OCR GCSE GATEWAY BIOLOGY A · J247

BIOLOGY



EXAM QUESTION PACK

B5.1 INHERITANCE

SCORE	PERCENTAGE
/154	%

STEMUP

These questions belong to OCR, not to us.

The examination questions, mark schemes and examiner comments in this pack were written and published by OCR. They are past assessment materials, reproduced here so that students can revise from them.

What we do not own

STEMUP is not affiliated with OCR and does not own, and makes no claim to own, any of the question, mark scheme or examiner report material in this pack. OCR has not endorsed, approved or been involved in the production of it. OCR and the qualification titles used here belong to their respective owners and appear for identification only.

Where to find the originals

OCR publishes its past papers, mark schemes and examiner reports. Always check the current specification at ocr.org.uk before you revise, because content and wording can change between series.

If you hold the rights to any material in this pack and would like it amended or removed, contact admin@stemup.co.uk and we will act on it.

Gateway Biology A (9-1)

Inheritance

Please note that you may see slight differences between this paper and the original.

Candidates answer on the Question paper.

OCR supplied materials:
Additional resources may be supplied with this paper.

Other materials required:
- Pencil
- Ruler (cm/mm)

Duration: Not set

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions, unless your teacher tells you otherwise.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Where space is provided below the question, please write your answer there.
- You may use additional paper, or a specific Answer sheet if one is provided, but you must clearly show your candidate number, centre number and question number(s).

INFORMATION FOR CANDIDATES

- The quality of written communication is assessed in questions marked with either a pencil or an asterisk. In History and Geography a *Quality of extended response* question is marked with an asterisk, while a pencil is used for questions in which *Spelling, punctuation and grammar and the use of specialist terminology* is assessed.
- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **154**.
- The total number of marks may take into account some 'either/or' question choices.

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

1 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]

2 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]

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

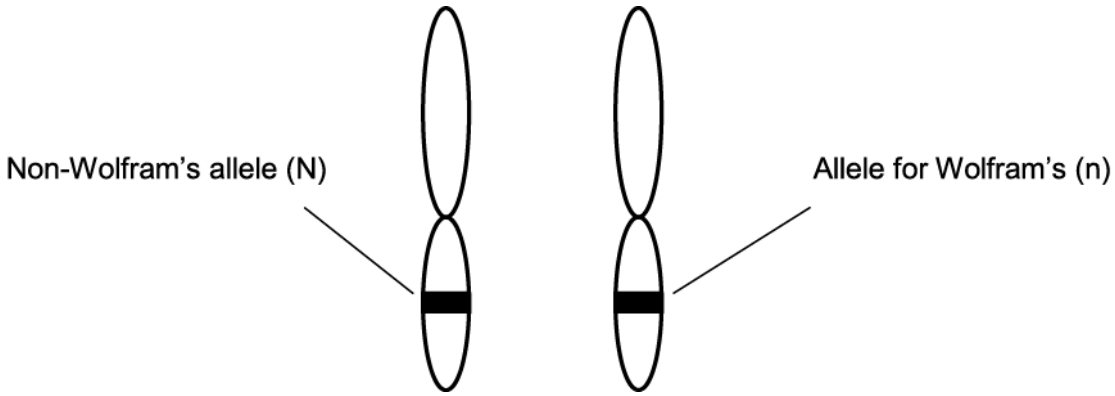
STEMUP.CO.UK

3(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.

The diagram shows a pair of chromosomes from a person called Tim.



Complete these sentences.

Tim does not have Wolfram's syndrome.

This is because his genotype is _ _ _ _ _ _ _ _ _ _ _ _ _

This means the probability of any one of his sperm having the Wolfram's allele is _ _ _ _ _ _ _ _ _ _ _ _ _

[2]

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

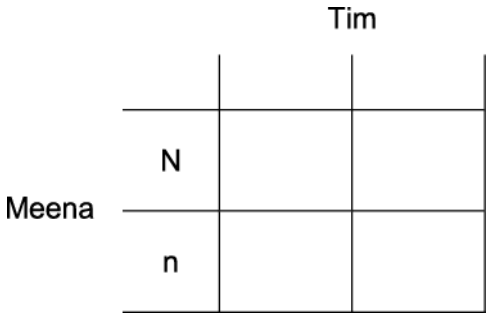
STEMUP.CO.UK

(b)

(i) Meena is expecting a baby.

