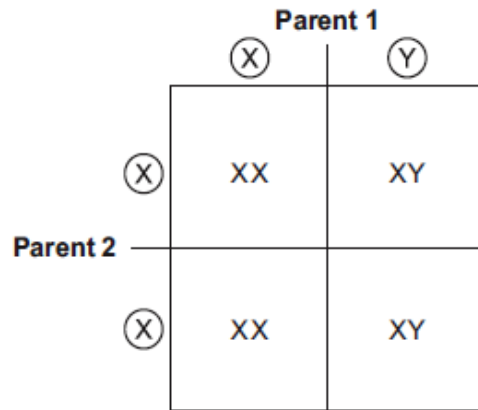
Draw a ring around the correct answer to complete the sentence.

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.

.....

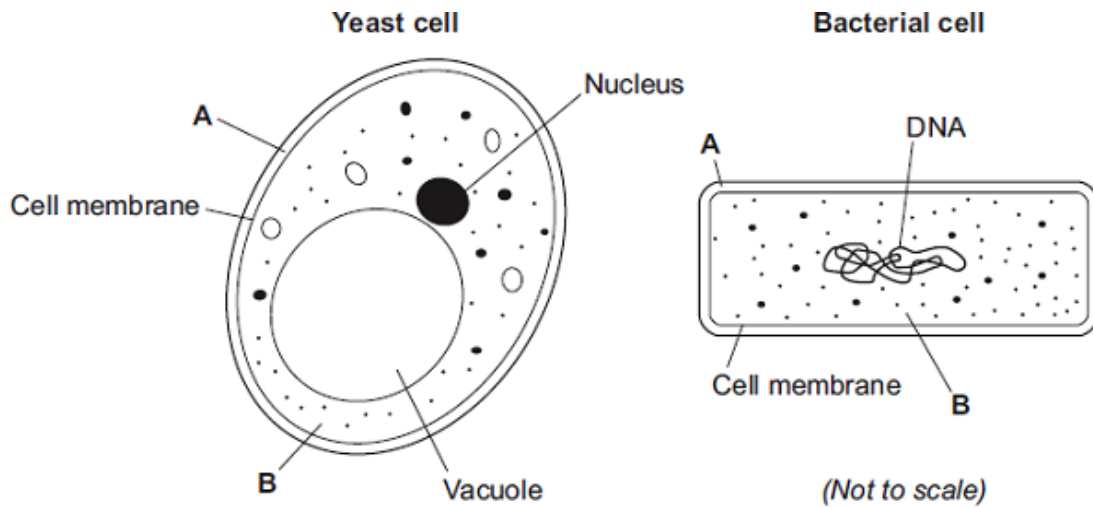
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.....

.....

(2)
(Total 7 marks)

Q7. (a) The diagrams show the structures of a yeast cell and a bacterial cell.



(i) Both the yeast cell and the bacterial cell have structures **A** and **B**.

Name structures **A** and **B**.

A

B

(2)

(ii) The yeast cell and the bacterial cell have different shapes and sizes.

Give **one** other way in which the structure of the bacterial cell is different from the structure of the yeast cell.

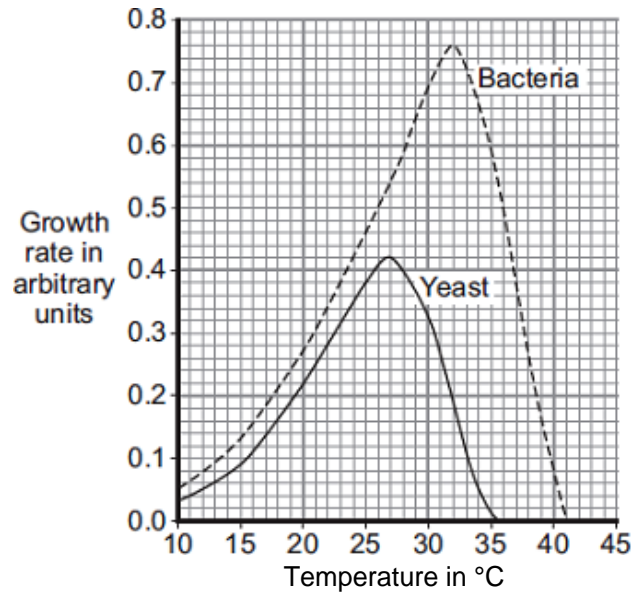
.....

.....

