17. Inheritance

17.1 Chromosomes, genes and proteins

Paper 1 and 2

Question Paper

Paper 1

Questions are applicable for both core and extended candidates unless indicated in the question

1 Which sex chromosomes need to be present in a sperm cell to produce a male offspring?

A X only **B** Y only **C** XX **D** XY

2 What do genes code for?

A fats

B proteins

C starch

D sugars

3 What describes an allele?

A an alternative form of a chromosome made of DNA

B an alternative form of a chromosome made of protein

C an alternative form of a gene made of DNA

D an alternative form of a gene made of protein

4 Which statement about the human sex chromosomes is correct?

A Females have an X chromosome and a Y chromosome.

B Females have two Y chromosomes.

C Males and females have at least one X chromosome.

D Males and females have at least one Y chromosome.

5 What is defined as a length of DNA that codes for a protein?

A amino acid

B antibody

C chromosome

D gene

6 Which term is a genetic change?

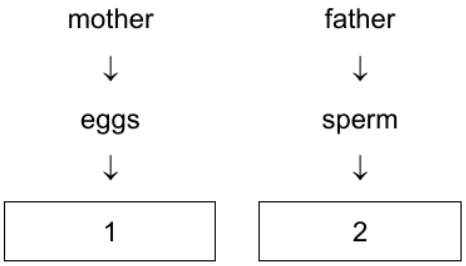
A allele

B genotype

C mutation

D phenotype

7 A student used a diagram to explain the inheritance of sex in humans.



Which statements should she use to complete boxes 1 and 2?

	box 1	box 2
A	all have an X chromosome	half have an X chromosome and half have a Y chromosome
B	all have a Y chromosome	half have an X chromosome and half have a Y chromosome
C	half have an X chromosome and half have a Y chromosome	all have an X chromosome
D	half have an X chromosome and half have a Y chromosome	all have a Y chromosome

8 The diagram shows the inheritance of sex in humans.

		male gametes	
		X	Y
female gametes	X	XX	XY
	X	XX	XY

A man and a woman have one female child.

What is the chance of the couple's next child being female?

A 25% **B** 50% **C** 75% **D** 100%

9 An allele is a version of which structure?

A amino acid

B chromosome

C gene

D protein

10 Which of these determine the sex of humans?

A X and Y genes

B X and Y alleles

C X and Y chromosomes

D X and Y genotypes

11 In humans, sex determination is controlled by the X and Y chromosomes.

A man and a woman have three children, two boys and a girl.

What is the probability that their next child will be a girl?

A 25% **B** 50% **C** 75% **D** 100%

12 What is defined as a length of DNA that codes for a protein?

A amino acid

B chromosome

C gene

D nucleus

13 Which statement about the human sex chromosomes is correct?

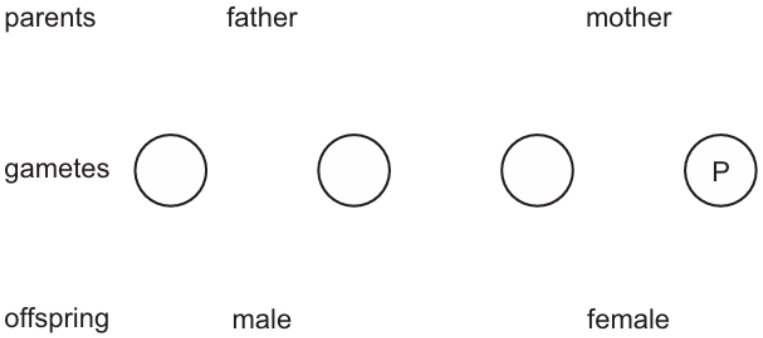
A Females have an X chromosome and a Y chromosome.

B Females have two Y chromosomes.

C Males and females have at least one X chromosome.

D Males and females have at least one Y chromosome.

14 The diagram shows part of a genetic diagram for the inheritance of sex in humans.



What are the sex chromosomes in gamete P and the male offspring?