Tim is the father.

Complete this genetic diagram.



[2]

(ii) Wolfram's syndrome can affect the production of hormones from the pancreas.

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

Explain why the doctor thinks this.

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

---

[4]

4 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]

5 A mouse has a diploid chromosome number of 40.

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]

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

6 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]

© OCR 2022. You may photocopy this page.

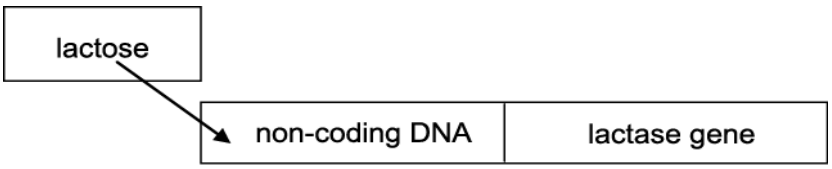
Created in ExamBuilder

STEMUP.CO.UK

7 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]

8 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]

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

9(a) Wolfram's Syndrome is a genetic disorder.

It is caused by a recessive allele (n).

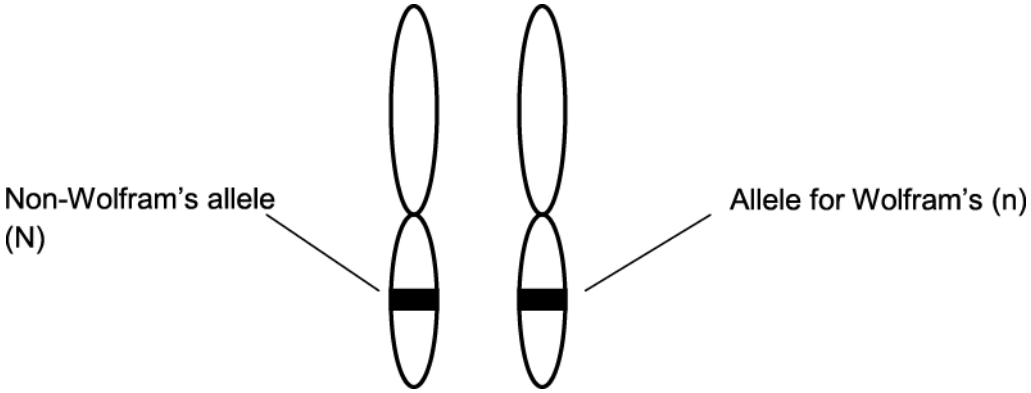
In people with Wolfram's syndrome, a protein does not function correctly.

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	

[2]

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

(c)

(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.

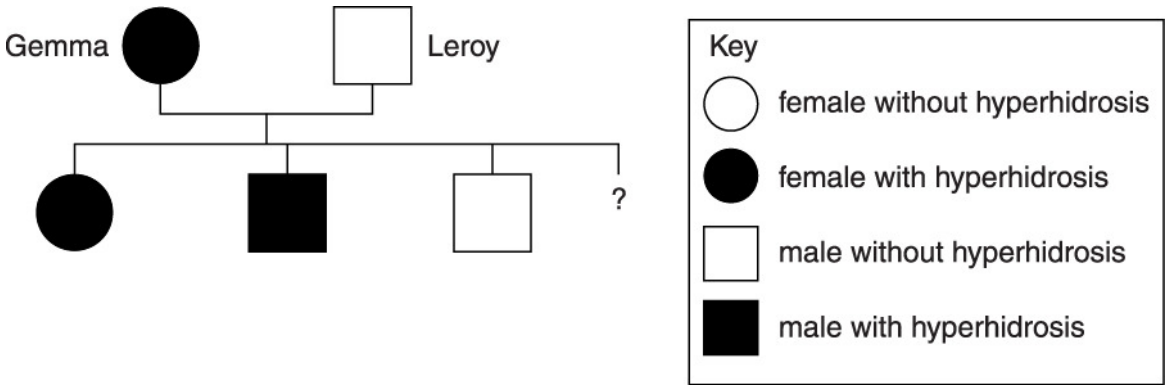
Use information from part **(c) (i)** and your biological knowledge.

