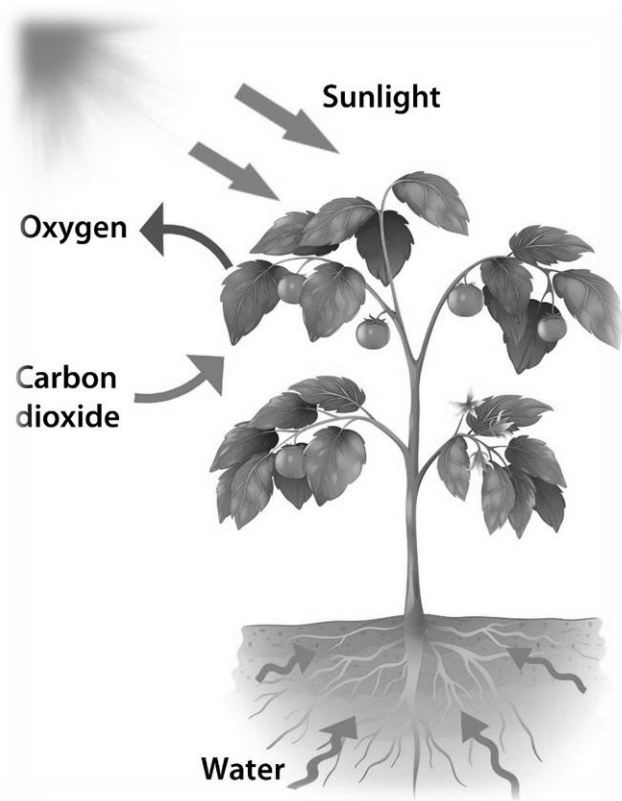


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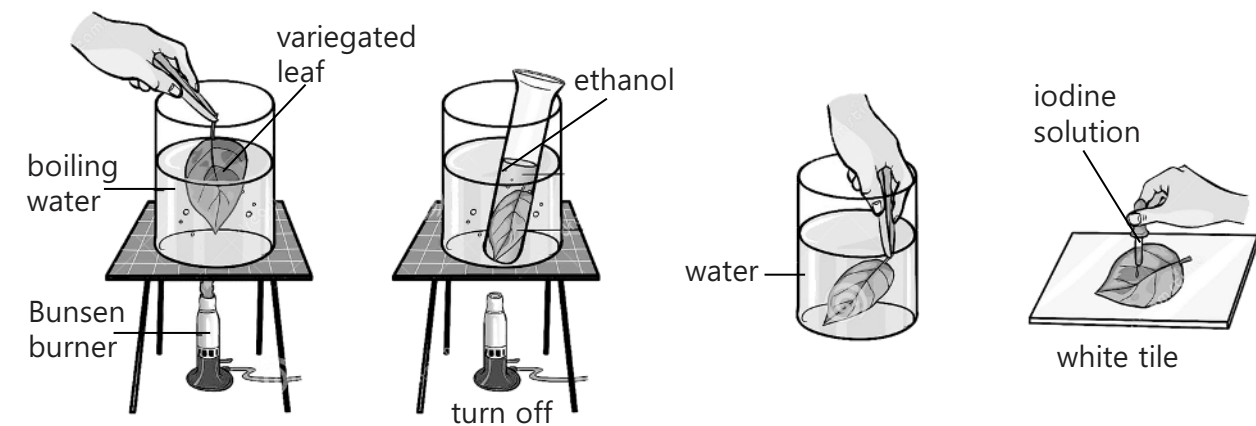
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Topic. 06.
Plant Nutrition

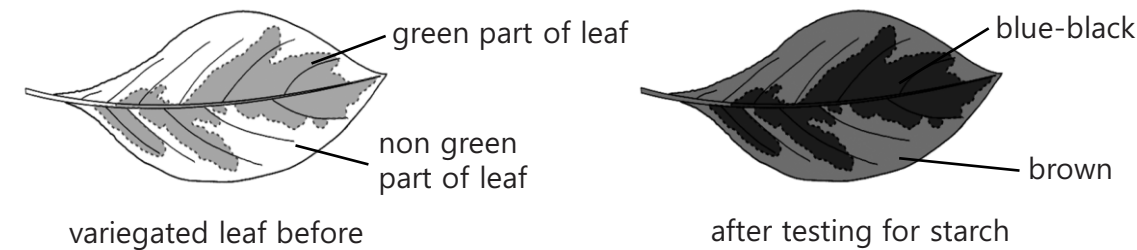


② Chlorophyll and photosynthesis

- ① starch test for photosynthesis
- i. glucose is quickly used
 converted into other substances
 transported or stored as starch
→ so plants make glucose in photosynthesis, but not be tested for its presence
 - ii. starch is stored in chloroplasts
→ testing a leaf for starch is a reliable indicator for photosynthesis
- ② method
- i. take plant with variegated (green and white) leaves
 - ii. destarching
→ plant by keeping in complete darkness for about 48 hours
 - iii. photosynthesising
→ expose plant to the sunlight for a few days
 - iv. aborting photosynthesis
→ leaf boiled in water for 2 minutes
→ to break down cell walls, denature enzymes and allow for easier penetration by ethanol
 - v. removing chlorophyll
→ warmed in ethanol until leaf is colourless to extract chlorophyll
→ which would mask observation
 - vi. dipped in water briefly to soften leaf



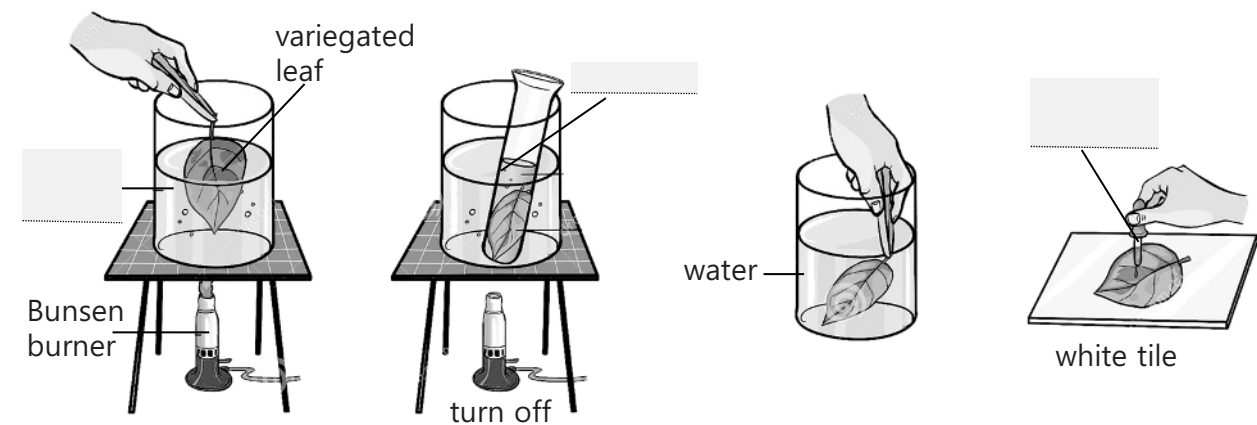
- ③ test and analysis
- i. leaf is placed on a white tile and iodine is added
 - ii. if starch is present → colour will be blue-black
if absent → colour will remain brown or yellow



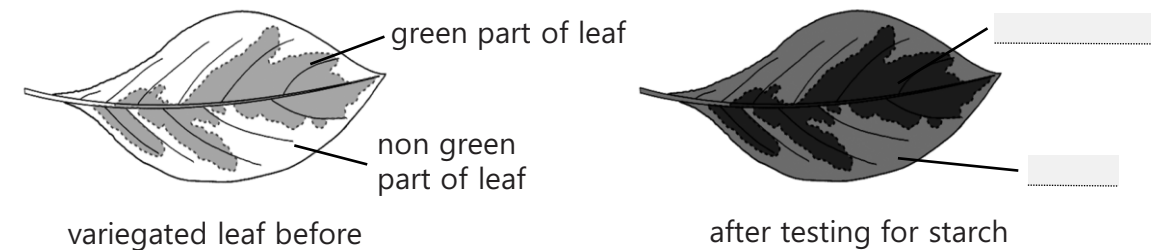
② Chlorophyll and photosynthesis

- ① starch test for photosynthesis
- i. glucose is _____
→ so plants make glucose in photosynthesis, but _____
 - ii. starch is stored in chloroplasts
→ _____ is a reliable indicator for photosynthesis

- ② method
- i. take plant with variegated (green and white) leaves
 - ii. _____
→ plant by keeping in _____
 - iii. _____
→ expose plant to the sunlight for a few days
 - iv. aborting photosynthesis
→ _____ for 2 minutes
→ _____
 - v. removing chlorophyll
→ warmed in _____
→ which would mask observation
 - vi. dipped in water briefly to soften leaf



- ③ test and analysis
- i. leaf is placed on a white tile and iodine is added
 - ii. if starch is present → colour will be _____
if absent → colour will remain _____



MEMO

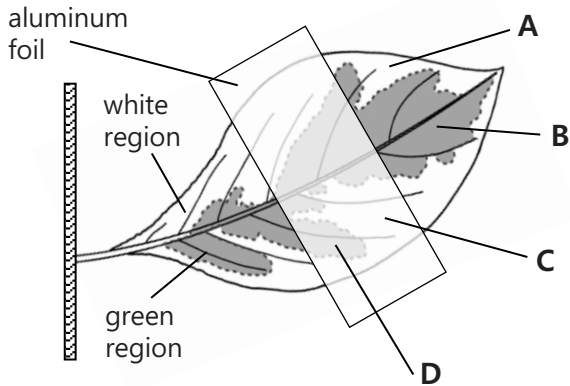
001.

Plants manufacture their own supplies of glucose.
What are the raw materials and the waste product of this process?

	raw material	waste product
A	water and chlorophyll	carbon dioxide
B	carbon dioxide and water	oxygen
C	carbon dioxide and glucose	oxygen
D	glucose and oxygen	carbon dioxide

002.

A plant with variegated leaves has the starch removed from its leaves by placing it in a dark cupboard for 48 hours.
Aluminum foil is then fixed on one leaf as shown and the plant is exposed to light. After 8 hours, which part of the leaf contains starch?



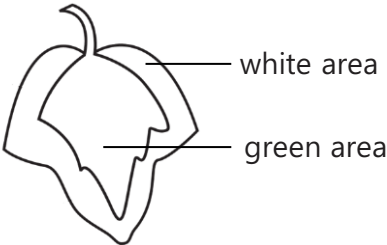
003.

Which substances are used for photosynthesis?

