

The Immune System



تم تحميل هذا الملف من موقع المناهج الإماراتية

موقع المناهج ← المناهج الإماراتية ← الصف الثاني عشر العام ← علوم ← الفصل الثالث ← ملفات متنوعة ← الملف

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ملفات اكتب للمعلم اكتب للطالب ا اختبارات الكترونية ا اختبارات ا حلول ا عروض بوربوينت ا أوراق عمل
منهج انجليزي ا ملخصات وتقارير ا مذكرات وبنوك ا الامتحان النهائي ا للمدرس

المزيد من مادة
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التواصل الاجتماعي بحسب الصف الثاني عشر العام



صفحة المناهج
الإماراتية على
فيسبوك

الرياضيات

اللغة الانجليزية

اللغة العربية

التربية الاسلامية

المواد على تلغرام

المزيد من الملفات بحسب الصف الثاني عشر العام والمادة علوم في الفصل الثالث

شرح جهاز الغدد الصماء

1

مراجعة شاملة ومهمة

2

مراجعة الجهاز الهضمي وجهاز الغدد الصماء

3

التغذية

4

الجهاز الهضمي

5

THE IMMUNE SYSTEM

Grade 12 | General | 2026



Immune
Responses



Immune
Cells



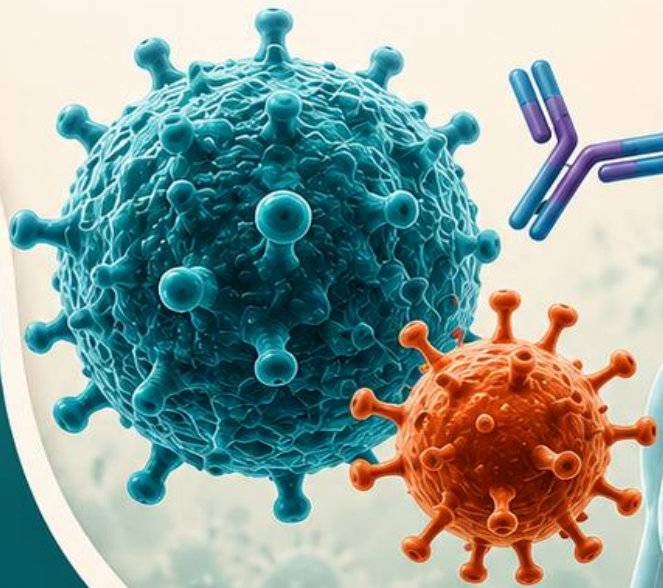
Antigens and
Antibodies



Diseases and
Disorders



Genetic, Inflammatory
& Metabolic Diseases



Prepared by:

Ali Marouf



0506764022



1 WHAT IS AN INFECTIOUS DISEASE?

An **infectious disease** is a disease caused by a **pathogen** passed from one organism to another, which disrupts homeostasis in the body.

Some, but not all, types of **bacteria**, **viruses**, **protozoans**, **fungi**, and **parasites** are pathogens.

**BACTERIA****VIRUSES****PROTOZOANS****FUNGI****PARASITES**

2 GERM THEORY

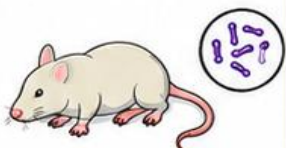
The germ theory states that some microorganisms are **pathogens**.

The theory was not clearly demonstrated until **Robert Koch** developed his postulates.

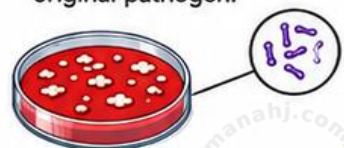
3 ROBERT KOCH AND ANTHRAX

- 1 He isolated bacteria from the blood of cattle that had died from anthrax.
- 2 He grew the bacteria in the laboratory.
- 3 He injected the bacteria into healthy cattle.
- 4 The healthy cattle developed anthrax.
- 5 He isolated bacteria again from the newly infected cattle and found them identical to the first culture.

