Genes, inheritance and selection – 2021/20 GCSE Gateway Biology Combined Science A

1. Nov 2021/Paper_J250/01/No.6

Which hormone is involved in sperm production?

A Insulin

B Oestrogen

C Progesterone

D Testosterone

Your answer ☐ **[1]**

2. Nov 2021/Paper_J250/01/No.5

The table shows information about five different contraceptive methods.

Method	How it works	Number of unexpected pregnancies per 1000 women using the method
IUD	releases copper which stops sperm entering uterus	8
male condom	stops sperm entering vagina	180
patch	releases chemical into body	90
pill	contains chemical that stops ovulation	90
sterilisation	stops egg reaching uterus	5

Which **two** non-hormonal contraceptive methods are the most effective?

A Male condom and IUD

B Male condom and sterilisation

C Patch and pill

D Sterilisation and IUD

Your answer ☐ **[1]**

3. Nov 2021/Paper_J250/02/No.3

Which is the correct combination of chromosomes that determine sex in humans?

A XX in a female

B XX in a male

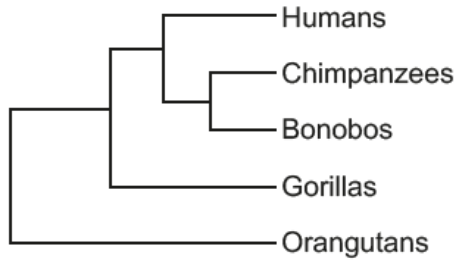
C XY in a female

D YY in a male

Your answer ☐ **[1]**

4. Nov 2021/Paper_J250/02/No.3

The diagram shows a phylogenetic tree produced using DNA analysis.



What does the phylogenetic tree show about the classification of humans?

A It shows bonobos and chimpanzees to be human's closest relations.

B It shows bonobos and orangutans to be human's closest relations.

C It shows gorillas and chimpanzees to be human's closest relations.

D It shows gorillas and orangutans to be human's closest relations.

Your answer ☐ **[1]**

5. Nov 2021/Paper_J250/02/No.8

Selective breeding in cattle can have risks.

Which outcome of selective breeding will have the **greatest** risk for the cattle?

A Greater muscle mass.

B Increased chance of genetic defect.

C Increased milk yield.

D Loss of horns.

Your answer ☐ **[1]**

6. Nov 2021/Paper_J250/02/No.14

This question is about diseases.

(a) (i) Complete the table to compare some different diseases.

Tick (✓) **five** boxes.

Tuberculosis has been done for you.

Disease	Communicable	Non-communicable	Affects plants	Affects humans	Caused by bacteria	Caused by a virus
Crown gall disease						
Type 1 diabetes						
Tuberculosis (TB)	✓			✓	✓	

[2]

(ii) TB is a disease of the lungs. TB is transmitted by breathing in when an infected person near you coughs or sneezes.

One way to prevent the spread of TB is vaccination.

Describe **two other** ways you could prevent the spread of TB.

1 .....

2 .....

[2]

(b) There are many diseases and disorders of the circulatory system.

(i) Some blood cell disorders can affect the function of white blood cells or red blood cells.

Suggest **two** effects on the body if either white blood cells or red blood cells are prevented from working efficiently.

1 .....

2 .....

[2]

(ii) Cardiovascular diseases affect the heart.

Which lifestyle factor can increase a person's chance of developing cardiovascular disease?

Tick (✓) **one** box.

Exercise ☐

Healthy diet ☐

Smoking ☐

Virus infection ☐

[1]

***(c)** The cornea is the front part of the eye that allows in light. The layers of cells in the cornea are similar to the cells in skin layers, the difference is that they have become transparent to allow the light through.

Scientists are now using stem cell technology for treating damage to the cornea to restore vision.

Describe how stem cells could be used in the treatment of damage to the cornea and any possible risks involved in this type of treatment.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... **[6]**

7. Nov 2020/Paper_J250/02/No.9

A scientist crossed a white flower with a purple flower.
The white flower is homozygous recessive. The purple flower is heterozygous.

The scientist uses this Punnett square to predict the expected ratio of offspring.

	P	p
p	Pp	pp
p	Pp	pp

What is the expected ratio of phenotypes in the offspring?

