

# Inheritance (F)

1. Scientists found DNA from a Stone Age woman trapped in gum from a tree. The woman had chewed the tree gum. Using this DNA scientists were able to predict some of her features.

Which feature would scientists have been able to predict from her DNA alone?

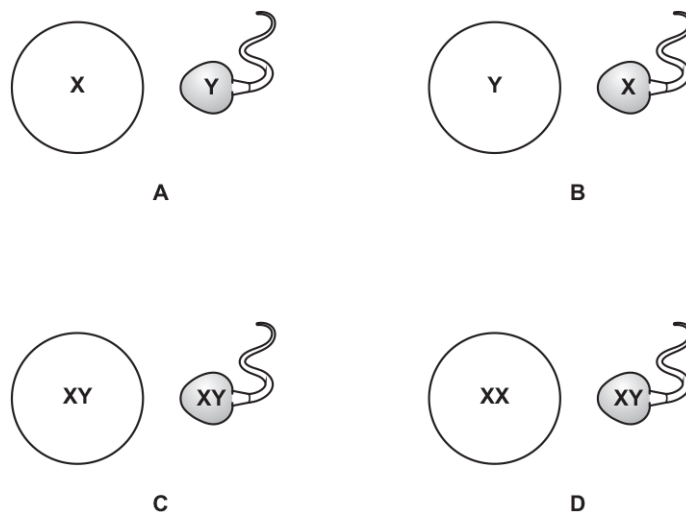
- A Body weight
- B Diet
- C Eye colour
- D Height

Your answer

[1]

2. The diagrams show gametes and sex chromosomes.

Which diagram shows the correct combination of sperm and egg to produce a **male** baby?



Your answer

[1]

3. Gregor Mendel studied the inheritance of characteristics in pea plants.

Which of these is a possible reason why he chose pea plants for his experiments?

- A Pea plants can produce many offspring, quite quickly.
- B Pea plants can reproduce asexually.
- C Pea plants do not develop mutations.
- D Pea plants do not produce gametes.

Your answer

[1]

4. Tigers have a diploid number of 38 chromosomes.

How many chromosomes are present in a tiger sperm cell?

- A 2
- B 19
- C 38
- D 72

Your answer

[1]

5. The table shows features of **meiosis**.

	Type of cells made	Genetic variation introduced
<b>A</b>	body cells	✓
<b>B</b>	body cells	X
<b>C</b>	gametes	✓
<b>D</b>	gametes	X

Which row in the table is correct?

Your answer

[1]

6. Cystic fibrosis is a genetic condition caused by a recessive allele (**f**).

Which is the genotype of a person **with** cystic fibrosis?

- A Heterozygous and **ff**
- B Heterozygous and **Ff**
- C Homozygous and **ff**
- D Homozygous and **FF**

Your answer

[1]

7. Each cell in the eye of a kangaroo has **16** chromosomes.

How many chromosomes are there in one kangaroo **sperm cell**?

- A 4
- B 8
- C 16
- D 32

Your answer

[1]

8. Which combination of gametes will produce a male baby?

- A A sperm with **XY** chromosomes and an egg with **XX** chromosomes.
- B A sperm with one **X** chromosome and an egg with one **Y** chromosome.
- C A sperm with one **Y** chromosome and an egg with one **X** chromosome.
- D A sperm with **XX** chromosomes and an egg with **XY** chromosomes.

Your answer

[1]

9. Which of these is an example of **discontinuous** variation?

- A Body weight
- B Hand span
- C Height
- D Sex

Your answer

[1]

10. An organism has the genotype TT.

Which term describes this organism?

- A Heterozygous dominant
- B Heterozygous recessive
- C Homozygous dominant
- D Homozygous recessive

Your answer

[1]

11. Which process produces gametes?

- A Diffusion
- B Fertilisation
- C Meiosis
- D Mitosis

Your answer

[1]

12. There are two main types of reproduction, sexual and asexual.

Which is an **advantage** of sexual reproduction?

- A Creates more variation
- B Produces larger numbers of offspring
- C Produces offspring that are all identical so well adapted
- D Only needs one parent

Your answer

[1]

13. What did Gregor Mendel discover?

- A A theory for how life on Earth started
- B How characteristics are inherited in pea plants
- C The shape of the DNA molecule
- D The theory of natural selection

Your answer

[1]

14 (a). Hypercholesterolemia (HC) is caused by a dominant allele on chromosome 19. This allele has mutations which cause a change in the order of DNA nucleotides.

A woman who does **not** have HC and a man who is heterozygous are expecting a baby.

What is the probability of the baby having HC?

Complete the genetic diagram to explain your answer.