(1)

- (b) Sourdough bread is light in texture and tastes slightly sour. The bread is made using two types of microorganism, a yeast and a bacterium. The bacterium can make acids such as lactic acid. The acid makes the bread taste sour.

The graph shows how the growth rates of the yeast and the bacteria change with temperature.



- (i) Sourdough bread rises fastest at 27°C.
Use information from the graph to explain why.

.....

.....

.....

.....

(2)

- (ii) The bread tastes most sour if it rises at 32°C.
Use information from the graph to explain why.

.....

.....

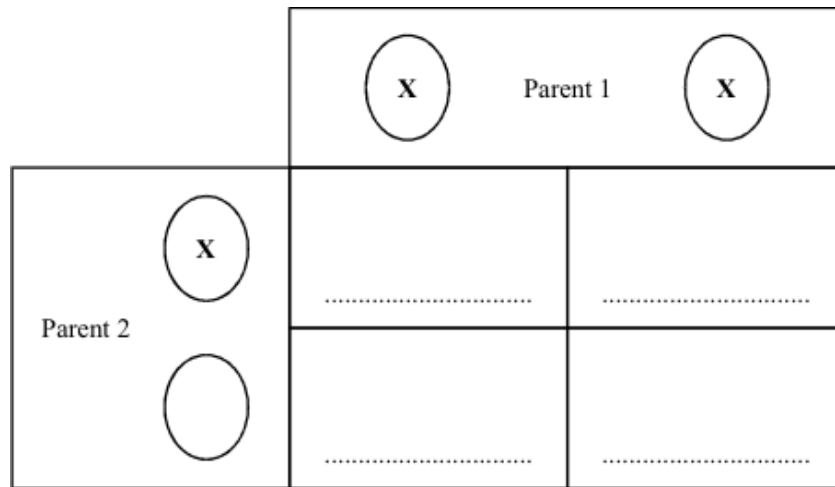
.....

.....

(2)

(Total 7 marks)

Q8. The chromosomes for determining the gender or sex of a person are labelled **X** and **Y**.



(a) Complete the Punnett Square to show the genotype of parent 2 and of the four offspring.

(3)

(b) Which parent is the mother?

.....

(1)

(c) What are the chances of getting a baby boy?

.....

(1)

(Total 5 marks)

Q9. Cystic fibrosis is an inherited disorder that can seriously affect health.

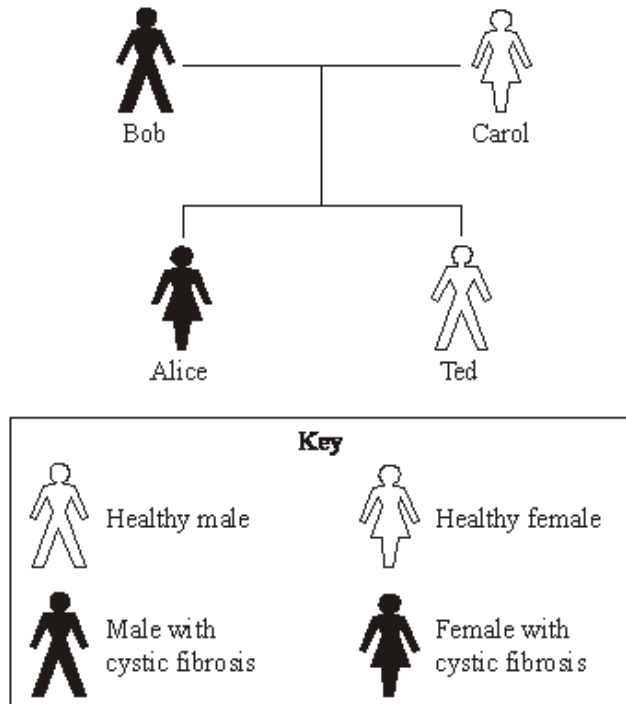
(a) Which **one** of these is affected by cystic fibrosis?

Draw a ring around your answer.

blood cell membranes kidneys nervous system

(1)

- (b) The diagram shows the inheritance of cystic fibrosis in a family. The allele that produces cystic fibrosis is recessive.



- (i) Explain why Alice inherited cystic fibrosis.

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

(2)

- (ii) Explain why Ted did **not** inherit cystic fibrosis.

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

(2)

(c) Bob and Carol know that there is a risk that their next baby will have cystic fibrosis.

Embryos can be screened for the allele that produces cystic fibrosis.

Many people support the screening of embryos, but others do not.