- A $C_6H_{12}O_6$ and H_2O
- B CO_2 and O_2
- C $C_6H_{12}O_6$ and O_2
- D CO_2 and H_2O

004.

In a photosynthesis experiment, a plant is left in bright sunlight for several hours.
A leaf is then removed from the plant and tested for starch, using iodine solution.
The diagram shows the leaf from the plant that was used in the experiment.



Which diagram shows the color result of the experiment?

	white area	green area
A	brown	blue/ black
B	blue/ black	brown
C	brown	brown
D	blue/black	blue/ black

005.

What are the two products of photosynthesis?

- A $C_6H_{12}O_6$ and H_2O
- B CO_2 and O_2
- C $C_6H_{12}O_6$ and O_2
- D CO_2 and H_2O

006.

What is formed first in a green plant as a result of photosynthesis?

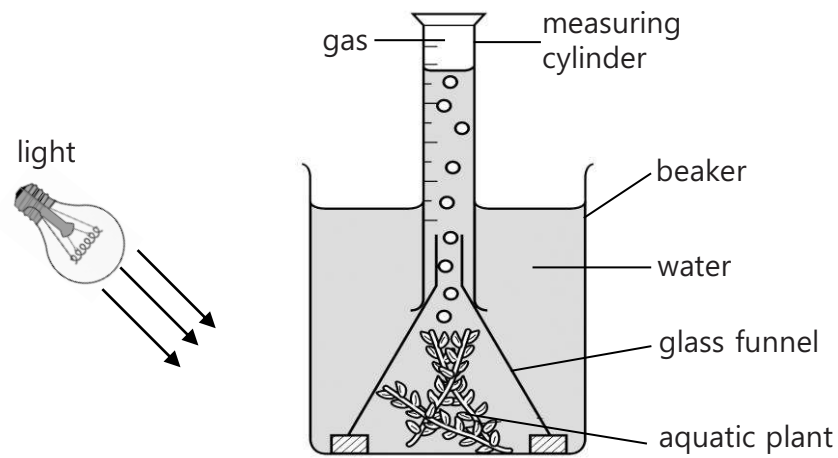
- A glucose
- B starch
- C fatty acid
- D protein

MEMO

MEMO

007.

The diagram shows the apparatus used in an investigation to measure the rate of oxygen production during photosynthesis.



The investigation was repeated several times and the average amount of gas collected was calculated.

Which two factors must be kept constant during this investigation?

- A the size of the funnel and the beaker
- B the amount of aquatic plant and the duration time of light
- C the amount of aquatic plant and the volume of gas
- D the amount of water and the size of the measuring cylinder

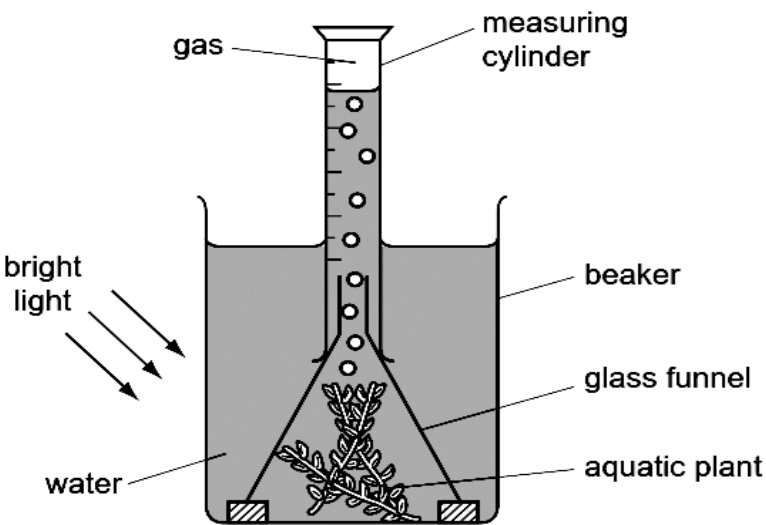
008.

Which form of energy is stored within carbohydrates made during photosynthesis?

- A light
- B heat
- C wave
- D chemical

009.

The diagram shows an experiment to investigate photosynthesis.



What is the most abundant gas present at the top of the measuring cylinder at the end of the experiment?

- A ethane
- B carbon dioxide
- C oxygen
- D ammonia

010.

The equation for photosynthesis is shown.



Which words correctly complete gaps P, Q and R?

	P	Q	R
A	oxygen	glucose	carbon dioxide
B	glucose	oxygen	carbon dioxide
C	carbon dioxide	glucose	oxygen
D	oxygen	carbon dioxide	glucose

MEMO

MEMO

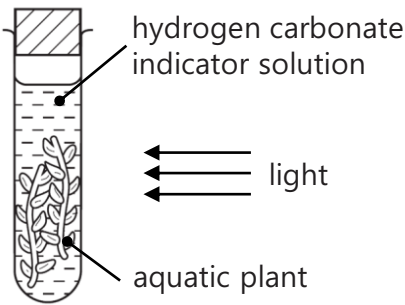
MEMO

011.

A research is set up to investigate gas exchange in aquatic plants. The hydrogen carbonate indicator solution is yellow at the start.

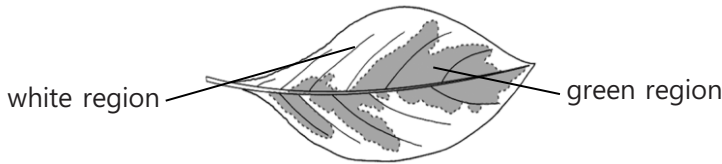
Which colour is it after two hours?

- A yellow or orange
- B pink or red
- C blue or purple
- D dark gray or black



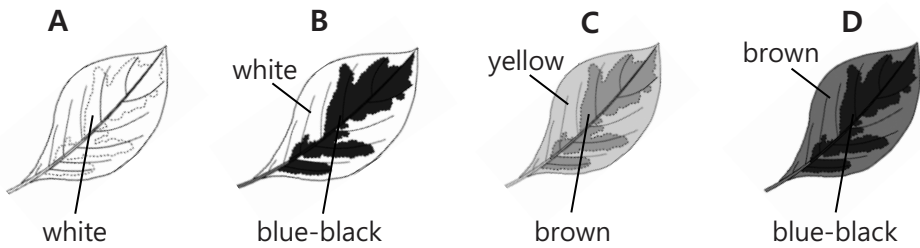
012.

A plant with variegated leaves similar to the one below was kept in bright light for eight hours.



A leaf was taken from the plant and the chlorophyll removed. It was then tested for starch using iodine solution.

Which diagram shows the result of the test?



013.

Which is the equation for photosynthesis?

- A $C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$
- B $2C_2H_5OH + 2CO_2 \rightarrow C_6H_{12}O_6$
- C $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$
- D $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$

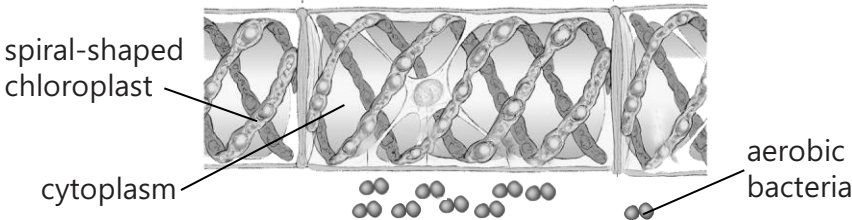
014.

In which conditions do the leaves of a green plant photosynthesise?

	darkness	bright light
A	O	X
B	X	O
C	X	X
D	O	O

015.

The diagram shows a cell with groups of bacteria around its edge.



The aerobic bacteria move to areas of high oxygen concentration.

Which gas in the cell causes the bacteria to form these groups?

- A carbon dioxide
- B oxygen
- C nitrogen
- D sulfur dioxide

MEMO

016.

State two substances(Ⓐ) that are needed and two substance(Ⓑ) that are made during photosynthesis.

Ⓐ

Ⓑ

017.

State the name of the green pigment in the plant cells needed for photosynthesis.

.....

018.

The cells in the leaves of plants that make simple sugar, glucose, contain a green substance.

① State the name of the cells that make glucose.

.....

② State the name of this green substance in the cell.

.....

019.

State the balanced chemical equation for photosynthesis.

.....

020.

Explain why plants take up water and carbon dioxide during photosynthesis.

.....

.....

.....

.....

021.

Water is one of the raw materials needed for photosynthesis in green plant.

① State the name of the other raw material needed for photosynthesis

.....

② State four ways a plant uses the glucoses produced in photosynthesis.

Ⓐ

Ⓑ

Ⓒ

Ⓓ

022.

State the word equation for photosynthesis.

.....

MEMO

MEMO

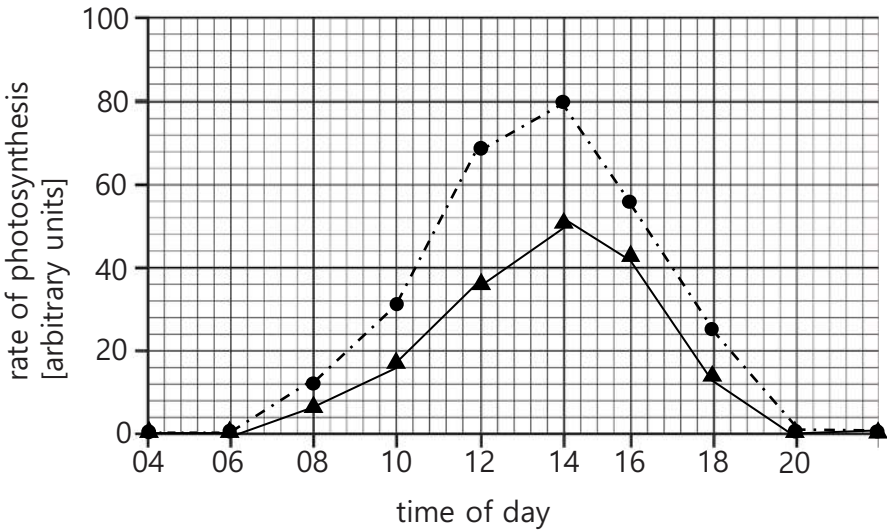
029.

A corn plants, *Zea mays*, were grown in two separate plots. Each plot used a carbon dioxide enrichment system to control the atmospheric carbon dioxide concentration.

The atmospheric carbon dioxide concentrations in the two plots were kept at 875ppm and 350ppm.



When the corn plants were fully grown, scientists calculated the average rates of photosynthesis at regular intervals from 04:00 to 22:00 for both plots. The results are shown in the graph below.