A 1 purple : 1 white

B 1 purple : 2 white

C 2 purple : 1 white

D 4 purple : 0 white

Your answer ☐ **[1]**

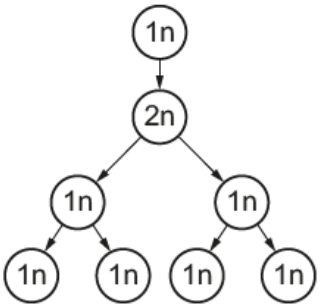
8. Nov 2020/Paper_J250/02/No.10

Meiosis is a type of cell division that is needed to make gametes.

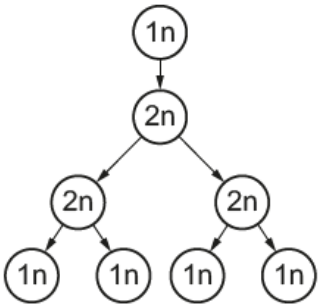
Which diagram shows meiosis?

n = number of chromosomes

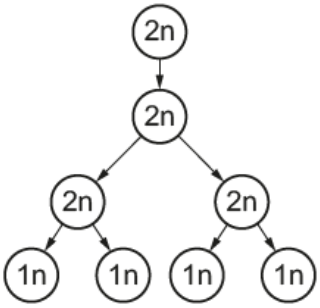
A



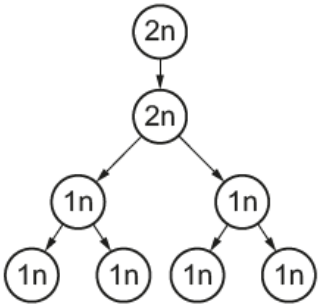
B



C



D



Your answer ☐ **[1]**

9. Nov 2020/Paper_J250/02/No.13

Myostatin is a protein that animals produce to stop muscle development.

A gene controls the production of myostatin. This gene is mutated in the Belgian Blue breed of cattle.

Belgian Blue cattle have more muscle compared with other cattle.

(a) (i) Belgian Blue cattle have a different muscle **phenotype** than other cattle.

What is meant by the term phenotype?

..... **[1]**

(ii) Explain why Belgian Blue cattle have a different muscle phenotype.

.....

.....

.....

..... **[2]**

(iii) The Belgian Blue cattle were produced by selective breeding.

It is unlikely that the Belgian Blue cattle would have developed by natural selection.

Explain why.

.....

.....

.....

..... **[2]**

*(b) Describe the process of selective breeding Belgian Blue cattle and explain the impact of this on the farming industry.

Include both the benefits and risks of selective breeding in your answer.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... **[6]**

(c) Selective breeding is one way the genome can be modified to produce desired characteristics.

Write down **one** other way the genome can be modified to produce desired characteristics.

..... **[1]**

10. Nov 2021/Paper_J250/07/No.4

The mass of an individual is one example of their phenotype.

Which row describes variation in mass of individuals within a population?

	Type of variation	Influenced by the environmental	Influenced by their genetics
A	continuous	no	yes
B	continuous	yes	yes
C	discontinuous	yes	no
D	discontinuous	no	yes

Your answer ☐ **[1]**

11. Nov 2021/Paper_J250/07/No.5

A flower homozygous dominant for colour is crossed with a homozygous recessive flower.

What is the predicted percentage of **heterozygous** offspring?

A 25%

B 50%

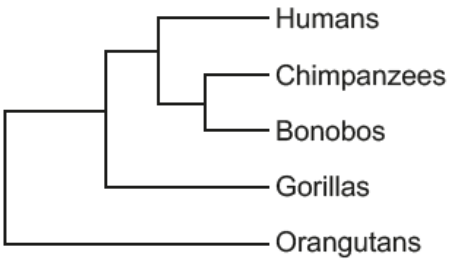
C 75%

D 100%

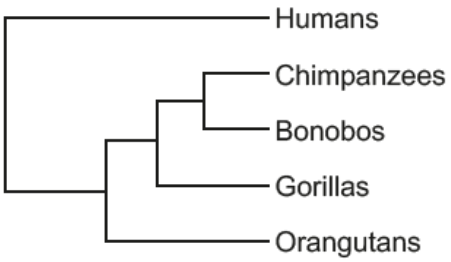
Your answer ☐ **[1]**

12. Nov 2021/Paper_J250/07/No.7

Humans share 98.7% of their DNA with bonobos and 97% with orangutans. The phylogenetic trees, **P** and **Q**, represent developments in the classification of humans.



