TOPIC 11 - TRANSPORT IN HUMANS

Why is it necessary to have a transport system?

In complex multicellular organisms such as plants and animals, numerous cells are located at the centre of the body, far away from the outside environment

- Simple diffusion is not enough to bring oxygen and nutrients to all of their cells and remove waste products with sufficient speed
- Thus, the need for a ***transport system*** to carry substances from one part of the body to another.

Transport to body cells	Transport away from body cells (for excretion)
➢ _____ (from lungs) ➢ _____ (from ileum)	➢ _____ (to lungs) ➢ _____ (to kidney)

Mammals have developed a transport system in their bodies consisting of:

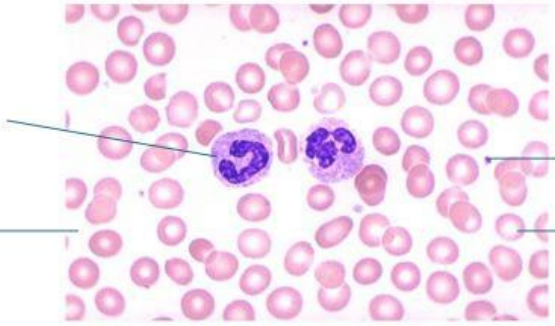
- a series of _____ that runs through the entire body
- fluid i.e._____, which flows through the vessels, carrying nutrients or waste products
- a _____ (muscular pump), which ensures that the blood keeps flowing through the vessels

This transport system is known as the _____.

Definition:	It is a system of blood vessels with a pump and _____ to ensure one-way flow of blood .

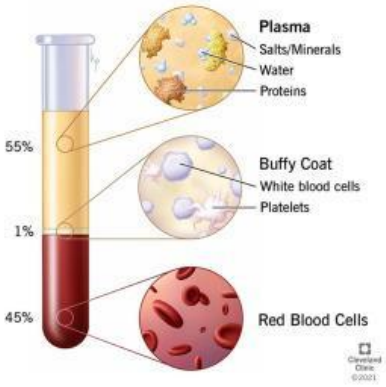
BLOOD – STRUCTURE & COMPOSITION

When a blood smear on a microscope slide is examined under a light microscope, the photomicrograph below is what will be observed.



Blood is made up of three major components:

1. Plasma – liquid part of the blood
2. Platelets
3. Cells: Red blood cells (erythrocytes) & White blood cells (leucocytes)



N2022/21Q9(a) Describe the composition of human blood. [5]

Practical Skill (Paper 3/4) – Draw the red blood cell and white blood cell in the space below based on the photomicrograph above

LIVEWORKSHEETS

PLASMA

N2012/21 Q8(b) Describe the composition and the importance of plasma in the circulatory system. [7]

Structure	***Function***
• A pale _____ liquid • <u>Composition of plasma:</u> Made up of 90% water with the following dissolved substances in solution: o Soluble _____ (amino acids, glucose) o Vitamins o Ions (mineral salts) e.g. Ca^{2+}, Na^{+}, Cl^{-} o Excretory products (_____, _____) o _____ (insulin, adrenaline) o Soluble plasma proteins (fibrinogen – for blood clotting)	To transport: • blood cells throughout the body • soluble digested food, vitamins and ions to _____ • hormones to target body organs • soluble plasma proteins to _____ in the body for clotting • carbon dioxide from _____ to the _____ to be excreted • urea from all body cells to the _____ to be excreted in the _____ To distribute _____ uniformly through the body, maintaining a constant body temperature (~37°C in humans)

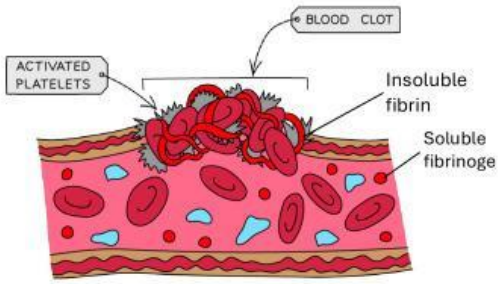
PLATELETS

Structure	***Function*** *J2022/22 Q8(b)Explain the role of platelets and the importance of this role.[4]*
• Fragments of some cells in the bone marrow o Platelets are not true cells • Consists of cytoplasm surrounded by a cell membrane (has no nucleus) • Lifespan: 6 days only	• Plays a role in _____, forming a temporary plug at wound or cut • Clotting is important because: o Prevents excessive loss of _____ from the body through a wound or cut o Enables tissue _____ to take place under the dried clot o Prevents the entry of _____ into the body.