**D** is the dominant HC allele and **d** is the recessive allele.

		Man	
		D	d
Woman	d		
	d		

Probability = ..... [2]

(b). Write the words **allele**, **chromosome** and **nucleotide** in the boxes to show their size from smallest feature to largest feature.

Smallest feature	<input type="text"/>
	<input type="text"/>
Largest feature	<input type="text"/>

[1]

(c). One in 500 people are heterozygous for HC.

There are 66 000 000 people in the UK.

Calculate how many people in the UK are heterozygous for HC.

Number of people = ..... [1]

15 (a). Rats are a major pest in many areas of the world. They can reduce food security and spread diseases.



Warfarin is a chemical that is used as a rat poison. It stops platelets working in the blood.

Describe the function of platelets in the blood.

[2]

(b). Some rats are resistant to warfarin. When fed with large amounts of warfarin the rats do not die.

Scientists found that the resistance is due to the dominant allele **R**.

Two resistant rats (**Rr**) mate.

Complete this genetic diagram to find the ratio of resistant rats to non-resistant rats that would be expected to be produced.

		Rr	
		.....	.....
Rr	R	.....	.....
	r	.....	.....

Ratio = ..... [3]

(c). After several years, the percentage of resistant rats in the population had increased.

Use Darwin's theory of natural selection to explain this observation.

[3]

(d). Scientists are now trying to find another poison to use on rats.

They have introduced a chemical called phosphine. This blocks the action of mitochondria in rat cells.

Explain why this might kill rats.

[3]

**16 (a).** Retinitis pigmentosa is a genetic condition.

It is caused by a mutation to a gene. This mutation produces a recessive allele.

If people have retinitis pigmentosa then the cells in their retina are damaged.

If a person has two alleles for retinitis pigmentosa, they will not be able to see properly.

- i. Why does a person need two affected alleles to have the condition?

[1]

- ii. Why does the condition affect the ability to see properly?

[1]

(b). Two people are heterozygous for retinitis pigmentosa and are expecting a baby.

Complete the genetic diagram to work out the probability that the baby will have the condition.

R is the normal allele and r is the allele for retinitis pigmentosa.

	R	r
R		
r		

Answer =

[3]

(c). Explain the meaning of these terms.

Mutation

Gene

[2]



17 (a).

Characteristics can be examples of continuous or discontinuous variation.

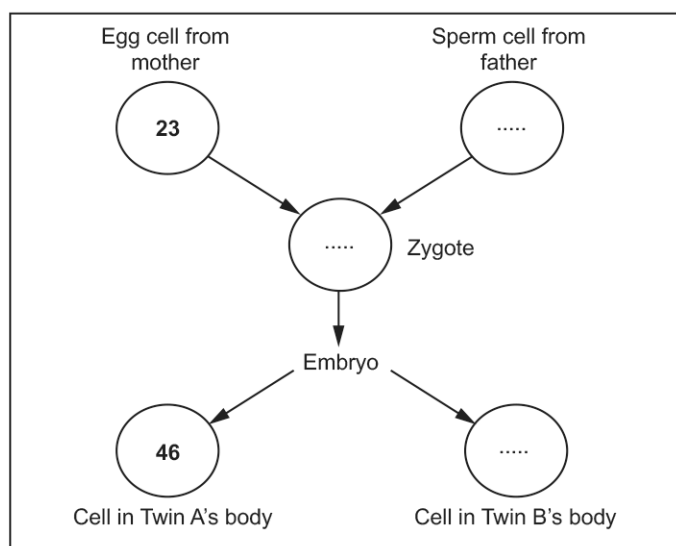
Write the **four** characteristics below in the correct columns of the table.

Sex	Blood group	Height	Eye colour
<b>Continuous variation</b>		<b>Discontinuous variation</b>	

[2]

(b). Identical twins occur when an embryo splits into two.

In the diagram below, some of the chromosome numbers in the different cells have been given to you.



Complete the diagram to show the number of chromosomes in:

- The sperm cell
- The zygote
- The cell in Twin B's body.

[3]

18 (a).

The sex chromosomes determine the sex of a baby.

What are the sex chromosomes of a male and of a female?

Male

Female

[2]

(b). The data in the table shows the ratio of males to females in England and Wales.

	<b>Ratio of males to females in England and Wales</b>
<b>At birth</b>	105 males : 100 females
<b>Average over the whole population</b>	98 males : 100 females

- i. What percentage of babies are male at birth?

Answer = % **[1]**

- ii. In a hospital 410 babies are born in a week.  
Calculate how many of them are likely to be male.

Answer = **[1]**

- iii. On average, men do not live as long as women.  
How does the data in the table show this?