Phylogenetic tree P



Phylogenetic tree Q

Which row matches the developments in the classification of humans?

	Phylogenetic tree	After DNA analysis	Most scientifically accepted phylogenetic tree
A	**P**	✓	✓
	Q	✗	✗
B	**P**	✗	✗
	Q	✓	✓
C	**P**	✗	✓
	Q	✓	✗
D	**P**	✓	✗
	Q	✗	✓

Your answer ☐ **[1]**

13. Nov 2021/Paper_J250/07/No.10

The human genome project mapped the human genome. This gave many benefits and risks.

Which statement is an ethical issue arising from the mapping of the human genome?

A Genes linked to different types of disease are identified and mapped.

B Human migration patterns can be traced to find the origin of our ancestors.

C Someone's genetic makeup can be used by life insurance companies to predict their risk of future illness.

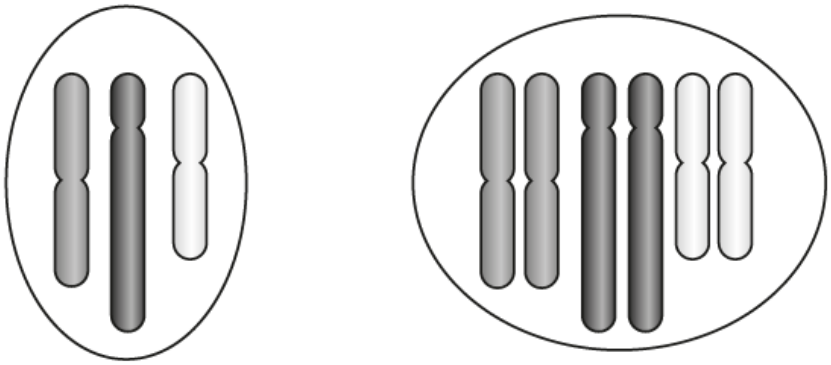
D Treatments are developed due to understanding of inherited disorders.

Your answer ☐ **[1]**

14. Nov 2021/Paper_J250/07/No.14

(a) The diagram shows two cells from a mosquito with a chromosome number of 6.

Different types of cell division produced **Cell A** and **Cell B**.



Cell A **Cell B**

Name the type of cell division that produced **Cell A** and explain its importance for the mosquito.

Type of cell division .....

Explanation .....

..... **[2]**

(b) Sexual reproduction is important for species as it results in differences within a species.

(i) Within a species of mosquito there are some mosquito that need blood to lay eggs and others that do not.

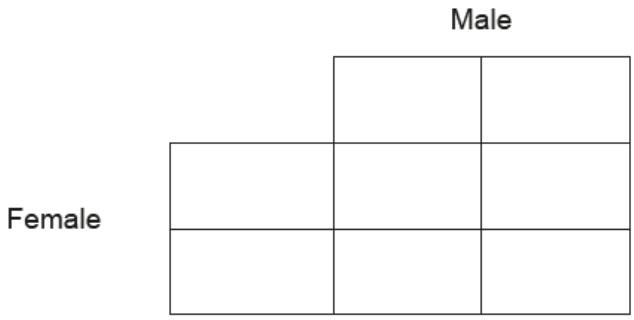
Why is this an example of discontinuous variation?

.....

..... **[1]**

(ii) What is the probability of a baby being male when humans sexually reproduce?

Complete the genetic diagram to explain your answer.



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

15. Nov 2020/Paper_J250/08/No.1

A scientist crossed a white flower with a purple flower.
The white flower is homozygous recessive. The purple flower is heterozygous.

The scientist uses this Punnett square to predict the expected ratio of offspring.

	P	p
p	Pp	pp
p	Pp	pp

What is the expected ratio of phenotypes in the offspring?

A 1 purple : 1 white

B 1 purple : 2 white

C 2 purple : 1 white

D 4 purple : 0 white

Your answer ☐ **[1]**

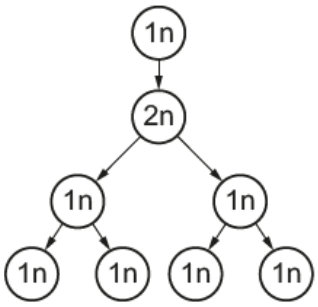
16. Nov 2020/Paper_J250/08/No.2

Meiosis is a type of cell division that is needed to make gametes.