4 KOCH'S POSTULATES

- 1 **Postulate 1:**
The suspected pathogen must be isolated from the diseased host in every case of the disease.

- 2 **Postulate 2:**
The suspected pathogen must be grown in pure culture on artificial media in the laboratory.

- 3 **Postulate 3:**
The suspected pathogen from the pure culture must cause the same disease when placed in a healthy new host.

- 4 **Postulate 4:**
The suspected pathogen must be isolated from the new host, grown again in pure culture, and shown to have the same characteristics as the original pathogen.






1 WHAT IS A RESERVOIR?

A **reservoir** is a source of the **pathogen** in the environment. Reservoirs may be **humans**, **animals**, or **inanimate objects** such as soil.



2 HUMAN RESERVOIRS



- Humans are the main reservoir for pathogens that affect humans.
- A symptom-free person who can still pass the pathogen to others is called a **carrier**.
- Pathogens that cause colds, influenza, and sexually transmitted diseases such as HIV can be passed on without the person knowing he or she is infected.

3 ANIMAL RESERVOIRS



- Animals can also act as reservoirs of pathogens passed to humans.
- Influenza can infect **pigs**.
- Rabies is found in **domestic dogs** and wild animals such as **bats**, **skunks**, and **raccoons**.



4 OTHER RESERVOIRS



- Some soil bacteria, such as **tetanus bacteria**, can cause disease in humans if they contaminate a deep wound.
- **Contaminated water or food** is another reservoir of pathogens.
- Water used in growing or preparing food can transfer pathogens, and food may also become contaminated through contact with humans or insects such as **flies**.



5 HUMAN INFECTIOUS DISEASES



Disease	Cause	Affected Organ System	How Disease is Spread
Tetanus	Bacterium	Nervous system	Soil in deep puncture wound
Strep throat	Bacterium	Respiratory system	Droplets/direct contact
Lyme disease	Bacterium	Skeletal and nervous systems	Vector (tick)
Chicken pox	Virus	Skin	Droplets/direct contact
Rabies	Virus	Nervous system	Animal bite
Influenza (the flu)	Virus	Respiratory system	Droplets/direct contact
Hepatitis B	Virus	Liver	Direct contact with exchange of body fluids
Giardia	Protozoan	Digestive tract	Contaminated water
Malaria	Protozoan	Blood and liver	Vector (mosquito)
Athlete's foot	Fungus	Skin	Direct contact or contaminated objects





1 TRANSMISSION OF PATHOGENS

1 Direct contact

Pathogens pass through direct human contact. Examples include colds, infectious mononucleosis, herpes, and sexually transmitted diseases.



2 Indirectly through the air

When an infected person coughs or sneezes, pathogens travel in tiny mucus droplets and may spread to another person or to an object.



3 Indirectly through contaminated objects

Many organisms survive on objects handled by humans. Cleaning dishes, utensils, and countertops, as well as careful hand-washing, helps prevent spread.



4 Vectors

Certain diseases are carried by vectors, especially arthropods such as mosquitoes and ticks. Examples include Lyme disease, malaria, Zika virus, and West Nile virus.



2 DIFFERENCE BETWEEN VIRUS AND BACTERIAL INFECTION

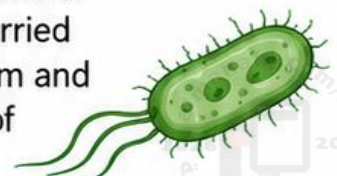
VIRUS

When a pathogen enters the body, it invades some body cells. A virus multiplies inside cells and leaves either by exocytosis or by causing the cell to burst, which damages tissues and may kill cells.



PATHOGENIC BACTERIA

When pathogenic bacteria invade the body, they may produce harmful chemicals or toxins. These toxins can be carried through the bloodstream and damage various parts of the body.





1 SYMPTOMS OF DISEASE



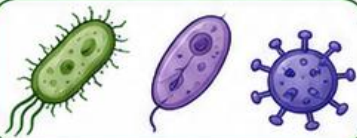
Toxins produced by some pathogens affect specific organ systems.