<u>CLOTTING PROCESS</u>

- Platelets get activated by the presence of damage cells causing <u>fibrinogen</u> to change
- Plasma protein, fibrinogen, is converted into an insoluble stringy protein called _____.
- Fibrin forms a mesh, which traps _____ and becomes a _____ to prevent the entry of _____ and stops further loss of _____.

*** Calcium ions must be present in the clotting process



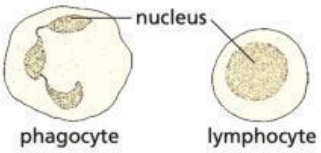
RED BLOOD CELL (ERYTHROCYTE)

Structure	***Function***
• Contains pigment _____ • No _____ • Flat, _____ shape *(Refer to Topic 1 notes for adaptations of red blood cells)*	Transport _____ in the form of _____ from the _____ to _____.

LIVEWORKSHEETS

WHITE BLOOD CELL (LEUKOCYTE)

- Have multi-lobed nucleus
- Made in bone marrow



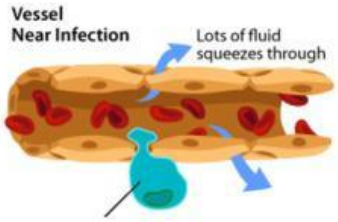
- Have large, round nucleus
- Made in lymph nodes

- Larger than the red blood cells
- Colourless and irregular in shape
- Two types of white blood cells: Phagocytes & Lymphocytes

J2013/22 Q9(b(ii)Describe the functions of white blood cell [3]

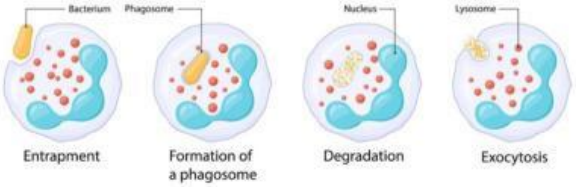
(a) Phagocyte

Capable of movement and can squeeze out of capillaries (formation of pseudopodia) into spaces among the body cells



Phagocytes squeeze through capillary walls

Function: Carry out **phagocytosis** i.e. _____ and _____ potential harmful pathogen to prevent or overcome infection

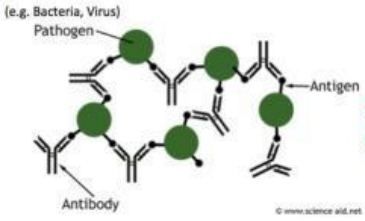


(b) Lymphocyte

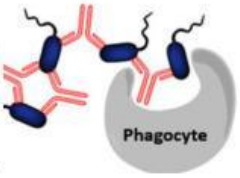
Function: Produce _____

Antibodies can be used in different ways:

1. Antibodies bind to the _____ on the surface of pathogens causing the pathogens to clump together (_____) for efficient ingestion by _____.

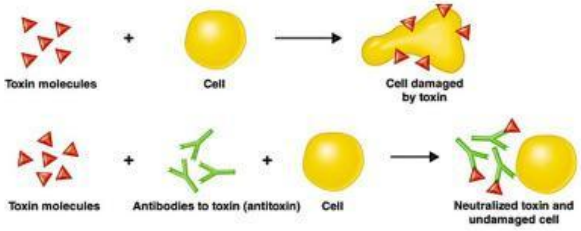


Agglutination

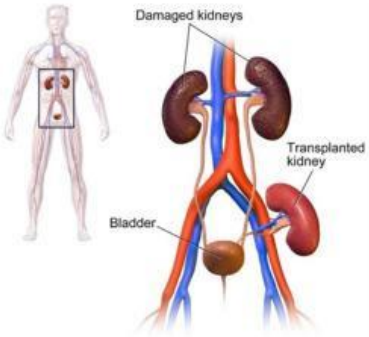


Phagocyte can easily engulf and ingest the pathogens

2. Some antibodies are in the form of _____i.e. neutralize poisons (toxins) in the blood which have been released by pathogens.



3. Plays a role in tissue/organ rejection during tissue/organ transplant.



Kidney Transplant

ORGAN/TISSUE TRANSPLANT & REJECTION

Organ or tissue transplant is when a person's damaged or diseased organ or tissue is replaced by a healthy one.