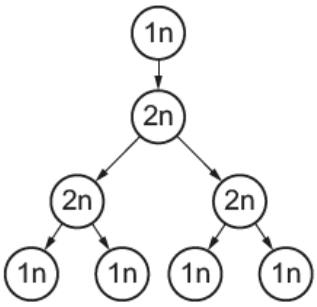
Which diagram shows meiosis?

n = number of chromosomes

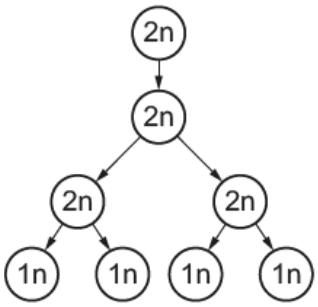
A



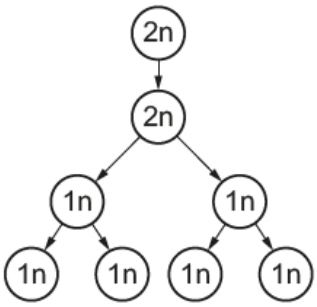
B



C



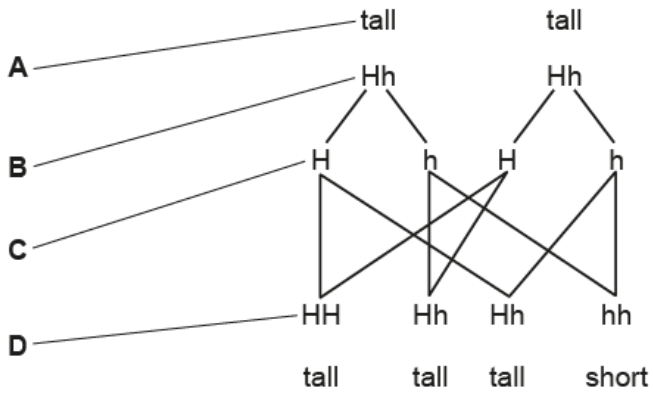
D



Your answer ☐ **[1]**

17. Nov 2020/Paper_J250/08/No.5

The genetic cross shows how genes are passed from parents to offspring.



Which part of the genetic cross shows the gametes?

Your answer ☐ **[1]**

18. Nov 2020/Paper_J250/08/No.7

The phenotype of rabbits can be black or white fur. The allele for black fur is dominant.

Which genetic cross identifies the genotype of a rabbit with black fur (rabbit **X**) as Bb?

A Cross rabbit **X** with a black rabbit. All offspring have black fur.

B Cross rabbit **X** with a black rabbit. 50% of offspring have black fur and 50% have white fur.

C Cross rabbit **X** with a white rabbit. All offspring have white fur.

D Cross rabbit **X** with a white rabbit. 50% of offspring have black fur and 50% have white fur.

Your answer ☐ **[1]**

19. Nov 2020/Paper_J250/08/No.9

Which statement about alleles and genes is correct?

A Alleles are found in the cytoplasm, while genes are only found in the nucleus on the DNA.

B Allele is just another name for gene, they are both the same codes for a characteristic.

C Genes are sections of DNA that code for a characteristic, alleles are different forms of a gene.

D It is possible to have two different genes for a characteristic but only one allele.

Your answer ☐ **[1]**

20. Nov 2020/Paper_J250/08/No.10

Phylogenetics is used in the process of classification of organisms.

Which of these is **not** part of Phylogenetics?

A All species existing today descended from a single common ancestor.

B Organisms are grouped using characteristics visible to the human eye.

C Phylogenetics is used to identify common ancestors.

D Sequencing of DNA can reveal the evolutionary history of an organism.

Your answer ☐ **[1]**

21. Nov 2020/Paper_J250/08/No.14

Scientists have used genetically engineered bacteria to produce the human hormone insulin.

(a) Describe the main steps in the process of genetic engineering.

.....

.....

.....

.....

.....

.....

.....

.....

..... **[4]**

(b) Insulin may be used to treat type 2 diabetes.

Describe the interaction between type 2 diabetes and nutrition.

.....

.....

.....

..... **[2]**

(c) The human genome has been mapped.

Discuss how this could help with the future treatment of type 2 diabetes.

.....

.....

.....

..... **[2]**