---

[4]

10(a) Scientists have discovered that this is caused by a **dominant** allele.

Look at this family tree.



Gemma and Leroy are expecting a fourth child.

What is the probability that it will have hyperhidrosis?

Explain how you worked out your answer.

probability = _____

explanation _____

_____

_____

_____ **[2]**

(b) Some people sweat too much.

This is called hyperhidrosis.

Gemma's doctor injects her with a drug that makes her sweat less.

(i) Put a tick (✓) in the box that describes what this drug changes.

Gemma's genotype but not her phenotype	☐
Gemma's phenotype and her genotype	☐
neither Gemma's phenotype nor her genotype	☐
Gemma's phenotype but not her genotype	☐

[1]

(ii) The drug contains an antigen made by bacteria.

The drug stops the sweat glands working for about 4 months.

It only works for this long because the antigens are gradually destroyed by Gemma's body.

Explain how Gemma's body destroys antigens.

---

[2]

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

11 Some people sweat too much.

This is called hyperhidrosis.

Scientists have discovered that this is a genetic disorder.

(i) Gemma's cells contain the gene that causes h yperhidrosis.

Write about where in cells genes are found.

---

[2]

(ii) Gemma can **not** pass on hyperhidrosis to her friends.

Explain why.

---

[2]

12 Some humans and animals have an inherited condition called cornea plana.

It causes the cornea to be less curved than normal.

Scientists performed an experiment on mice to try and work out how cornea plana is inherited.

They mated together two mice who had normal vision.

There were nine offspring and three had cornea plana.

Complete these sentences about the inheritance of cornea plana.

Cornea plana is caused by a change to a gene.

A change in a gene is called a _____.

The allele that causes cornea plana is _____ to the normal allele.

[2]

© OCR 2022. You may photocopy this page.

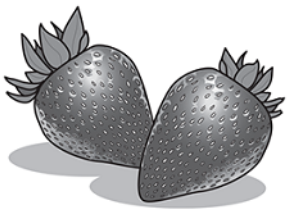
Created in ExamBuilder

STEMUP.CO.UK

13 A farmer is choosing which strawberry plants to grow.

He reads an advert in his farming magazine.

Buy strawberry plants from us!



We have been selectively breeding strawberry plants for many years.

This has produced a plant with very sweet tasting strawberries.

All the plants we sell are clones of this plant.

We guarantee that none of the plants we sell are genetically modified.

The company are sure that **every** plant they sell will produce sweet strawberries.

Explain why they are so sure.

[2]

14(a) A student answered some questions in a biology test.

His answers contain mistakes.

Explain what they are.

Question: Write down three examples of proteins.

Student's answer: DNA, collagen, insulin

Student's mistake _____

_____ [1]

(b) Question: Why are sperm cells and egg cells different in size?

Student's answer: Egg cells are bigger because they supply all the chromosomes and genes for the zygote.

Student's mistake _____

_____

_____

_____ [2]

(c) Question: How do enzymes work?

Student's answer: An enzyme is like a key that fits into a substrate's active site.

Student's mistake _____

_____

_____

_____ [2]

15 Some humans and animals have an inherited condition called cornea plana.

It causes the cornea to be less curved than normal.

Scientists performed an experiment on mice to try and work out how cornea plana is inherited.

They mated together two mice who had normal vision.

There were nine offspring and three had cornea plana.

Complete these sentences about the inheritance of cornea plana.

Cornea plana is caused by a change to a gene.

A change in a gene is called a _____.

The allele that is produced is _____ to the normal allele.

The two parent mice must be _____ for the allele for cornea plana.