**[2]**

**19 (a).** Wolfram's Syndrome is a genetic disorder.

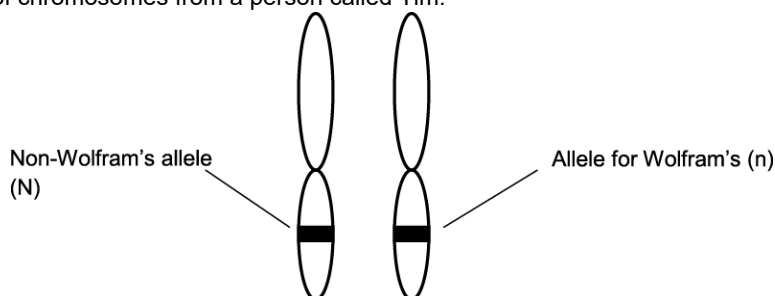
It is caused by a recessive allele (n).

In people with Wolfram's syndrome, a protein does not function correctly.

Explain how a change in an allele can stop a protein functioning correctly.

[4]

**(b).** The diagram shows a pair of chromosomes from a person called Tim.



Fill in the table to show Tim's genotype and phenotype.

Choose your answers from this list.

**does not have Wolfram's syndrome**  
**has Wolfram's syndrome**  
**heterozygous**  
**homozygous dominant**  
**homozygous recessive**

genotype	
phenotype	

(c). [2]

i.

Meena is expecting a baby.

Tim is the father.

Complete this genetic diagram.

		Tim	
Meena	N		
	n		

[2]

ii. Wolfram's syndrome can affect the pancreas.

Meena and Tim's doctor tells them that there is a chance that their baby will have problems controlling their blood glucose level.

Explain why the doctor thinks this.

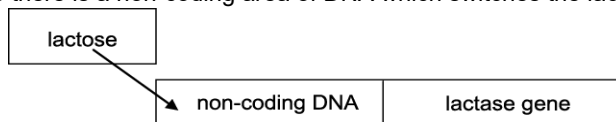
Use information from part (c) (i) and your biological knowledge.

[4]

20. Bacteria can produce an enzyme called lactase which digests lactose.

The enzyme is only made when lactose is present.

This is because there is a non-coding area of DNA which switches the lactase gene on.



Bacteria can have a mutation in the non-coding DNA.

What is a possible effect of such a mutation?

- A. Lactase cannot be made even if lactose is present.
- B. Lactase is made but will have a different order of amino acids.
- C. Lactase is made but it will be the wrong shape to digest lactose.
- D. Lactose is made rather than lactase.

Your answer

[1]

21. Some plants have been genetically engineered so that they grow larger.

Each cell of the plant has a new gene inserted so that it produces a different protein.

What does genetic engineering do to the plant?

- A. It changes the phenotype and the genotype.
- B. It changes the genotype but not the phenotype.
- C. It changes the phenotype but not the genotype.
- D. It changes neither the genotype nor the phenotype.

Your answer

[1]

22. FOP is a disorder that causes soft tissue in the body to turn to bone.

It is caused by a dominant allele.

People who have this condition are often infertile.

Natural selection predicts that the number of children born with the condition will go down.

Which explanation can explain why the number of people with FOP is staying constant?

- A. The allele is being produced regularly by mutation.
- B. Dominant alleles can remain hidden for generations.
- C. The allele may increase the rate of meiosis.
- D. The allele has no effect on a person's phenotype.

Your answer

[1]

23. A mouse has a diploid chromosome number of 40.

Which row in the table shows the correct number of chromosomes in each cell?

Your answer

[1]

		Number of chromosomes in	
		a mouse egg cell	a mouse eye cell
<b>A</b>		40	40
<b>B</b>		20	20
<b>C</b>		20	40
<b>D</b>		40	20

24. In many countries people rely on bananas for food.

Black sigatoka is a disease of banana plants.

It is caused by a fungus.

Banana plants grown by farmers are usually produced asexually.

This process uses mitosis.

This means that if one banana plant can die of black sigatoka then they all can.

Write down why.

[1]

25. The DNA of the unborn baby can be found in the blood sample of the mother.

This DNA is tested to see which chromosomes are present.

Which conclusion is correct?

- A. If a Y chromosome is present then it must be a boy.
- B. If a Y chromosome is present then it must be a girl.
- C. If an X chromosome is present then it must be a boy.
- D. If an X chromosome is present then it must be a girl.

Your answer

[1]

26. A sperm cell of a mouse has 20 chromosomes.

Which row in the table shows the correct number of chromosomes in each cell?

	Number of chromosomes in	
	a mouse egg cell	a mouse eye cell
A	40	40
B	20	20
C	20	40
D	40	20

Your answer

[1]

END OF QUESTION PAPER