1 - Pathogens (micro-organisms that cause communicable diseases)	
Communicable disease	**Infectious** disease caused by **pathogens** -> easily **spread**.
Bacteria	**Small prokaryotic** cells -> produce **toxins** that cause **cell damage**.
Virus	**Not** cells -> **reproduce** inside body cells -> causes cells to **burst**.
Fungi	Some **single celled** -> others made of **hyphae** -> produce **spores**.
Protist	**Single celled eukaryotes** -> often transferred by **vectors**.
Spread	By **contaminated food** and **water**, **air** and **direct contact**.
Reducing spread	Being **hygienic**, destroying **vectors**, **isolation**, and **vaccination**.
2 - Communicable Diseases	
Measles	**Viral** -> spread by **coughs/sneezes** -> causes **rash** and **fever** -> can lead to **pneumonia** or **encephalitis** -> **vaccination** available.
HIV	**Viral** -> spread by **sexual contact / sharing needles** -> **flu-like** symptoms -> control with **antiretroviral drugs** -> attacks **immune system** -> can lead to **AIDS**.
Tobacco mosaic virus	**Viral** -> **mosaic** pattern on **leaves** (discolouration) -> affects **photosynthesis** -> affects **growth** -> spread by **contact**.
Rose black spot	**Fungal** -> **purple** or **black spots** on **leaves** -> leaves turn **yellow** and **drop off** -> affect **photosynthesis** and **growth** -> spread in **water / wind** -> use **fungicides** -> **strip** and **destroy leaves**.
Malaria	Caused by **protist** -> spread by **mosquitoes** (**vectors**) when **feeding** -> causes **fever** -> can be **fatal** -> stop mosquitoes **breeding** -> use **insecticides** and **nets**.
Salmonella	**Bacterial ->** contaminated food causes **food poisoning** -> **toxins** cause **fever**, **vomiting**, **diarrhoea** -> **poultry** given **vaccination**.
Gonorrhoea	**Bacterial** -> **sexually transmitted** -> **pain** when **urinating** and **yellow/green discharge** -> treat with **antibiotics** (but some **strains resistant**) -> prevent by using **condoms**.
3 - Natural Barriers	
Skin	Physical **barrier** -> secretes **antimicrobial** substances.
Nose	**Hair** and **mucus** to **trap** pathogens.
Airways	**Mucus** traps pathogens -> **hairs** on **cilia cells** sweep mucus.
Stomach	Produces **hydrochloric acid** -> **kills** pathogens in **food/drink**.

4 - Immune System Response to Pathogens	
Phagocytosis	White blood cells **engulf** and **digest** pathogens.
Antibodies	White blood cells produce **specific shape antibodies** -> **lock** onto **antigens** on surface of pathogen.
Antitoxins	**Counteract toxins** produced by **bacteria**.
5 - Vaccinations and Drugs	
Vaccinations	**Small** amounts of **dead** or **inactive pathogens** are injected.
Vaccination response	White blood cells produce **specific shape antibodies** -> **lock** onto **antigens** on surface of pathogen.
Future infection response	White blood cells have **memory** of the **antigens** -> **rapidly** produce **specific shape antibodies** before person gets ill.
Painkillers	**Relieve pain** and **reduce symptoms** but **don't kill** pathogens.
Antibiotics	**Kill bacteria** (specific antibiotics needed for specific bacteria) -> **cannot kill viruses** (they reproduce inside body cells).
Antibiotic resistance	Bacteria **mutate** and become **resistant** to antibiotic -> **cannot** be **killed** -> risk of **super bugs** e.g. MRSA.
6 - Developing Drugs	
Drugs from plants	**Painkiller aspirin** from **willow**. **Heart drug digitalis** from **foxgloves**.
Drugs from micro-organisms	**Antibiotic penicillin** discovered by **Alexander Fleming** from the ***Penicillium*** **mould**.
Drug testing	Drugs tested for **efficacy** (does it **work**), **toxicity** (is it **harmful**), and **optimum dose** (most **effective** but few **side effects**).
Preclinical trials	1. Test drugs on **human cells** and **tissues** in the **lab**. 2. Test drugs on **live animals**.
Clinical trials	1. Test on **healthy volunteers** (low dose gradually increased) 2. Test on **patients** with the **disease** (use double-blind trial).
Placebo	**Inactive substance** made to **resemble** a **drug**. E.g. a sugar pill.
Double-blind trial	Split patients into **2 groups**. **Neither patient nor doctor** knows who has the **real drug** and who has the **placebo**. Reduces **bias**.

GCSE Science

Biology B3 – Infection & Response