[3]

16 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]

17 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]

18 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]

19 Which process produces gametes?

A Diffusion
B Fertilisation
C Meiosis
D Mitosis

Your answer [1]

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

20(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**

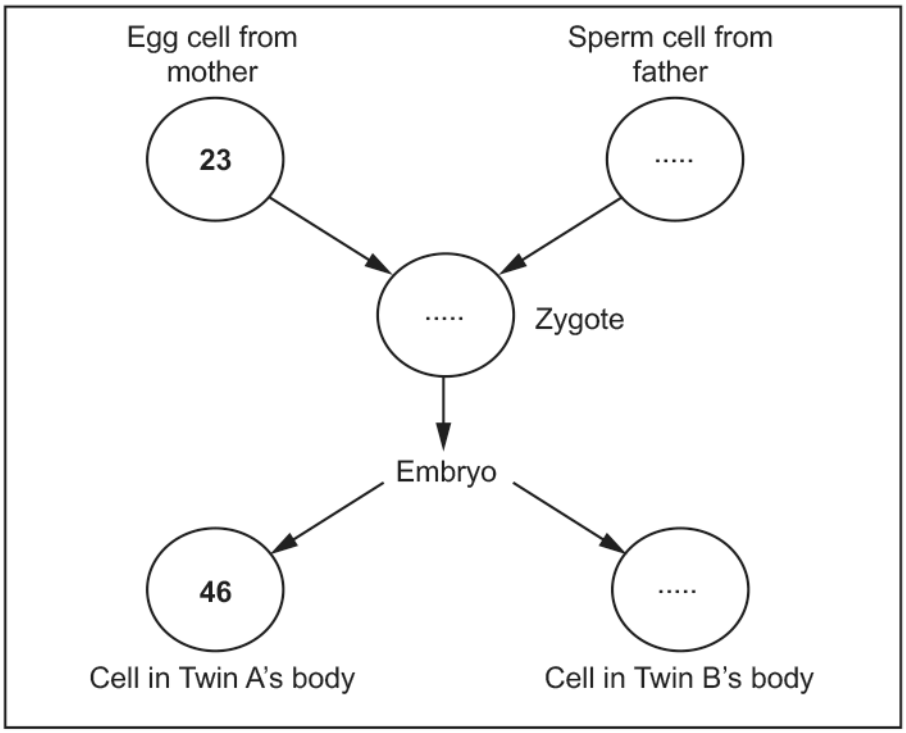
Continuous variation	Discontinuous variation

[2]

STEMUP.CO.UK

(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]

21(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]

STEMUP.CO.UK

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

	Ratio of males to females in England and Wales
At birth	105 males : 100 females
Average over the whole population	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]

STEMUP.CO.UK

22(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.

Explain the meaning of these terms.

Mutation .....

.....

Gene .....

.....

[2]

(b) 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]

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

(c) 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]

23 Which of these processes can produce a **new** allele?

A A change in the environment
B Asexual reproduction
C Mutation
D Selective breeding

Your answer ☐ [1]

24 Why is the process of meiosis important in making gametes?

A The cells produced are diploid.
B The cells produced are genetically identical.
C The cells produced are much smaller in size.
D The cells produced have half the number of chromosomes.

Your answer ☐ [1]

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

25 What is a genome?

A A description of the number of chromosomes in an organism.
B All the proteins that one organism can produce.
C A store of seeds to preserve genetic variation.
D The entire genetic material of an organism.

Your answer [ ] [1]

26 A harmful protein can cause pain in the joints. A new treatment is being developed to stop the protein causing pain.

What effect would this treatment have on the person's phenotype and genotype?

A Changes both the phenotype and genotype
B Changes the genotype only
C Changes the phenotype only
D No change to their phenotype or genotype

Your answer [ ] [1]

27(a) Retinitis pigmentosa is a genetic condition that affects the eyes.

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

The condition causes rod cells in the retina to break down.

Explain the meaning of these terms.

Gene ----------

Allele ----------

---[2]

STEMUP.CO.UK

(b)

(i) Two people who are heterozygous for retinitis pigmentosa are expecting a baby.

Draw a genetic diagram to calculate the probability that the baby will have the condition.

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

Answer = ---------- [3]

(ii) If the baby has retinitis pigmentosa, it will have normal colour vision but will not be able to see well in dim light.

Explain why.