Tetanus bacteria produce a toxin that causes **spasms in voluntary muscles**.



Botulism usually results from eating food in which botulism bacteria have produced a toxin, and this toxin **paralyses nerves**.



Some **bacteria**, some **protozoans**, and **all viruses** invade and live inside cells, causing damage.



Some symptoms, such as **coughing** and **sneezing**, are triggered by the **immune system**.

2 DISEASE PATTERNS

ENDEMIC DISEASE

Small numbers of cases are continually found within a population, such as the **common cold**.



EPIDEMIC

A large outbreak occurs in one area and affects many people, such as the **2003 SARS** epidemic.



PANDEMIC

An epidemic spreads through a large region such as a country, continent, or the entire globe. **HIV** is given as an example, and influenza (Spanish flu, Asian flu, Hong Kong flu) has caused several pandemics in history and killed millions of people.





1 ANTIBIOTIC

- An **antibiotic** is a substance that can kill or inhibit the growth of microorganisms.
- **Penicillin** is secreted by the fungus *Penicillium*.
- It was isolated, purified, and first used in humans during World War II.
- Other fungal secretions used as antibiotics include **erythromycin**, **neomycin**, and **gentamicin**.
- Synthetic antibiotics have also been developed.



Penicillium growing on oranges

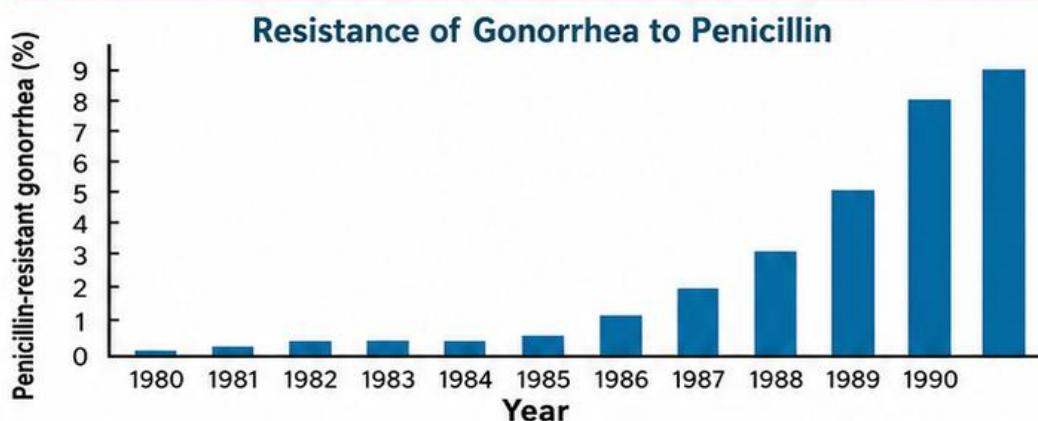
2 ANTIBIOTIC RESISTANCE



Penicillin was once used effectively for gonorrhea, but most strains of gonorrhea bacteria are now resistant to penicillin, so new drug therapies are needed to treat it.

The figure shows the increase in gonorrhea resistance from 1980–1990.

3 RESISTANCE OF GONORRHEA TO PENICILLIN



The graph shows the reported incidence of penicillin-resistant gonorrhea in the U.S. from 1980–1990.





1 CHEMICAL BARRIERS

- 1- **Lysozyme** enzyme breaks down bacterial cell walls and kills pathogens.
- 2- **Saliva, tears, and nasal secretions** contain **lysozyme**.
- 3- **Mucus** acts as a protective barrier and prevents bacteria from sticking to inner epithelial cells.
- 4- **Hydrochloric acid** in the stomach kills many microorganisms found in food.



Saliva & Tears



Mucus & Cilia



Stomach Acid

NOTE:

- **Cilia** line the airway and move mucus and trapped bacteria away from the lungs.
- When the airway is infected, extra mucus is secreted and **coughing** and **sneezing** help move infected mucus out of the body.



