



All you need to know about ...

Module

B1

OCR 21st Century Science

CELLS, CHROMOSOMES & GENES

Instructions for how an organism develops are found in the nucleus

- chromosomes are found in cell nuclei - they come in pairs
- every human body cell has 23 chromosomes
- genes are sections of DNA molecules that make up chromosomes
- genes are instructions on how to make proteins - they are pairs
- humans have about 30000 pairs of genes
- sex cells have only a copy of one chromosome from each pair
- chromosomes in a pair carry the same genes in the same place
- there are two different forms (alleles) for any gene
- alleles can be **dominant** or **recessive**
- male and female alleles combine in a fertilised egg
- different offspring from the same parents can differ
- human males have sex chromosomes XY
- human females have sex chromosomes XX
- sex of an embryo is determined by a gene on the Y chromosome
- the gene governs the development of sex organs into ovaries/testes

FEMALE

	XX
X	X
XY	XX
Y	XY

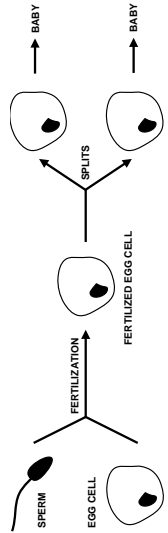
MALE XY X XX XX

2 chances of female

2 chance of male

SEXUAL REPRODUCTION

- TWO PARENTS REQUIRED - MALE AND FEMALE
- GENES FROM BOTH PARENTS INFLUENCE CHARACTERISTICS
- CLONES ARE POSSIBLE (IDENTICAL TWINS)
- IDENTICAL TWINS HAVE THE SAME GENES
- IDENTICAL TWINS ARE CLONES OF EACH OTHER
- IDENTICAL TWINS ARE NOT CLONES OF THEIR PARENTS



HUNTINGTON'S DISORDER

- caused by a dominant (D) allele
- only to inherit from one parent to have the condition.
- symptoms don't happen until middle age
- causes loss of muscle control and forgetfulness
- condition is fatal.
- DD** - have Huntington's
- dd** - NOT have Huntington's
- Dd** - have Huntington's

CYSTIC FIBROSIS

How do you get it?

- it is inherited - you get it from your parents
- dominant gene (F) produces normal mucus
- recessive gene (f) leads to cystic fibrosis**
- have **ff** - have cystic fibrosis
- have **Ff** - not have cystic fibrosis but are a carrier
- both parents have **Ff** - chance of child having **ff** is 1 in 4

How does it affect someone?

- cells that make mucus don't work properly
- the mucus is too thick and blocks the lungs
- enzymes are stopped from reaching the lungs

Cannot be cured but can be treated

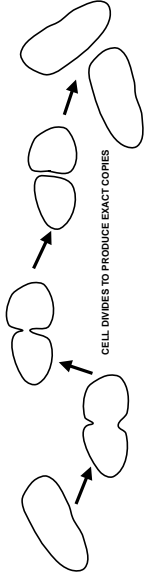
- physiotherapy helps clear mucus from lungs
- antibiotics can treat chest infections

Prevention

- AMNIOCENTESIS cells are taken from a foetus
- doctors look to see what genes are present
- parents can then choose to end the pregnancy

ASEXUAL REPRODUCTION

- ONLY ONE PARENT
- GENES ARE IDENTICAL TO PARENT
- ARE CLONES
- BACTERIA, HYDRA and PLANTS REPRODUCE THIS WAY



STEM CELLS

- SPECIALISED** cells
- can grow into any type of cell in the human body
- can be taken from embryos which are a few days old
- these embryos have been used for fertility treatment

Method

- A nucleus is taken out of a human egg cell
- It is replaced with a nucleus from one of the patient's cells
- An embryo develops
- After a few days, cells are removed from the new embryo
- Stems cells are grown in a dish

Use

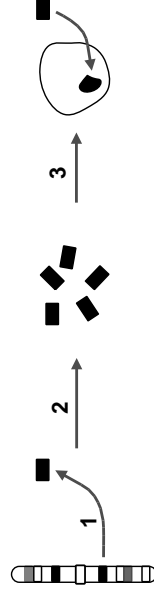
- to make new cells to treat diseases such as Parkinson's
- new cells need the same gens as the parent
- cells are rejected if not suitable

Human cloning

- would produce an embryo with the same genes as the parent
- genes are identical to parent

GENE THERAPY

- remove a normal allele from someone without the disorder
- make lots of copies
- put a copy into the cell nucleus of someone with disorder



ETHICS IN HUMAN CLONING

- creating embryos for medical treatment is wrong
- involves creating a life which is then destroyed
- lowers the value of life
- an embryo is a human life and has rights
- its age makes no difference
- it doesn't matter if it is right or wrong
- it is more important that it helps people get better
- the right decision is the one which suits the majority
- certain actions are never justified as they are unnatural