BE2 – Knowledge organiser part B

Developing a new drug

Preclinical Testing: The drug is tested on **cells, tissues and animals** for **toxicity**.

Stage One: The drug is tested on **healthy volunteers** to test for **toxicity.**

Stage Two: The drug is tested on a **small group of patients** with the illness to test for **toxicity and efficacy.**

Stage Three: The drug is tested on a **bigger group of patients** with the illness to test for **efficacy and dosage.**

Before the drug can be licensed for use, the research has to be **peer-reviewed** in order to **prevent bias.**

Drugs are tested for:

- **Toxicity** (to make sure they are safe)
- **Efficacy** (to make sure they work)
- **Dosage** (to find out the **optimum** dose)

Most drug trials are **double-blind**,

This means the **patient and the doctor are not aware** of who is getting the drug or placebo.

A **placebo** is a fake drug or sugar pill.

It is used as a **control** to compare results to.

Detecting Plant Diseases

Plant diseases can be detected by:

- **Stunted** growth
- **Spots** on leaves
- Areas of **decay**
- Growths or **tumours**
- **Malformed** stems or leaves
- **Discolouration**
- The presence of **pests**

Identifying Plant Diseases

Plant diseases can be identified by:

- Reference to a gardening **manual or website**
- Taking infected plants to a **laboratory** to identify the pathogen
- Using **testing kits** that contain monoclonal antibodies

Plant Defence Responses

Physical Defence Responses

- Cellulose **cell walls**
- Tough **waxy cuticle** on leaves
- Layers of **dead cells** around the stem or bark which fall off

Chemical Plant Defence Responses

- **Antibacterial chemicals**
- Secrete **poisons** to deter herbivores

Mechanical Adaptations

- **Thorns and hairs** to deter animals
- **Leaves** which **droop or curl** when touched
- **Mimicry** to trick animals

Aphids are **little insects** which destroy the plant.

They can be killed using **insecticides.**

Detecting Plant Diseases

Stunted growth can be caused by **nitrate deficiency.** Nitrates are important for protein synthesis.

Chlorosis (leaves turning yellow) is caused by a **magnesium deficiency.** Magnesium ions are needed to make chlorophyll for photosynthesis

Uses of monoclonal antibodies

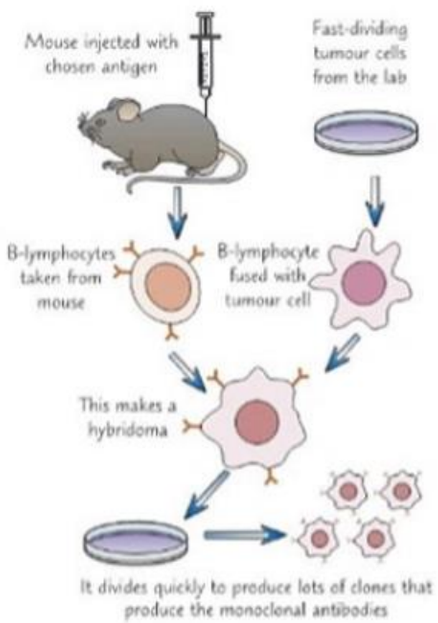
Monoclonal antibodies can be used:

- For **diagnosis** (e.g. in pregnancy tests)
- In laboratories **to measure levels of chemicals** (e.g. hormones) in the blood or to detect levels of a certain pathogen
- In **research** to locate or identify specific molecules in a cell or tissue. The monoclonal antibody **binds with a fluorescent dye.**
- To **treat diseases** (e.g. cancer)
  - The monoclonal antibody binds to a radioactive substance (e.g. drug)
  - It stops cancer cells growing and dividing
  - It does not harm the other cells in the body

Monoclonal antibodies have **more side effects** than first expected.

This means they are **not as widely used** as hoped when they were originally developed

Producing Monoclonal Antibodies



Monoclonal antibodies are produced from **clones of a single white blood cell.** This means that all the antibodies are **identical** and only target **one specific antigen.**

A **hybridoma cell** is a mouse B-lymphocyte fused with a **tumour cell** – this means that there is a cell that **grows easily** and produces **lots of antibodies.**

These antibodies can then be **collected and purified.**

Monoclonal antibodies are useful as they only bind to **the target molecule** on **one type of cell.**