2 CELLULAR DEFENSE



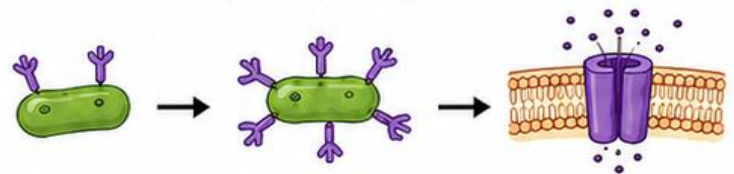
- 1- White blood cells, especially **neutrophils** and **macrophages**, are **phagocytic**.
- 2- **Phagocytosis** is the process by which phagocytic cells surround foreign microorganisms.
- 3- Phagocytes release **digestive enzymes** and other harmful chemicals from **lysosomes**, destroying the microorganism.



3 COMPLEMENT PROTEINS



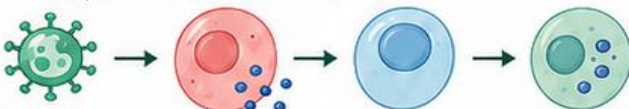
- 1- About 20 proteins are found in blood plasma.
- 2- They **enhance phagocytosis** by helping phagocytic cells bind better to pathogens.
- 3- Some complement proteins form a complex **pore** in the plasma membrane that destroys the pathogen.



4 INTERFERON



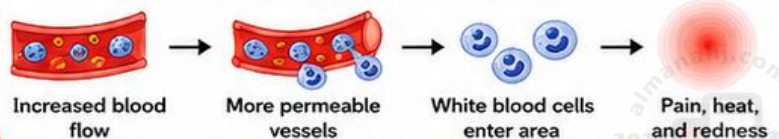
- 1- When a virus enters the body, virus-infected cells secrete a protein called **interferon**.
- 2- Interferon binds to neighboring cells and stimulates them to produce **antiviral proteins**.
- 3- These proteins help prevent viral replication in those cells.



5 INFLAMMATORY RESPONSE



- 1- The inflammatory response is a complex series of events involving **chemicals** and **immune cells**.
- 2- When pathogens damage tissues, chemicals released by both the **invader** and **body cells** attract phagocytes to the damaged area.
- 3- They increase blood flow to the infected area and make blood vessels more **permeable**.
- 4- This allows **white blood cells** to escape into the infected area.
- 5- The accumulation of white blood cells in the area contributes to **pain, heat, and redness**.





5 CELLS OF THE IMMUNE SYSTEM

Cell Type	Function
 Neutrophils	Phagocytosis; blood cells that ingest bacteria .
 Macrophages	Phagocytosis; blood cells that ingest bacteria and remove dead neutrophils and other debris.
 Lymphocytes	Specific immunity; blood cells that produce antibodies and other chemicals and help kill pathogens .

6 LYMPHATIC SYSTEM (الجهاز اللمفي)

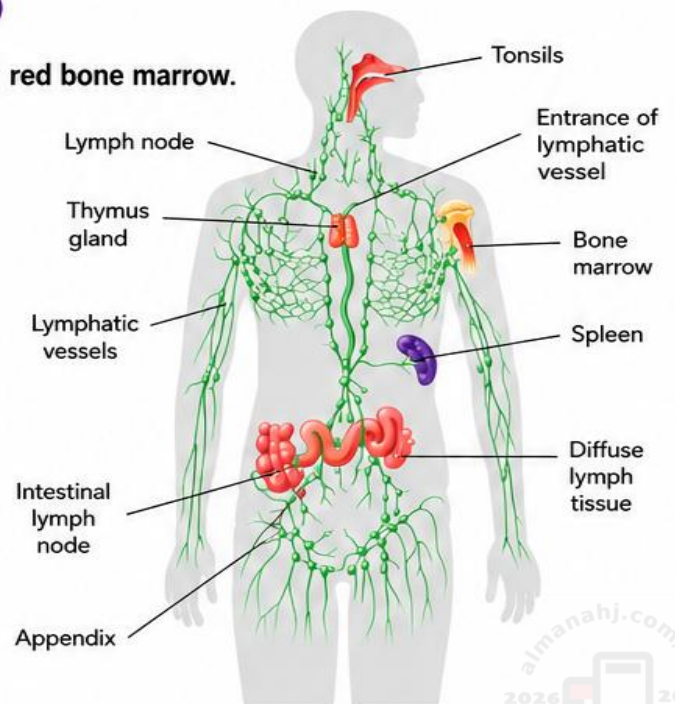
1- Lymph is the watery part of the blood plasma that leaks out of **capillaries** to **clean body cells**. Lymph circulates among tissue cells, is collected by **lymphatic vessels**, and is returned to the circulatory system through **veins** near the heart.



