HOW DNA CODES FOR PROTEINS

* The order of bases forms a code; e.g AG TTCAM

- each group of **3** codes for a specific AMINO ACID
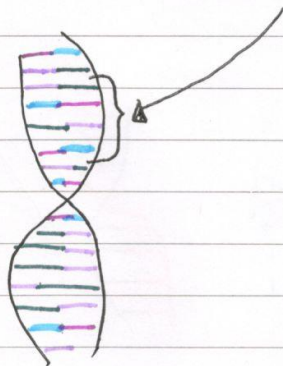
- amino acids are joined together to make a **protein**
- The different orders of amino acids determine which protein it is.

Therefore DNA determines which protein is produced.

- The DNA is two strands which is wound together to form a double helix.

GENE = A section of DNA that codes for a
specific sequence of amino acids
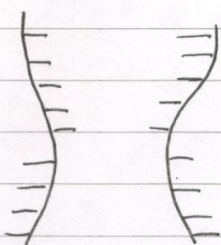which join together to form a protein.
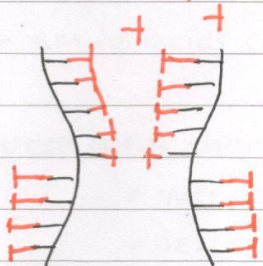

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Protein Synthesis

↳ The process of producing a protein from DNA.

① DNA cannot move out the nucleus as it is too big.

① The 2 strands pull apart

③ mRNA nucleotides
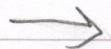
• mRNA nucleotides come along and match to their complementary base.

④ • Mrna nucleotides join to form a full strand.
• This now means you have a replica of the original DNA

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⑤

- These new strand are small enough so these can move out the nucleus
- They move out + into the |RIBOSOMES|

⑥

- In the ribosomes, the bases are read in groups of 3 to code for an amino acid

= ● ←The amino acid.

⑦ ●●●● + ●●●● + ...

Proteins can be enzymes, hormone or structural proteins

The amino acids connect together to form a PROTEIN!

___

Mutations change the sequence of bases in DNA by either:
- INSERTING a base into a code
- DELETING the code
- SUBSITUTING one base to another

↳ All of these will change the way the bases are read = changing which amino acid is coded for = change protein.

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INHERITANCE

Allele = The different forms of the gene.

i.e the gene that codes for eye colour — the one that codes for blue is an allele (as its one form of the gene) and the gene that codes for brown is another allele.

★ Human cells have 2 alleles for each gene as they inherit one from each parent.

Two types of alleles:

① DOMINANT allele
→ only one (of the 2 in each cell) needs the be present for the characteristic to be expressed, and the phenotype to be seen.

② RECESSIVE allele
→ Two copies need to be present to see the characteristic

e.g : lets say the gene for the ability to tongue roll is recessive.

You would need to have "rr" to be able to tongue roll. If your genotype was "Rr" or "RR" the characteristic wouldn't be observed.

If the gene for tongue rolling was dominant, you would see the characteristic with genotypes "Rr" and "RR"

They will tell you in the exam if the gene is recessive or dominant

recessive genes are always lowercase letters and dominant gene uppercase.

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How to determine the **probability** of 2 parents having a certain genotype:

e.g Cystic fibrosis is a recessive allele:

		mums alleles	
		B	b
Dads alleles	B	BB	Bb
	B	BB	Bb

↙

• cystic fibrosis will only show on those with "bb" as it is recessive. In this case, 0% of offspring will have it, as "bb" is not seen in the 4 possible alleles for the child.

Embryonic Screening

It allows scientists to observe whether the child will have a genetic condition or not.

Arguments **for**	Arguments **against**
Reduces the number of people suffering	Designer babies - could lead to people picking characteristics
Treating disorders is expensive	Expensive to carry out Screening
	Prejudice - its assuming those with a genetic condition aren't living a good life

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Sex determination

- Cells have 23 pairs of chromosomes;
    - 22 control characteristics
    - The 23rd pair carries SEX DETERMINE GENES, these are the Y and X chromosomes

FEMALE GAMETES = XX

MALE GAMETES = XY

female gamete

	X	X
X	XX	XX
Y	XY	XY

male gamete

The baby

Theres a 50% chance of it being a boy or a girl.

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VARIATION

physical characteristics
→ you can observe

genetic
→ makeup

★ The phenotype of an organism depends on its genotype and its environment.

evolution

EVOLUTION = a change in the inherited characteristics of a population over time through a process of natural selection.

evolution occurs because of natural selection:

① mutations occur which provide variations between organisms
② Some mutations give a survival advantage
③ As these organisms are more likely to survive, they will be the ones who reproduce = their specific genes will be passed on