---

[3]

STEMUP.CO.UK

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

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

Describe how sex is determined in humans.

You may use a genetic diagram in your answer.

--- [2]

(b) In 2015 there were approximately 698 000 babies born in England and Wales.

Calculate how many of these were male.

Answer = ---------- [2]

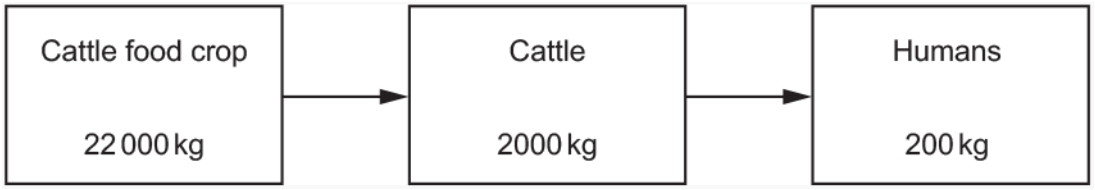
(c) There are more females than males living in England and Wales as an average over the whole population.

Suggest **one** reason why there are more females.

--- [1]

STEMUP.CO.UK

29 The diagram shows the flow of biomass through an agricultural food chain.



High levels of light intensity can damage plants. To prevent damage, plants have a protection mechanism.

When light intensity levels get **too high**, the protection mechanism switches on. This stops the plant absorbing too much light.

When the light intensity drops to safe levels, the protection mechanism switches off **slowly**.

Explain why this mechanism would **reduce** the biomass available to humans.

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

[6]

30 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]

31 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]

32 Which of these is an example of discontinuous variation?

A Body weight
B Hand span
C Height
D Sex

Your answer [1]

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

33 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

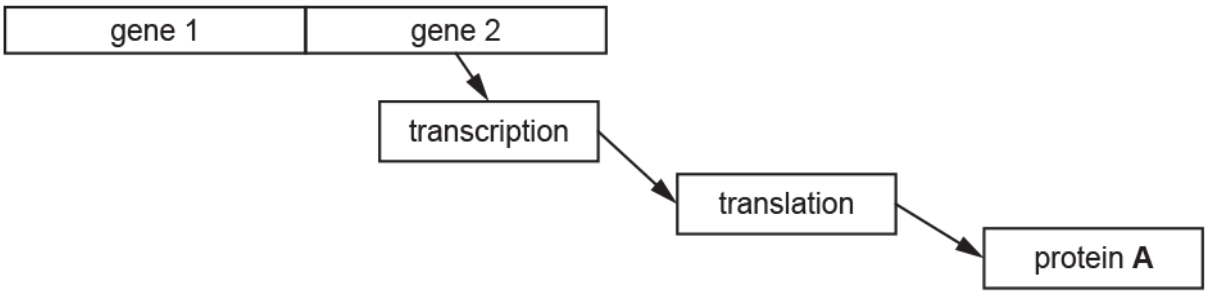
Your answer ☐ **[1]**

34 What was Mendel's contribution to modern genetics?

A He developed the theory of natural selection.
B He discovered that most characteristics are controlled by multiple genes.
C He worked out how sex determination occurs in mice.
D He found a pattern that shows how characteristics are passed on.

Your answer ☐ **[1]**

35 Gene **1** and gene **2** are both needed for the production of protein **A**.



What is the function of **gene 1** in this process?

A It codes for the amino acids in protein **A**.
B It codes for the mRNA needed to make protein **A**.
C It acts as the site for protein synthesis.
D It controls the expression of **gene 2.**

Your answer ☐ **[1]**

STEMUP.CO.UK

36 Some people get very painful headaches called migraines.

Scientists think that this is caused by a protein in the brain called CGRP.

Levels of the CGRP protein are higher in the brains of people who get migraines.

Doctors are trying to find a treatment to prevent migraines.

They have produced an antibody against the CGRP protein.

The doctors test the antibody treatment on migraine patients.

The patients are divided into two groups:

- One group is given an injection of the antibody
- The second group receives an injection of a placebo.

They record the mean number of days each patient had migraines before and after treatment.

The table shows their results.