7 LYMPHATIC ORGANS (الأعضاء اللمفية)

2- Lymphocytes are a type of white blood cell produced in **red bone marrow**.

	Lymph nodes	filter lymph and remove foreign materials from it.
	Tonsils	form a protective ring of lymphatic tissue between the nasal and oral cavities.
	The spleen	stores blood , destroys damaged red blood cells.
	The thymus gland	is located above the heart and helps activate T cells .
	T cells	are produced in bone marrow but mature in the thymus gland.





1 B CELL RESPONSE



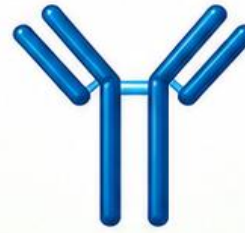
- **Antibodies** (الإجسام المضادة) are **proteins** produced by B lymphocytes that react specifically with a foreign **antigen**.



- **An antigen** (مولد الضد) is a **foreign substance** that causes an immune response.

Antibody

(جسم مضاد)



Proteins produced by B lymphocytes that bind specifically to antigens.

Antigen

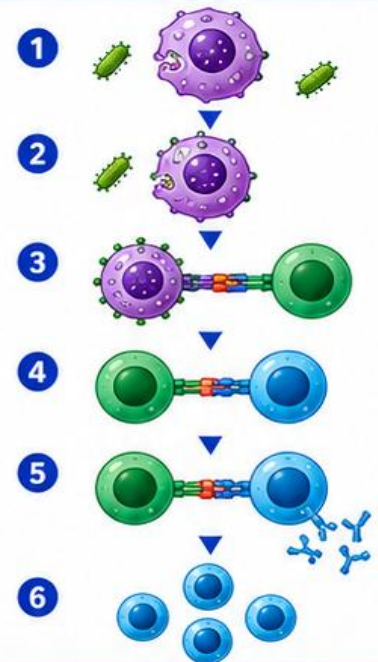
(مولد الضد)



A foreign substance that triggers an immune response.

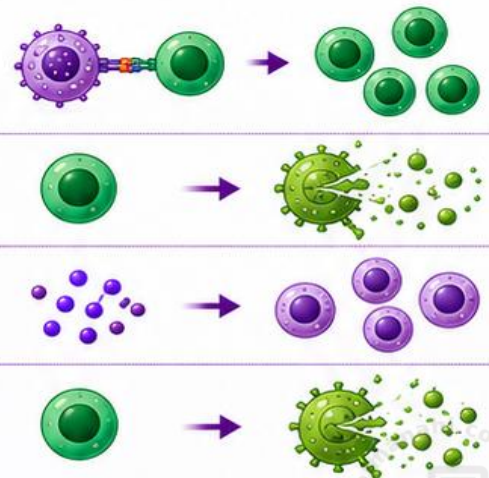
2 HOW B CELLS ARE ACTIVATED

- 1 A **macrophage** surrounds, and **digests** a pathogen.
- 2 It takes a piece of the pathogen, called a **processed antigen**, and displays it on its surface.
- 3 The **macrophage** binds to a **helper T cell (Th)** and activates it.
- 4 The activated **helper T cell** reproduces, binds processed antigens, and attaches to a **B cell**.
- 5 Once an activated **helper T cell** binds to a **B cell**, the B cell begins to manufacture **antibodies** to bind to the antigen and initiating the **inflammatory response**.
- 6 Some of B cells remain as **memory B cells**.