(i) Suggest **one** reason why many people support the screening of embryos for the cystic fibrosis allele.

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

(1)

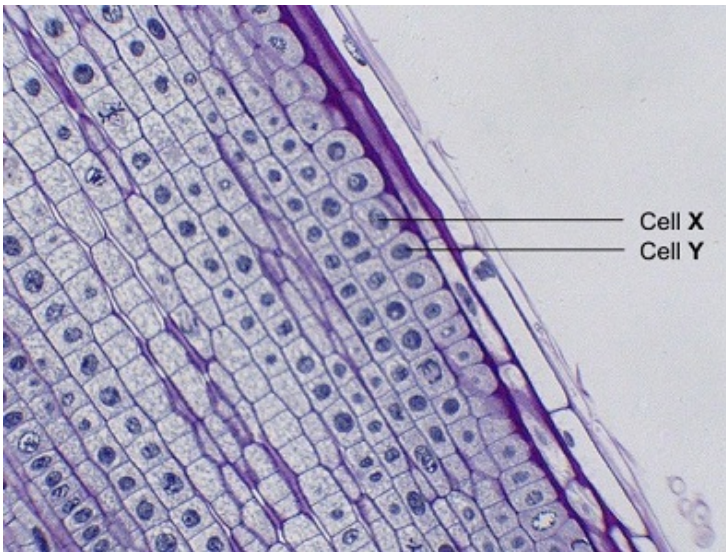
(ii) Suggest **one** reason why many people are against the screening of embryos for the cystic fibrosis allele.

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

(1)

(Total 7 marks)

Q10. The photograph shows some cells in the root of an onion plant.



By UAF Center for Distance Education [CC BY 2.0], via Flickr

(a) Cells **X** and **Y** have just been produced by cell division.

(i) Name the type of cell division that produced cells **X** and **Y**.

.....

(1)

(ii) What happens to the genetic material before the cell divides?

.....

(1)

(b) A gardener wanted to produce a new variety of onion.

Explain why sexual reproduction could produce a new variety of onion.

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

(3)

(Total 5 marks)

Q11. 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.

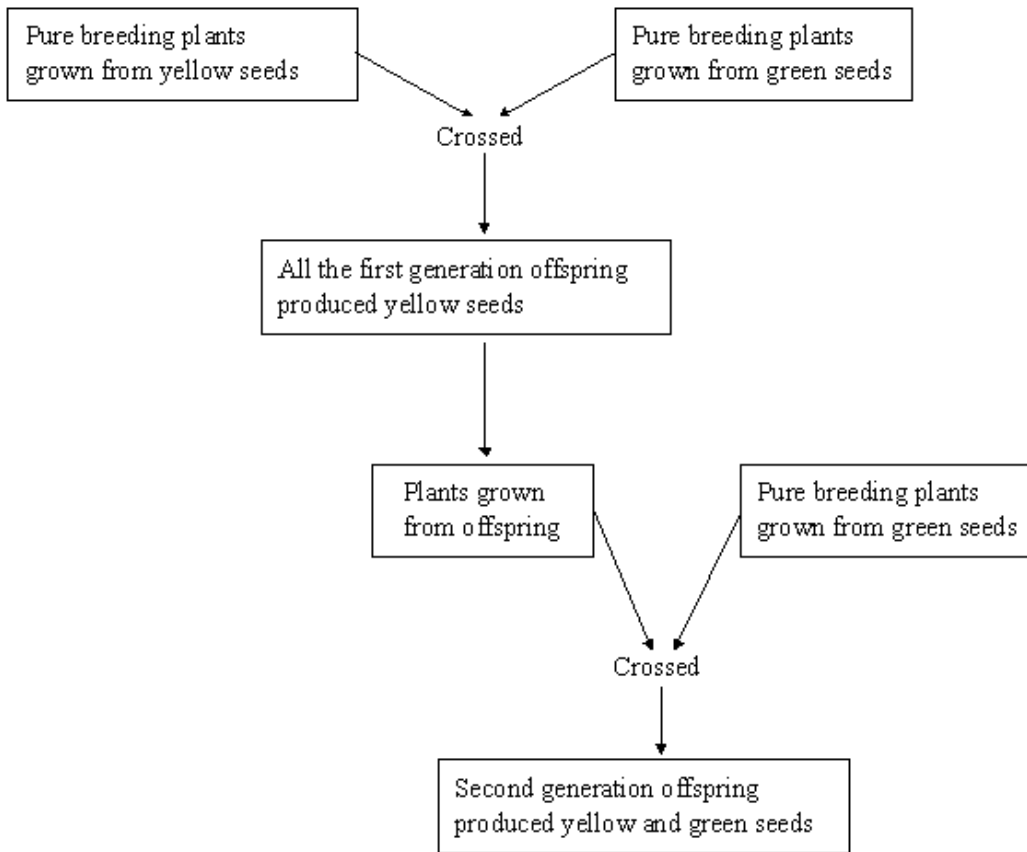
Explain why.

