



TOPIC: CO-ORDINATION AND RESPONSE.

Q1. Define the term *nervous system*?

.....
.....
..... [2]

Q2.Explain the components of CNS and PNS?

.....
.....
..... [2]

Q3.Define the term *receptor*?

.....
..... [2]

Q4.Define the term *effectors*?

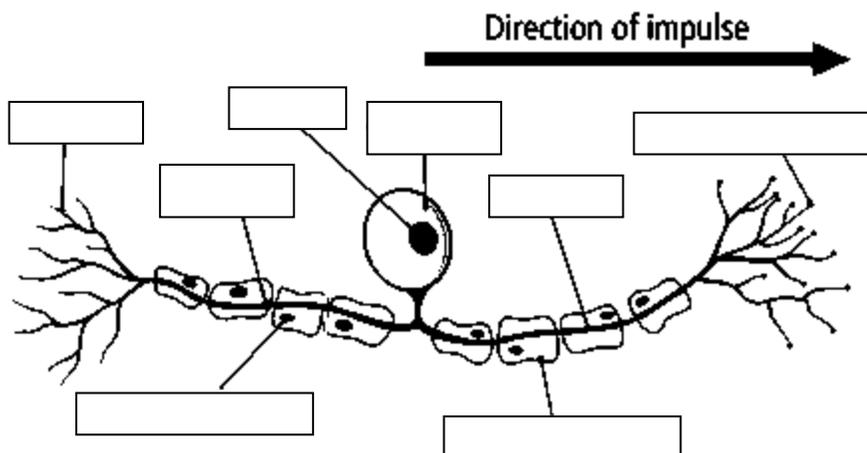
.....
.....
..... [2]

Q5. Define the term *reflex action*.

.....
..... [2]

Q6. a) Label the parts of this neuron. [8]

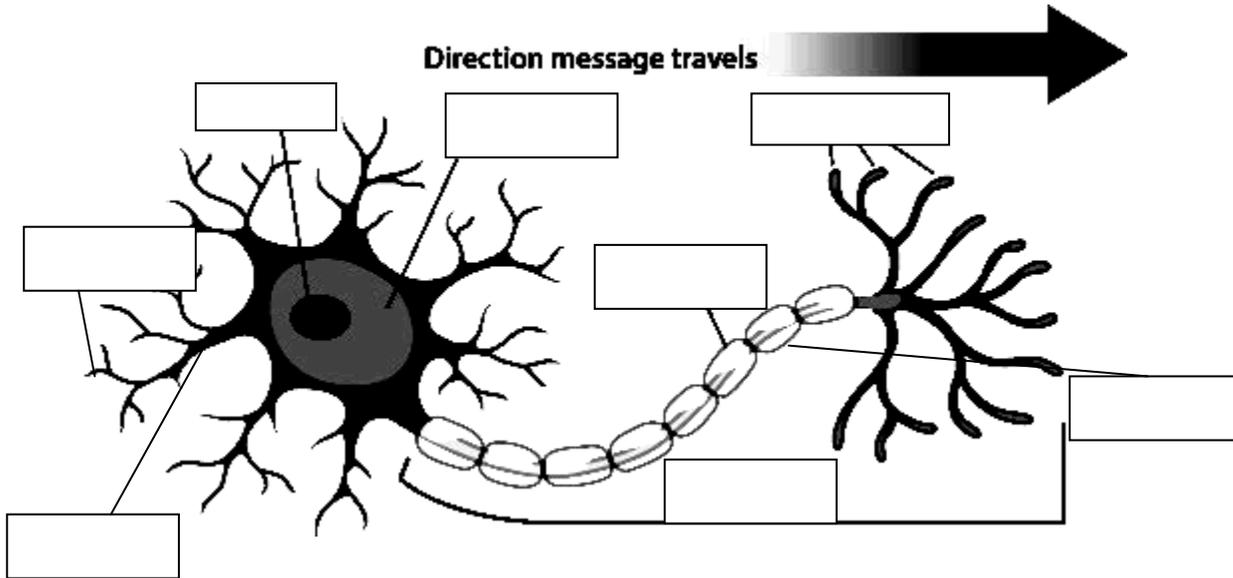
b) name of the neuron [1]



Q7.

a) Label the parts of this neuron. [8]

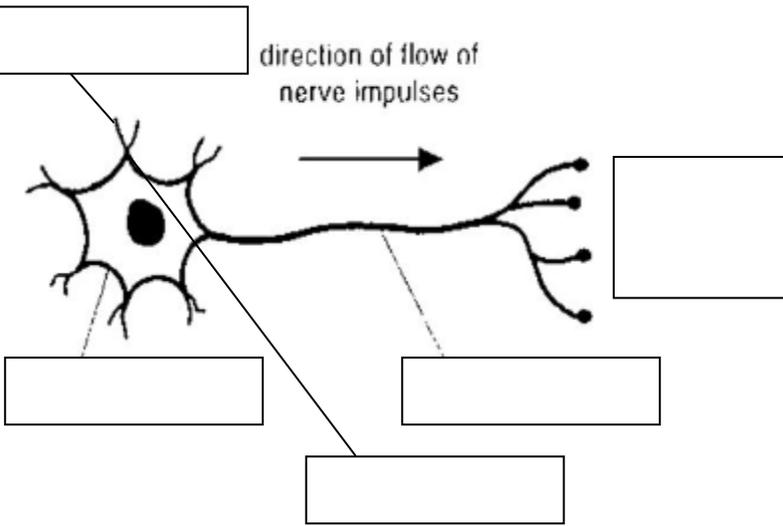
b) name of the neuron [1]



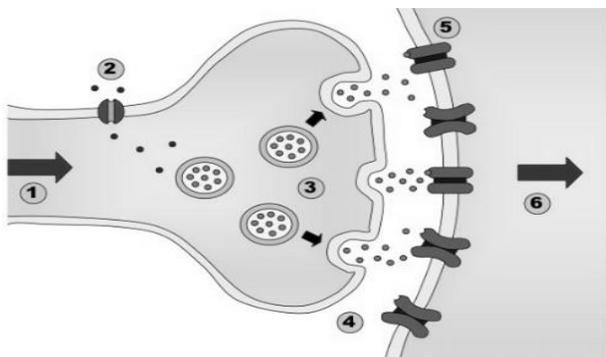
Q8.

a) Label the parts of this neuron. [5]

b) name of the neuron [1]



Q9.



a) Describe how impulse is transmitted from one neuron to another neuron?

.....

.....

.....

[8]

Q10. Define the term *voluntary and involuntary actions*?

[4]

Q11. Explain the reflex arc for the cranial and spinal reflex?

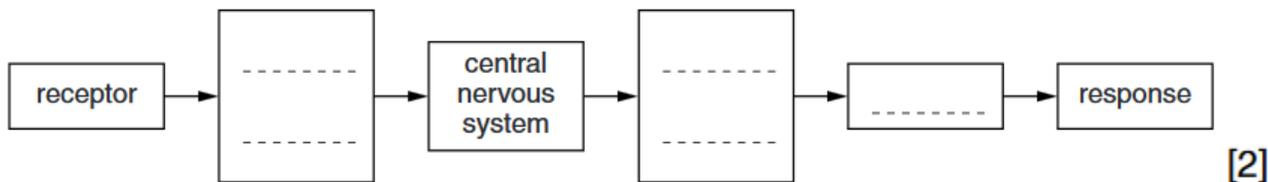
[4]

Q12. Explain the reaction for the voluntary action how the impulse travels?

[2]

Q13.

(a) Receptors receive stimuli and convert them into electrical impulses. Fig. 2.1 shows the pathway taken by electrical impulses in a reflex action. Complete Fig. 2.1 by writing the name of the appropriate component on the dotted lines.



Q14.

a) Describe how voluntary actions differ from involuntary actions.

[4]

Q15.

A person is stung on the hand by an insect and automatically withdraws their hand rapidly.

(a) Describe the part played by the nervous system in this action.

[4]

(i) Name the type of nerve cell shown in Fig.

..... [1]

(ii) State two features that distinguish it from other types of nerve cell.

1.....

2..... [2]

(iii) Where, in the nervous system, is this cell located?