3 T CELL RESPONSE

- 1 After helper T cells are activated by antigen presentation from macrophages, they can also activate **cytotoxic T cells** (خلايا سامة).
- 2 Activated **cytotoxic T cells** destroy pathogens and release chemicals called **cytokines**.
- 3 **Cytokines** stimulate immune cells to divide and recruit more immune cells to the infected area.
- 4 **Cytotoxic T cells** bind to pathogens, release a chemical attack, and destroy them.





7 PASSIVE AND ACTIVE IMMUNITY

The body's first response to a pathogen is the **primary response**. During this response, **nonspecific and specific immunity** work together to clear the pathogen. One important result of the specific immune response is the production of **memory B and T cells**. These long-living memory cells **respond rapidly** if the same pathogen enters again and reduce the chance of developing the disease a second time.



Type	How it happens	Key points
Passive immunity (مناعة سلبية) Antibodies immunity 	Temporary protection occurs when antibodies made by other people or animals are transferred or injected into the body.	- It occurs naturally from mother to child through the placenta and breast milk. - It can also be used after exposure to diseases such as hepatitis A and B, tetanus, and rabies. Antibodies can also inactivate snake and scorpion venoms.
Active immunity (مناعة نشطة) Vaccination immunity 	Occurs after the immune system is exposed to disease antigens and memory cells are produced.	- It may result from infection or immunization. Immunization (التطعيم) is deliberate exposure to an antigen using killed or weakened pathogens that cannot cause disease. Booster shots increase the immune response and provide further protection.

8 COMMON IMMUNIZATION

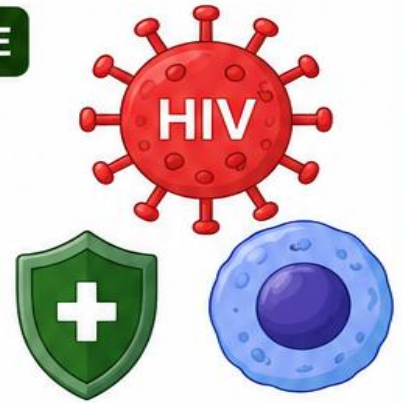


Immunization	Disease	Contents
 DPT	Diphtheria (D), tetanus (T), pertussis (P) (whooping cough)	D: inactivated toxin T: inactivated toxin P: inactivated bacteria
 Polio	Poliomyelitis	Inactivated virus
 MMR	Measles, mumps, rubella	All three inactivated viruses
 Varicella	Chicken pox	Inactivated virus
 HIB	Haemophilus influenzae (flu) type b	Portions of bacteria cell wall covering
 HBV	Hepatitis B	Subunit of virus

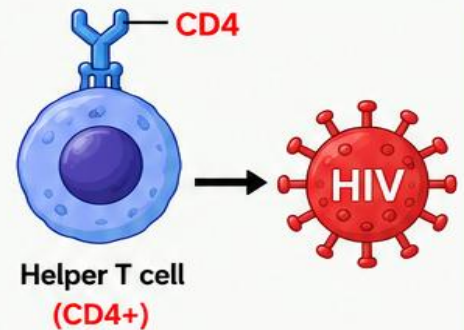


**9****Q- 24 HOW HIV CAN CAUSE IMMUNE SYSTEM FAILURE****Immune System Failure (فشل جهاز المناعة)**

Defects in the immune system can increase the likelihood of infectious diseases and some cancers. Some diseases also reduce the effectiveness of the immune system. One example is **Acquired Immune Deficiency Syndrome (AIDS)**, which results from infection by **Human Immunodeficiency Virus (HIV)**.

