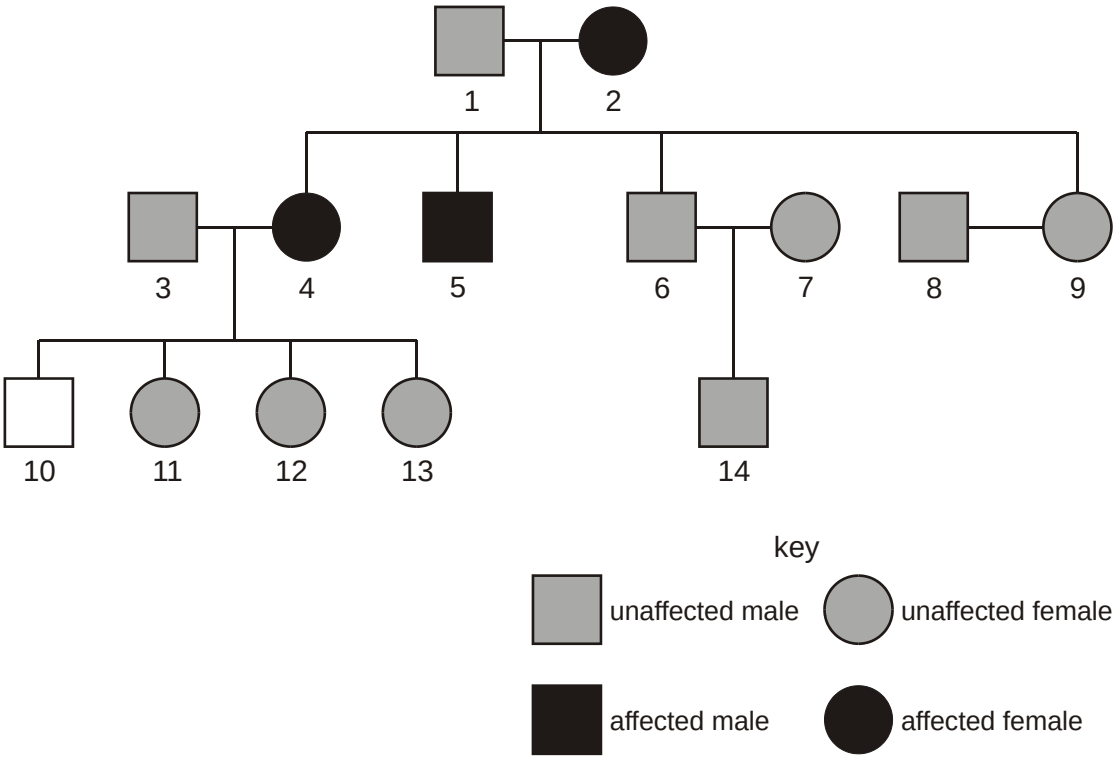
GHS National 5 Genetics

1. The diagram shows a family tree in which some members of the family had a hereditary disease. The disease is caused by a dominant allele.



(a) In the questions below, use **G** to represent the dominant allele for the disease, and **g** to represent the normal allele.

(i) Give the genotype of the grandmother, person 2.

.....

1 mark

(ii) Explain how you arrived at your answer.

.....

.....

.....

.....

2 marks

(b) (i) Give the genotype of person 5.

.....

1 mark

(ii) Explain how you arrived at your answer.

.....

.....

1 mark

(c) Person 10 died soon after birth. What is the possibility that he would have developed the disease if he had survived?

.....

1 mark

(d) Harmful alleles like allele **G** arise because of mutation.

(i) Explain what is meant by mutation.

.....

.....

1 mark

(ii) State **one** cause of mutation.

.....

1 mark

Maximum 8 marks

2. Human twins may result from:

either the fertilisation of two separate eggs, released together;

or the fertilisation of a single egg which then divides into two cells, each cell developing into a baby.

The table below gives information about three sets of twins.

set of twins	name	blood group	eye colour	mass in kg	sex
set 1	Sasha	A	brown	37	female
	Ninvata	AB	brown	37	female
set 2	Lucy	O	brown	38	female
	Tom	O	brown	32	male
set 3	Fred	O	blue	34	male
	Jack	O	blue	36	male

(a) Which **one** of the characteristics below **cannot** be used to decide whether twins have come from a single egg or two eggs?
Tick the correct box.

blood group ☐ mass ☐

eye colour ☐ sex ☐

1 mark

(b) (i) Use the information in the table to suggest which set of twins could have come from a single egg.

.....