Homeostasis

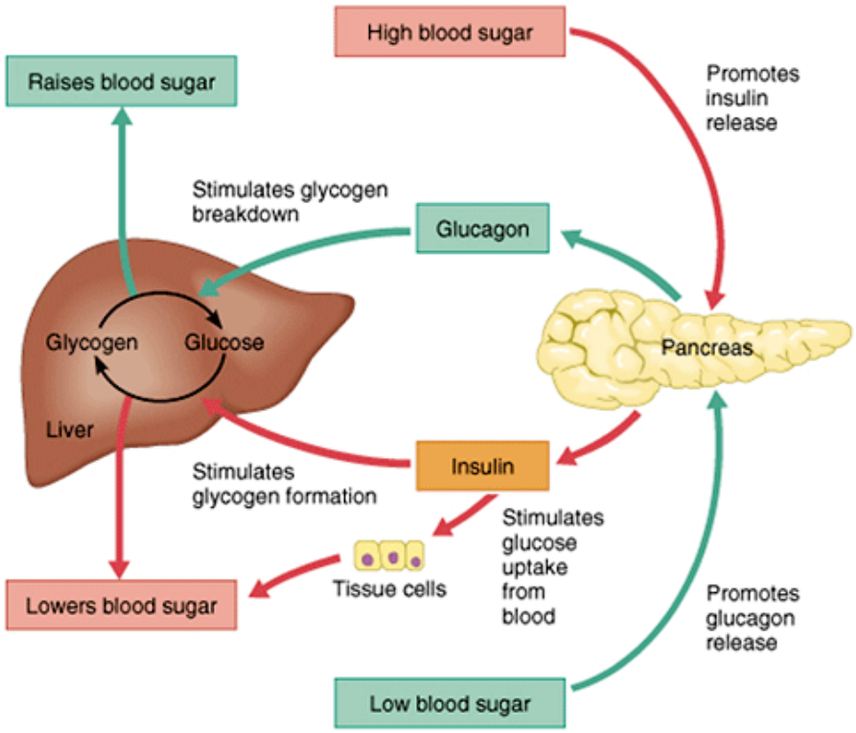
Homeostasis is your body trying to keep everything INSIDE your body stable, constant or balanced.

What needs to be kept constant in our bodies?

- **Blood sugar levels**
- **Core body temperature**
- **Water levels in blood.**

Control of blood sugar levels.

What happens if our blood sugar levels become too high or low?



Differences between nerves and hormones.

Nervous System	Endocrine System
Works by **nerve impulses** *(has chemicals in synapses though)*	Works by **hormones** transmitted in blood stream
Travel **fast** and usually have 'instant' effect	Travel **slowly** and may take longer to ask
Response is **short** lived	Response is usually **longer** lasting
Impulse act on individual cells (**localised** effect)	**Widespread** effects on different organs (still only work on cells/organs with correct receptors)

How are hormones used to control fertility?

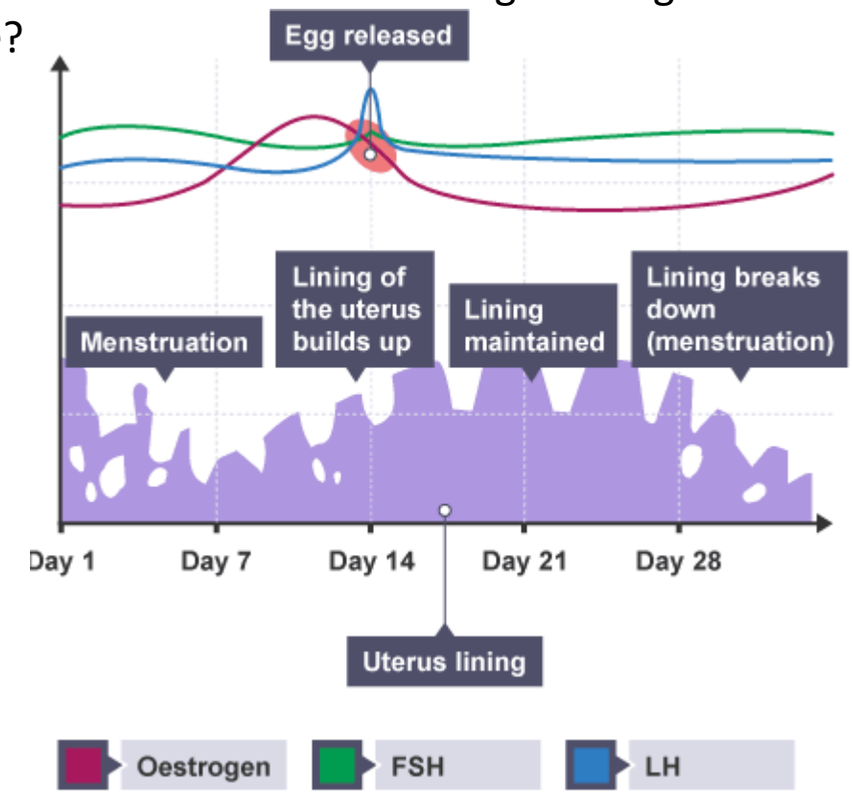
Human **fertility** is controlled by **hormones**, so fertility can be controlled using hormonal forms of contraception.

The oral contraceptive, which is known as the pill, contains **oestrogen** or **progesterone**. These hormones inhibit the production of **FSH**, and eggs cannot mature.

Control of the menstrual cycle through hormones.

Endocrine Gland	Hormone	Function
Anterior Pituitary 	FSH	• Stimulates follicular growth in ovaries • Stimulates estrogen secretion (from developing follicles)
	LH	• Surge causes ovulation • Results in the formation of a corpus luteum
Ovaries 	Estrogen	• Thickens uterine lining (endometrium) • Inhibits FSH and LH for most of cycle • Stimulates FSH and LH release pre-ovulation
	Progesterone	• Thickens uterine lining (endometrium) • Inhibits FSH and LH

How do these hormone levels change throughout the cycle?



Fertility treatments

Some women have difficulty becoming pregnant because they don't produce enough FSH to allow their eggs to mature. Fertility drugs contain **FSH** and **LH**, which stimulate eggs to mature in the ovary.