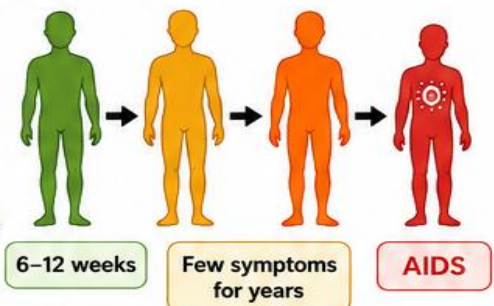


- 1** Helper T cells have **CD4+ receptor** on their plasma membrane.
- 2** HIV is an **RNA virus** that infects helper T cells that produce new viruses.
- 3** Over time, the number of **helper T cells decreases**, so the infected person becomes less able to fight disease.

**THE PROGRESS OF HIV INFECTION**

● **Early phase:** during the 6–12 weeks while viruses are replicating in helper T cells.

- Symptoms such as **fever** and **night sweats**, but these symptoms often decrease after about eight to ten weeks.
- After that, the patient may have **few symptoms** for as long as **ten years** while still being able to pass the infection through **sexual intercourse** or **blood products**.
- HIV is a **secondary immunodeficiency disease** because the immune system of a previously healthy person fails.
- Without antiviral drug therapy, the patient usually **dies** from a secondary infection after about **ten years** of being infected with HIV.



Current **antiviral drug therapy** aims to control HIV replication, but **resistant strains**, **expensive drugs**, and **side effects** remain major problems.



**9****Q- 9 GENETIC DISORDERS****Genetic Disorders (الاختلالات الوراثية)**

Some diseases are caused by the **inheritance of genes** (توراث الجينات) that do not function properly in the body.

**Examples of genetic disorders**

albinism



sickle cell anemia



Huntington's disease



hemophilia



Abnormal chromosome number disorders:
Down syndrome and Turner syndrome.



Many diseases have both a **genetic** and an **environmental** cause.
Example: Coronary artery disease (CAD).

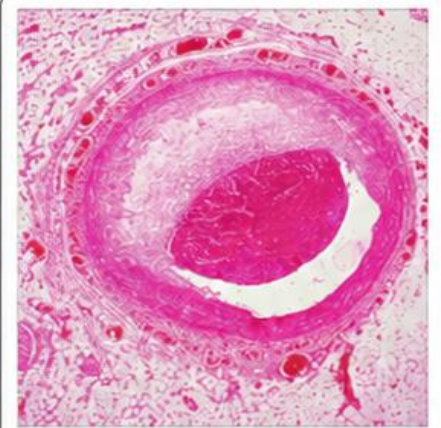
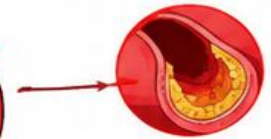


Figure 15 When blood cannot flow through a coronary artery, such as the diseased artery shown here, a heart attack or sudden death can result.

11**Q- 11 CORONARY ARTERY DISEASE (CAD)**

(مرض الشريان التاجي)

**1**

CAD **blockage of arteries** that deliver oxygenated blood to the heart muscle lead to a **heart attack** or **sudden death**.

**2**

Environmental factors such as **diet** and **inactivity** contribute to the development of CAD.

**3**

Families with a history of CAD have a **two to seven times** greater risk of having CAD.

**4**

The exact genetic factors are **not known**.



**10****Q- 10+25 DEGENERATIVE DISEASES (الأمراض التنكسية)**

Degenerative diseases are diseases that **result from the body wearing out or** from the natural **aging** process.

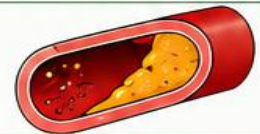
Examples:

**1**

degenerative arthritis (التهاب المفاصل): joints have experienced an increased amount of wear and tear, most people have it by **age 70**

**2**

Arteriosclerosis (تصلب الشرايين): the hardening of the arteries.



Degenerative diseases may also have a **genetic component**.

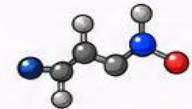
11**METABOLIC DISEASES (الأمراض الأيضية)**

A metabolic disease results from an **error in a biochemical pathway**.

Examples

1

Phenylketonuria (PKU): an inherited disorder that creates the **inability to break down** part of a protein called phenylalanine.