1 mark

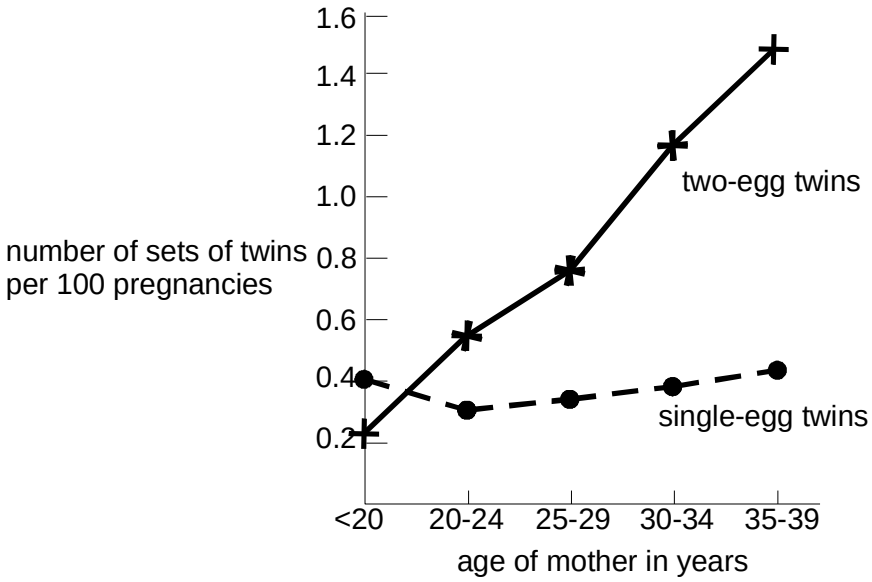
(ii) Explain why you have suggested this set of twins.

.....

.....

1 mark

(c) The graph shows the number of sets of single-egg and two-egg twins born to mothers of different ages.



Two hormones, produced by the pituitary gland, cause eggs to develop in the ovary.

Which statement could explain the results shown on the graph?
Tick the correct box.

As women get older, their ovaries do not respond to either of the hormones.	☐	As women get older, they are less likely to give birth to single-egg twins.	☐
As women get older, they produce more of each hormone.	☐	As women get older, their ovaries release two eggs every month.	☐

1 mark

(d) There are two types of cell division, meiosis and mitosis.

(i) Why are eggs and sperms produced by **meiosis**?

.....

.....

1 mark

(ii) Why does a fertilised egg divide by **mitosis**?

.....

.....

1 mark

Maximum 6 marks

3. The drawings show identical twins, Sara and Helen, and their parents.

father

mother

Sara

Helen

(a) (i) Sara and Helen have blue eyes like their mother.

Describe how genetic information is passed on from a parent to a child.

.....

.....

.....

.....

2 marks

(ii) Sara and Helen have brown hair like their father and blue eyes like their mother.

Why do children have characteristics of both parents?

.....

.....

1 mark

(b) Sara and Helen are identical twins.

Why do they have identical characteristics?

.....

.....

1 mark

(c) Sara now spends a lot of her time working outdoors in a hot country.
Helen now works in an office in England.

The table shows information about three human characteristics.

characteristic	**Is it identical for Sara and Helen?**
eye colour	yes
skin colour	no
weight	no

Explain why their eye colour is identical but their weight and skin colour are **not** identical.

.....

.....