- The organ or tissue transplanted can be obtained from the _____ itself or from a _____.
- The organ or tissue to be transplanted must not be rejected by the recipient's _____ (must be compatible)
- Any incompatible organ or tissue will be identified as _____ by the recipient's immune system and will be destroyed by _____ produced by the recipient's lymphocyte.

LIVEWORKSHEETS

PREVENTION OF REJECTION

- Before transplantation can take place, the organ or tissue must be checked for compatibility, a procedure known as tissue matching.
  - The tissue of both donor and recipient must be as _____ similar as possible, as in the case of sisters, brothers, parents and close relatives.
  - Tissue rejection will not arise if the organ or tissue comes from the recipient's body itself.
- Use of _____ drugs to inhibit the activity of the recipient's immune system. However, there are problems such as:
  - The recipient has lower resistance to _____
  - The recipient must continue taking the drugs for the rest of their life

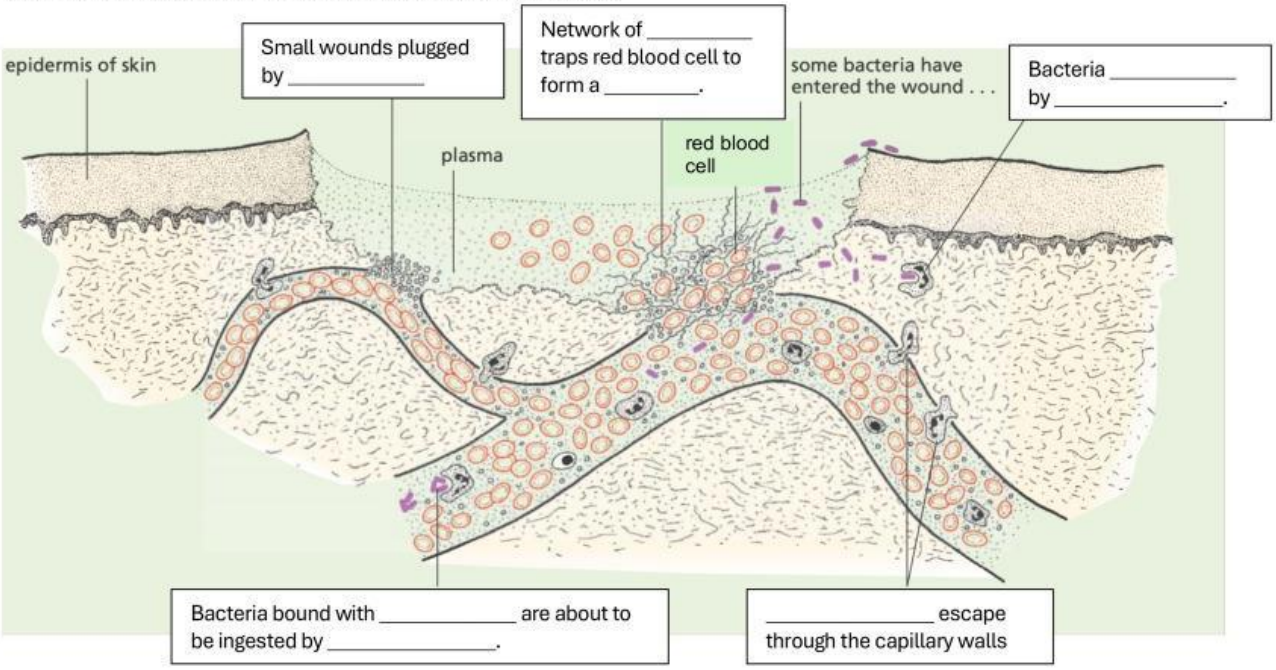
BODY'S LINE OF DEFENCE AGAINST PATHOGEN (disease-causing organism)

1. **First** defense: _____ prevents entry of bacteria into the body. How?
   - Skin is a solid physical barrier separating the internal environment from the external
   - Skin surface (pH ~ 5.0) is slightly acidic in nature due to the properties of sweat

2. **Second** defense (if the skin is damaged e.g. by a wound): _____ formed by _____ prevents the bacteria from entering the body.

3. **Last line of defense** (if the first two defenses are not sufficient and the pathogen manages to enter the body): _____ i.e. phagocytes remove the pathogen via _____, helped by the _____ produced by lymphocytes.

4. Once the infection has been cleared, some of the antibodies against this particular pathogen will remain within the circulatory system providing immunity against this pathogen in the future.



5090 J2010/22 Q8(a) 'Either' Describe how the body's defense mechanisms protect the person from infection [8]

LIVEWORKSHEETS