**2**

Type 2 diabetes (السكري 2): occurs when the pancreas does not make insulin, This results in **high glucose levels** in the bloodstream.



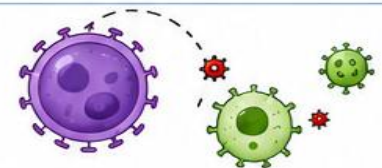
- This can damage the **kidneys** and the **retinas** of the **eyes**.



Key idea: Metabolic diseases can have a **genetic component** and can also involve **environmental** factors such as **diet**.

**12****4. INFLAMMATORY DISEASES (الأمراض الالتهابية)**

are diseases in which the body produces an **inflammatory response** to a common substance.



Examples:

Allergies (الحساسية)



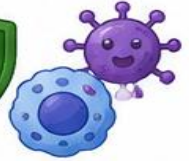
Autoimmunity diseases (أمراض المناعة الذاتية)





13

Q- 30 COMPARISON BETWEEN INFLAMMATORY RESPONSE AND INFLAMMATORY DISEASES



Aspect	Inflammatory Response (الاستجابة الالتهابية)	Inflammatory Diseases (الأمراض الالتهابية)
 Definition	inflammatory response in infectious disease enhances the overall immune response.	inflammatory response to a common substance.
 Cause	removing bacteria or other microorganisms from the body.	Such as allergies and autoimmunity.
 Effect on the Body	Helpful to the body.	Not helpful(harmful) to the body.

14

Q- 26

5. CANCER (السرطان)



Cancer is characterized by **abnormal cell growth** during cell division. **Tumors** interfere with normal body functions.



1

The abnormal cells can **travel** throughout the body.



2

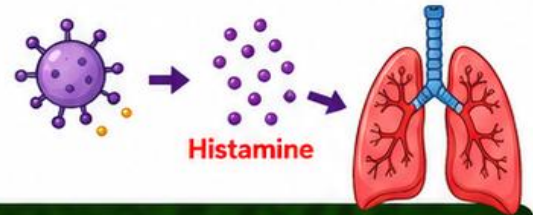
leukemia is the blood cancer.



3

Both **genetic** and **environmental** factors have been shown to cause cancer.



**12****Q- 12****ANAPHYLACTIC SHOCK**

A particular allergen can cause a massive release of **histamine**.



The smooth muscles in the **bronchioles** contract, which restricts air flow into and out of the lungs.



Anaphylactic reactions are life-threatening and require prompt medical treatment.

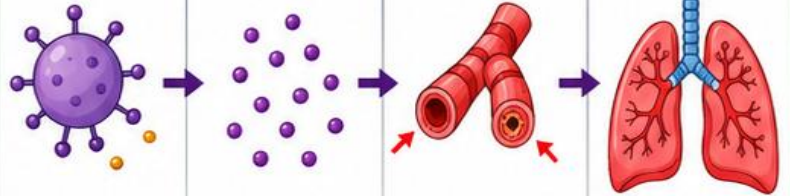
HOW ANAPHYLACTIC SHOCK OCCURS

1. Allergen enters body

2. **Histamine** is released

3. Bronchioles constrict

4. Restricted air flow in/out

**COMMON ALLERGENS THAT CAN TRIGGER ANAPHYLACTIC SHOCK**

Peanuts



Tree nuts



Shellfish



Milk



Eggs



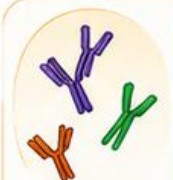
Insect stings

13**Q- 27**

- Rheumatoid arthritis** is a form of arthritis in which antibodies attack the **joints**.



- Rheumatic fever** is an inflammation in which antibodies attack the **valves of the heart**.



- Lupus** is a disorder in which autoantibodies are formed and attack **healthy tissue**.

**RHEUMATOID ARTHRITIS**

An autoimmune disease in which the immune system attacks the joints.



Swelling



Deformities



Pain



Stiffness

Figure 17 The large knobs and deformities of these fingers are due to rheumatoid arthritis, an autoimmune disease.