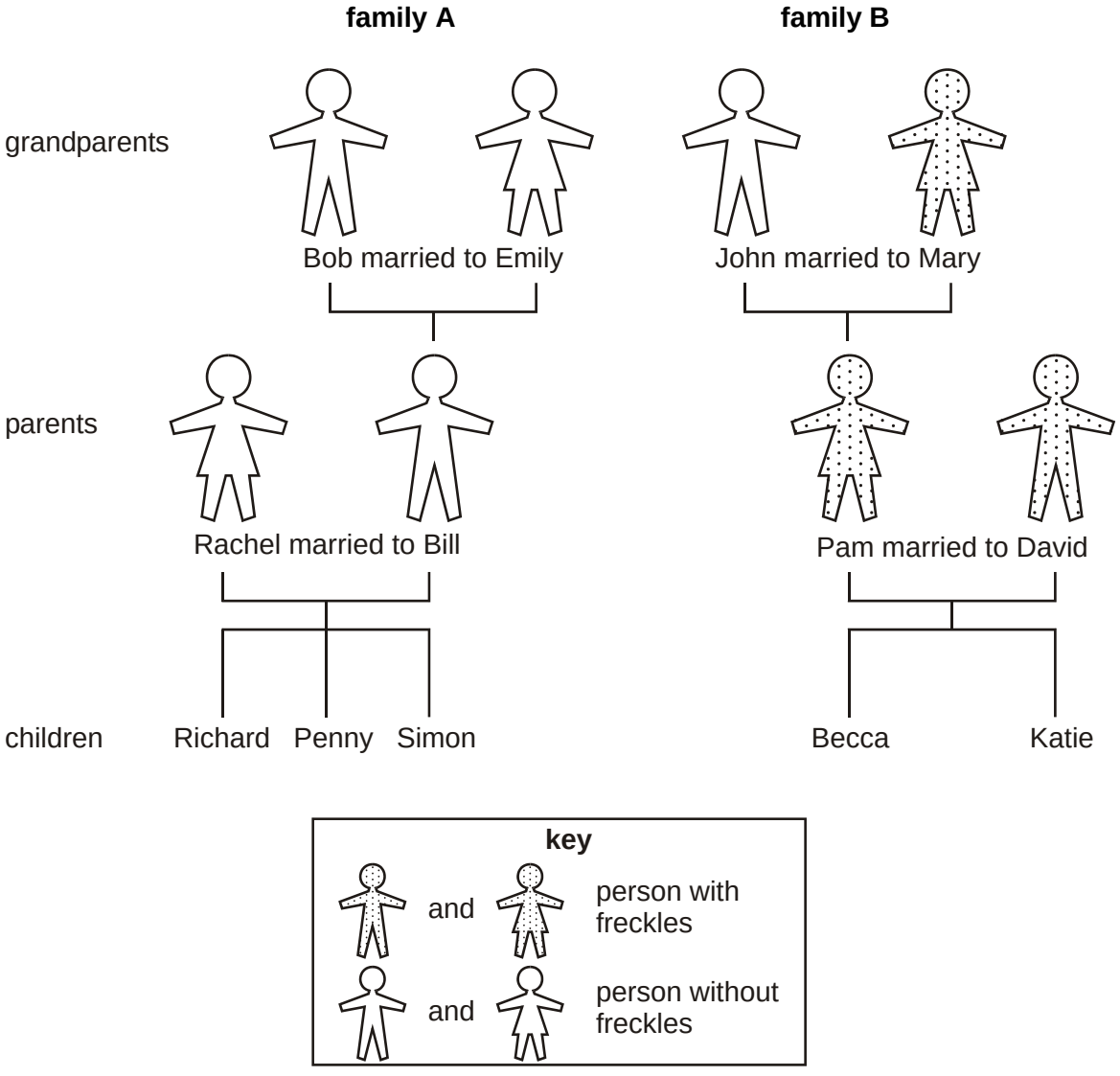
.....

.....

2 marks

maximum 6 marks

4. The diagram shows two families. Some of the people in the diagram have freckles.



(a) (i) Which children are most likely to have freckles?
Tick the correct boxes.

Richard	Simon	Katie	Penny	Becca
☐	☐	☐	☐	☐

1 mark

(ii) How did you decide?

.....

.....

1 mark

(iii) Suggest why Bill does **not** have freckles.

.....

.....

1 mark

(b) (i) Which **two** cells pass on information from parents to their children?
Tick the **two** correct boxes.

bone cell	☐	cheek cell	☐
egg cell	☐	muscle cell	☐
red blood cell	☐	sperm cell	☐

1 mark

maximum 4 marks

5 (a) Complete the following passage using **only** words from the list below.

diploid gametes haploid meiosis mitosis red blood cells

The transfer of inherited characteristics to new cells and new individuals depends on two types of cell division.

During ....., the chromosomes are duplicated exactly and ..... cells are produced.

However, during ....., the chromosome sets are first duplicated and then halved producing ..... cells. These cells will become ..... . [5]

(b) Using a labelled, genetic diagram, explain the inheritance of the sex of an individual.

[4]

[Total : 9]

6. Use only words or letters from the list below to complete the sentences in the following paragraph.

diploid, forty-four, forty-six, gamete, haploid, twenty-two, twenty-three, X, Y, zygote

The nuclei of human body cells contain …… pairs of chromosomes, that is

…… chromosomes and two sex chromosomes.

Sperm cells have a …… nucleus with a single sex chromosome.

The …… formed from the fusion of an ovum with a sperm cell, containing a

…… sex chromosome, will develop into a male. [Total: 5]

7. (a) Select the correct term from the list below and write it in the box next to its description.

allele dominant gene genotype heterozygous homozygous phenotype recessive

description	term
a form of a gene that always has its effect when it is present	
a form of a gene that codes for one of a pair of contrasting features	
an organism having two different forms of a gene for a particular feature	
the alleles that an organism has in its chromosomes	

[4]

[4]

(b) Two red flowered plants were crossed. The seeds produced were germinated and grew into 62 white flowered plants and 188 red flowered plants.

(i) Which flower colour is controlled by the recessive form of the gene? [1]

(ii) Using the symbols R and r, construct a genetic diagram to explain the results of this cross.

[5]

(iii) One of the white flowered offspring was crossed with a red flowered offspring.
Predict the two possible ratios of red and white flowered plants that their seeds would produce.

1.....

2.....[2]

[Total: 12]

Total marks = 49

Your mark:

	50