	P	male offspring
A	X	XX
B	X	XY
C	Y	XX
D	Y	XY

15 A rabbit has 44 chromosomes in each of its body cells.

Which row correctly describes the gamete cells? **(extended only)**

	number of chromosomes	gametes compared to body cells
A	22	genetically identical
B	22	genetically different
C	44	genetically identical
D	44	genetically different

16 Which word describes an individual who has two identical alleles for a particular gene?

A dominant

B heterozygous

C homozygous

D phenotype

17 The diagram shows what happens during fertilisation.

egg + sperm → fertilised egg → male embryo

Which sex chromosomes are present in the egg, sperm and fertilised egg shown?

	egg	sperm	fertilised egg
A	X	X	XX
B	X	Y	XY
C	Y	X	XY
D	Y	Y	YY

18 What is the transmission of genetic information from generation to generation known as?

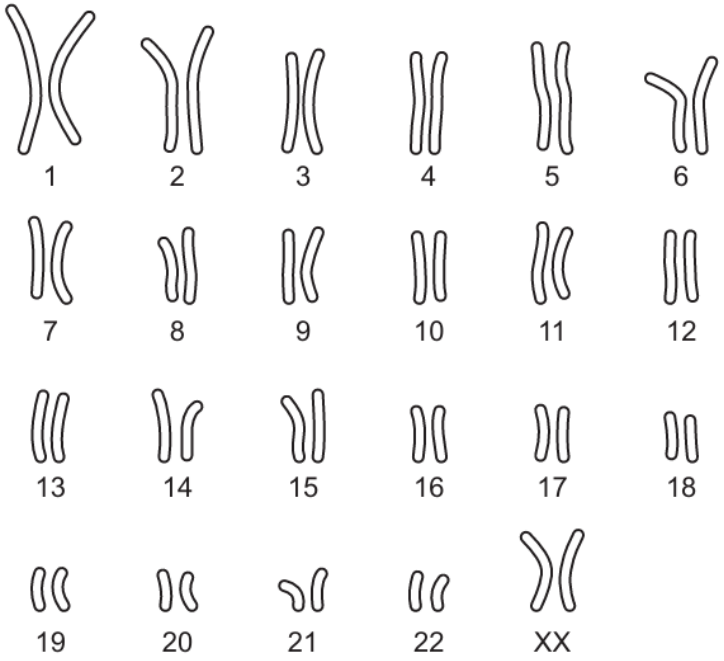
A cell division

B inheritance

C meiosis

D mitosis

19 The diagram shows the chromosomes in one human cell.



What can be concluded from the chromosomes in this cell? **(extended only)**

A The cell is from a man.

B The cell is from a woman.

C There are only 23 chromosomes per cell.

D There are only 46 pairs of chromosomes per cell.

Paper 2

Questions are applicable for both extended candidates only

20 Why do different cells in a human body produce different proteins? **(extended only)**

A Alleles can be dominant or recessive.

B Only particular genes are expressed.

C Cells have different genes.

D The sequence of bases in the DNA varies between different cells.

21 Where are amino acids assembled into protein molecules? **(extended only)**

A the DNA

B the genes

C the nucleus

D the ribosomes

22 Why are cells in the pancreas the only body cells that produce insulin? **(extended only)**

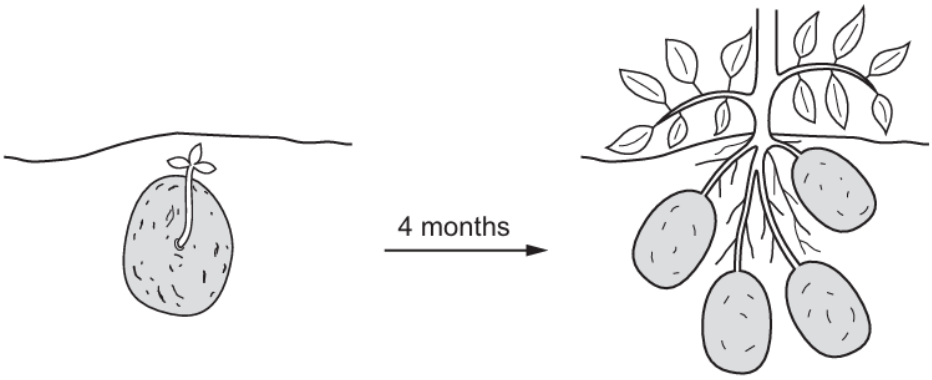
A All of the genes in the nucleus of a cell in the pancreas are expressed.