Treatment	Mean number of migraine days per patient **before** treatment	Mean number of migraine days per patient **after** treatment	Percentage decrease in migraine days per patient
antibody injection	9.1	4.4	
placebo	9.1	6.4	29.7

(i) Explain why a placebo group is used in drug testing.

---

[3]

(ii) Calculate the percentage decrease in migraine days in the patients that had the antibody injection.

Give your answer to **1** decimal place.

Percentage decrease = ... %

[3]

37 Huntington's disease is a genetic condition. It is caused by a **dominant allele**.

Explain what is meant by the term dominant allele.

---

[2]

38(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]

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

39(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 the correct functioning of platelets in the blood.

Explain why warfarin can be used as a rat poison.

---

[2]

(b) In 1958, some rats were found that were resistant to warfarin. They did not die, even when fed with large amounts of the poison. Scientists found that the resistance was due to dominant allele **R**.

Two resistant rats can mate and produce non-resistant rats.

Draw a genetic diagram below to show how these non-resistant rats can be produced.

[3]

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

(c) When scientists studied the resistant rats they found that there were two different types.

Homozygous rats are resistant to warfarin but need to eat 20 times more vitamin K.

Heterozygous rats are resistant to warfarin but only need slightly increased amounts of vitamin K.

The scientists found that the non-resistant rats never died out completely.

Explain why.

[2]

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

	Type of cells made	Genetic variation introduced
A	body cells	✓
B	body cells	✗
C	gametes	✓
D	gametes	✗

Which row in the table is correct?

Your answer [1]

41 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.

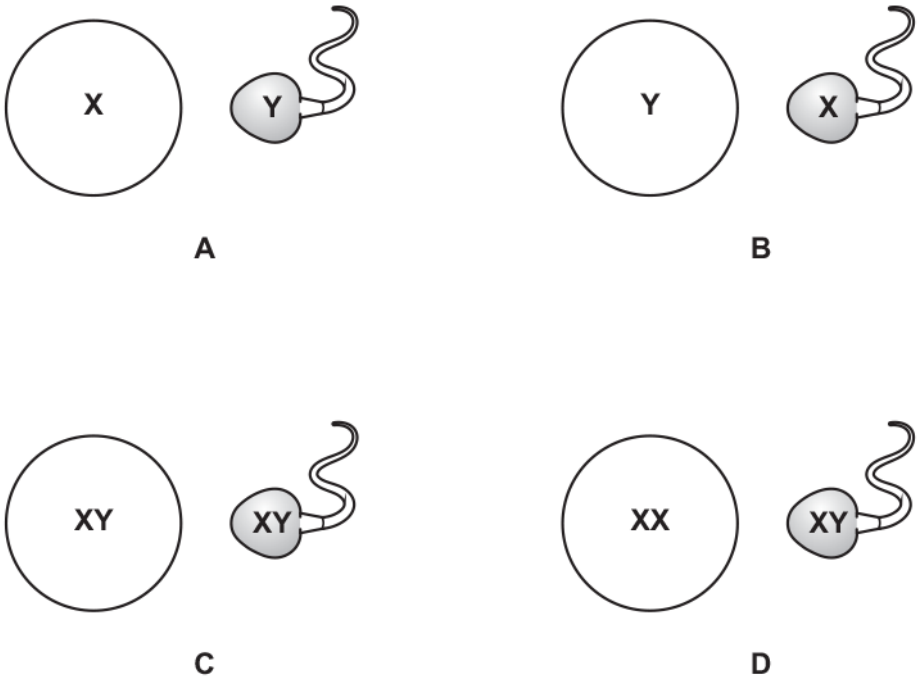
Which feature would scientists have been able to predict from her DNA alone?

A Body weight
B Diet
C Eye colour
D Height

Your answer ☐ [1]

42 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]

STEMUP.CO.UK

43 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]

44 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]

45(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.

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

Smallest feature	
Largest feature	

[1]

STEMUP.CO.UK

(b) 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]

(c) 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]

46 Why are the effects of most mutations **not** observed?

A Most mutations do not affect the genotype or phenotype.

B Most mutations do not affect the phenotype.

C Mutations mainly affect internal body processes.