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

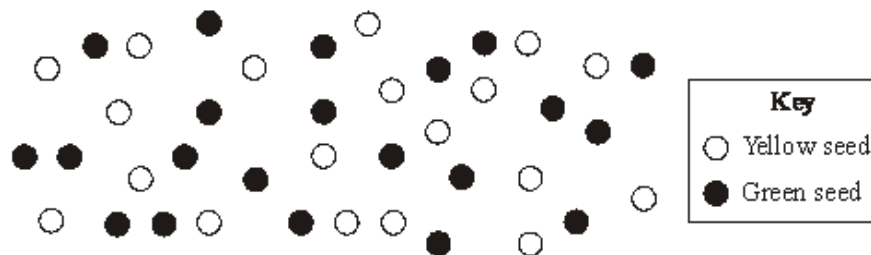
(2)

(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.

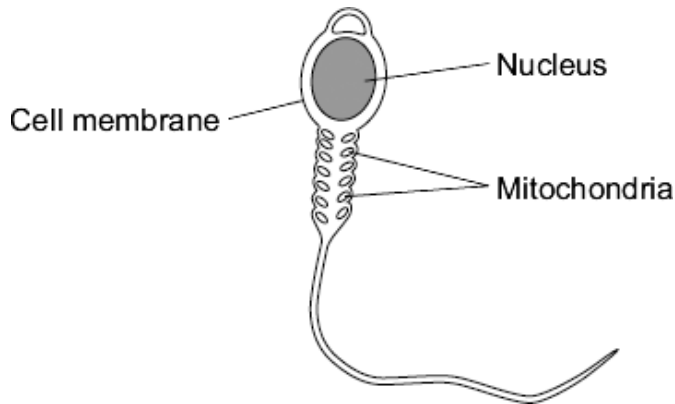
Use a genetic diagram to show why this ratio of yellow seeds to green seeds was produced by the second generation.

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

(4)
(Total 8 marks)

Q12. Cells in the human body are specialised to carry out their particular function.

(a) The diagram shows a sperm cell.



The sperm cell is adapted for travelling to, then fertilising, an egg.

(i) How do the mitochondria help the sperm to carry out its function?

.....
.....

(1)

(ii) The nucleus of the sperm cell is different from the nucleus of body cells.

Give **one** way in which the nucleus is different.

.....
.....

(1)

(b) Stem cells from human embryos are used to treat some diseases in humans.

Explain why.

.....

.....

.....

.....

(2)
(Total 4 marks)

M1. (a) (i)

Feature	Mitosis only	Meiosis only
Produces new cells during growth and repair	✓	
Produces gametes (sex cells)		✓
Produces genetically identical cells	✓	

All 3 correct = **2** marks

2 correct = **1** mark

0 or 1 correct = **0** marks

2

(ii) (a man) testis / testes
accept testicle(s)

1

(a woman) ovary / ovaries
do not accept 'ova' / ovule

1

(b) (i) XY / YX
or
X and Y

1

(ii) XX
or
X and X or 2 X's
accept X

1

(c) $\frac{1}{2}$ / 0.5 / 50% / 1:1 / 1 in 2
do not accept 1:2 / 50/50
allow 50:50
allow 2 in 4

1

[7]

M2. (a) Mendel

1

(b) (i) **TT**

1

(ii) a dominant allele

1

- (c) 1 : 1 1
- (d) 100 short plants 1

[5]

M3. (a) (i) gametes
apply list principle 1

(ii) chromosomes
apply list principle 1

(b) (i) The allele is recessive
no mark if more than one box is ticked 1

(ii) two
apply list principle 1

(c) (i) **A**
apply list principle 1

(ii) **B**
apply list principle 1

[6]