B Other body cells do **not** have the gene for insulin.

C The cells in the pancreas have twice as many genes as the other body cells.

D The gene for insulin is only expressed by cells in the pancreas.

23 Potatoes are stem tubers. A tuber can be placed in the ground to grow into another plant, which can grow many more tubers.



The diploid number of the potato plant is 24.

How many chromosomes will there be in the cells of the stem, the leaf and the pollen? **(extended only)**

	stem	leaf	pollen
A	24	24	12
B	24	12	48
C	48	12	24
D	48	48	12

24 The statements describe how a protein is made.

1 mRNA passes through a ribosome.

2 mRNA molecules carry a copy of the gene to the cytoplasm.

3 The gene coding for the protein is copied in the nucleus.

4 Ribosomes assemble amino acids into proteins.

What is the order of statements that describes how a protein is made? **(extended only)**

A $2 \rightarrow 1 \rightarrow 3 \rightarrow 4$

B $2 \rightarrow 3 \rightarrow 4 \rightarrow 1$

C $3 \rightarrow 1 \rightarrow 2 \rightarrow 4$

D $3 \rightarrow 2 \rightarrow 1 \rightarrow 4$

25 The following are involved in protein synthesis.

1 amino acids assembled in order

2 mRNA moves to the cytoplasm

3 mRNA passing through a ribosome

4 DNA in the nucleus

In which order do they become involved when proteins are made? **(extended only)**

A 1 → 3 → 2 → 4

B 3 → 2 → 1 → 4

C 4 → 2 → 3 → 1

D 4 → 3 → 2 → 1

26 Some descriptions of different human cells are listed.

1 contains 46 chromosomes

2 haploid nucleus

3 diploid nucleus

4 contains one set of unpaired chromosomes

Which descriptions are correct for the nucleus of a human gamete? **(extended only)**

A 1 and 2 **B** 1 and 3 **C** 2 and 4 **D** 3 and 4

27 Which statement about a diploid human cell is correct? **(extended only)**

A There are 22 chromosomes and an X or a Y chromosome.

B There are 22 pairs of chromosomes and two sex chromosomes.

C There are 23 chromosomes.

D There are 23 pairs of chromosomes and two sex chromosomes.

28 A zygote has ten chromosomes in its nucleus.

Which row shows the number of chromosomes in the cells of this species? **(extended only)**

	body cells	sperm cells	embryo cells
A	5	5	10
B	5	10	20
C	10	5	10
D	10	10	20

29 What carries a copy of the gene to the cytoplasm to make a protein? **(extended only)**

A alleles

B DNA molecules

C ribosomes

D mRNA molecules

30 The Tasmanian devil is an animal with seven pairs of chromosomes in each body cell.

The diagram shows the chromosomes in a cell from a Tasmanian devil.

Which statement is correct? **(extended only)**

A The cell is a haploid cell containing pairs of chromosomes.

B The cell is a diploid cell with no pairs of chromosomes.

C The cell is a haploid cell with no pairs of chromosomes.

D The cell is a diploid cell containing pairs of chromosomes.

31 Which cell contains a haploid nucleus? **(extended only)**

A neurone

B sperm cell

C skin cell

D red blood cell

32 What is a diploid nucleus? **(extended only)**

A a nucleus containing one set of chromosomes

B a nucleus containing two sets of chromosomes

C a nucleus with one double helix of DNA

D a nucleus with two genes

33 A human zygote is a diploid cell.

Which statement about human diploid cells is correct? **(extended only)**

A They do not have a nucleus.

B They fuse to form gametes.

C The nucleus contains a single set of chromosomes.

D The nucleus contains two sets of chromosomes.