..... [1]

(b)Nerve cells are specialized cells. Suggest how the parts of the nerve cell labeled in Fig. 2.1 enable the nerve cell to function successfully.

Cytoplasm

.....

.....

Myelin sheath

.....

..... [4]

(c)Reflexes involve a response to a stimulus.

(i)Complete the flow chart by putting the following terms in the boxes to show the correct sequence in a reflex.

Coordinator effectors receptor response stimulus



[2]

Q18.

a)Complete Table by naming three sense organs and the stimulus which each detects.

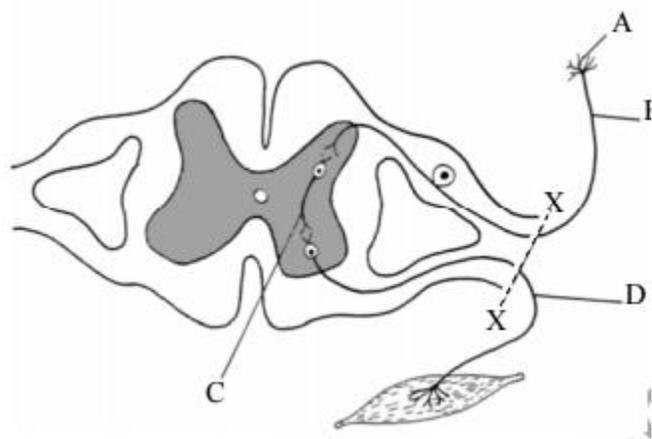
sense organ	stimulus

[3]

(b)Reflexes are involuntary actions coordinated by reflex arcs like the one shown in Fig.

Q19.

The diagram shows the pathway of a reflex arc.



(a) Name the parts labeled A, B, C and D. A:

A: [1]

B: [1]

C: [1]

D: [1]

(b) Draw arrows on the diagram to show the direction of a nerve impulse in the parts labeled B and D. [2]

(c) What is the name of the gap between the parts labeled B and C?

..... [1]

(d) How does the nerve impulse pass across this gap?

..... [1]

(e)

(i) If the nerve to the arm were cut along the line marked X- - - X, how would this affect the person's movement?

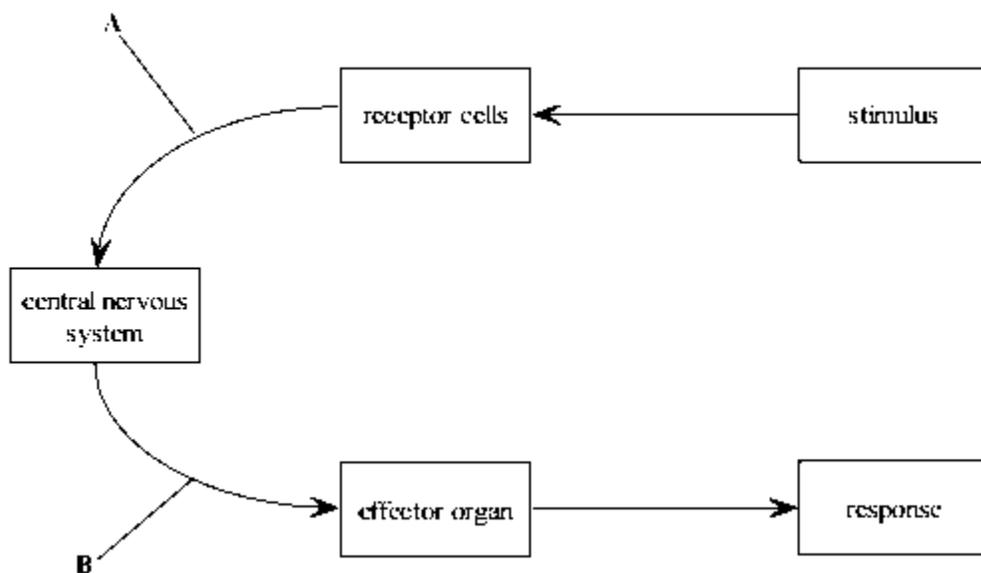
..... [1]

(ii) Give a reason for your answer.

..... [1]

Q20.

The diagram shows the main stages in a reflex action.



(a) The stimulus in this reflex action was a hot plate touching the hand.

(i) Where are the receptor cells located?

..... [1]

(ii) Name the type of nerve cell labeled A.

..... [1]

(ii) Name the type of nerve cell labeled B.

..... [1]

(iv) There is a third nerve cell between nerve cells A and B. Where is this nerve cell located?

..... [1]

(v) What would be the response to the hand touching a hot plate?

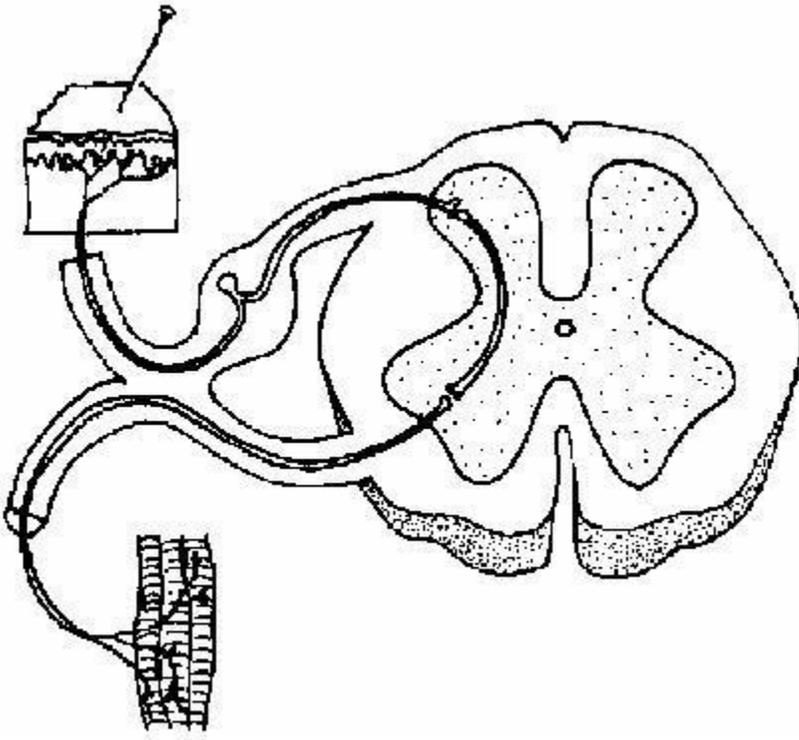
..... [1]

(vi) How is this response brought about?

..... [1]

Q21. Label the following on the diagram of spinal reflex.

- Sensory neuron
- Relay neuron
- Motor neuron
- Mixed nerve
- Ganglion
- Grey matter
- White matter
- Receptor
- Response



Q22.

a) If the man standing near the footpath wants to blink the eye to a girl near the mall , how his nervous system will coordinate?

.....

.....

.....

.....[3]

The blood circulatory system

1 How do white cells differ from red cells

- (a) in their structure,
- (b) their function?

2 Where are blood cells made in the body?

3 Name two proteins carried in the plasma.

4 What else is carried in the plasma?

5 Put the following events in their correct order starting with the first one listed:

atria fill with blood, semi-lunar valves close, tricuspid and bicuspid valves close, ventricles contract, semi-lunar valves open, atria contract, ventricles relax, tricuspid and bicuspid valves open

6 Fill in the missing words.

Oxygenated blood from the lungs returns to the ...(A)... atrium of the heart in the ...(B)... vein. From here it enters the ...(C)... ventricle and leaves the heart in the ...(D)... to go to the body.

From the body.....(E)...blood returns via the ...(F)...to the ...(G)... atrium, and then leaves the heart in the ...(H)..... artery to go to the ...(I)....

7 Which one of the following is not a characteristic of capillary blood vessels?

- (a) Repeatedly branched.
- (b) Small diameter.
- (c) Permeable to salts (ions)
- (d) Thick walled.

8 Arteries carry blood the heart. Veins carry bloodthe heart.

9 In which parts of the circulatory system are there valves?

10 What is the connection between tissue fluid, plasma and lymph?

11 How is lymph propelled through the lymphatics?

12 What is the function of lymph nodes?

13 Complete the table.

Substance	Transported by the blood	
	<i>From</i>	<i>To</i>
Oxygen	(A)	whole body
(B)	whole body	lungs
(C)	liver	kidneys
(D)	intestine	(E)
Heat	(F)	(G)

Self-assessment questions

12.02

The blood circulatory system (continued)

14 After a period of vigorous activity you would expect blood leaving a muscle to have

- (a) less carbon dioxide, less oxygen and less glucose
- (b) more carbon dioxide, more oxygen and less glucose
- (c) more carbon dioxide, more oxygen and more glucose
- (d) more carbon dioxide, less oxygen and less glucose.

15 Blood from the alimentary canal returns to the heart by way of

- (a) hepatic vein and vena cava
- (b) hepatic artery, hepatic vein and vena cava
- (c) hepatic portal vein and vena cava
- (d) hepatic portal vein, hepatic vein and vena cava.

16 Describe briefly how platelets, fibrin and red cells interact to form a blood clot.

17 Briefly describe the principal lines of defence against bacteria entering the blood system.

18 The substances produced by lymphocytes to combat bacterial cells are called

- (a) antigens,
- (b) antibodies,

- (c) antidotes,
- (d) antitoxins.

19 You may acquire natural, active immunity to a disease if

- (a) you are injected with an antibody to the disease
- (b) you recover from an attack of the disease
- (c) you are inoculated, against the disease
- (d) you are born with antibodies to the disease?

20 In each case, give an example of a disease to which immunity can be acquired by injecting

- (a) an inactivated bacterial toxin
- (b) a killed bacterium
- (c) an antibody.

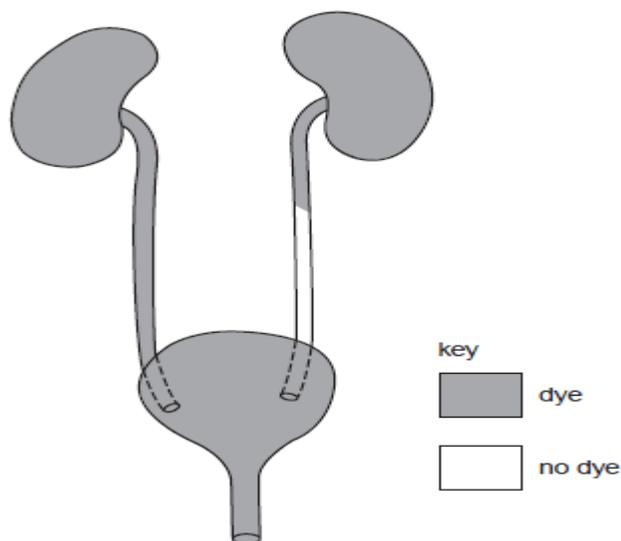
21 A person: whose blood group is AB can receive a blood transfusion from

- (a) group O only
- (b) group AB only
- (c) groups A and B
- (d) any group.

22 Apart from any inherited tendency towards coronary heart disease, what are thought to be the four main risk factors?

TOPIC : EXCRETION IN HUMANS AND HOMEOSTASIS

1. A patient has dye injected into the blood supply to his kidneys. The dye appears in his excretory system as shown.



Which part is blocked?

- A** one kidney
- B** one ureter
- C** the bladder
- D** the urethra

2. In which organ is urea formed and through which tube does it leave the body?

	organ	tube
A	kidney	ureter
B	kidney	urethra
C	liver	ureter
D	liver	urethra

3. Which substances are usually found in the urine of a healthy person?

A glucose and proteins

C salts and water

B salts and amino acids

D water and

proteins

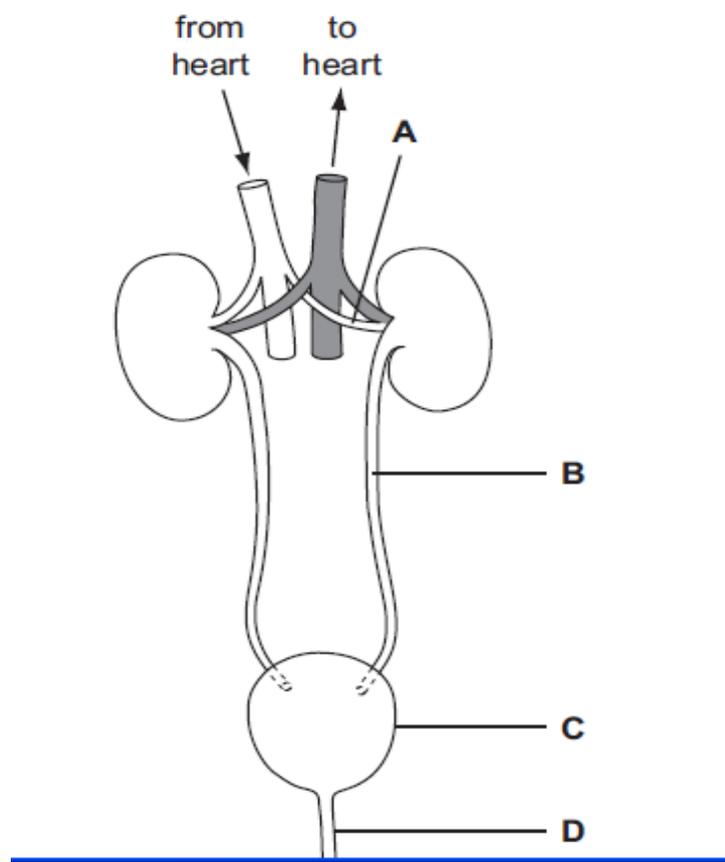
4. During a long-distance race, the body temperature of an athlete begins to rise.

Which changes occur to help return the body temperature to normal?

	sweating	blood vessels in the skin
A	decreases	constrict
B	decreases	dilate
C	increases	constrict
D	increases	dilate

5. The diagram shows structures associated with the human urinary system.

Which structure is the urethra?



6. How do sweat glands and blood vessels near the skin surface respond when body temperature rises above normal?

	sweat glands	blood vessels near the skin surface
A	decreased activity	constriction
B	decreased activity	dilation
C	increased activity	constriction
D	increased activity	dilation

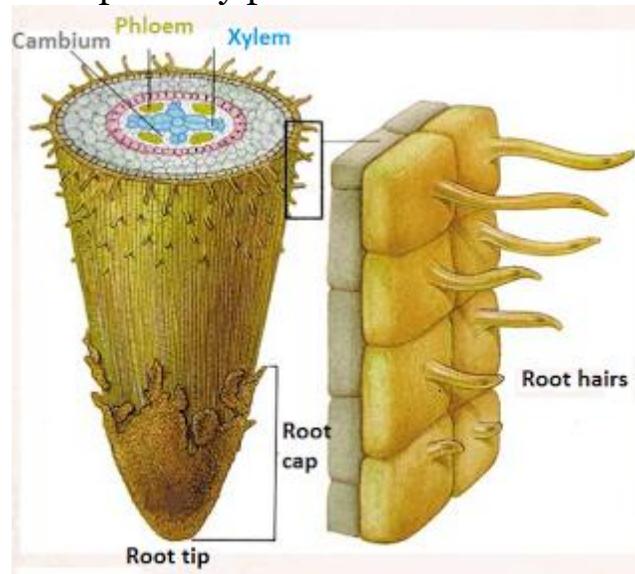
7. A person has a high-protein diet.

What describes the level of urea in the blood leaving the liver and in the urine leaving the kidneys?

	blood leaving liver	urine leaving kidneys
A	high urea	high urea
B	high urea	low urea
C	low urea	high urea
D	low urea	low urea

-
- Study the following material and answer the questions that follow-
-

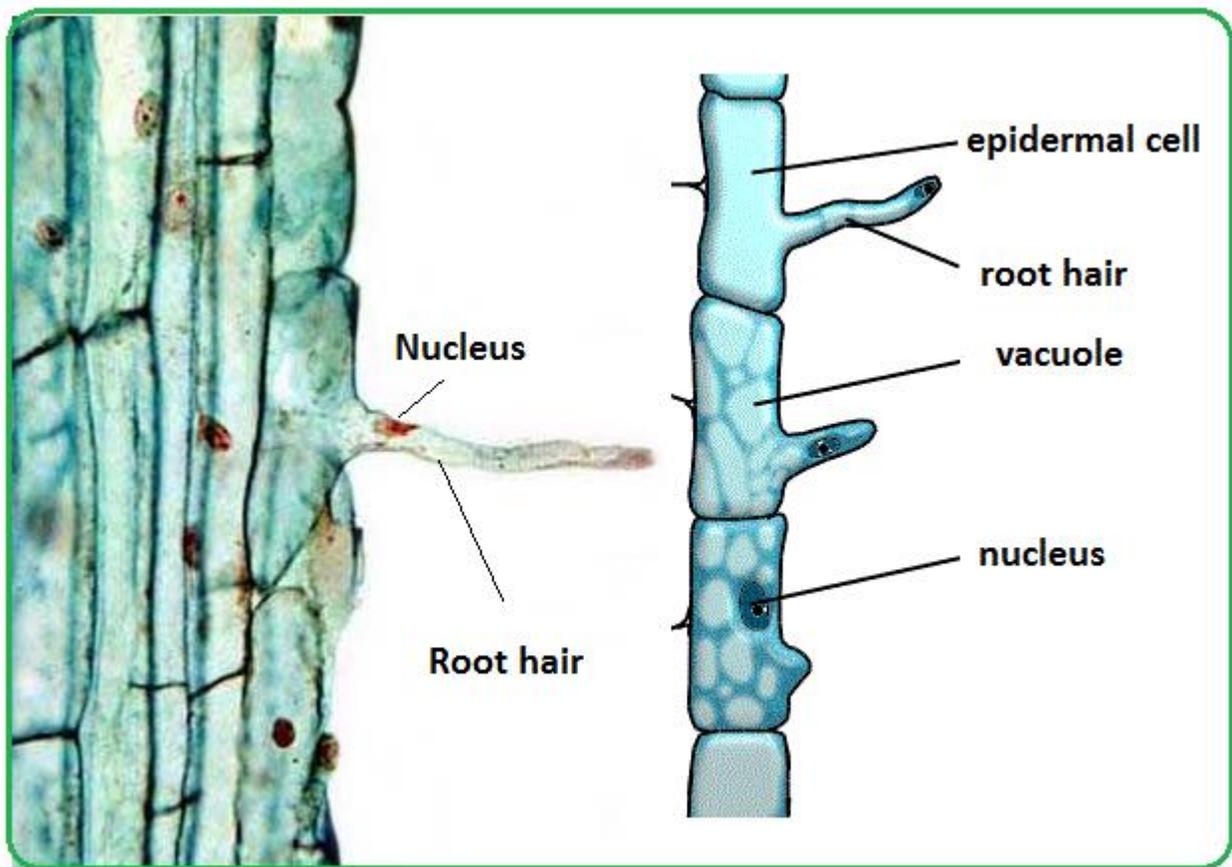
Root hairs and water uptake by plants



Plants take in **water** from the soil, through their **root hairs**:

- At the very tip is a **root cap**. This is a layer of cells which protects the root as it grows through the soil.
- The rest of the root is covered by a layer of cells called the **epidermis**.
- The **root hairs** are a little way up from the root tip. Each root hair is a **long epidermal cell**. Root hairs do not live for very long. As the root grows, they are replaced by new ones.

Root hair cells, as seen under the light microscope:

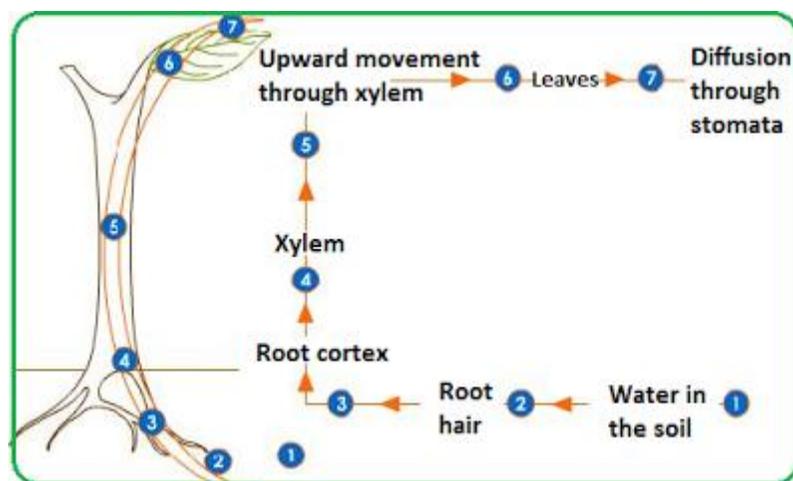


The **hair** is an **extension** of the cell and not a separate cellular structure.

Functions of root hair cells

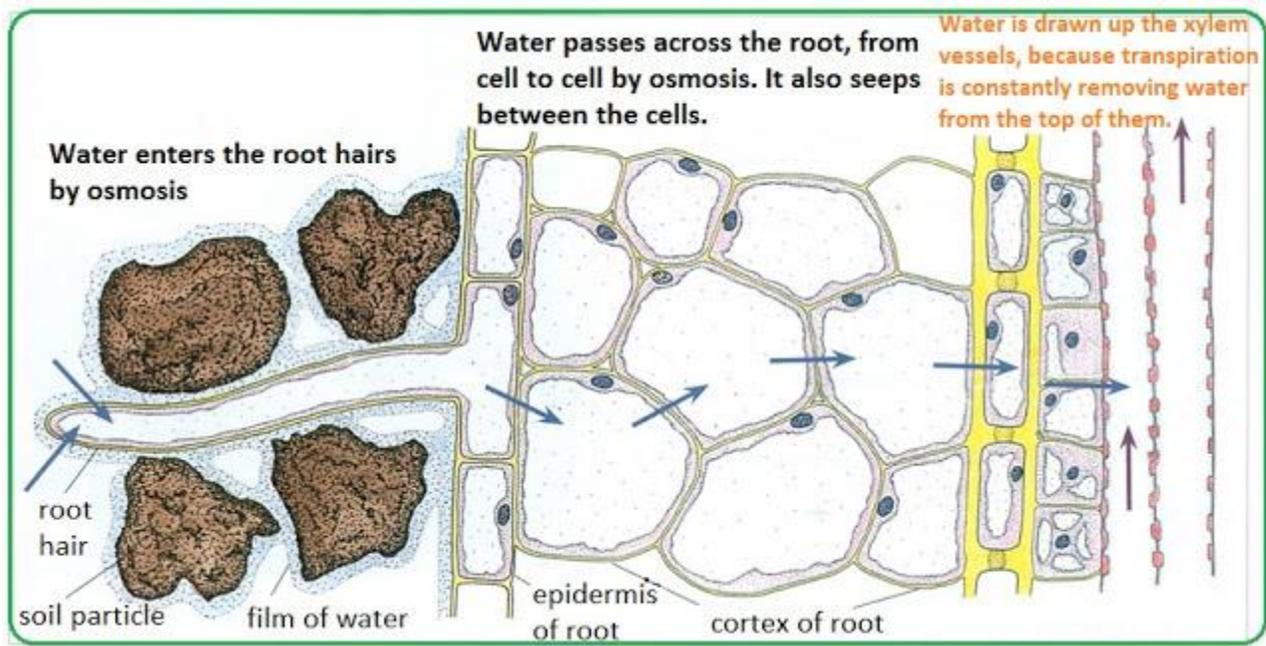
- **Increase** the external **surface area** of the root for **absorption** of **water** and **mineral ions** (the hair increases the surface area of the cell to make it more efficient in absorbing materials).
- Provide **anchorage** for the plant.

Passage of water through root, stem and leaf



Water enters **root hair** cells by **osmosis**. This happens when the water potential in the **soil** surrounding the root is higher than in the cell → water diffuses from the soil into the root hair, **down** its **concentration gradient**.

- As the water enters the cell, its water potential becomes higher than in the cell next to it, e.g. in the **cortex**. So water moves, by **osmosis**, into the next cell. Some of water may also just **seep** through the spaces between the cells, or through the cell walls, never actually entering a cell.



- Water vapour evaporating from a leaf creates a kind of **suction**, its pressure at the top of the vessels is lower than that at the bottom → water move up the **stem** in the xylem, more water is drawn into the leaf from the xylem. This creates a **transpiration stream**, pulling water up from the root. Mature xylem cells have no cell contents, so they act like open-ended tubes allowing free movement of water through them. Roots also produce a root pressure, forcing water up xylem vessels.
- Water moves from xylem to enter **leaf** tissues **down** water **potential gradient**. In the leaves, water passes out of the xylem vessels into the surrounding cells.

Common misconceptions

Water does not travel through xylem vessels by osmosis. Osmosis involves the movement of water across cell membranes – xylem cells do not have living contents when mature, so there will be no membranes.

Try this

Describe how the structure of xylem tissue is adapted to its functions.

The cells join together to make a long tubular structure.

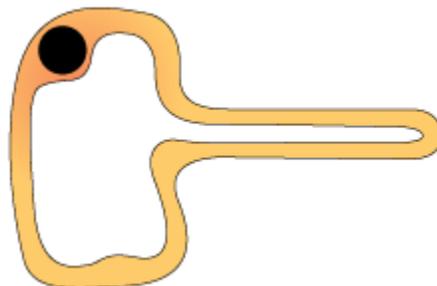
There are no cross-wall and no living contents so the water and mineral salts can pass through freely.

Describe the mechanism of water movement through the xylem.

Water moves by the pull from the leaves caused by the transpiration.

Xylem vessels are very thin, so they act like a capillary tube helping to withdraw water upward.

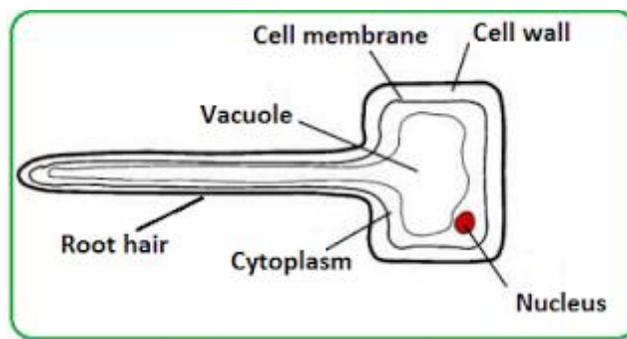
1. a) Labell all parts of the root hair cell (5 mark)



- b) Which plant cell part is missing from this cell? (1 mark)
- c) Name the process by which the cell absorbs:
 - i) Water (1 mark)
 - ii) Minerals (1 mark)

Answer:

- a)

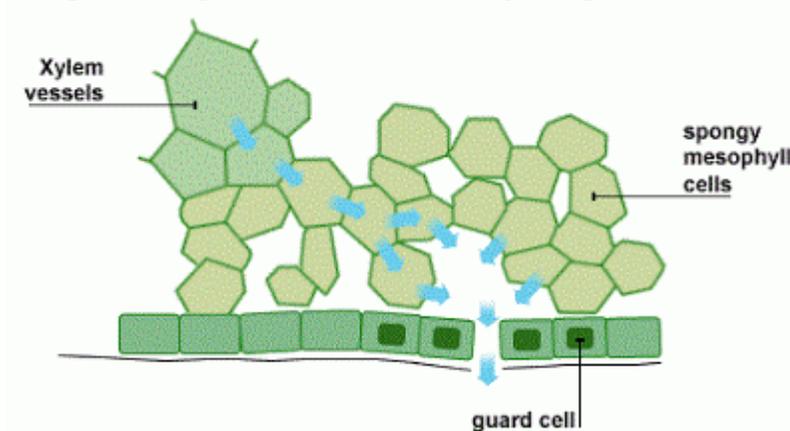


b) Chloroplast

c) i) osmosis

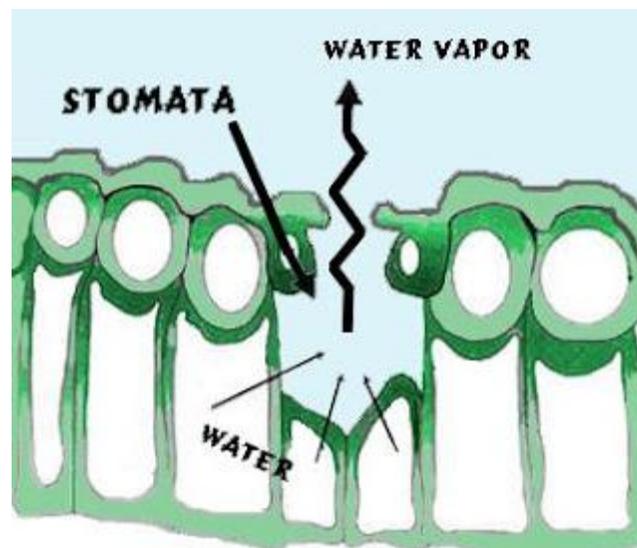
ii) diffusion or active transport (or active uptake)

Transpiration in plants and factors affecting transpiration rate



In the leaves, **water** molecules leave the **xylem vessels** and move from cell to cell. They move through the **spongy mesophyll** layer by **osmosis** along a concentration gradient. Water then **evaporates** into **spaces** behind the stomata and diffuses through the **stomata** into the surrounding air.

Transpiration is the **evaporation** of **water** at the surfaces of the **mesophyll** cells, followed by loss of water vapour from plant leaves, through the **stomata**.



Water in the leaf cells forms a thin layer on their **surface**. The water evaporates into the **air spaces** in the spongy **mesophyll**. This creates a **high** concentration of water molecules. They diffuse out of the leaf into the surrounding air, through the **stomata**, by **diffusion**.

Mechanism of water movement through a plant

Water molecules are attracted to each other (cohesion) → water vapour evaporating from a leaf creates a kind of suction, pressure of water at the top of the vessels is lower than that of the bottom → water move up the **stem** in the xylem, more water is drawn into the leaf from the xylem. This creates a **transpiration stream**, pulling water up from the root.

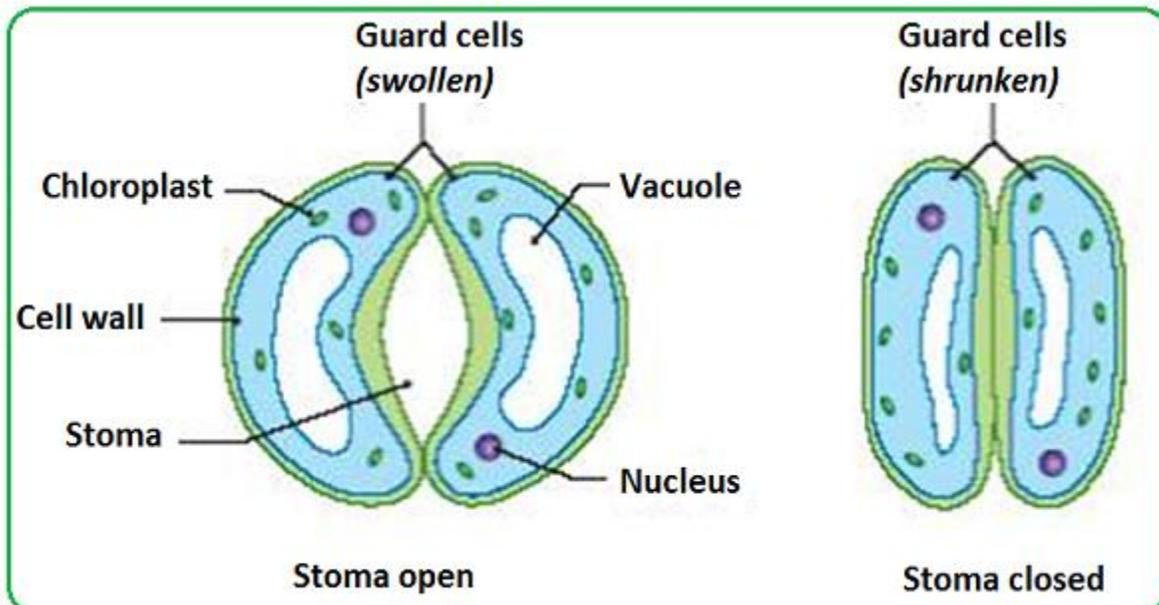
The rate of transpiration can be affected by several factors:

Factors affecting transpiration rate

Factor	Explanation
↑ temperature	↑ the kinetic (movement) energy of water molecules → they diffuse faster.
↑ air movement (wind...)	Removes water molecules as they pass out of the leaf → maintaining a steep concentration gradient for diffusion .
↓ humidity	↓ the concentration of water molecules outside the leaf → steeper concentration gradient for diffusion .
↑ light intensity	Stomata open to allow gas exchange for photosynthesis → water vapour can diffuse out of the leaf.

The opening and closing of the **stomata** is controlled by the **guard cells**.

- In **light**, guard cells **take up** water by osmosis and become **turgid**. Because their inner walls are rigid they are pulled apart, **opening** the pore.
- In **darkness** water is **lost** and the inner walls move together **closing** the pore.



Because of this, the transpiration rate is increased by an increase in light intensity.

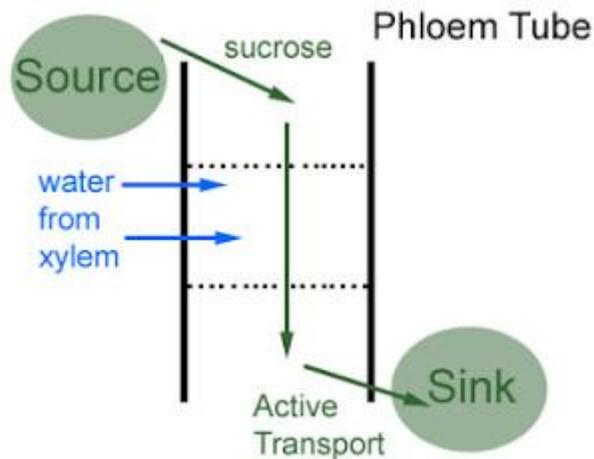
* Most of the factors that result in a change in transpiration rate are linked to **diffusion**. When writing explanation, try to include references to the **concentration gradient** caused by a change in the factor.

How wilting occurs

Young plant stems and leaves rely on their cells being **turgid** to keep them rigid. If the amount of **water lost** from the leaves of a plant is > than the amount **taken** into the roots → the plant will have a **water shortage** → cells become **flaccid** (soft) and will no longer press against each other → Stems and leaves lose their rigidity, and **wilt**.



Translocation of organic foods in plants



Translocation is the movement of organic food such **sucrose** and **amino acids** in **phloem**; from regions of production to regions of storage OR regions of utilisation in respiration or growth.

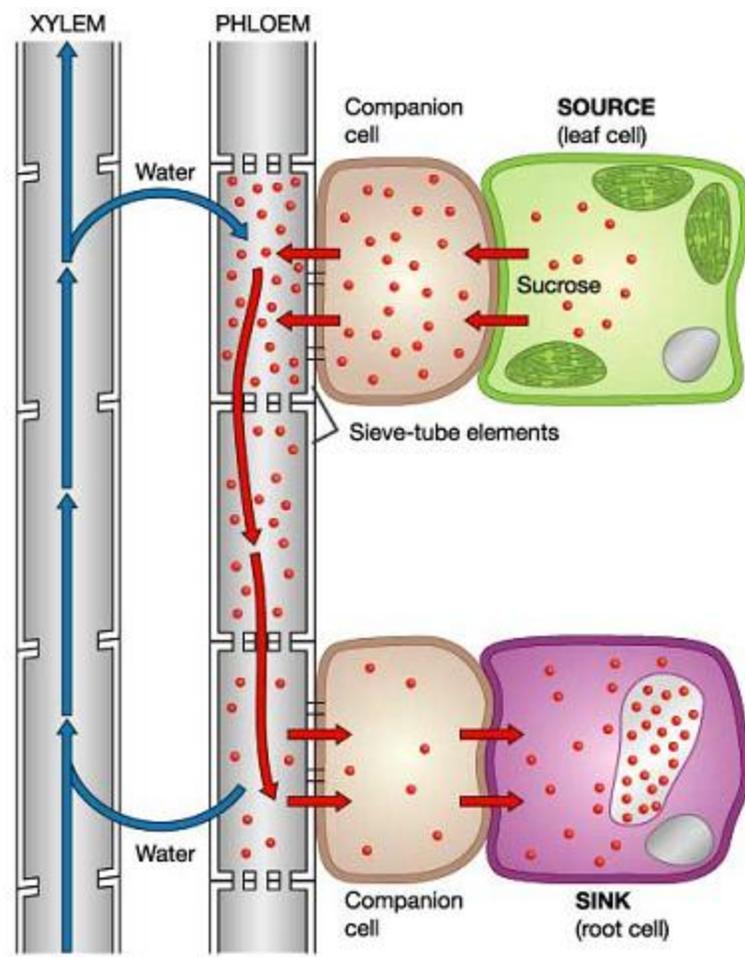
1. Glucose the product of **photosynthesis** is very important as it makes many other important nutrients, e.g. **sucrose**.

- Sucrose in the leaves then enters the **phloem** vessels.
- The phloem transports the sucrose all **across the leaf** where it can be made used of.

2. Amino acids are also transported in the phloem.

Sucrose and amino acids are transported to every tissue of the plant, each cell use it in a different way.

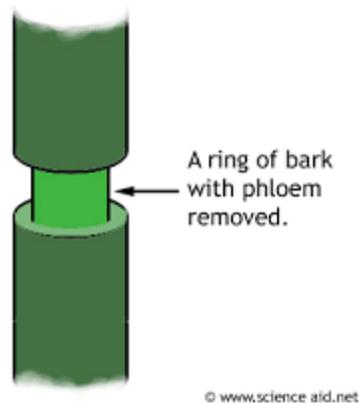
- **Root cells** convert sucrose into glucose for **respiration** and **store** it.
- **Growing cells** make cellulose for **cell walls** from sucrose and use the amino acids to make **proteins** for growth.
- And **fruits** use the sucrose to make the attractive **scent** and **tasty nectar** to attract insects.



The areas of the plant where sucrose is made, are called **sources**, and where they are delivered to and made use of are called **sinks**.

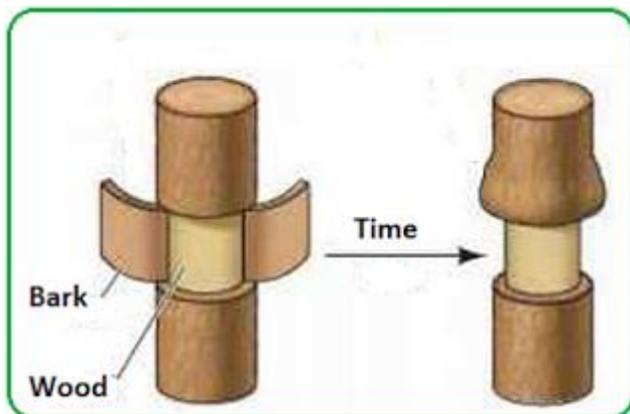
Ringing Experiment

The **phloem** vessels are situated nearer to the bark in comparison with xylem → they can be selectively removed by cutting a **ring** in a stem just deep enough to cut the phloem but not the xylem.



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After a week there is:



- a **swelling above** the ring
- **reduced growth below** the ring
- the **leaves** are unaffected.

This was early evidence that **sugars** were transported downwards in the phloem.

Grey squirrels and other small mammals gnaw the bark and destroy the phloem that is in the inner bark region.

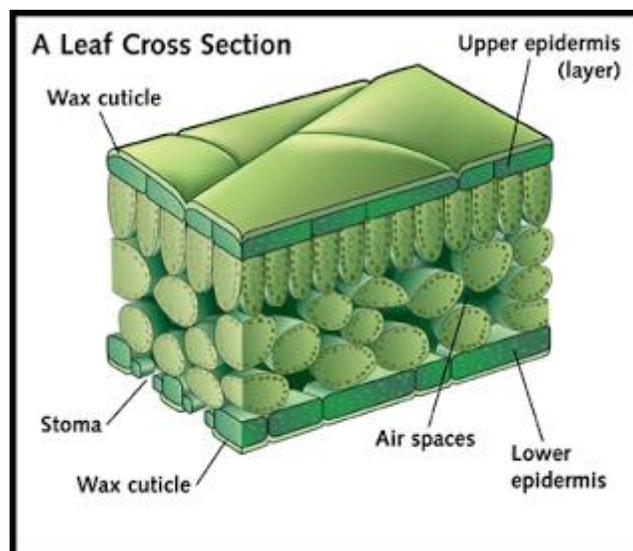
Translocation of applied chemicals (pesticides) throughout the plant



People who grow crops for food sometimes need to use chemicals called **pesticides**. Pests such as **insects** that eat the crop plants, or **fungi** that grow on them, can greatly reduce the yield of the crop. Pesticides are used to kill the insects or fungi.

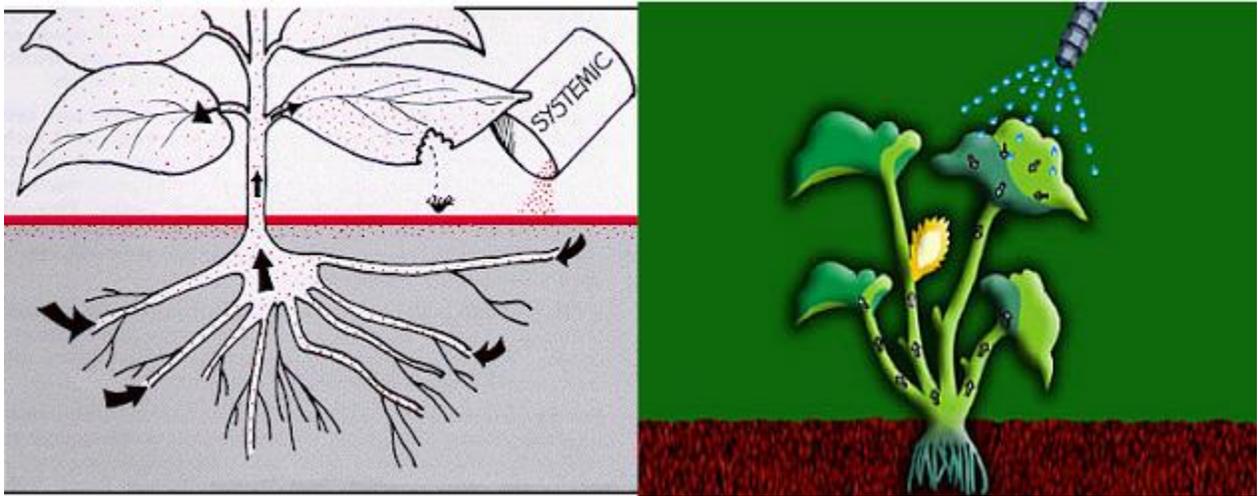
Some pesticides kill only the insects or fungus that the spray touches. They are called **contact pesticides**. They can be very effective if they are applied properly, but they also kill insects and pests that are useful to the plant.

Systemic pesticides are more effective because when sprayed onto the leaves of the plant, they are **absorbed** by it through the **cuticle** or **stomata** and into the phloem tubes. They move through the plant in the **phloem (translocation)** and are taken in by any insect eating the plant or sucking up phloem sap.



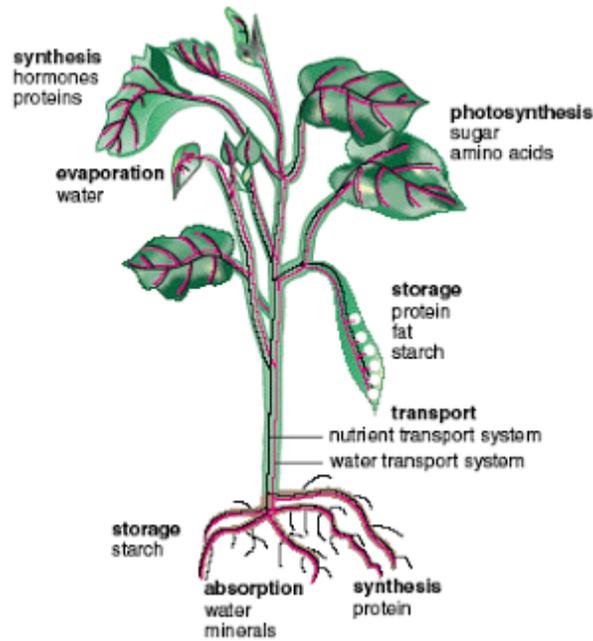
So any insect feeding on the plant, even if it was hidden under the leaf where the spray could not reach it, will eventually end up feeding on pesticide. The same is true for fungi; no matter where they are growing on the plant, the pesticide will eventually reach them. Once an insect has ingested enough pesticide it will die, meanwhile the harmless insects remain safe.

The disadvantages of systemic pesticides are that they may accumulate in the food chain.



Systemic pesticides may need to be taken up by roots or through the leaves.

Transport of materials from sources to sinks at different seasons



'**Source**' is the part of a plant where substances are **produced** (e.g. leaves for sucrose, amino acids) or **enter the plant**.

'**Sink**' refers to the part of the plant where the substrate can be **stored** (e.g. roots or stem for starch).

Examples:

Sources:

Leaves - sucrose is produced here.

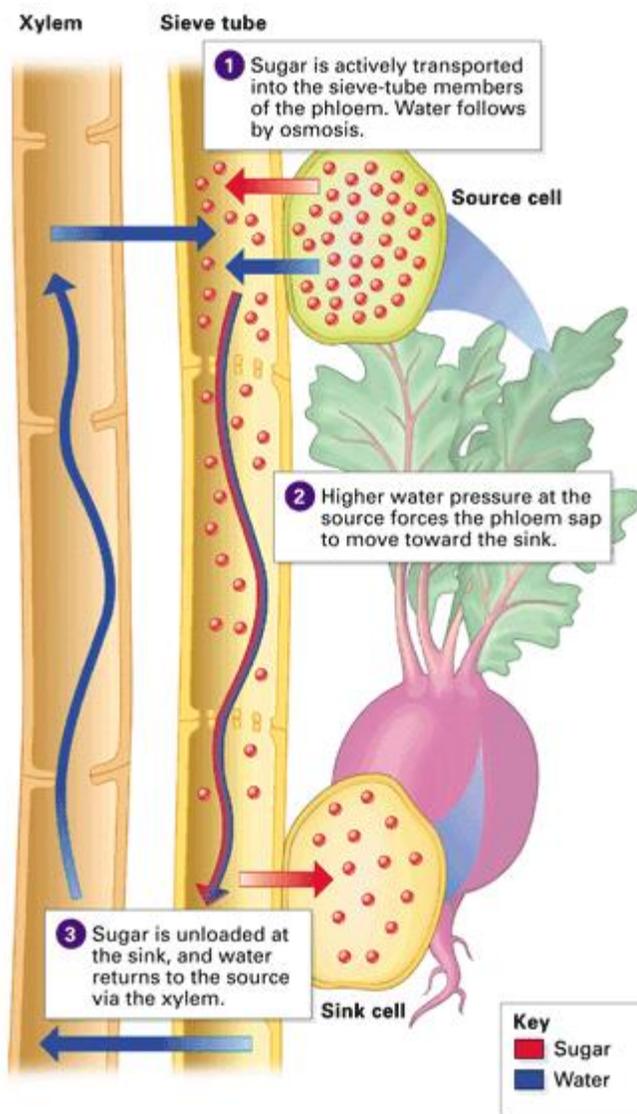
Root hairs - Nitrates are absorbed here.

Sinks:

Roots/Stems - starch is stored here.

Root tips - amino acids are stored here.

When a plant is actively photosynthesising and growing, the **leaves** are generally the major **sources** of translocated materials. They are constantly **producing sucrose**, which is carried in the phloem to all other parts of the plant.



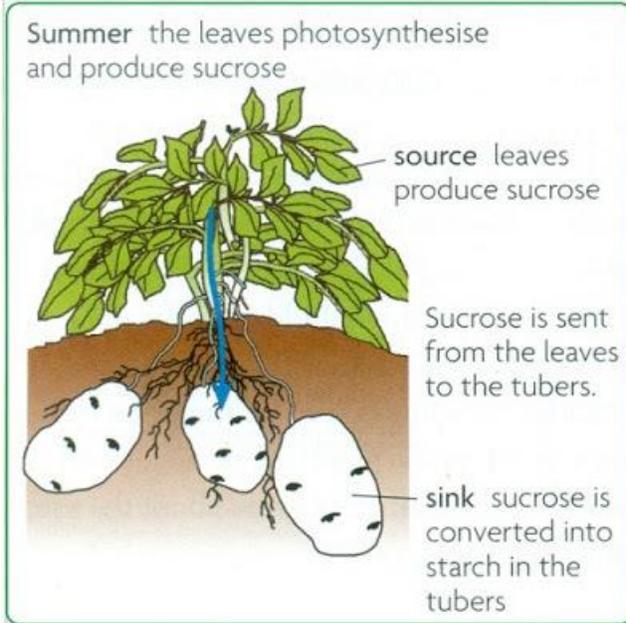
These parts - the **sinks** - include the **roots**, the **flowers** and the **fruits**:

- The **roots** may change some of the sucrose to starch and store it.
- The **flowers** use the sucrose to make fructose.
- Later, when the **fruits** are developing, quite large amounts of sucrose may be used to produce sweet, juicy fruit ready to attract animals.

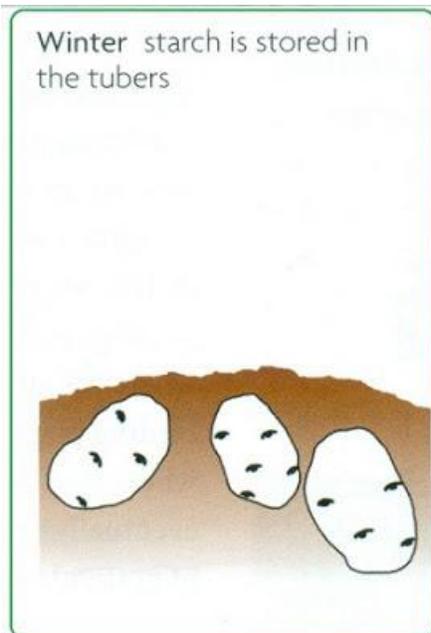
But many plants have a time of year when they become **dormant**. During this stage, they wait out harsh conditions in a state of reduced activity.

Dormant plants do not photosynthesise, but survive on their stored starch, oils and other materials. When the seasons change, they begin to grow again. Now the stored materials are converted to sucrose and transported to the growing region.

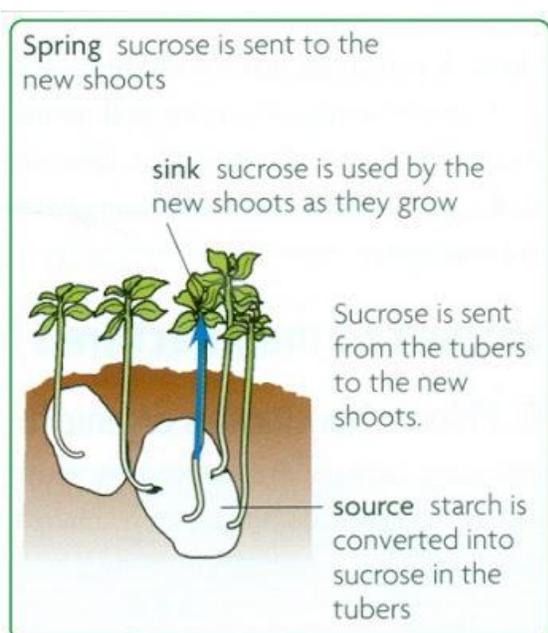
For example, potato plants are not able to survive the cold frost of winter.



- During the **summer**, the leaves photosynthesise and send sucrose down into underground stems. Here, swellings called **tubers** develop. The cells in the root tubers change the **sucrose to starch** and store it.



- In **winter**, the leaves die. Nothing is left of the potato plant above ground - just the stem tubers beneath the soil.

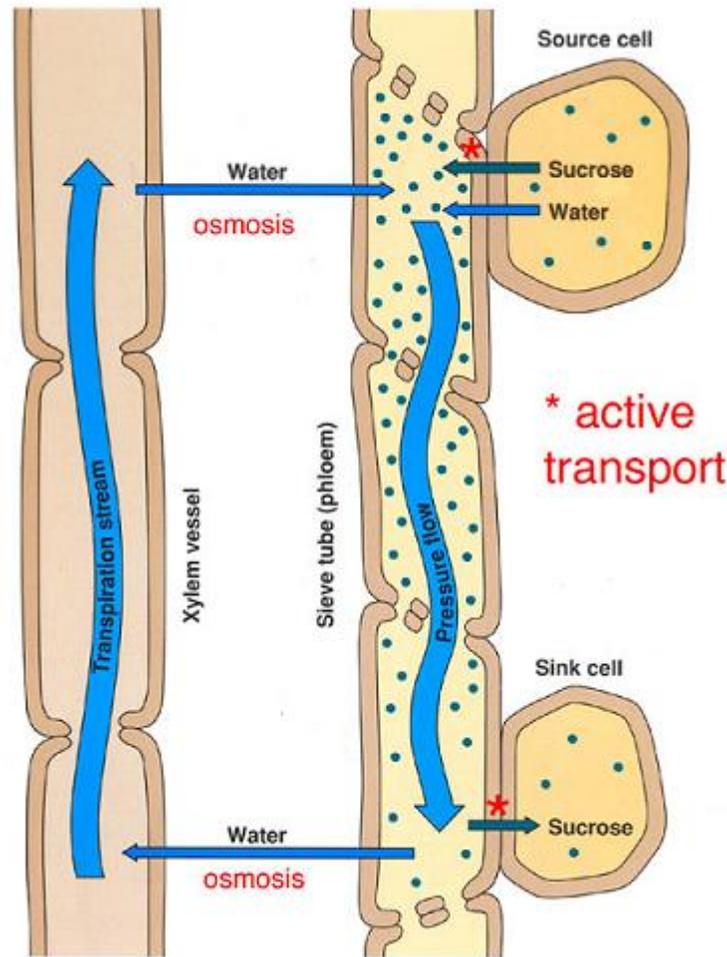


- In **spring**, they begin to grow new shoots and leaves. The **starch** in the tubers is changed back to the **sucrose**, and transported in the phloem to the growing **stems and leaves**. This will continue until the leaves are above ground and photosynthesise.

So in **summer**, the **leaves** are **sources** and the growing stem **tubers** are **sinks**. In **spring**, the stem **tubers** are **sources** and the growing **leaves** are **sinks**.

Conclusion:

Phloem can transfer sucrose in **either direction** - up or down the plant. This isn't true for the transport of water in the **xylem** vessels. That can only go **upwards**, because transpiration always happens at the leaf surface, and it is this that provides the 'pull' to draw water up the plant.



Comparison of transpiration and translocation

	Transport	From	To	Mechanism	High rate
Transpiration	H ₂ O, Mineral ions	Soil	Leaves, Flowers, Fruits	Passive process using a tension in the xylem produce by evaporation of water.	on hot, sunny, windy and dry days
Translocation	Sucrose, Amino acids	Leaves	Shoot, root tips, root cortex, seeds, flowers, fruits	Active process, the water enters the tubes to build up a head of pressure that forces the phloem sap to the sinks .	on warm, sunny days when plants are producing more sugar

Questions :-

1. State the functions of xylem and phloem.
2. What is the significance of a large number of root hair and their being single celled?
3. How does absorption of water and ions take place from soil into root hair cells?
4. Draw and label parts of root hair.
5. Explain the pathway of water from root to leaf.
6. Define translocation.
7. Explain that how and why do some parts of plant may act as a source and as a sink at different times during plant life.
8. Explain how transpiration and wilting connected?

NOTE :-

- Get the syllabus of Biology 2019 [0610] printed on a hardcopy.
 - Get past year papers from 2015-2017 – M/J , O/N series [21,22,23,41,42,43,61,62,63] bound spirally hardcopy
 - Do Past year papers for MCQ and structured for any 6+6 each.
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