M4. (a) **A** sperm 1

B egg 1

C fertilised egg 1

D embryo 1

(b) insert into mother
ignore fertilise / check fertilisation / check viability 1

womb / uterus 1

(c) (i) one quarter 1

(ii) no / little chance of success over 42 1

reference to table of only two women in the age bracket 40-42 years became pregnant

the statement 'only 2 out of 53 40-42 year old women became pregnant / had babies' gains 2 marks

1

(iii) so fewer twins / multiple births
or
multiple births more dangerous

1

[10]

M5. (a) DNA

1

(b) X and Y

1

(c) (i) 46 chromosomes

1

(ii) half the number

1

(d) meiosis

1

[5]

M6. (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]

- M7.** (a) (i) A = (cell) wall
ignore cellulose

1

B = cytoplasm

1

- (ii) any **one** from:
accept has DNA instead of a nucleus, but not just has DNA

- bacterial cell / it has no nucleus
allow no mitochondria
- DNA free in cytoplasm
ignore size
- has no vacuole / no vesicles
ignore strands of DNA

1

- (b) (i) yeast grows best / better / well **or** optimum temperature for yeast / more yeast present
allow yeast works best / better / well

1

(yeast) makes CO₂ **or** respire / respiration
allow fermentation

1

- (ii) bacterium grows best / better / well / more bacteria present **or** optimum temperature for bacterium
ignore microorganisms / microbes
allow works / respire best / better / well

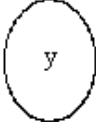
1

(bacterium) makes (lactic) acid
do **not** allow wrong acid

1

[7]

M8.

(a)  clearly labelled 'y'

1

mark the offspring in two horizontal rows

1 mark for each fully correct row

allow transferred error if parent 2 is incorrect

XX XX

1

XY XY

accept YX

1

(b) parent 1

accept XX

1

(c) 50:50

or

equal **or** even

or

1:1 **or** 50%

accept 1/2 **or** 2/4

1

[5]

M9.

(a) cell membranes

1

(b) (i) two recessive / cystic fibrosis / faulty / diseased / the allele(s) / genes

two can be implied by second marking point

ignore chromosomes

1

from Bob **and** Carol / both parents / the parents

if no other marks awarded 'Carol is a carrier' gains 1 mark

1

(ii) (inherited) dominant / normal allele / gene

1

from Carol / mother

ignore references to recessive allele / gene from father / Bob

if no other marks awarded he has just / only one recessive allele gains 1 mark

1

(c) (i) reduce number of people with cystic fibrosis (in population)

or

reduce health-care costs

or

expensive to have baby with cystic fibrosis

*accept to allow decision / emotional argument qualified
eg allows abortion*

or

allows people to make choices about termination

or

help to prepare financially / emotionally etc

1

(ii) any **one** from:

- possible damage / risk to embryo / fetus / baby
allow possible harm / risk to mother
- screening / it is expensive
- (may) have to make ethical / moral / religious decisions
*ignore not natural / playing God / unethical / immoral / religious
unqualified*
- right to life

1

[7]

M10. (a) (i) mitosis

correct spelling only

1

(ii) replicates / doubles / is copied / duplicates

*accept cloned
ignore multiplied / reproduced*

1

(b) fertilisation occurs / fusion (of gametes)

*accept converse for asexual, eg none in asexual / just division in
asexual*

1

so leading to mixing of genetic information / genes / DNA / chromosomes

*genes / DNA / chromosomes / genetic information comes from 1
parent in asexual*

ignore characteristics

1

one copy (of each allele / gene / chromosome) from each parent
or
gametes produced by meiosis
or
meiosis causes variation

meiosis must be spelt correctly

1

[5]

M11. (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

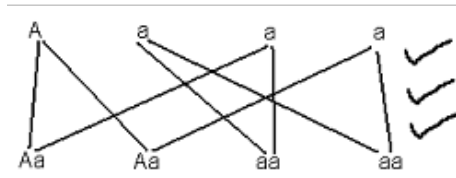
or

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]

M12. (a) (i) release energy
allow provide / supply / give energy
*do **not** accept produce / create / generate / make energy*
*do **not** allow release energy for respiration*

1

(ii) contain half the (number of) chromosomes **or** contains
one set of chromosomes **or** contains 23 chromosomes
allow genetic information / DNA / genes / alleles instead of
chromosomes
accept haploid

1

(b) any two from:

- (stem cells) are unspecialised / undifferentiated
allow description eg 'no particular job'
- are able to become differentiated
or can form other types of cell / tissue / organ
- stem cells can / able to divide / multiply

2

[4]