° sometimes this may occur over many years that the organism will be so different it'll become a different species.
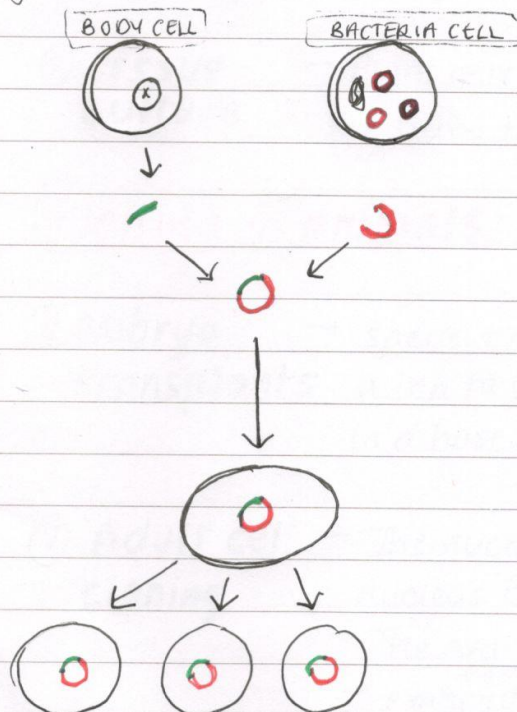
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SELECTIVE BREEDING

This is when humans choose which organisms to breed to produce offspring with desirable characteristics

However, it can lead to inbreeding which is when you breed closely related individuals, this reduces the gene pool, so if there is a change environment, the species may become extinct as they wont have a range of characteristics.

Genetic Engineering

• Genetic engineering is modifying the genome of an organism by introducing a gene from another organism to give a desired characteristic.

BODY CELL　　　BACTERIA CELL

• Genes are cut out from cell using 'restriction enzymes'
• Plasmid from bacterium also cut using same enzyme

• The gene + plasmid are joined together using 'DNA ligise'

• It is placed in a vector (host cell) and allowed to multiply

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Benefits of genetic engineering	Risks of genetic engineering
Useful to mass produce hormones	Crops may have an effect on wildflowers
It can improve crops	
Greater crop yields can solve world hunger	We don't fully understand the effects of GM crops on human health

Cloning

Cloning in Plants:

① **cuttings** — a section of the stem is cut + then planted + grows a clone

② **tissue culture** — Plant cells are taken + placed in a growth medium + grow into clones

Cloning in animals:

① **embryo transplants** — sperm + egg cells are obtained + fertalised in a lab to form an embryo before being placed in a host mother to be born

② **Adult cell cloning** — The nucleus is removed from an egg and the nucleus from an adult body cell is placed in the egg
— The egg is stimulated to divide + form an embryo
— embryo planted in host mother + baby is born.

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BENEFITS OF CLONING	RISKS OF CLONING
Produce lots of offspring with desired characteristics	Gene pool is reduced so its less likely the population will survive if a disease arises
Helps endangered species	Clones have a low survival rate
	May lead to human cloning

The theory of evolution :

① Variation exists within a species due to DNA mutations.
② Organisms with characteristics most suited to the environment are more likely to survive — (survival of the fittest).
③ These breed = beneficial characters passed on to offspring
④ Over many generations the frequency of alleles for this advantageous characteristic will increase.

SPECIATION → The process of a new species developing through the selection of different alleles.

★ The genetic variation increases until The new population become so different they have now become a different species.

Fossils → the remains of organisms from millions of years ago. They can be used to show how the anatomy of organism have changed over time.

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Extinction

FACTORS CONTRIBUTING TO EXTINCTION:
- Changes in environment which the species cannot adapt to quickly enough.
- New predators
- New disease
- New competition for food
- A catastrophic event
- Destruction of habitat.

Adaptions, Interdependence, + competition

COMMUNITIES

Community = All the populations of different species living together in a habitat.

ABIOTIC FACTORS

A non-living factor.

e.g light intensity, temperature, moisture levels, pH of soil, wind intensity/direction, CO_2 levels, oxygen levels

BIOTIC FACTORS

A living factor

e.g food availability, new predators, new pathogens, competition

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ADAPTIONS

Organisms have adaptions to survive where they live.

- **Structual adaptions** - shape or colour of part of an organism.
    - sharp teeth
    - camoflauge
    - Thich fat layer

- **Behavioural adaptions**
    - playing dead to avoid predators
    - Basking in sun to absorb heat
    - courting to attract a mate

- **functional** - involved in processes such as reproduction
    - late implantation of embryos
    - conserve water through producing little sweat.

ORGANISATION OF ECOSYSTEM

FOOD CHAINS:

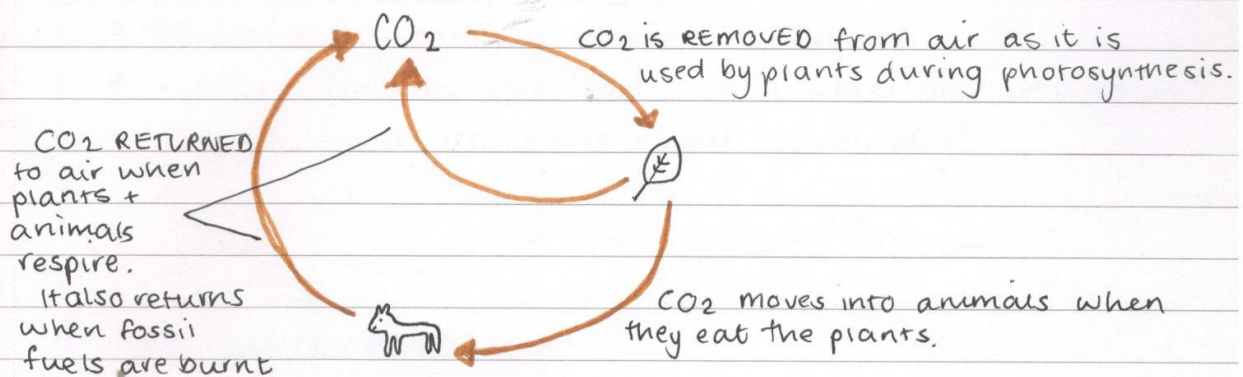TERTIARY CONSUMER
↓
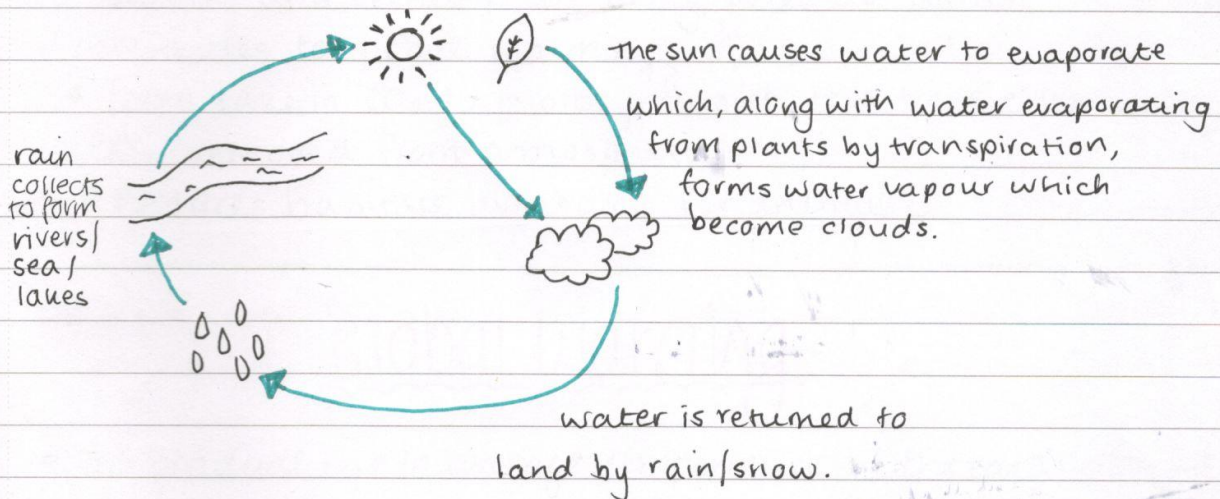PRIMARY CONSUMER
↓
PRIMARY CONSUMER
↓
PRODUCER

↑ Biomass reduces as you move up each level as not all biomass can be eaten

photosynthetic organisms which photosynthesise to make glucose

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THE CARBON CYCLE

CO_2

CO_2 is REMOVED from air as it is used by plants during photosynthesis.

CO_2 RETURNED to air when plants + animals respire.

It also returns when fossil fuels are burnt

CO_2 moves into animals when they eat the plants.

THE WATER CYCLE

The sun causes water to evaporate which, along with water evaporating from plants by transpiration, forms water vapour which become clouds.

rain collects to form rivers/ sea/ lakes

water is returned to land by rain/snow.

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DECOMPOSITION

→ decomposers work by secreting enzymes to break things down

WHAT EFFECTS RATE OF COMPOSITION :

- Temperature (chemical reactions are faster)
- Water (microbs grow faster, using water from respiration)
- Oxygen (most decomposers respire anerobically)

Deforestation

★ This is the cutting down of a large number of trees in the same area in order to use the land for something else.

ISSUES CAUSED:

- Burning trees releases CO_2 being released which contributes to global warming
- Trees take in CO_2 to photosynthesise, less trees = less CO_2 removed from atmosphere
- Reduces habitats available for animals.

Global Warming

= The gradual rise in average temperature of the earth due to increasing atmospheric levels of CO_2 + methane

greenhouse gases

Consequences:

★ Melting ice caps = destroy habitats
★ Rising sea levels = destroy habitats
★ Organisms may become extinct due to less habitats

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Maintaining Biodiversity

<u>POSITIVE</u> human interactions with ecosystems:
1. Maintaining rainforests to ensure habitats are not destroyed
2. Reducing water pollution
3. Reserving areas of scientific interest.
4. Replanting hedgerows + other animal habitats

<u>NEGATIVE</u> human interactions with ecosystems
1. Production of greenhouse gases leading to global warming
2. Producing sulfur dioxide leading to acid rain which destroys habitats.
3. Chemicals used in farming leak into environment
4. Cleaning land to build = destroying habitats.

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