Describe and explain the effect of carbon dioxide concentration on the average rates of photosynthesis of the corn plants from 04:00 to 22:00. Use the data from the graph above.

.....

.....

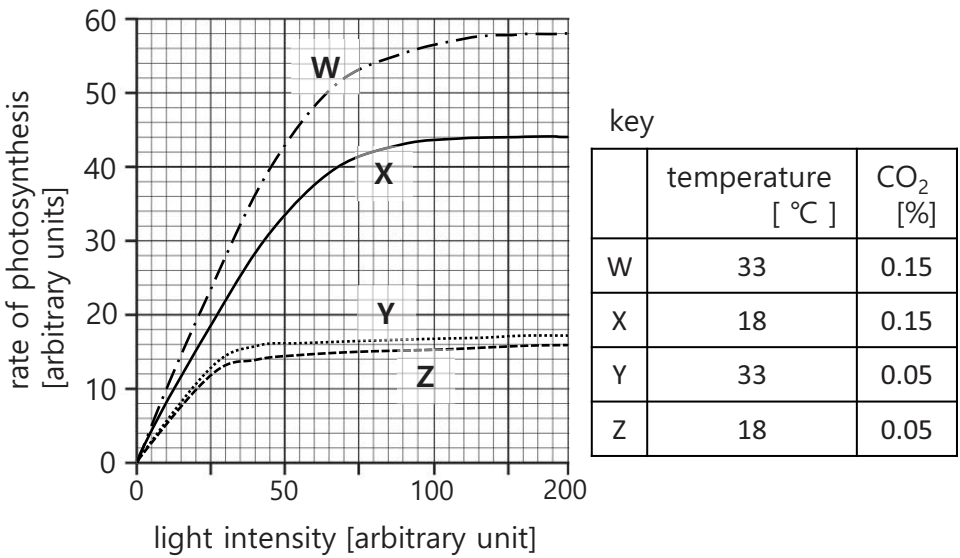
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030.

A student carried out four experiments, **W** to **Z**, to investigate the effect of light intensity on the rate of photosynthesis of tomato plants. The experiments were carried out at two concentrations of carbon dioxide and at two temperatures. The results are shown in the graph below.



- ① Define the term limiting factor.
-
-
-
- ② Use the results in the graph to identify the limiting factor for the rate of photosynthesis at the light intensities given in the table below. Write your answers in the table.

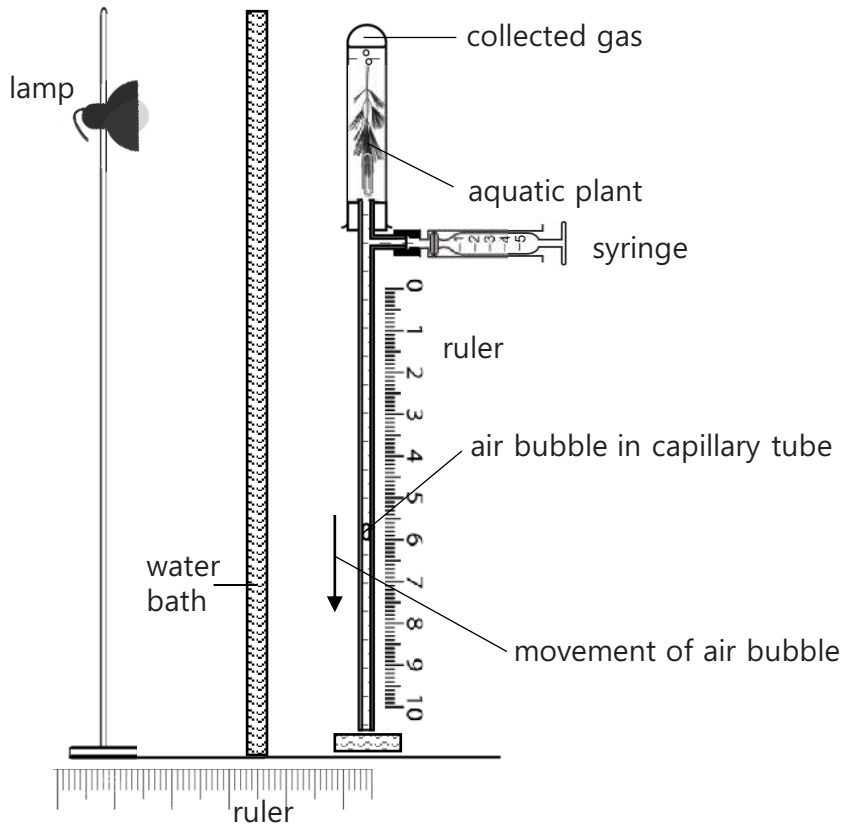
experiment	light intensity [arbitrary unit]	limiting factor
W	50	
X	50	
Y	100	
Z	100	CO ₂ concentration

MEMO

MEMO

034.

A scientist set up the apparatus to investigate the effect of light intensity on the rate of photosynthesis of an aquatic plant.



The scientist maintained the temperature at 20°C and measured the distance travelled by the air bubble in the capillary tube for a period of five minutes on three occasions for each light intensity. The results are shown in table on next page.

- ① Explain why the scientist included the water bath and the syringe in the apparatus.
-
-
- ② Explain why the air bubble moves down the capillary tube.
-
-
-

continue to the next page ...

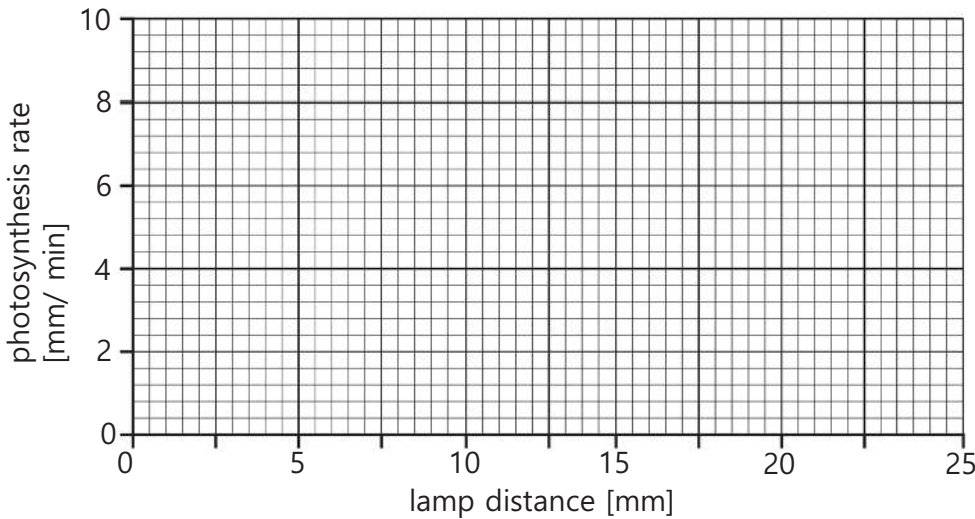
MEMO

From the previous page...

- ③ Calculate the rate of photosynthesis when the lamp was 20 cm from the aquatic plant and write your answer in the table.

lamp distance (cm)	air bubble moved distance (mm)	photosynthesis rate (mm/min)
5	64	8
10	48	6
15	24	3
20	8	()
25	4	0.5

- ④ Plot the results from the table above on the axes on the figure below. Draw an appropriate line on the graph to show the relationship between distance of the lamp from the aquatic plant and the rate of photosynthesis.

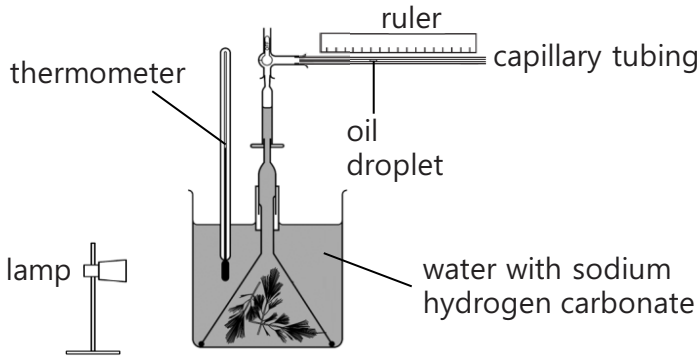


- ⑤ Explain why the rate of photosynthesis decreases as the distance of the lamp from the aquatic plant increases.
-
-
-
-

MEMO

035.

Water Thyme, *Hydrilla verticillata*, is an aquatic plant often used to provide oxygen in fish tanks. A student investigated the effect of temperature on the rate of photosynthesis of *H. verticillata*. The apparatus that they used is shown in the figure below.



- ① Explain why:
- a the lamp was kept at the same distance from the *H. verticillata* throughout the investigation;

.....

.....

- b the water was enriched with carbon dioxide by adding sodium hydrogen carbonate.

.....

.....

.....

The students determined the rate of photosynthesis by measuring the movement of the oil droplet along the glass tubing. Their results are shown in the table below.

temperature (°C)	10	15	20	25	30	35	40	45
distance travelled by the droplet (mm per minute)	2.5	14	20	32	38	29	3.5	0.5

continue to the next page ...

MEMO

From the previous page...

- ② Describe the effect of temperature on the rate of photosynthesis of *H. verticillata*.

.....

.....

.....

- ③ Photosynthesis is a chemical process catalysed by enzymes. Explain how the results shown in the table support the idea that enzymes are involved in photosynthesis.

.....

.....

.....

.....

- ④ *H. verticillata* originally grew only in temperate region. This plant has escaped into the wild in tropical region where its rapid growth has reduced the biodiversity of many streams and rivers.

Suggest why the growth of *H. verticillata* in tropical region is far greater than in temperate region.

.....

.....

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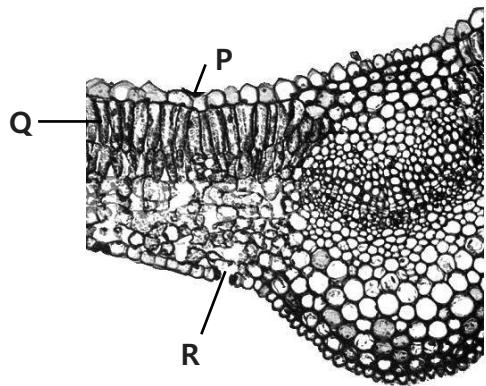
MEMO

MEMO

051.

The diagram shows a cross-section of a leaf.

