2.3: DNA and inheritance

Genetic profiling

- isolation, fragmentation, separation, comparison
- involves cutting the DNA into short pieces which are then separated into bands
- used to show the similarity between two DNA samples by comparing the pattern of the bands produced
- used in criminal cases, in paternity cases and in comparisons between species for classification purposes

+ identifies the presence of certain genes which may be associated with a particular disease
+ reliable

The ethical issues linked with DNA profiling

- The storage of DNA profiles can be seen as an invasion of privacy.
- Insurance companies may receive stored DNA who could analyse your DNA for predisposition to disease.

Genetic modification

- the artificial transfer of genes from one organism to another

+ disease resistance
+ increased yield

– effects on health
– effects on the environment

The structure of DNA

- ladder-like, with the bases forming the rungs
- two long chains of alternating sugar and phosphate connected by bases and twisted to form a double helix

Complementary base pairs

- A (adenine) pairs with T (thymine).
- C (cytosine) pairs with G (guanine).

2.5: Response and regulation

Sense organs

- a group of receptor cells which respond to specific stimuli and then relay this information as electrical impulses along neurones to the central nervous system

Forms of stimuli

- light
- sound
- touch
- temperature
- chemicals

The nervous system

- the brain
- the spinal cord
- nerves

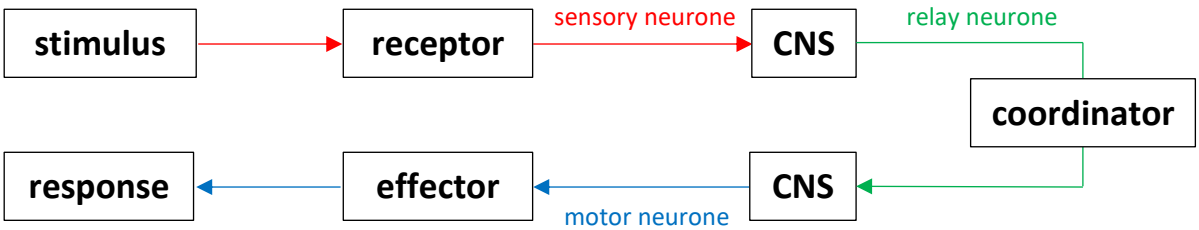
The central nervous system

- the brain
- the spinal cord

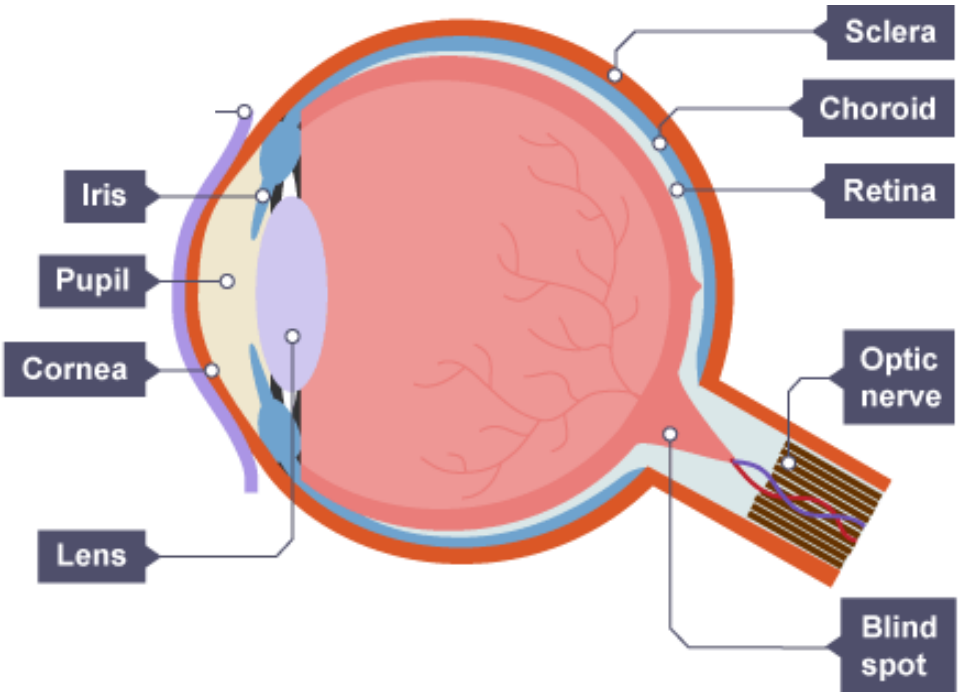
The properties of reflex actions

- fast
- automatic
- sometimes protective, e.g. the withdrawal reflex, blinking, pupil size

The components of a reflex arc



The eye



The sclera

- has a protective, tough outer coat

The cornea

- the clear part allows light to enter and refracts light entering.

The pupil

- a hole in the centre of the iris
- allows light to enter

The iris

- muscles that alter the size of the pupil to control the amount of light entering

The lens

- changes shape to focus light onto retina

The choroid

- a pigmented layer which absorbs light to prevent reflection
- contains blood vessels

The retina

- a light sensitive layer
- where images are formed
- where impulses are sent to the optic nerve

The blind spot

- where the optic nerve leaves the eye
- where there are no light-sensitive cells

The optic nerve

- carries impulses from the retina to the brain

Lifestyle choices

- affect some conditions

Alcohol

- changes various chemical processes in the body, including reaction time
- may cause people to become dependent on, addicted to and suffer withdrawal symptoms without it
- can cause long-term physical damage, e.g. liver, circulatory and heart diseases

Drugs

- misused
- affect people's bodies

Obesity and type 2 diabetes

- There is a link between rising levels of obesity and increasing levels of type 2 diabetes.

2.8: Disease, defence and treatment

Microorganisms

- mostly harmless
- many perform vital functions

Pathogens

- type of microorganism
- cause disease
- include bacteria, viruses, fungi and protists

The structure of a bacterial cell

- a cell wall
- a cell membrane
- cytoplasm
- no distinct nucleus

The structure of a virus

- a number of genes
- surrounded by a protein coat

Communicable diseases

- caused by bacteria, viruses and fungi
- spread by contact, aerosol, body fluids, water, insects and contaminated food

AIDS (Acquired Immune Deficiency Syndrome)

- caused by HIV (Human Immunodeficiency Virus), which infects lymphocytes
- spread by blood to blood contact, especially during sexual intercourse
- can cause infection with a variety of microorganisms, e.g. tuberculosis or pneumonia
- can be prevented through the use of condoms and the use of disposable gloves where there is any danger of contact with contaminated blood
- can be treated with antiviral agents when taken throughout life to prevent the multiplication of the virus inside cells