D Mutations often kill the organism.

Your answer ☐ [1]

47 The table describes meiosis.

	Genetic description of cells made	Genetic variation introduced	Type of cells made
A	haploid	✓	body cells
B	diploid	*X*	body cells
C	haploid	✓	gametes
D	diploid	✓	gametes

Which row in the table is correct?

Your answer ☐ [1]

48 How can a mutation in non-coding DNA change the activity of a cell?

A It can change the amino acid sequence in a protein.
B The base sequence of mRNA may be altered.
C The shape of a protein may be changed.
D Transcription of mRNA may be stopped.

Your answer ☐ [1]

49(a) Fanconi anaemia is a genetic disorder. It results in the bone marrow being destroyed.
This causes a decrease in the numbers of red blood cells, white blood cells and platelets.

Explain **two** possible symptoms of Fanconi anaemia.

1 ---

---

2 ---

---

[2]

STEMUP.CO.UK

(b) **Table 19.1** shows normal ranges for blood components in people **without** Fanconi anaemia.

Blood component	Number per mm^3
red blood cell	$4.5 – 6.5 \times 10^6$
white blood cell	$6.0 – 16.0 \times 10^3$
platelet	$1.5 – 4.0 \times 10^5$

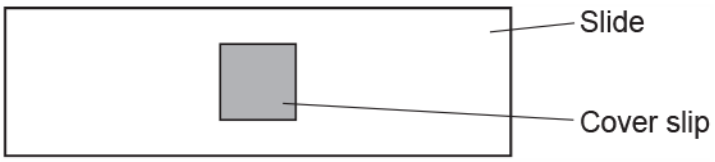
Table 19.1

(i) Suggest why there is such a wide range of white blood cell numbers.

---

[2]

(ii) The diagram shows a microscope slide containing blood from a patient.



The square cover slip is 10 mm wide and the thickness of the blood underneath is 0.001 mm.

Calculate the volume of blood under the cover slip.

Volume of blood = ... mm^3 **[1]**

(iii) Under the cover slip are 1000 white blood cells.

Does the blood sample provide evidence that the patient has Fanconi anaemia?

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

Use **Table 19.1** and your answer to part **(ii)** to justify your answer.

---

[3]

(c) There are many different genetic disorders that can affect blood cells. Details of three of these are found in **Table 19.2**.

Name of disorder	Cause of disorder	Symptom
D-B anaemia	dominant allele	low red blood cell numbers
S-D syndrome	recessive allele	low white blood cell numbers
Fanconi anaemia	recessive allele	small numbers of all blood cells

Table 19.2

A blood smear from another patient shows that he has 3×10^6 red blood cells per mm^3 of blood. Neither of his parents have a blood disorder.

Use **Table 19.1** and **Table 19.2** to explain which blood disorder the patient could have.

Name of disorder ---

Explanation ---

---

[3]

50(a) Hypercholesterolemia (HC) is the result of a mutation in the genome. It is caused by a dominant allele on chromosome 19. The mutation involved causes a change in the DNA nucleotides.

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

Smallest feature	
Largest feature	

[1]

(b) 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.

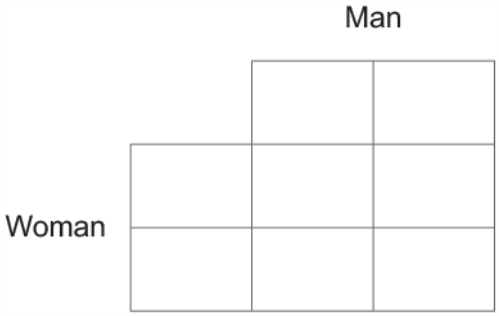
Number of people = ... **[1]**

(c) 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.

Use **D** for the dominant HC allele and **d** for the recessive allele.



Probability = ... **[2]**

(d) The allele that is affected by HC codes for a protein called LDL receptor protein.
The faulty allele often has four extra nucleotides, making a total of 2521 nucleotides.

Calculate the number of **amino acids** found in the healthy, **unaffected** protein.

Number of amino acids = ... **[2]**

END OF QUESTION PAPER

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK