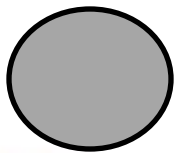


Infection and Response

Biology Paper 1

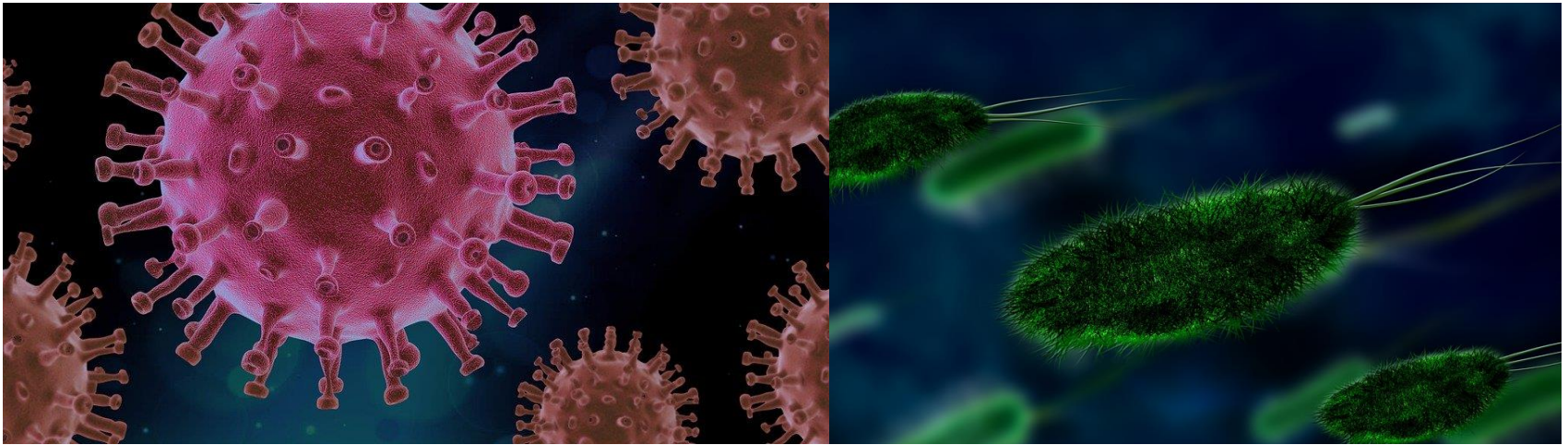


Content you will **NOT** be assessed on



3.1.1 Communicable Disease

Communicable diseases are diseases that are caused by pathogens such as viruses, bacteria, protists and fungi.



These diseases can be transferred from one person to another. **Pathogens** are microorganisms that cause infectious disease.

CS/F

CS/H

SS/F

SS/H



3.1.1 Communicable Disease

Transmission	Description
Direct Contact	
Droplet	
Air	
Water	
Food	
Vectors	



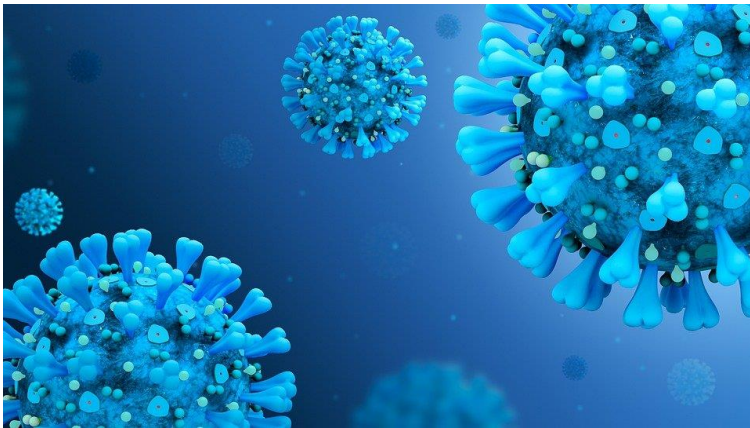
3.1.1 Communicable Disease

Method	Description
Contraception	
Personal Hygiene	
Food Hygiene	
Sterilising Water	
Vaccination	

3.1.1 Communicable Disease

How Bacteria and Viruses Make us Feel Ill

- When we get ill with a pathogen such as bacteria or a virus they reproduce quickly, and they produce toxins (poisons) which damage our cells and tissues and make us feel ill.
- Viruses also live and reproduce inside living cells and this can cause cell damage, this is another reason why viruses can make us feel ill.



Exam Practice

L2

A child has a sore throat. The mother takes the child to the doctor. The doctor says that the child has a bacterial infection.

Explain how the infection makes the child ill.

Bacteria reproduce quickly

Produce toxins

(Total 2 marks)



3.1.2 Viral Disease

Measles



Sym
S
Cor
S

l if
nd

CS/F

CS/H

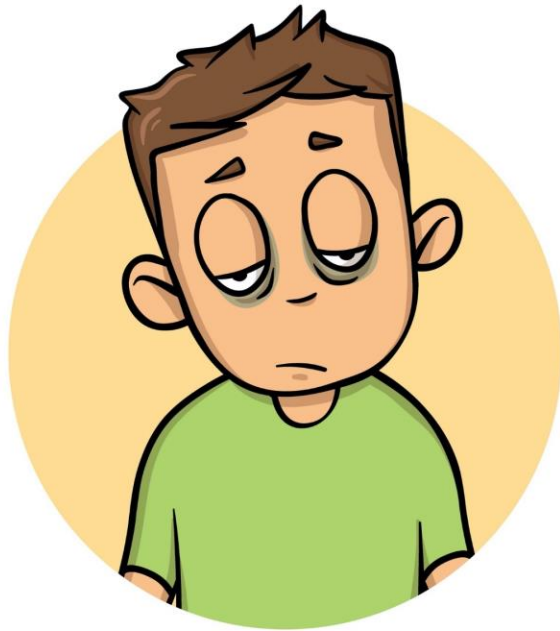
SS/F

SS/H

3.1.2 Viral Disease

HIV

HIV/AIDS INFOGRAPHICS



WAYS HIV/AIDS IS SPREAD FROM PERSON TO PERSON:



UNPROTECTED SEX



INJECTION DRUGS



BLOOD TRANSFUSION



ORGAN TRANSPLANTS



PREGNANCY, CHILDBIRTH, BREASTFEEDING



NON-STERILE MEDICAL INSTRUMENTS

HIV/AIDS ISN'T SPREAD THROUGH:



MOSQUITOES OR OTHER INSECTS BITESZ



SKIN-TO-SKIN CONTACT



HUGGING, KISSING



SHARING FOOD OR DRINKS



SWEEP OR TEARS



SHARING A TOILET, TOWELS, OR BEDDING



3.1.2 Viral Disease

TMV



Symptoms		scouration on the leaves of
Spread		y be plants in contact with ners using equipment that has
Control Spread		cted plants, clean equipment hands after handling diseased
Extra Information		d loss of leaves reduces ans that less glucose is made, se energy. Less glucose also acids are made which then akes less protein. Overall, this of the plant.

CS/F
CS/H
SS/F
SS/H

3.1.3 Bacterial Disease

Salmonella



Sym
S
Con
S

and
eria
ella.
enic

CS/F

CS/H

SS/F

SS/H



3.1.3 Bacterial Disease

Gonorrhoea

- Symptoms
- Spread
- Controlling Spread
- Extra Information

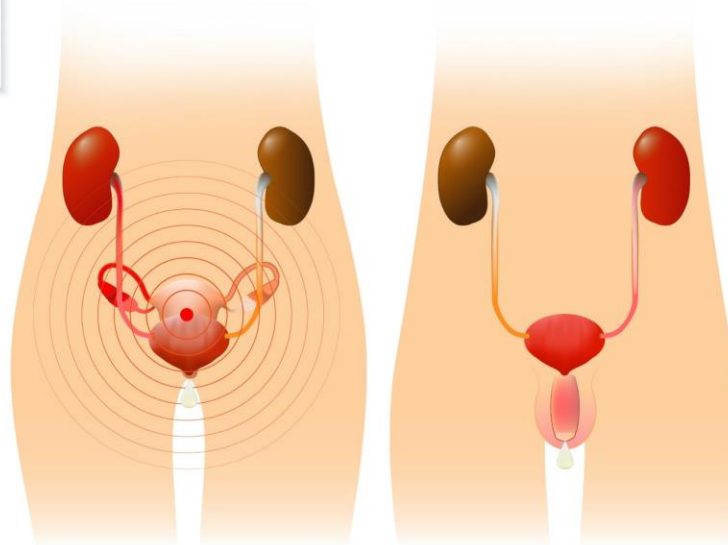
Neisseria gonorrhoeae



Abdominal pain
or pain with
intercourse

Vaginal
discharge
or bleeding

Signs and symptoms



In female

In male

- Infected kidneys
- Bladder and ureter infection
- Burning sensation during urination
- Inflammation of the penile
- Swollen testicles
- Discharge from penis



3.1.4 Fungal Disease

Black Rose Spot



CS/F

CS/H

SS/F

SS/H

3.1.5 Protist Disease

Malaria

- Protists are a group of **unicellular** microorganisms that live in the blood of another person and infect them.
- Malaria is an example of a disease spread by mosquitoes which carry the protist.
- An organism that spreads the disease is known as a **vector**.



CS/F

CS/H

SS/F


SS/H




3.1.5 Protist Disease

Malaria


PREVENTION




AVOID GOING OUT AT DUSK/DAWN WHEN MOSQUITOES ARE MORE ACTIVE




WEAR PROTECTIVE CLOTHES




USE INSECT REPELLENT



REMOVE STANDING WATER AT HOME



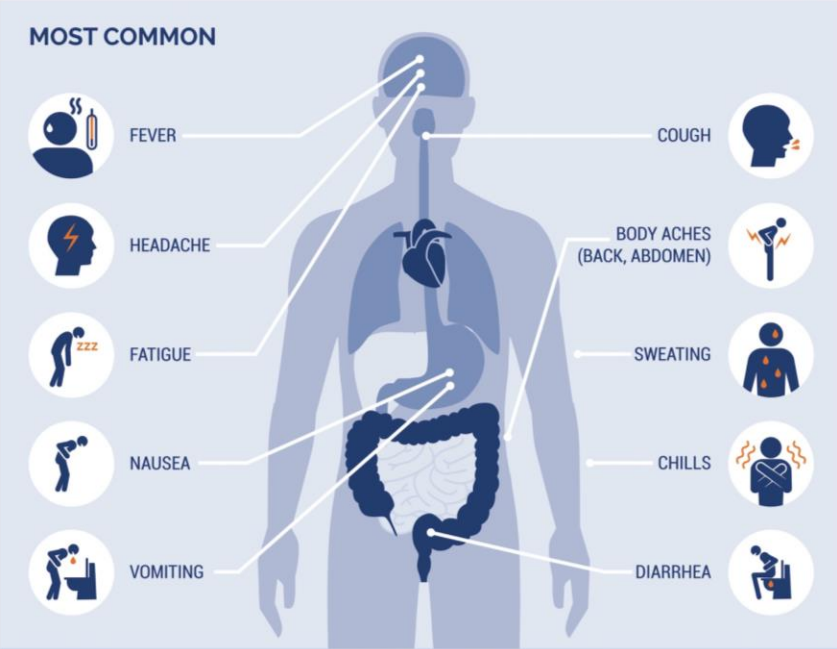
STAY IN PLACES WITH AIR CONDITIONING AND WINDOW SCREENS





SLEEP UNDER A MOSQUITO BED NET


SYMPTOMS


MOST COMMON





 FEVER


 COUGH


 HEADACHE


 BODY ACHES (BACK, ABDOMEN)


 FATIGUE

 SWEATING


 NAUSEA


 CHILLS


 VOMITING


 DIARRHEA


SEVERE MALARIA MAY CAUSE:


 CONVULSIONS

 JAUNDICE


 ANEMIA

 SPLEEN ENLARGEMENT


 ENLARGED LIVER

 KIDNEY FAILURE


TREATMENT




THERE IS NO VACCINE



TAKE MEDICATIONS TO PREVENT MALARIA BEFORE TRAVELING



TREAT MALARIA WITH ORAL DRUGS OR INTRAVENOUS INJECTIONS OF ANTI-MALARICS



THE TREATMENT WILL VARY ACCORDING TO THE TYPE AND SEVERITY OF MALARIA, AGE, PREGNANCY

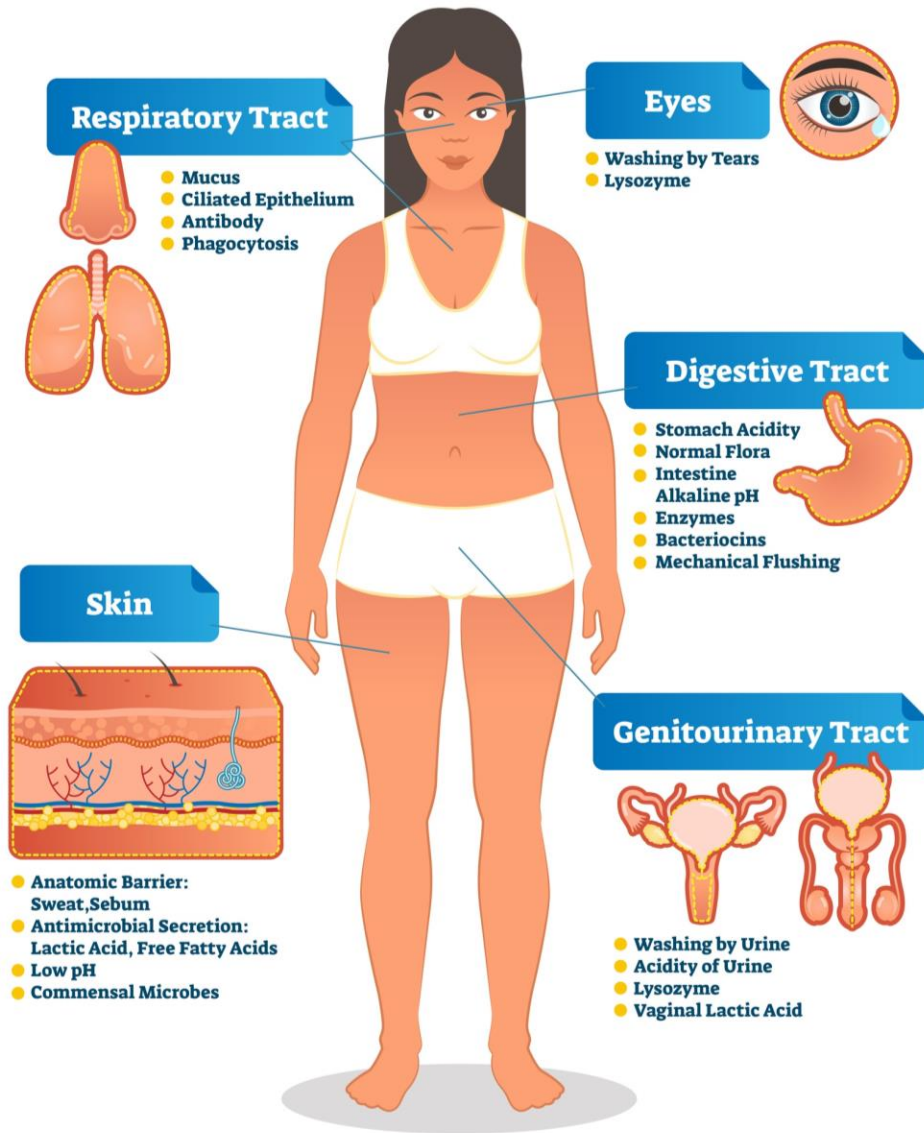
CS/F

CS/H

SS/F

SS/H

3.1.6 Human Defence Systems



tion of Defence

CS/F

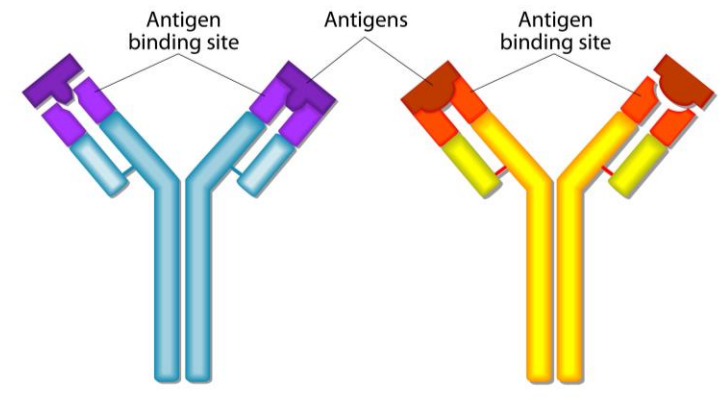
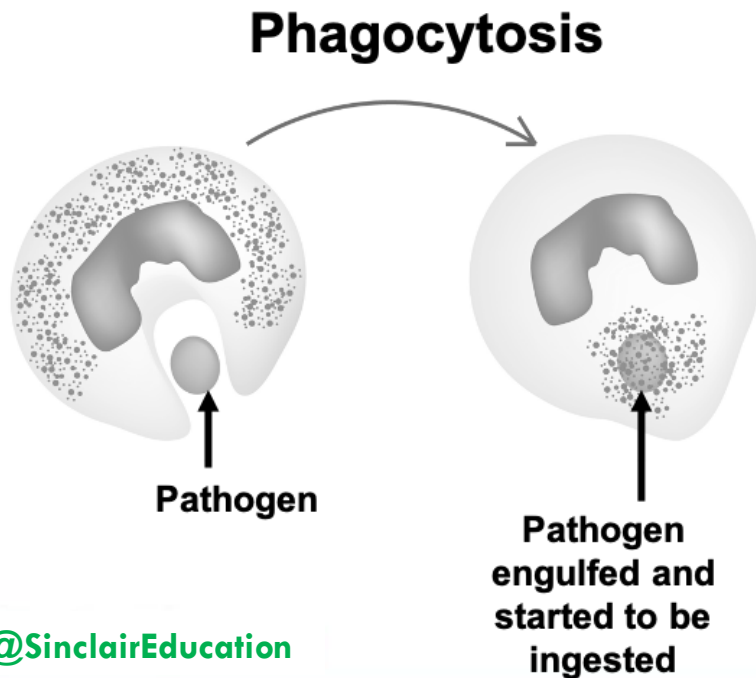
CS/H

SS/F

SS/H

3.1.6 Human Defence Systems

Producing Antitoxins	Antitoxins consist of the toxins that the pathogen makes and is set for the pathogen to be destroyed during phagocytosis.
Producing Antibodies	Antibodies have a specific shape to the antigen (protein coat) on the microbe. This means that particular antibodies will only work for particular diseases.



CS/F

CS/H

SS/F

SS/H

Exam Practice

L2

Describe how pathogens cause infections **and** describe how the immune system defends the body against these pathogens.

Level 1 (1 – 2 marks)

There is a description of pathogens with errors or roles confused.

or

the immune response with errors or roles confused.

Level 2 (3 – 4 marks)

There is a description of pathogens **and** the immune response with some errors or confusion

or

a clear description of either pathogens **or** the immune response with few errors or little confusion.

Level 3 (5 – 6 marks)

There is a good description of pathogens **and** the immune response with very few errors or omissions.

(6)



Exam Practice

L2

Describe how pathogens cause infections **and** describe how the immune system defends the body against these pathogens.

- bacteria and viruses are pathogens
credit any ref to bacteria and viruses
- they reproduce rapidly inside the body
- bacteria may produce poisons / toxins (that make us feel ill)
- viruses live (and reproduce) inside cells (causing damage).

white blood cells help to defend against pathogens by:

- ingesting pathogens / bacteria / (cells containing) viruses
credit engulf / digest / phagocytosis
- to destroy (particular) pathogen / bacteria / viruses
- producing antibodies
- to destroy particular / specific pathogens
- producing antitoxins
- to counteract toxins (released by pathogens)
credit memory cells / correct description
- this leads to immunity from that pathogen.

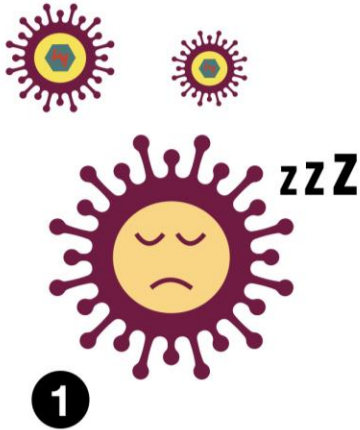


3.1.7 Vaccination

- Vaccines are a way of preventing illnesses in the population.
- When a person is vaccinated, they become immune to the disease they have had the vaccine for. This means that this person is very unlikely to catch the disease.
- If most people are immune there is less of a chance of non vaccinated individuals being exposed and so the disease is unlikely to spread, this is known as **herd immunity**.

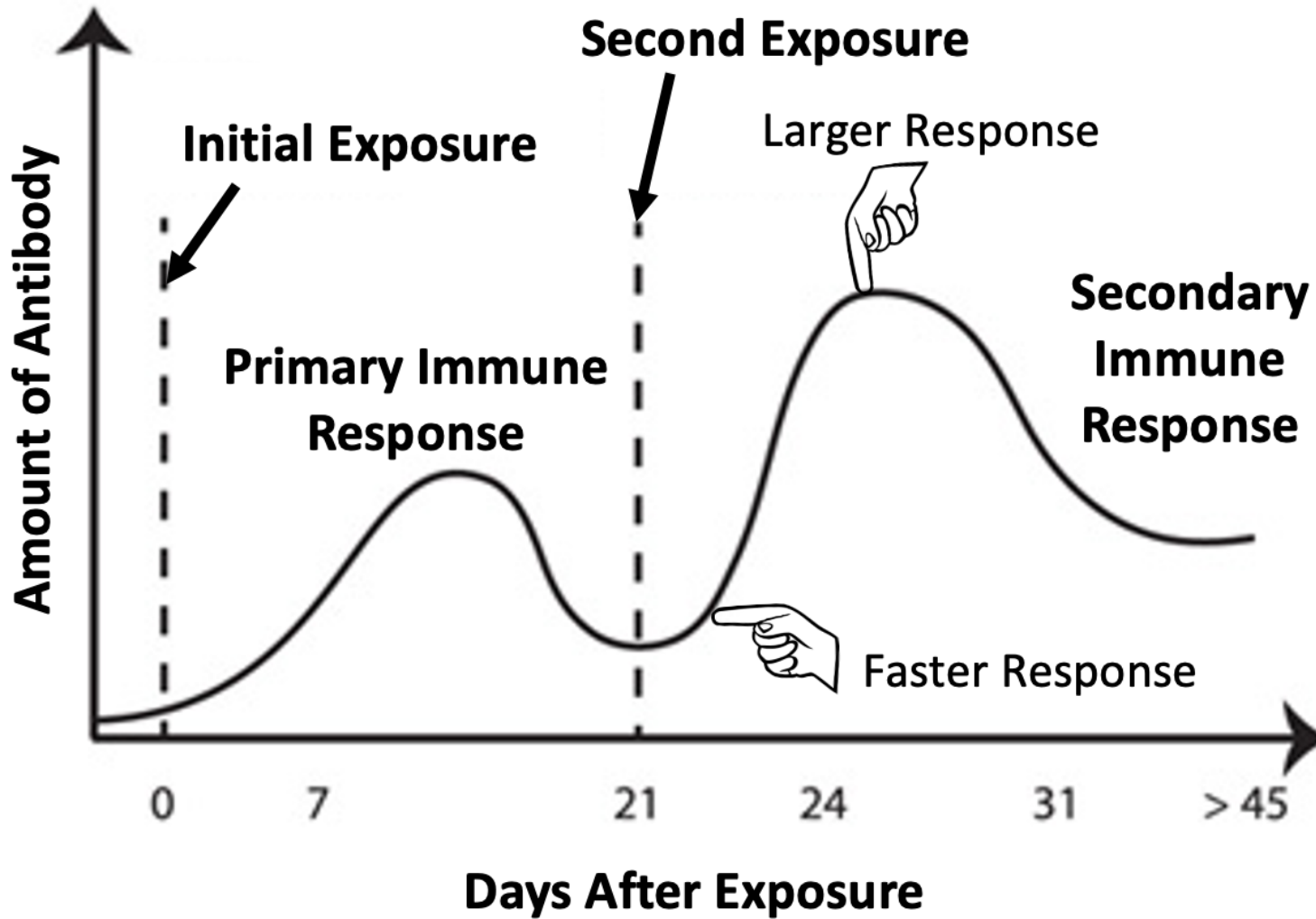


3.1.7 Vaccination



1
A weak or inactive form of the microbe is introduced to the body

3.1.7 Vaccination



CS/F CS/H SS/F SS/H

Exam Practice

L3

A person can be immunised against a disease by injecting them with an inactive form of a pathogen.

Explain how this makes the person immune to the disease.

Stimulates antibody production

By white blood cells

Rapidly produce antibodies upon reinfection

(3)



3.1.8 Antibiotics and Painkillers

Antibiotics are medicines that help to cure bacterial disease by killing the bacteria inside the body.

Penicillin is an example of an antibiotic.

Antibiotics work by damaging the bacterial cells, without damaging the body cells.

Antibiotics cannot kill viral pathogens because viruses live inside of cells.



Specific antibiotics treat specific infections, this means that you can't use any any antibiotic to treat a bacterial infection.

CS/F

CS/H

SS/F

SS/H



3.1.8 Antibiotics and Painkillers

Drug Resistance



- Normal bacterium

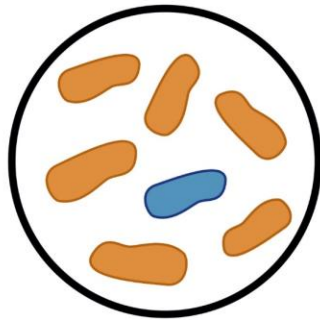


- Resistant bacterium

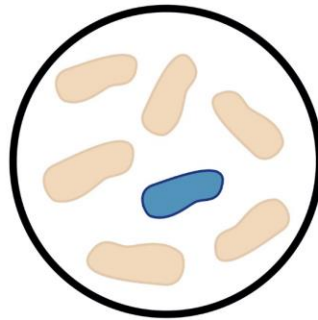


- Dead bacterium

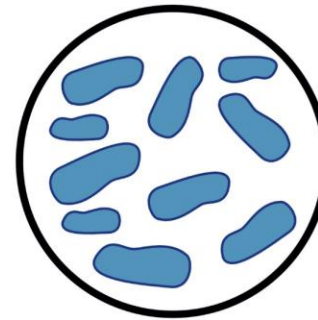
HOW ANTIBIOTIC RESISTANCE HAPPENS



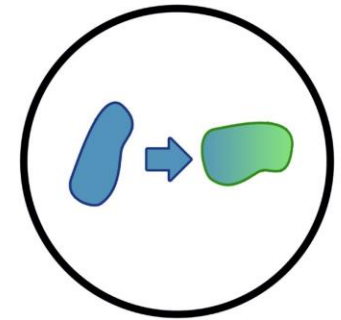
Lots of bacterium.
Some are more resistant than others to the antibiotic



An antibiotic is taken so that the bacteria are killed. The more resistance bacterium survive longer



The person stops taking the antibiotic. The more resistant bacterium survived and begin to reproduce.



Some bacteria are able to also pass this mutation onto others.



3.1.9 Drug Discovery

Traditionally drugs were extracted from plants and microorganisms. For example:



Plant	Foxglove
Drug	Digitalis
Use	Heart (strengthens contractions)



Plant	Willow
Drug	Aspirin
Use	Painkiller



Fungi	<i>Penicillium</i> mould
Drug	Penicillin
Use	Antibiotic

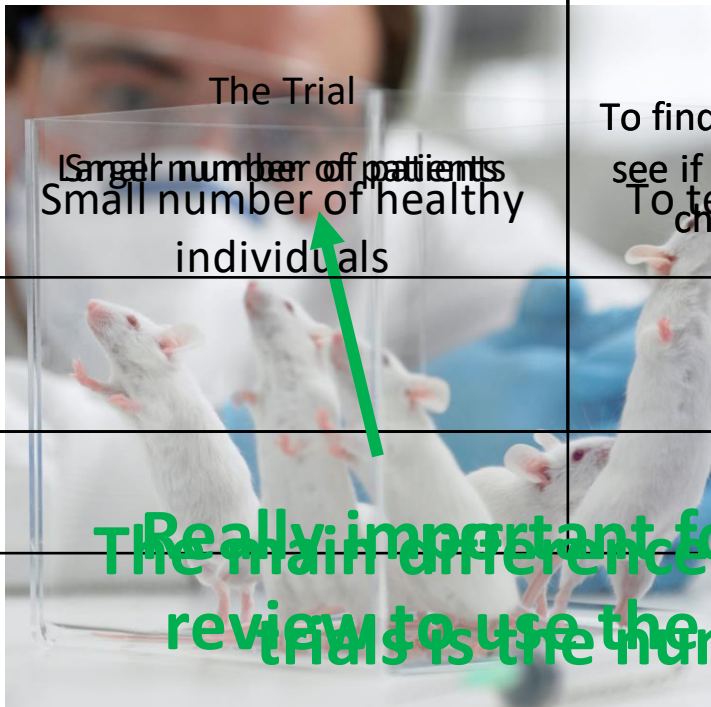
Discovered by Alexander Fleming

Most new drugs now are made by chemists in the pharmaceutical industry.



3.1.9 Drug Discovery



What/Who is Tested	Why Drug is Tested	Extra Detail
Animals, cells or tissues	To test for toxicity	<p>Low doses and double blind trial to avoid bias</p> <p>the first for safety? make sure conclusions are correct.</p>
 <p>The Trial</p> <p>Large number of patients</p> <p>Small number of healthy individuals</p>	<p>To find the optimum dose, to see if the drug works and to check for side effects</p> <p>To test for toxicity/side effects</p>	<p>One group is given a placebo which does not cause an effect to make sure results from the trial are valid.</p> <p>Healthy individuals are used as it is too great a risk for an ill person.</p>
		<p>Everything else between the two groups may also be taken as a control drug which would make side effects harder to see.</p>

Really important for any questions about peer review to use the key terms "avoid bias" and "valid"

The main difference between Phase 2 and 3 clinical trials is the number of patients involved.

CS/F

CS/H

SS/F

SS/H

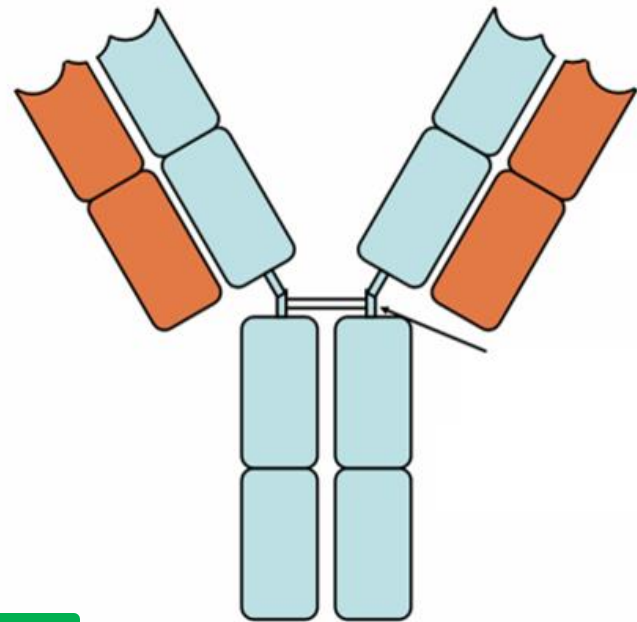
3.2.1 Monoclonal Antibodies

Monoclonal antibodies are identical copies of one type of antibody.

They are man-made proteins that act like human antibodies in the immune system.

Monoclonal antibodies are produced from a single clone of cells.

The antibodies are specific to one binding site on one protein antigen and so are able to target a specific chemical or specific cells in the body.



CS/F

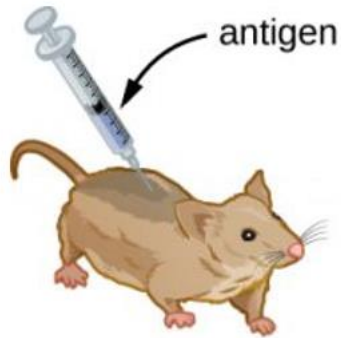
CS/H

SS/F

SS/H



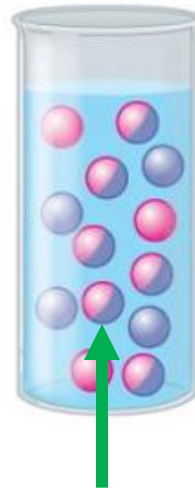
3.2.1 Monoclonal Antibodies



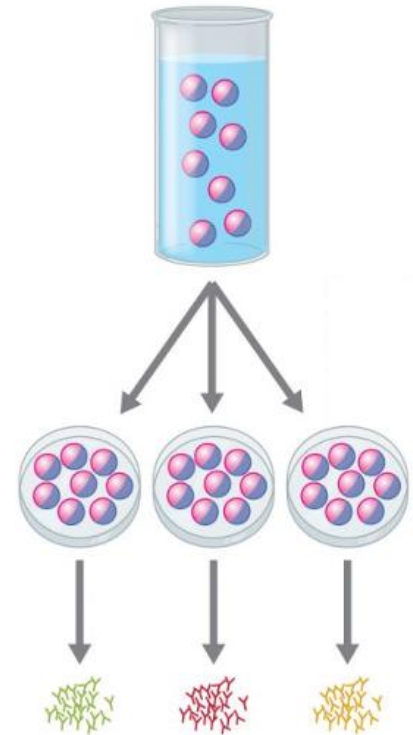
Inject antigen into mouse

The mouse lymphocytes are stimulated to produce antibodies

Combine these lymphocytes with tumour cells



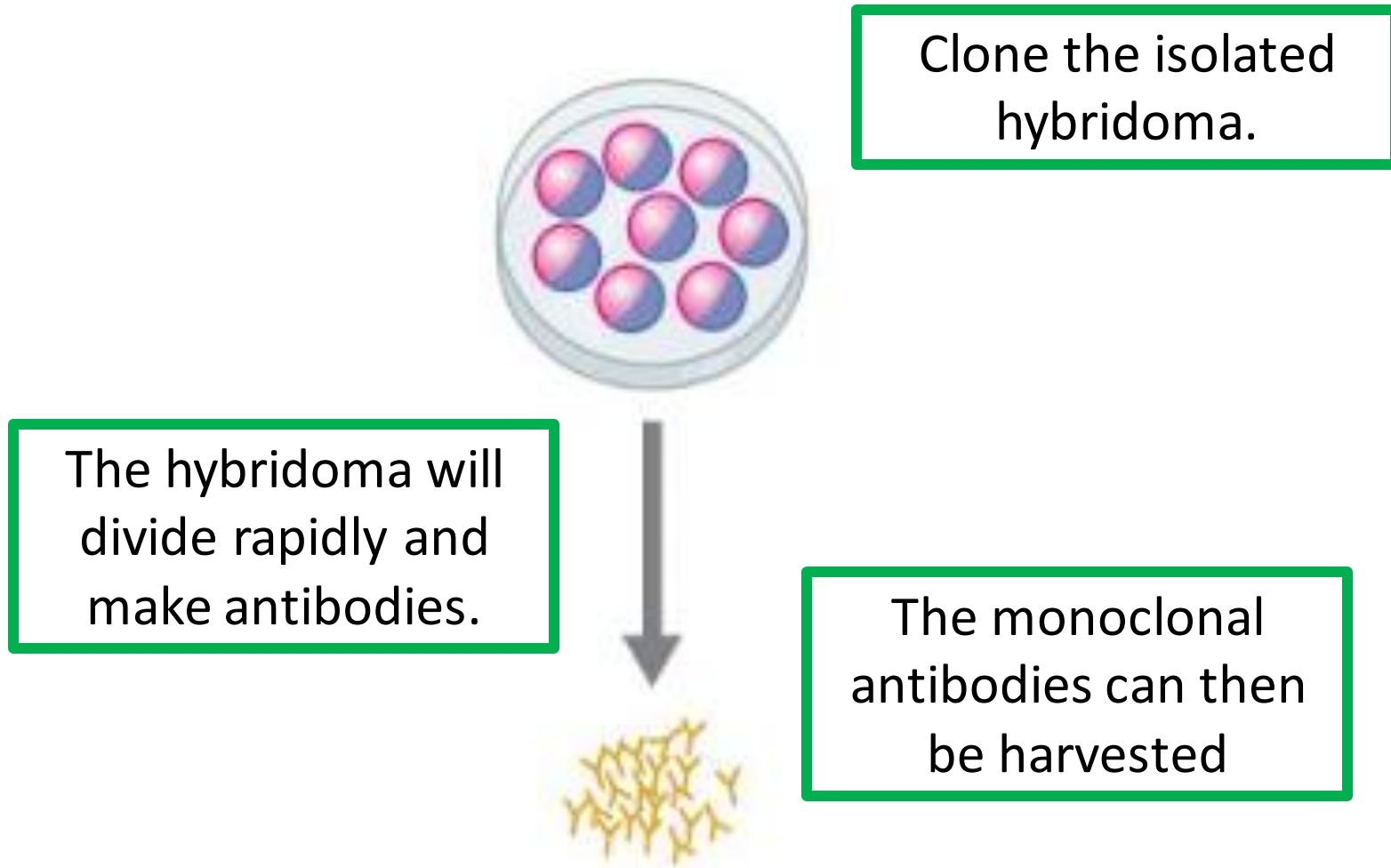
Hybridomas will be made



Isolate the hybridomas which make the monoclonal antibody specific to the antigen

CS/F CS/H SS/F **SS/H**

3.2.1 Monoclonal Antibodies



CS/F

CS/H

SS/F

SS/H



3.2.1 Monoclonal Antibodies

Key Term	Definition
Monoclonal Antibodies	
Hybridoma Cell	

Exam Practice

L3

To make the monoclonal antibodies a scientist first isolates the PVY protein from the virus.

Describe how the scientist would use the protein to produce the PVY monoclonal antibody.

Inject the protein into the mouse

Combine lymphocytes with tumour/make hybridoma

Isolate hybridoma making specific monoclonal antibody for PVY

Clone

These divide quickly and make the antibody



3.2.2 Uses of Monoclonal Antibodies

Uses of monoclonal antibodies include:

Treat cancer

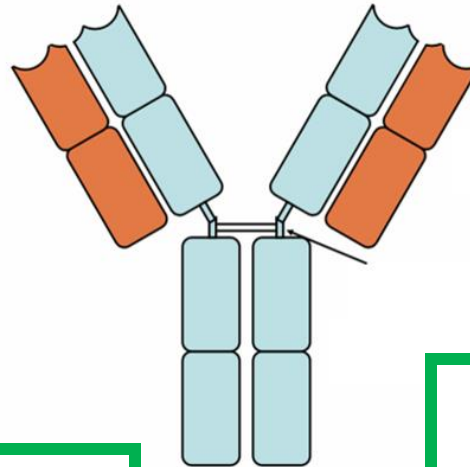
Lab tests to detect pathogens

Lab tests to measure levels of hormones

Lab tests to detect chemicals in blood

Pregnancy Tests

In research to locate specific molecules

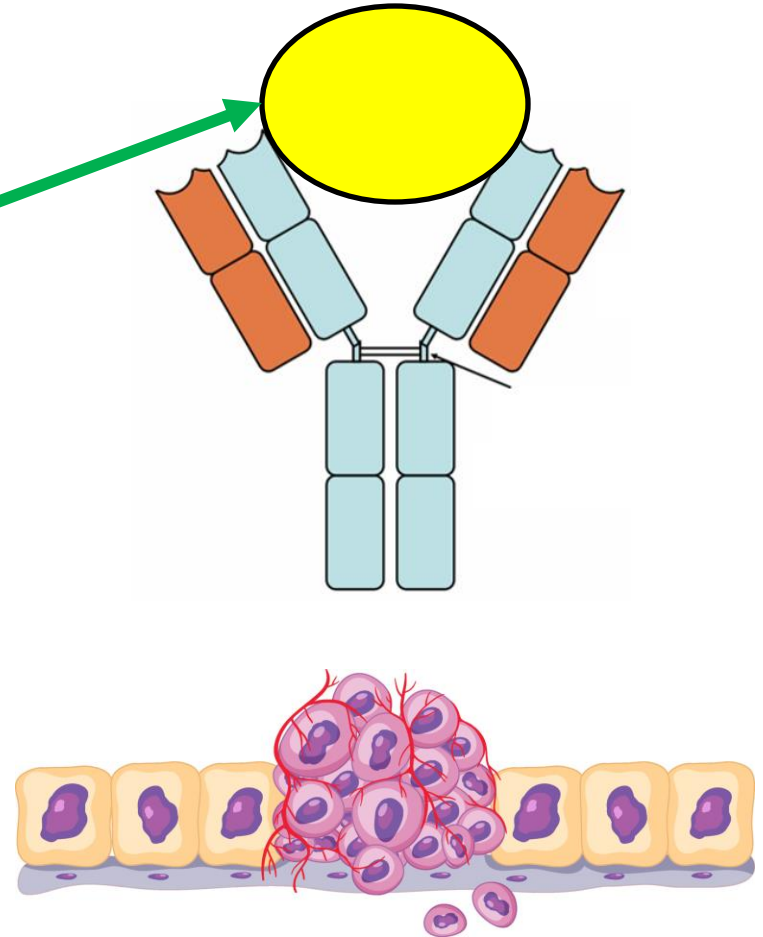


3.2.2 Uses of Monoclonal Antibodies

To treat cancer:

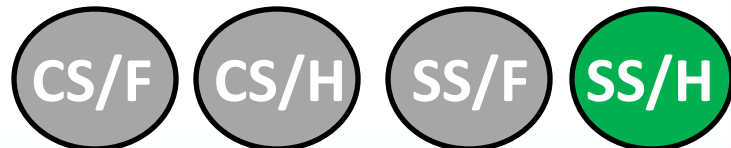
The monoclonal antibody is bound to a radioactive substance, toxic drug or chemical.

This substance will stop the cancerous cells from growing and dividing without harming other cells in the body.



Problems of monoclonal antibodies

More side effects than expected.



Exam Practice

L3

Candida albicans lives in the throat of infected patients.

A sample is taken from the throat of a patient with a suspected *Candida albicans* infection.

The sample is transferred onto a microscope slide.

Describe how the mAbs and a fluorescent dye could be used to see any *Candida albicans* pathogens on the slide.

Bind dye to mAbs

Put it on the slide

It will bind to any candida albicans



Exam Practice

L3

A monoclonal antibody has been produced to treat pancreatic cancer.

Explain how the monoclonal antibody works to treat pancreatic cancer.

Monoclonal antibody is attached to toxin/drug

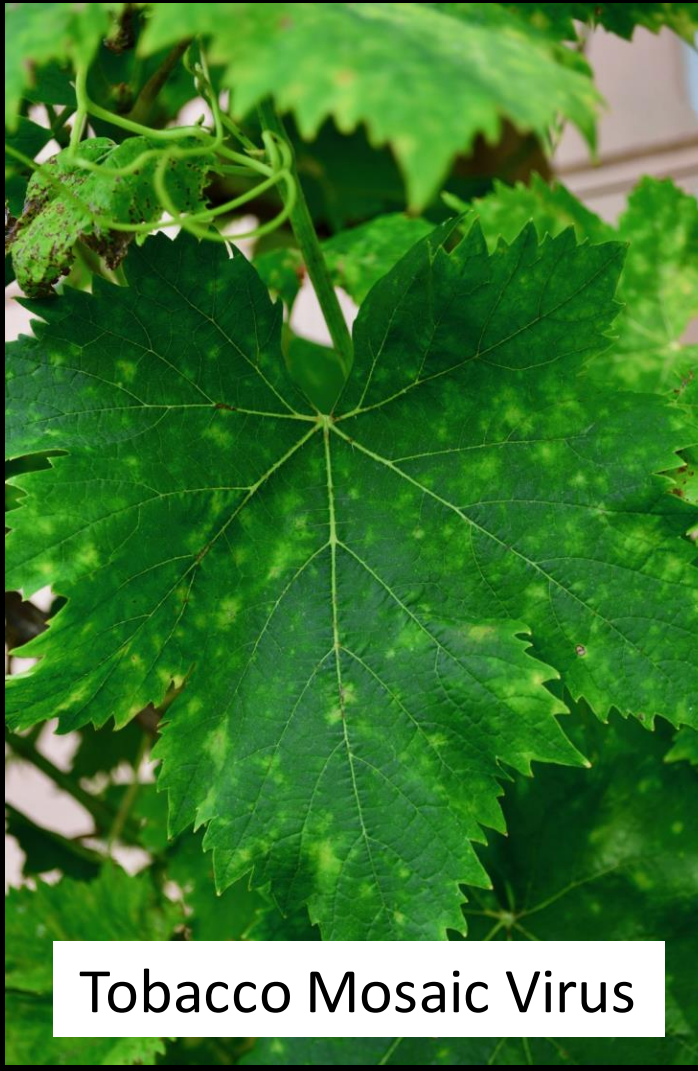
It will attach to cancer cell

Substance attached will stop the cell growing/dividing

(3)



3.3.1 Detecting Plant Diseases



Tobacco Mosaic Virus



Black Spot

Fungal Disease



Aphids

3.3.1 Detecting Plant Diseases

Aphids have a mouthpiece that pierces through the plant and into its phloem.

It feeds off the sugar within the phloem.

The plant has less sugar.

This stunts the growth of the plant.



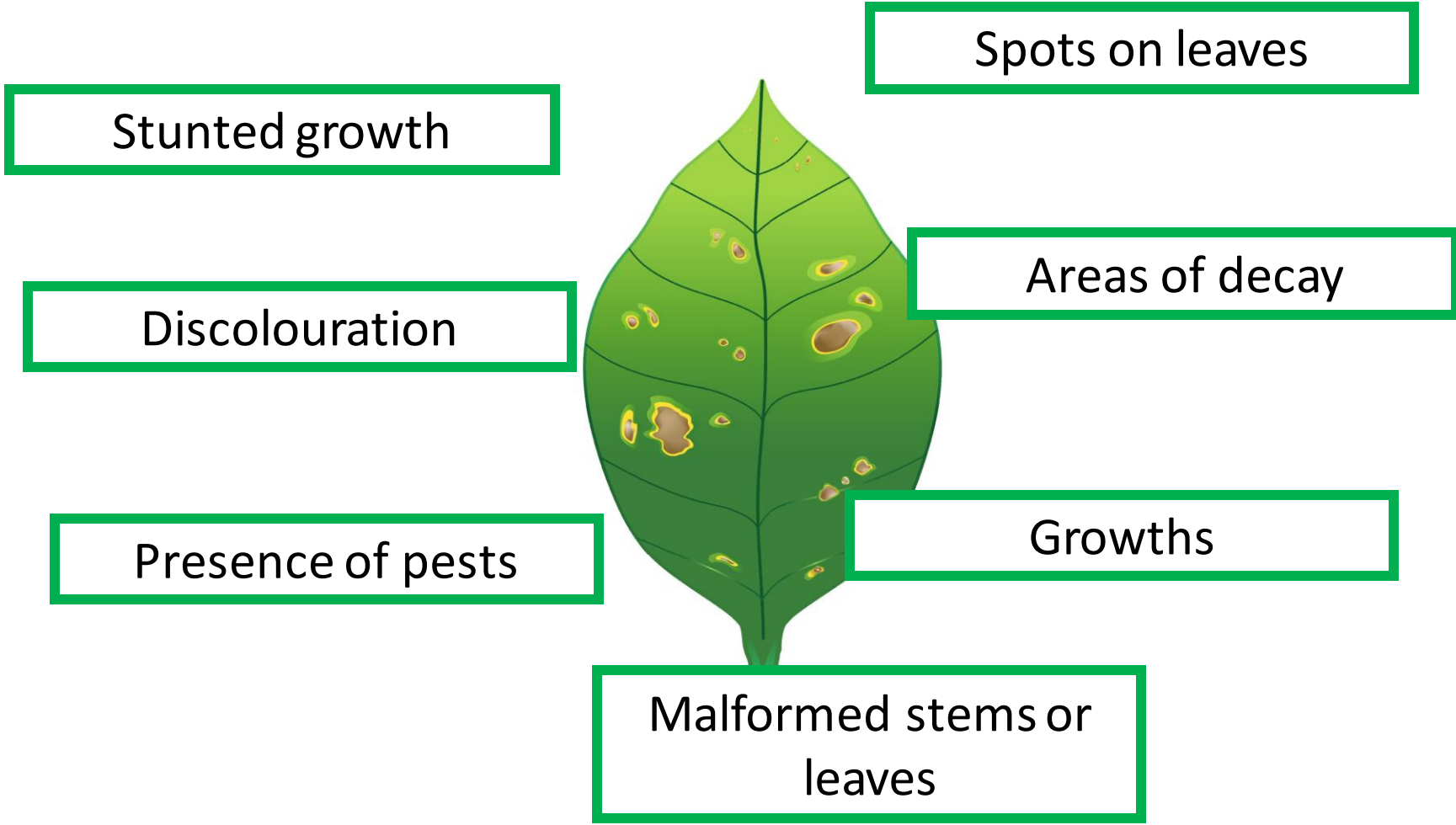
3.3.1 Detecting Plant Diseases

Plants can also be damaged by a range of ion deficiency conditions:

Condition	How It Affects Plant Growth
Nitrate Deficiency	
Magnesium Deficiency	

3.3.1 Detecting Plant Diseases

Plant diseases can be detected by:



CS/F CS/H SS/F **SS/H**

3.3.1 Detecting Plant Diseases

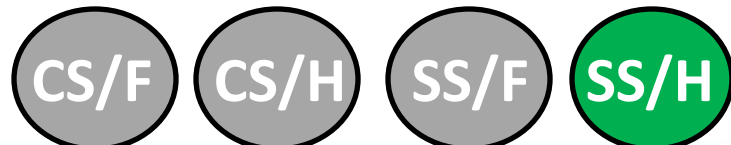
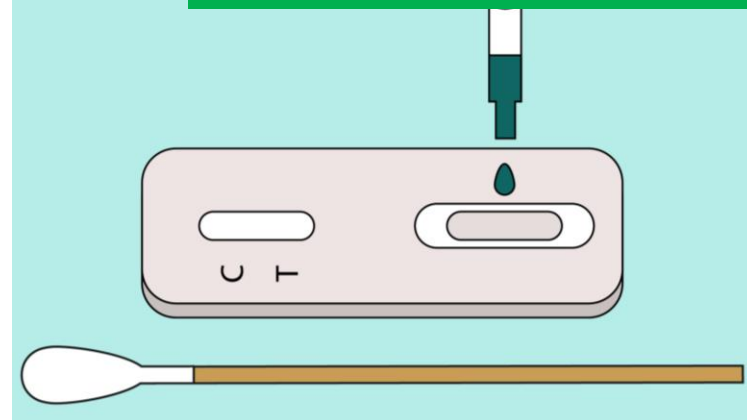
Plant diseases can be identified by:

Reference to a gardening manual or website



Taking infected plants to a lab to identify the pathogen.

Using testing kits with monoclonal antibodies.

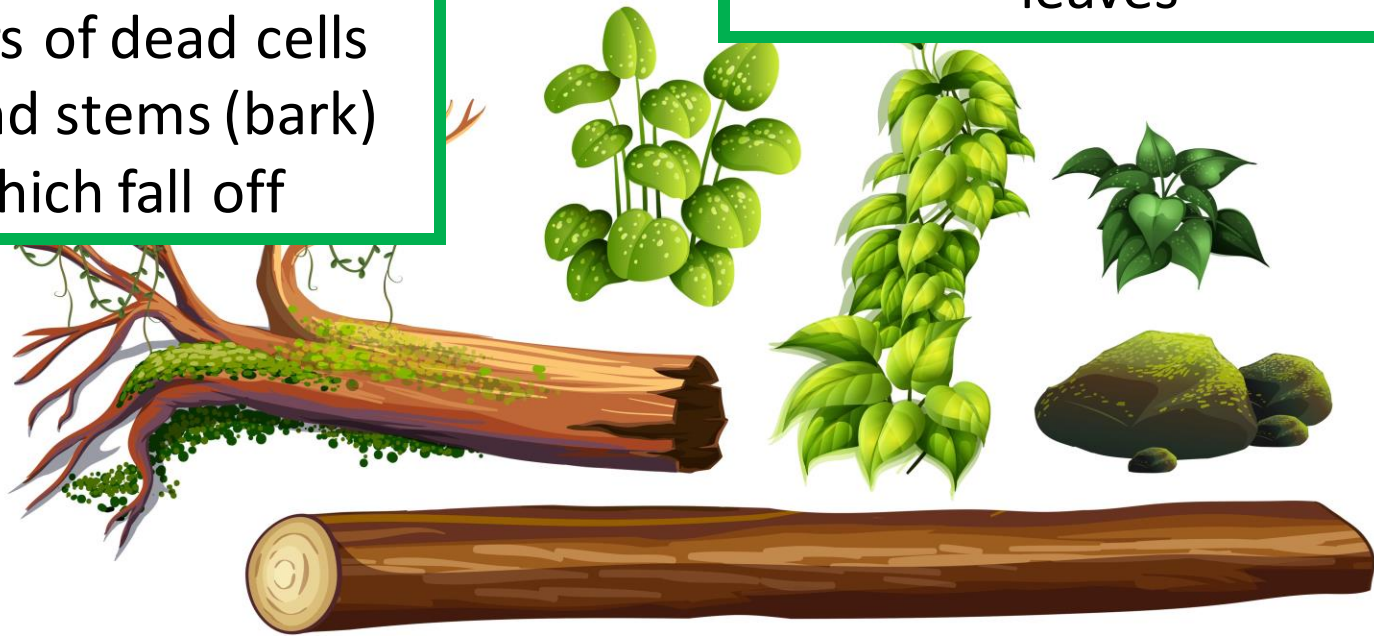


3.3.2 Plant Defence Responses

Physical defences of plants to resist invasion of microbes include:

Layers of dead cells around stems (bark) which fall off

Tough waxy cuticle on leaves



Cellulose cell walls



3.3.2 Plant Defence Responses

Chemical plant defence responses include:

Poisons to deter herbivores



NETTLE

Antimicrobial chemicals



SAGE

CS/F

CS/H

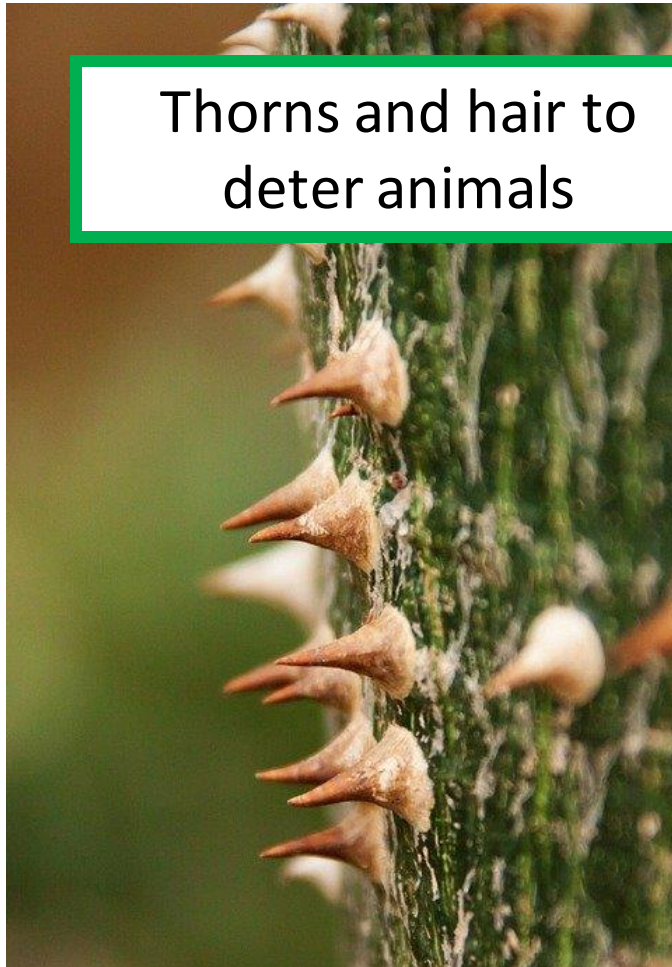
SS/F

SS/H



3.3.2 Plant Defence Responses

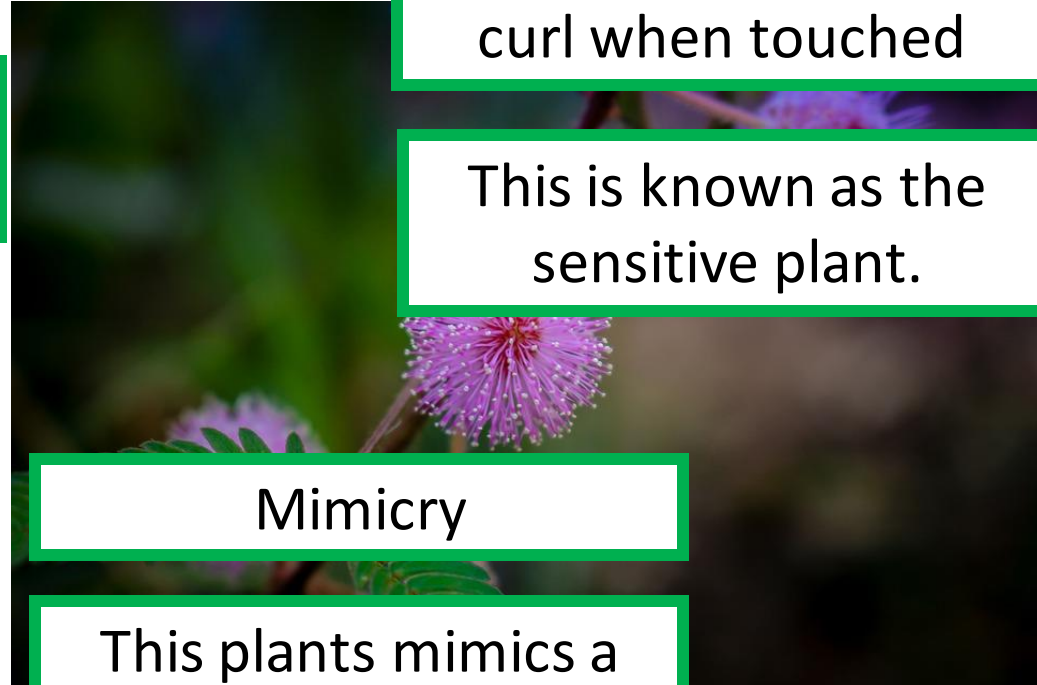
Mechanical adaptation include



Thorns and hair to deter animals

Leaves that droop or curl when touched

This is known as the sensitive plant.



Mimicry

This plants mimics a dead plant when it droops its leaves