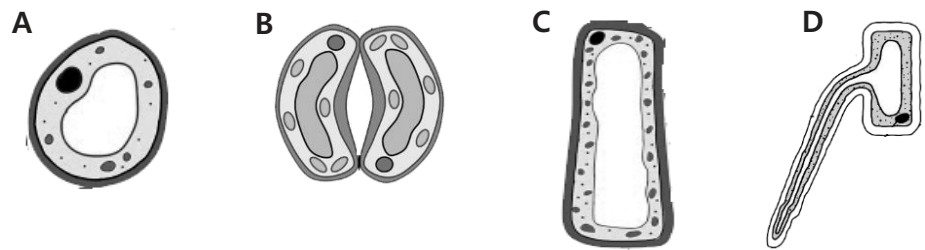
Which row shows the correct labels?



	upper epidermis	palisade mesophyll	stoma
A	P	Q	R
B	P	R	Q
C	Q	P	R
D	R	R	Q

052.

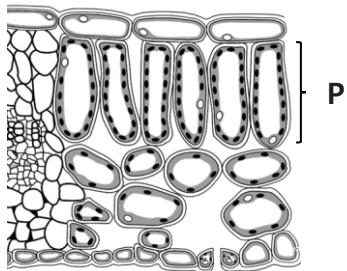
Which type of cell is found in palisade mesophyll layer?



053.

The diagram shows a cross-section through a leaf.

Which tissue is the cell labelled P part of?

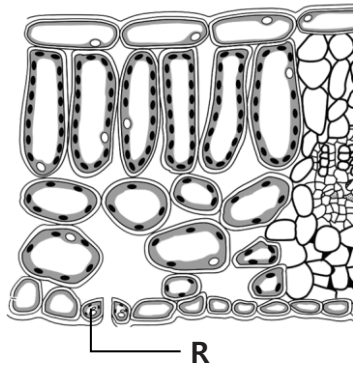


- A palisade mesophyll
- B spongy mesophyll
- C xylem
- D epidermis

054.

The diagram shows a cross-section through a leaf.

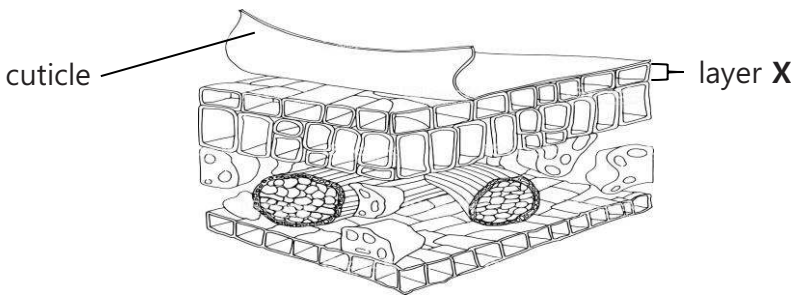
What is the cell labelled R?



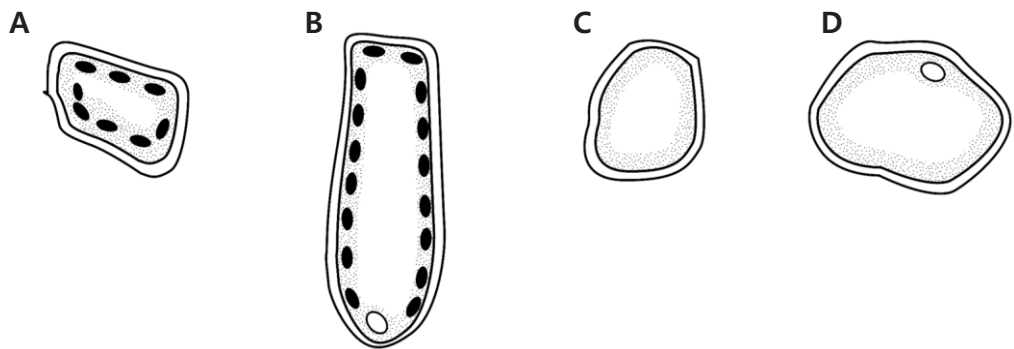
- A epidermis cell
- B palisade mesophyll cell
- C spongy mesophyll cell
- D guard cell

055.

The diagram shows a cross-section of part of a leaf.



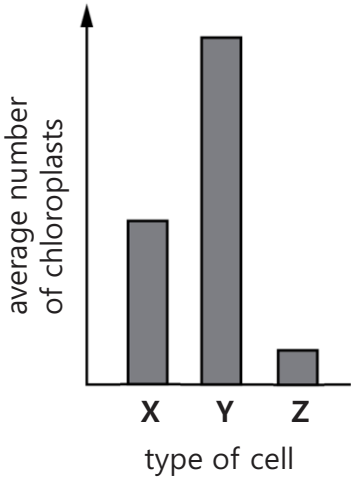
Which type of cell is found in layer X?



MEMO

056.

The bar graph shows the average number of chloroplasts in each of three different types of leaves cell.



What are the three types of cell?

	X	Y	Z
A	epidermis cell	palisade mesophyll cell	spongy mesophyll cell
B	spongy mesophyll cell	palisade mesophyll cell	epidermis cell
C	guard cell	palisade mesophyll cell	spongy mesophyll cell
D	spongy mesophyll cell	palisade mesophyll cell	guard cell

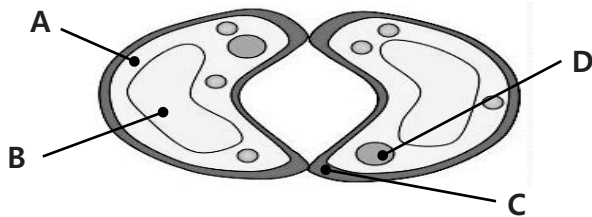
057.

Which cell type contains the most chloroplasts in plants?

- A epidermis cell
- B guard cell
- C palisade mesophyll cell
- D spongy mesophyll cell

058.

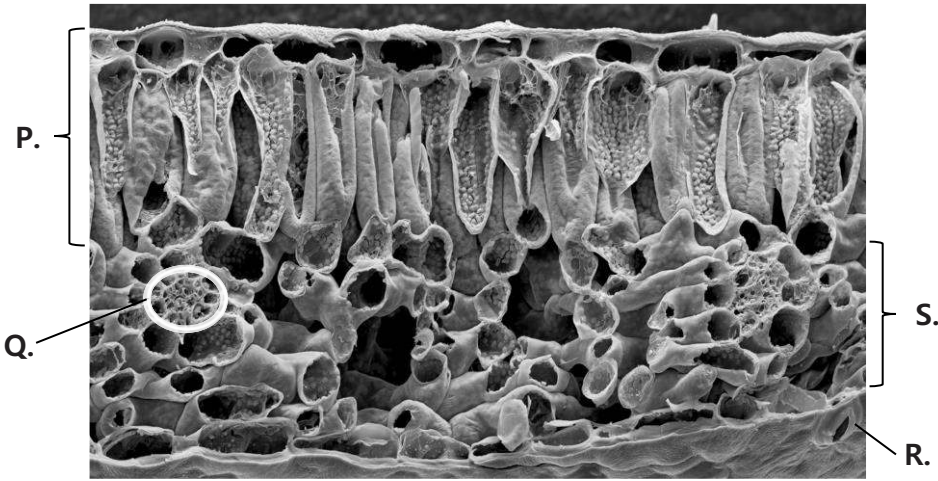
The diagram shows two guard cells. Which label shows the cell wall?



MEMO

059.

The figure shows a photomicrograph of a cross-section of part of a leaf.



① Identify tissue **P** on the figure and state the name and function.

name

function

② Identify tissue **S** on the figure and state the name and function.

name

function

③ Structure **Q** in the figure is part of the transport system in the leaf. State the names of two tissues that structure **Q** contains.

.....

.....

④ Identify and state the name of cell **R** in the figure.

.....

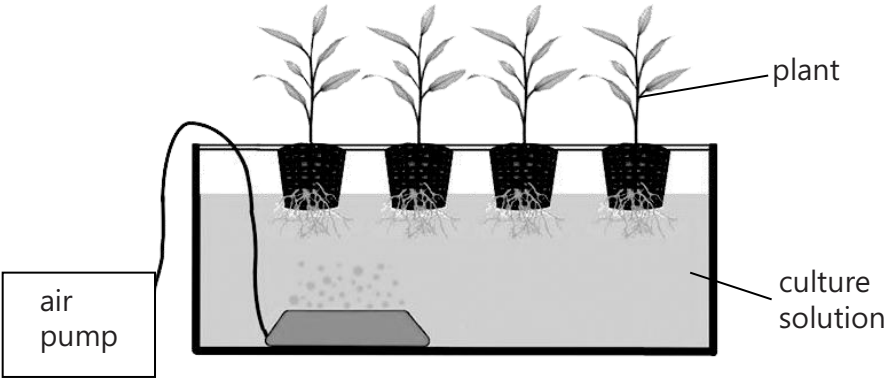
MEMO

077.

Students investigated the effect of mineral ion deficiencies on the growth of plants. The plant seedlings were divided into four groups. Each group was grown in a different culture solution as follows:

- A. complete solution containing **all** the major mineral ions
- B. solution with all the major mineral ions except **nitrate**(NO₃⁺) ions
- C. solution with all the major mineral ions except **magnesium**(Mg²⁺) ions
- D. solution with all the major mineral ions except **phosphate**(PO₄³⁻) ions

The apparatus used to investigate the growth of the plants is shown in the figure below.



- ① State three other environmental factors that could affect the growth of the seedlings.
- a)
 - b)
 - c)

The results of the investigation are shown in the table below.

group	number of plants	mean dry mass of one plant (g)		
		root	shoot	total
A	6	2.23	3.67	5.90
B	7	1.51	2.83	4.34
C	8	0.54	3.36	3.90
D	8	0.26	3.38	3.64

continue to the next page ...

MEMO

From the previous page...

- ② **Describe** and **explain** the results for the plants grown without nitrate ions (group B).
-
-
-
-
-
- ③ Describe the likely **appearance** of the plants grown in the solution without magnesium ions (group C) and **explain** your answer.
- appearance.**
-
- explanation.**
-
-
-
- ④ Phosphate ions are a component of DNA. Suggest why the plants in group D grew less than the plants in the complete solution (group A).
-
-
-
-
-

MEMO

MEMO

111.

112.

The figure right is a diagram of the human alimentary canal.

The figure right is a diagram of the human digestive system.

① Table below shows four functions of the alimentary canal.

Use the letters from the figure to complete table to give the part of the human digestive system that is identified by each function.

- Complete the table by:
- naming the part of the system that carries out each of the functions
 - using the letters from figure right to identify the part of the system named.

Write one letter only in each box. You may use the same letter more than once. There are some letters that you will not use. The first one has been done for you.

name of part	function	letter
	protease, lipase and amylase are produced	
	indigestible food is egested	
	produces bile	
	most soluble food is absorbed into the blood	
	hydrochloric acid is produced	

function	letter
protein digestion	
partially digested food is mixed with bile	
peristalsis	
most water is reabsorbed	
deamination	

② Some people develop gallstones, made of cholesterol, that accumulate in the gall bladder and the bile duct. Gallstones block the flow of bile. Explain how gallstones can affect the digestion of fat.

The human diet provides nutrients for the synthesis of biological molecules that make up cells, cell products and tissues.

① Complete the table to show the nutrients that are absorbed from food to synthesise the large molecules listed.

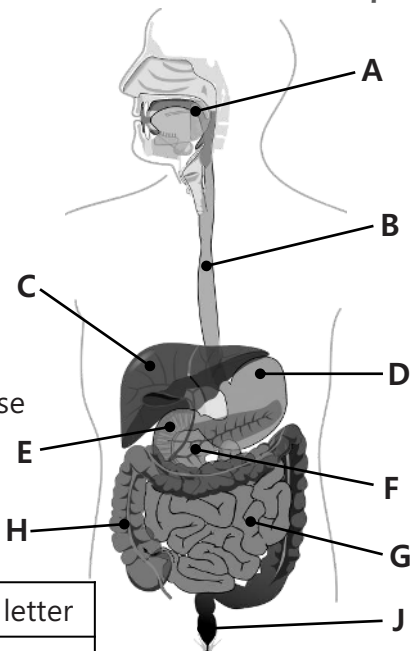
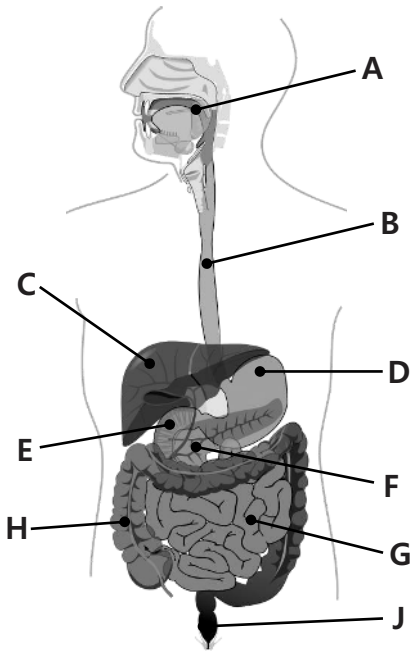
large molecule	nutrients absorbed
glycogen	
protein	
fat and oil	

② Mineral ions are required in the human diet in small quantities. State the mineral ion required for each process:

making haemoglobin

making bone

③ State another type of nutrient required in the human diet in small quantities.



MEMO

MEMO

129.

The activity of amylase is measured in four parts of the alimentary canal. Which two parts have the most amylase activity?

- A mouth and stomach
- B mouth and duodenum
- C stomach and duodenum
- D duodenum and colon

130.

Biological washing powder can be used to remove stains on clothing. Which enzymes will remove stains caused by oil?

- A lipase
- B amylase
- C trypsin
- D ligase

131.

Which type of food material is **not** digested before being absorbed by the body?

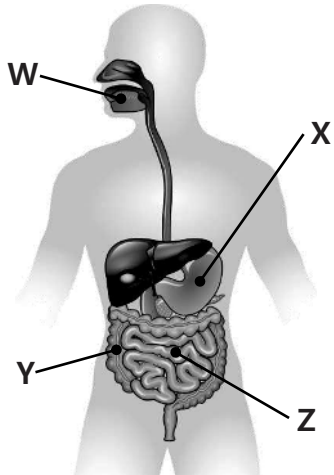
- A water
- B starch
- C oil
- D protein

132.

The diagram shows alimentary canal of the human body.

In which organs does the chemical digestion of proteins take place?

- A W and X
- B X and Y
- C X and Z
- D Y and Z



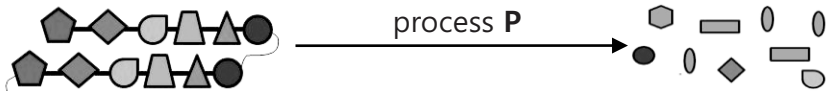
133.

Which organ produces amylase?

- A stomach
- B pancreas
- C liver
- D colon

134.

The diagram shows a large food molecule changing into smaller molecules.



What is process P?

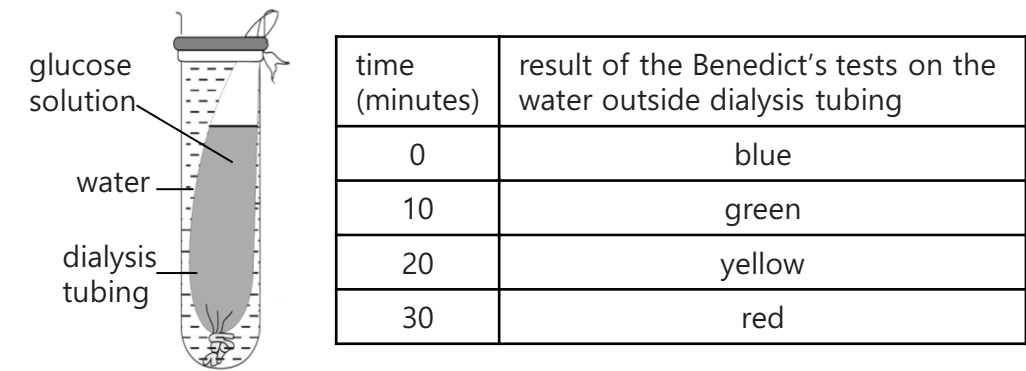
- A digestion
- B ingestion
- C absorption
- D secretion

MEMO

161.

Dialysis tubing is an artificial selective membrane, which is similar to the lining of the intestine. Researchers tested the diffusion of glucose through dialysis tubing by using the equipment shown in the figure below.

They took samples of the water outside the dialysis tubing at 10 minute intervals and tested the samples with Benedict’s solution. The results are shown in table.



① Describe and explain the results shown in table.

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.....

② They repeated the investigation with a higher concentration of glucose in the dialysis tubing. Predict the results that they would observe.

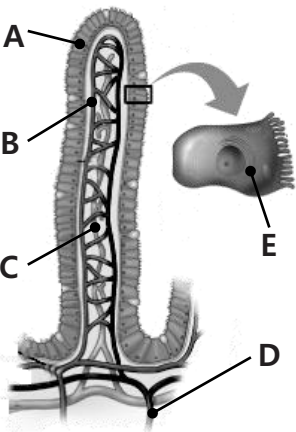
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162.

The small intestine is lined by many villi. The figure below shows a longitudinal section of a villus. (The figures are not drawn to the same scale.)



① Name structures **A**, **B**, and **C**.

A

B

C

② The blood that flows from **D** enters a vein. Name the vein that transports blood away from the small intestine.

.....

③ Cell **E** is an example of the cells that form the surface of the villi. Explain why there are many microvilli on cell **E**.

.....

.....

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.....

④ Some of the cells on the surface of the villi secrete mucus for protection. Suggest what the villi need to be protected against.

.....

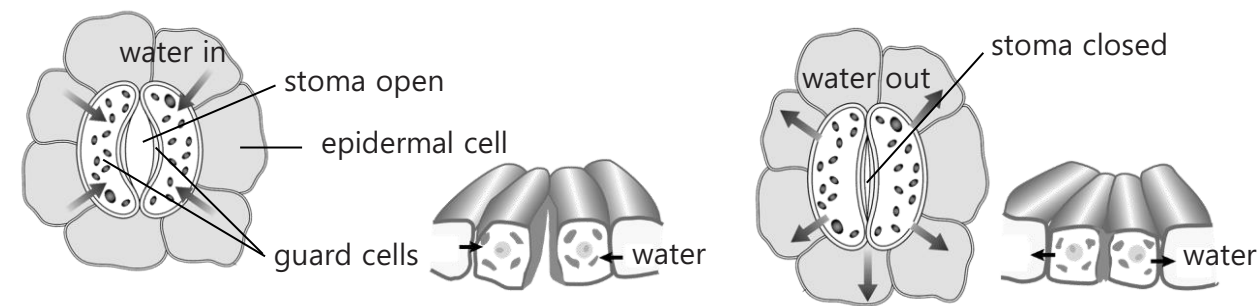
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MEMO

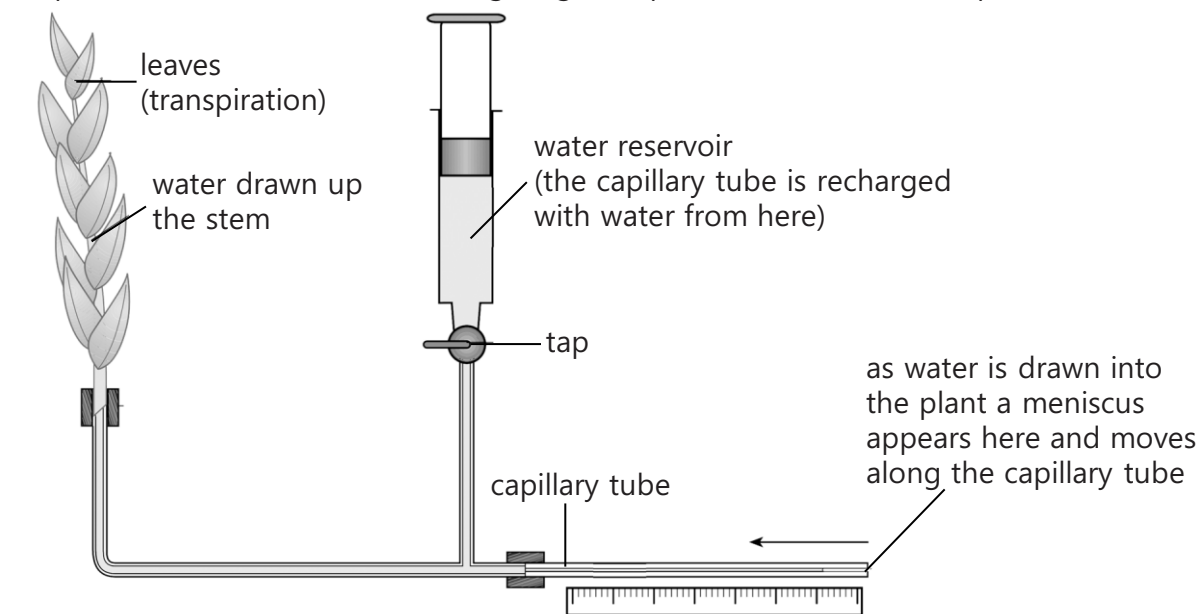
- © transpiration and stomata
- i. open
 - water enters guard cells by osmosis
 - guard cells become turgid
 - opening stoma
 - ii. close
 - water leaves guard cells by osmosis
 - guard cells become flaccid
 - closing stoma



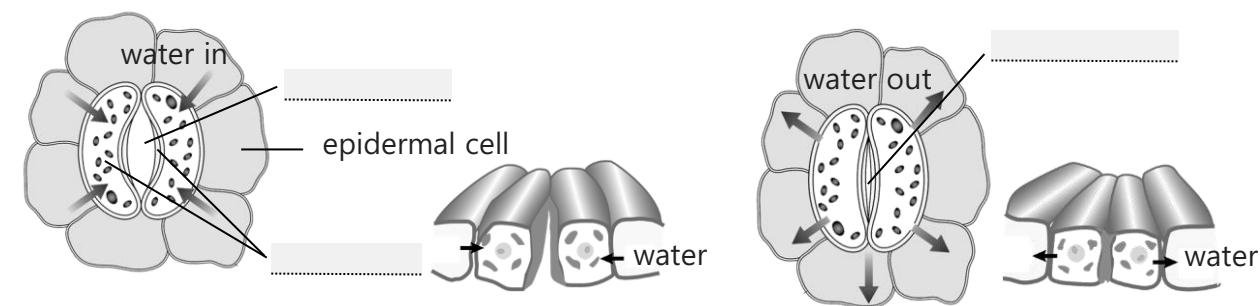
③ Rate of Transpiration

- a factors affecting rate of transpiration
- i. temperature
 - higher temperatures increase water holding capacity of air
 - increases transpiration rate
 - ii. humidity
 - low humidity increases water potential gradient between leaf and atmosphere
 - increasing transpiration rate
 - iii. light intensity
 - high light intensity causes stomata to open (to allow more photosynthesis)
 - increasing transpiration rate

- b photometer
- potometer is a device for investigating transpiration rate (water loss per unit time)



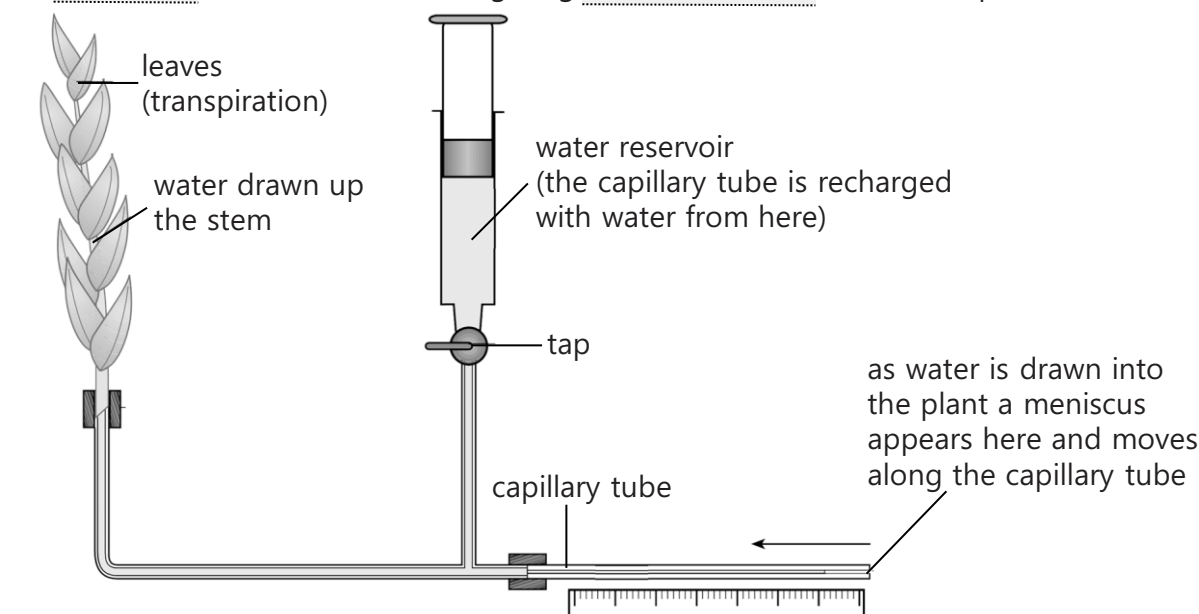
- © transpiration and stomata
- i. open
 - _____ by osmosis
 - guard cells become _____
 - _____
 - ii. close
 - _____ by osmosis
 - guard cells become _____
 - _____



③ Rate of Transpiration

- a factors affecting rate of transpiration
- i. _____
 - higher temperatures increase water holding capacity of air
 - _____ transpiration rate
 - ii. _____
 - low humidity _____ between leaf and atmosphere
 - increasing transpiration rate
 - iii. _____
 - high light intensity causes _____ (to allow more photosynthesis)
 - increasing transpiration rate

- b photometer
- _____ is a device for investigating _____ (water loss per unit time)



MEMO

179.

Some liquid is collected from the xylem in the stem of a plant.
What is present in the liquid?

- A mineral ions
- B sucrose
- C amino acid
- D oil

180.

Which plant will have the highest rate of transpiration?
(four plants are growing in the same environmental conditions)

	number of leaves on plant	average surface area of one leaf (cm ²)	average number of stomata of one leaf	average diameter of one stoma(μm)
A	21	51	2571	28
B	34	39	269	25
C	45	54	169	24
D	44	61	284	27

181.

A increase in which factor normally causes transpiration rate to decrease?

- A light intensity
- B stomatal opening
- C humidity
- D temperature

MEMO

182.

What will **decrease** the rate of transpiration in a plant?

- A an increase in the surface area of the cell surfaces inside the leaf
- B a decrease in the humidity of the atmosphere surrounding the leaf
- C a decrease in the temperature of the atmosphere surrounding the leaf
- D an increase in the number of stomata present on the surface of the leaf

183.

From which part of a leaf does most water evaporate during transpiration?

- A palisade mesophyll cells
- B xylem vessel
- C spongy mesophyll cells
- D cuticle

184.

Glasswort is a plant that grows in coastal areas. It has adaptations that enable it to live in areas with high salt concentration in the soil and strong winds.

Which adaptations would glasswort possess to minimise water loss from root cells by osmosis and leaves by evaporation?

	salt concentration in root cells	leaf surface area
A	high	low
B	low	high
C	high	high
D	low	low

MEMO

MEMO

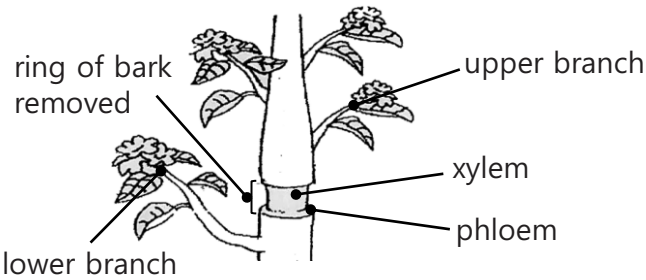
211.

What is a function of phloem?

- A transpiration
- B translocation
- C convert starch to glucose
- D transfer water to leaves

212.

The diagram shows part of the trunk of a small tree with a ring of bark removed. Removing the ring of bark takes away phloem but leaves the xylem intact.



What effect will removing the bark have on the two branches?

	upper branch		lower branch	
	growth	leaves	growth	leaves
A	reduced	normal	normal	normal
B	normal	wilted	normal	normal
C	normal	normal	reduced	normal
D	normal	normal	normal	wilted

213.

What is transported in the phloem and what is the direction of the transport?

- A sucrose, down only
- B sucrose, down and up
- C starch, down only
- D sucrose, down and up

214.

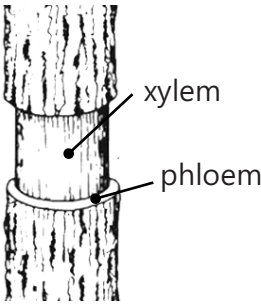
Cuscuta (dodder) is a plant that grows on other plants called the hosts. The dodder plant connects to the host's vascular bundles. The dodder plant does not have green leaves or roots.

What correctly describes the regions for translocation?

	host leaves	dodder
A	source	source
B	source	sink
C	sink	sink
D	sink	source

215.

The diagram shows the stem of a plant. A strip of the outer tissue including the phloem has been removed.



How is transport in the plant affected?

- A Dissolved salts cannot transport to the leaves.
- B Sucrose and amino acids and sucrose cannot transport to the roots.
- C Water cannot transport to the leaves.
- D Water cannot absorb to the roots.

216.

Translocation occurs in phloem tubes. Aphids feed on the contents of phloem tubes.



What type of food would be lacking in their diet?

- A mineral ions
- B sugar
- C amino acid
- D fat

MEMO

MEMO

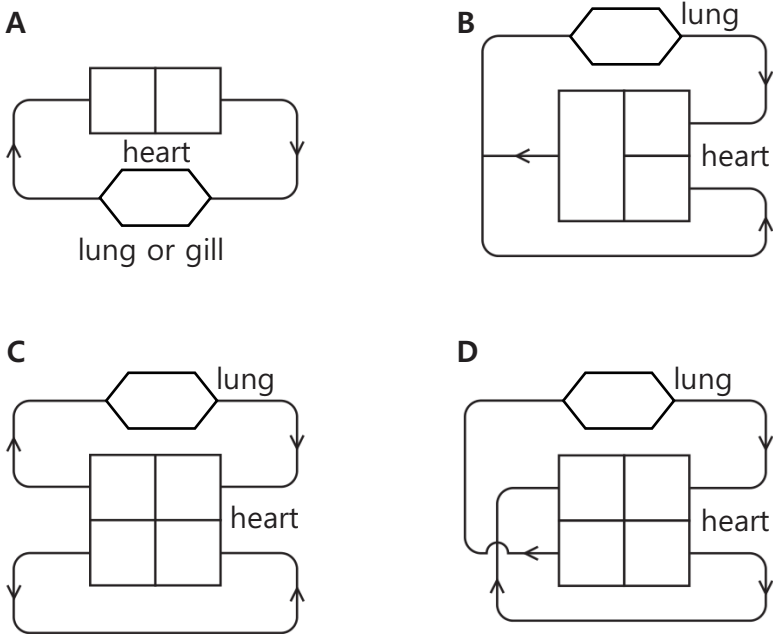
225.

Why is the circulatory system of human described as a double circulation?

- A Blood flows firstly through lungs and then through heart.
- B In the lung, blood flows firstly through pulmonary artery and then through pulmonary vein.
- C Blood flows through the heart twice in one complete circuit.
- D Blood flows firstly through veins and then through arteries.

226.

Which diagram shows the double circulatory system?



227.

Which pathway is taken by blood in a fish?

- A heart → body → gills → heart
- B gills → heart → body → gills
- C gills → heart → body → heart
- D heart → gills → body → heart

228.

What are the characteristics of double circulation?

- A In each circuit, blood passes from the kidneys to the liver before going back to the heart.
- B In each circuit, blood passes through the veins and the arteries before returning to the heart in capillaries.
- C In each circuit, blood passes through various capillaries before going to other parts of the body.
- D In each circuit, blood passes from the heart to the lungs and then back to the heart before going to other parts of the body.

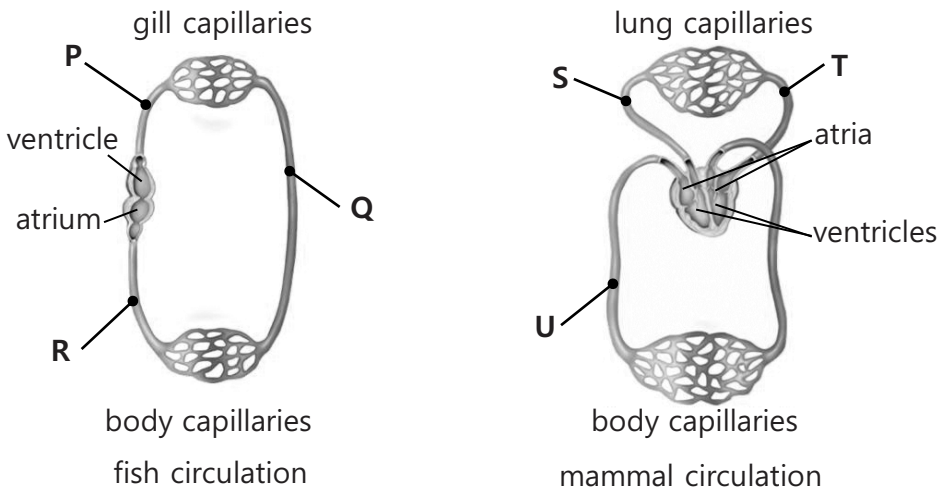
229.

How often must a blood cell in the liver vein pass through the heart before it again reaches the liver vein?

- A once
- B twice
- C three times
- D uncountable

230.

The diagrams show the single circulation of a fish and the double circulation of a mammal.



Which letters represent areas of oxygenated blood?

- A P and S
- B Q and U
- C Q and T
- D R and U

MEMO

MEMO

268.

Which statement is correct for most arteries in the human body?

- A They have a pulse.
- B They have valves.
- C They carry blood at low pressure.
- D They carry deoxygenated blood.

269.

Which structures in plants and in humans normally carry sugars?

	phloem	artery	xylem	alveoli
A	O	O	X	X
B	X	O	O	X
C	O	X	X	O
D	X	X	O	O

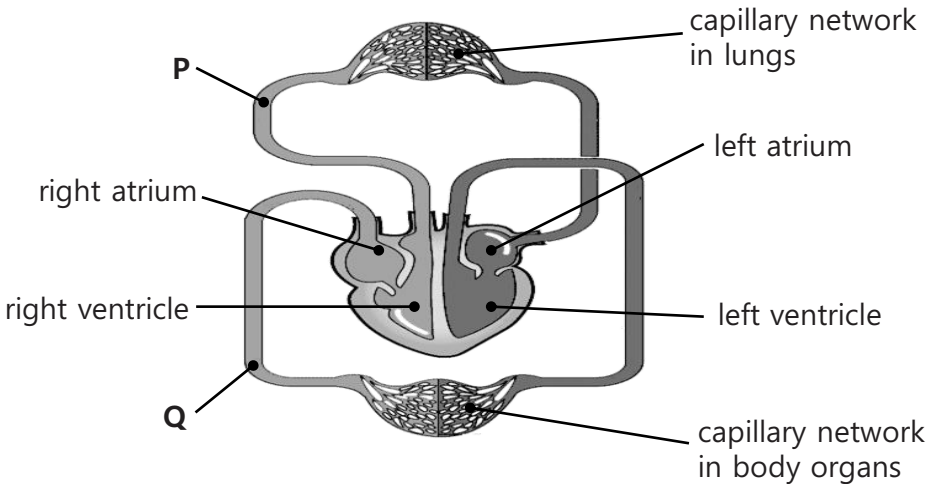
270.

What are blood vessels with valves?

- A aorta
- B vena cava
- C capillary
- D pulmonary artery

271.

The diagram shows the circulatory system of a human.



What describes the blood in vessels P and Q?

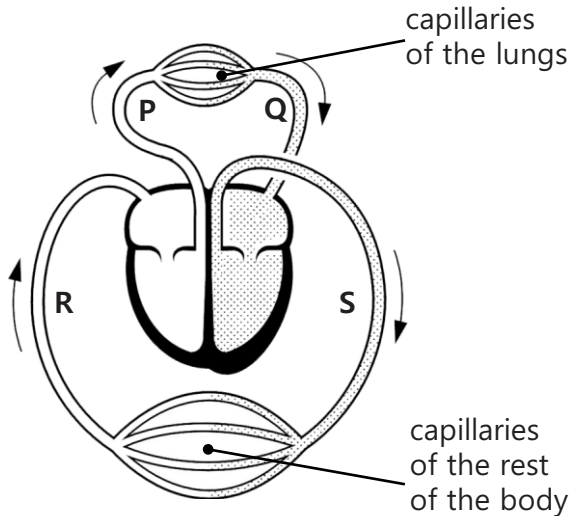
	P	Q
A	oxygenated	oxygenated
B	deoxygenated	oxygenated
C	deoxygenated	deoxygenated
D	oxygenated	deoxygenated

272.

The diagram shows a double circulatory system.

Which vessels carry oxygenated blood?

- A P and S
- B Q and S
- C P and R
- D Q and R



01. Circulation in Animals

								225.	C
226.	D	227.	D	228.	D	229.	C	230.	C
231.	B								

232. **Answer**

The correct answer should include the following words and phrases:

- blood flows through heart twice for one circuit (one circulation to lungs and another circulation to rest of the body)

233. **Answer**

The correct answer should include the following words and phrases:

- prevent mixing of oxygenated and deoxygenated blood
- higher blood pressure and blood flow rate than single circulation
- allows different blood pressure in each circulation

02. Heart Structure and Function

						234.	D	235.	B
236.	A	237.	C	238.	B	239.	C	240.	D
241.	A	242.	D	243.	B	244.	C	245.	A
246.	C	247.	B	248.	A	249.	C	250.	C

251. **Answer**

The correct answer should include the following words and phrases:

- septum

252. **Answer**

The correct answer should include the following words and phrases:

function	letter	name
chamber of the heart that contains oxygenated blood	G	left atrium
	H	left ventricle
chamber of the heart that pumps deoxygenated blood	B	right atrium
	D	right ventricle
structure that separates oxygenated and deoxygenated blood	I	septum
structure that prevents backflow of blood from ventricle to atrium	C	tricuspid valve
blood vessel that carries oxygenated blood	E	aorta
	F	pulmonary artery
blood vessel that carries deoxygenated blood	A	vena cava
	J	semilunar valve

253. **Answer**

The correct answer should include the following words and phrases:

①

explanation	letter	name
blood vessel that carries deoxygenated blood to the lungs	C	pulmonary artery
blood vessel that carries oxygenated blood away from the heart	A	aorta
blood vessel that carries blood to the kidneys	J	renal artery
blood vessel with the largest lumen	I	vena cava
heart chamber with the thickest muscular wall	G	left ventricle

②

- blood enters the left atrium (F) of the heart through the pulmonary veins (D)
- left atrium (F) contract and blood move to left ventricle (G)
- left ventricle (G) contract and blood move through aorta (A) and renal artery (J)

254. **Answer**

The correct answer should include the following words and phrases:

①

- A: aorta
- B: pulmonary artery
- C: pulmonary vein
- D: vena cava

②

- greater distance
blood goes to the whole body through A and blood goes to the lungs through B
- more muscular ventricle
blood in A is pumped by left ventricle and blood in B is pumped by right ventricle

254. **Answer**

③

- blood in C and D travelled through the capillaries
- blood vessel C and D are larger and have wider lumen

④

- valve E
opens when atrium contracts
closes when ventricle contracts
stops back flow from ventricle to atrium
- valve F
opens when ventricle contracts
closes when ventricle relaxes
stops back flow from aorta to ventricle

03. Heart Disease

								255.	C
256.	D	257.	B	258.	B				

259. **Answer**

The correct answer should include the following words and phrases:

①

- more exercise
- stop smoking

②

- stent:
small mesh tube inserted in artery
→ opens (or supports) narrow artery
- dilatation (or balloon angioplasty):
→ tube (or catheter) with balloon inserted into artery → inflate balloon to widen artery
- by-pass:
another blood vessel joined (or replace) artery

261. **Answer**

①

- Ⓐ oxygen/ glucose
- Ⓑ carbon dioxide

②

- Ⓐ - high fat (or cholesterol) diet
- smoking
- stress
- lack of exercise
- genetic influence
- Ⓑ all parts of artery below point X shaded

260. **Answer**

The correct answer should include the following words and phrases:

①

- pulse rate increases and remains constant
- increases from 48~52 bpm to 148~156 bpm
- maximum 156~158 bpm at 10 min

②

- nerves or adrenaline stimulates increasing heart pulse rate
- increase in blood CO₂ concentration
- increase demand for oxygen and glucose
- rate of aerobic respiration increases

262. **Answer**

①

- A: vena cava
- B: aorta
- C: left atrium
- D: bicuspid valve
- E: semi-lunar valve
- F: right ventricle

②

- coronary
- fatty deposit in wall of artery
→ blocks artery and restricts blood flow
→ restricts oxygen or nutrient supply

③

- heart not pumping blood
- keeps blood circulating for
→ blood is oxygenated
→ carbon dioxide is removed from blood

④

- septum divides heart into two ventricles
- ventricles contracting increase blood pressure
- right ventricle has thinner wall than left ventricle
→ lower pressure to lungs than to rest of body

MEMO

MEMO

308.

310.

When a pathogen enters the blood, the immune system uses different mechanisms to destroy the pathogen.

Human Immunodeficiency Virus (HIV) infects cells of the immune system.
State the effects of HIV on the human immune system.

The figure shows one of these mechanisms.

.....

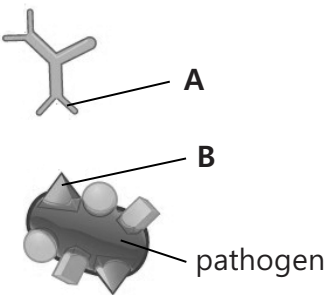
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Which row describes the structures involved?



	structure A	A is made by	structure B
A	antigen	phagocytes	antibody
B	antigen	lymphocytes	antibody
C	antibody	phagocytes	antigen
D	antibody	lymphocytes	antigen

309.

311.

What is a chemical barrier to pathogens?

State three ways in which HIV is transmitted from infected to uninfected people.

- A stomach acid
- B antibody
- C blood
- D skin

1.

.....

2.

.....

3.

.....

MEMO

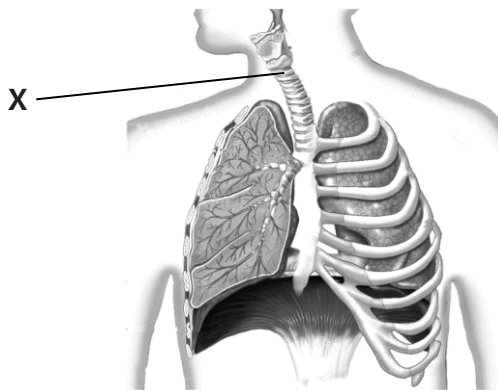
MEMO

323.

325.

The figure below shows some structures in the human neck and thorax.

What increases the rate of diffusion of carbon oxide into alveoli in the lungs?

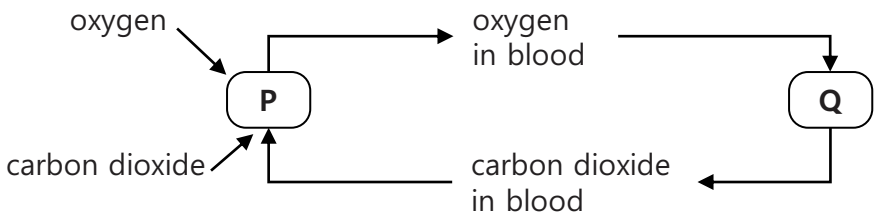


- A Air arriving in the lungs is saturated with oxygen.
- B Blood is taken away from the lungs as it circulates.
- C Blood arriving in the lungs contains 4% carbon dioxide.
- D Air leaving the lungs is saturated with water vapour.

The lining of tube X has cilia. What is an important function of the cilia?

326.

The diagram below shows the exchange of gases during breathing and during respiration in the human body.



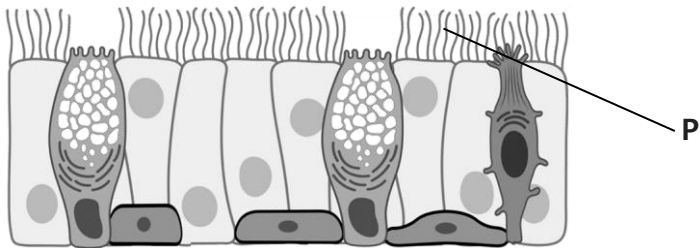
- A to increase the internal surface area of tube X
- B to help in the exchange of oxygen and carbon dioxide
- C to move mucus towards the throat
- D to moisten the air entering and leaving the lungs

What is represented by P and by Q?

	P	Q
A	air	lungs
B	body cells	lungs
C	lungs	body cells
D	lungs	air

324.

The figure below shows some ciliated cells from the trachea.



What is the function of the parts labelled P?

327.

Which features are present in gaseous exchange surfaces?

	small surface area	moist	thin walls
A	X	X	O
B	X	O	O
C	O	O	X
D	X	O	X

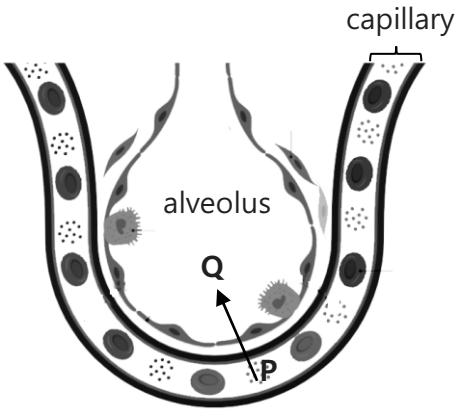
- A filtering bacteria
- B protecting reflux
- C detecting pathogens
- D moving mucus

MEMO

340.

The diagram shows an alveolus and capillary in a human lung.

Which row shows the correct gas and concentrations for diffusion from **P** to **Q** in normal conditions?



	at point P	at point Q
A	low concentration of O ₂	high concentration of O ₂
B	high concentration of O ₂	low concentration of O ₂
C	low concentration of CO ₂	high concentration of CO ₂
D	high concentration of CO ₂	low concentration of CO ₂

341.

The table below shows the approximate composition of air breathed out by a human.

gas	air breathed out (%)
oxygen	16
carbon dioxide	4
nitrogen	77
water vapor	3

Where does the nitrogen in the air breathed out come from?

- A** It is in the air that was breathed in.
- B** It is a product of anaerobic respiration.
- C** It is a product of proteins broken down in the body.
- D** It is exchanged for carbon dioxide which is taken into the blood.

342.

What helps oxygen to be absorbed rapidly into the blood in the lungs?

- A** Alveoli have thick walls and a small surface area
- B** Alveoli have thin walls and a large surface area.
- C** Air breathed in has less carbon dioxide than air breathed out.
- D** The concentration of oxygen in the blood is higher than in the alveoli.

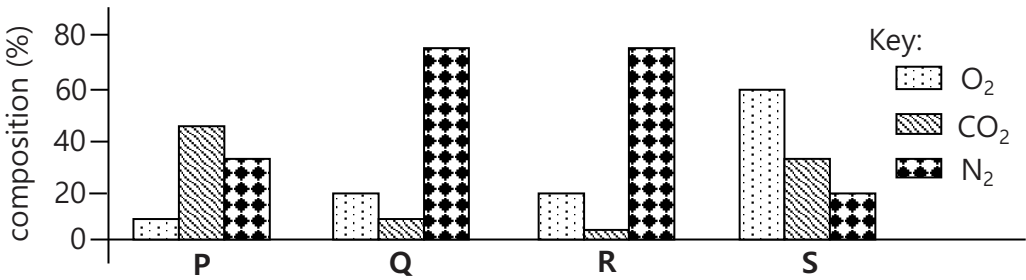
343.

A boy holds his breath for 20 seconds, breathes out, and then breathes in. Compared with the air he breathes in, the air he breathes out contains more

- A** carbon dioxide
- B** carbon dioxide and nitrogen
- C** carbon dioxide and water vapour
- D** carbon dioxide, nitrogen and water vapour

344.

The graph below shows the composition of four samples of air.



Which sample is inspired air and which sample is expired air?

	inspired air	expired air
A	P	Q
B	Q	S
C	R	Q
D	S	P

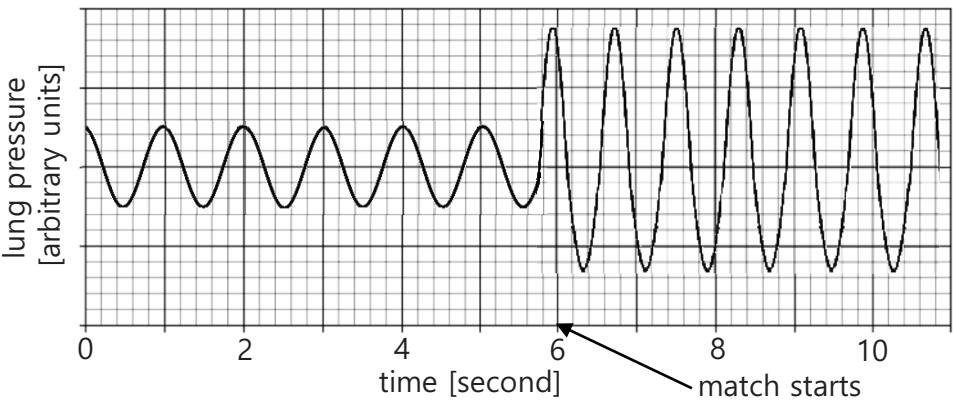
MEMO

MEMO

353.

The volume in the lungs of a student before and during the start of a football match was recorded.

The results are shown in the figure below.



① Use the results in the figure above to calculate the breathing rate before the start of the match.
Express your answer to the nearest whole number.

..... breaths per minute

② Use the results in the figure above to describe how the pattern of breathing during the match is different from the pattern of breathing before the match starts.

.....
.....
.....
.....
.....
.....

01. Breathing System

				318.	C	319.	A	320.	B
321.	B	322.	B	323.	C	324.	D	325.	B
326.	C	327.	B	328.	D	329.	C		

330. Answer

- keeps airways open
 - protects airways
- OR
- reduces resistance to movement of air
 - sound production in larynx

331. Answer

The correct answer should include the following words and phrases:

- ① bronchus or bronchiole
- ②
- goblet cells produce and release mucus
→ mucus traps dirt (or particles or pathogens)
 - cilia beat to move fluid (or mucus) out of airway

332. Answer

The correct answer should include the following words and phrases:

- diffusion
- across cell membrane
→ high concentration to low concentration of O₂ or down concentration gradient

333. Answer

The correct answer should include the following words and phrases:

part	name	role in breathing in
P	ribs	bone structure for protecting lungs prevent collapse of thoracic cavity or lungs changing thoracic cavity volume & pressure
Q	intercostal muscle	contracting & relaxing for moving ribs changing thoracic cavity volume & pressure
R	diaphragm	contracting and relaxing helps change volume of thorax to allow inhalation & exhalation



02. Inhalation and Exhalation

						334.	C	335.	A
--	--	--	--	--	--	------	---	------	---

336. Answer

The correct answer should include the following words and phrases:

- external intercostal muscles contract
- internal intercostal muscles relax
→ lifts ribs upwards
- diaphragm contracts
→ diaphragm flattens
- volume of thorax (or lungs) increases
→ pressure in thorax (or lungs) decreases
- air flows into the lungs

337. Answer

The correct answer should include the following words and phrases:

- external intercostal muscles relax and internal intercostal muscles contract
→ ribs downwards
- diaphragm relax
→ diaphragm change dome-shaped
- volume of thorax (or lungs) decrease
→ pressure in thorax (or lungs) increase
- air is flowed out by a pressure gradient

338. Answer

pressure varies inversely as volume

	intercostal muscles		diaphragm	pressure in thorax
	internal	external		
breathing IN	relax	contract	contract	decrease
breathing OUT	contract	relax	relax	increase