Revision Booklet 2022-2023
Edexcel IGCSE(9-1) in Biology

Part 1: Sections 1 & 2 of the specification

1. The nature and variety of living organisms
2. Structure and functions in living organisms

This revision booklet has been made to follow the specification point by point and it has questions based on each point.

Revision questions based on the specification

Section 1: The Nature and Variety of living things

1.1 – 1.4Characteristics and Variety of Living Things

List the 8 characteristics of life and give a brief description of each one with an example of a plant or animal carrying it out.

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Complete the table about living organisms: yes/no (with description if needed)

	Plants	Animals	Fungi	Bacteria	Protoctists	Viruses
Unicellular or multicellular?						
Able to photosynthesise? (Do their cells have chloroplasts?)						
Cell walls present? Do cells of these organisms have a cell wall? **What substance is it made of?**						

Nucleus present? Is the DNA enclosed in a nucleus in cells?						
Examples? Name some examples of these organisms						

Describe the common features shown by prokaryotic organisms such as bacteria.

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Why are viruses not considered living organisms as compared to the other 5 kingdoms?

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What are the characteristics of a virus?

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Define the term 'pathogen'

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Give an example of each a bacterial, fungal, protoctist, and viral pathogen

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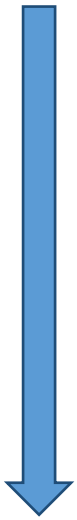
Section 2: Structures and functions in living organisms

2.1 – 2.4 structure of organisms

List the levels of organisation within an organism starting with the smallest and finishing at organism. Give a brief description of their roles

(Use these words: **Organs, Tissues, Systems, Organelles, Cells, Organism**)

Smallest



Largest

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Draw and label a plant and an animal cell in the spaces below:

Animal	Plant Cell

Complete the table below by including descriptions of the functions of cell organelles:

Cell Structure (Organelle)	**Plant, Animal or both?**	**Description and Function of the cell Structure**
Nucleus		
Cytoplasm		
Cell Membrane		
Cell Wall		
Chloroplast		
Vacuole		
Mitochondria		

2.5 – 2.6 Specialised cells and Stem cells

What is cell differentiation?

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Why do cells become differentiated?

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What are stem cells?

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Define:

Embryonic stem cells:

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Adult stem cells:

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Why are stem cells used in medicine?

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How can stem cells be used in medicine?

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Complete this table:

Advantages of using stem cells	Disadvantages of using stem cells

2.7 – 2.14 Biological molecules

What elements from the periodic table are found in **Carbohydrates**?
Choose from these elements: Sulphur, Carbon, Nitrogen, Hydrogen, Phosphorous, Oxygen.

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What elements from the periodic table are found in **Lipids** (fats and oils)?
Choose from these elements: Sulphur, Carbon, Nitrogen, Hydrogen, Phosphorous, Oxygen.

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What elements from the periodic table are found in **Protein**?
Choose from these elements: Sulphur, Carbon, Nitrogen, Hydrogen, Phosphorous, Oxygen.

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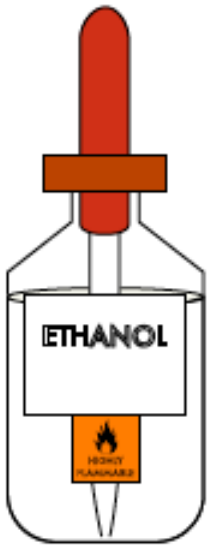
	Starch	Glycogen	Protein	Lipids
What are the functions of these large molecules?				
What are the subunits/monomers that make up these molecules?				
What are the names of the bonds between the monomers/subunits in these molecules?				
Are these found in plant cells or animal cells or both?				

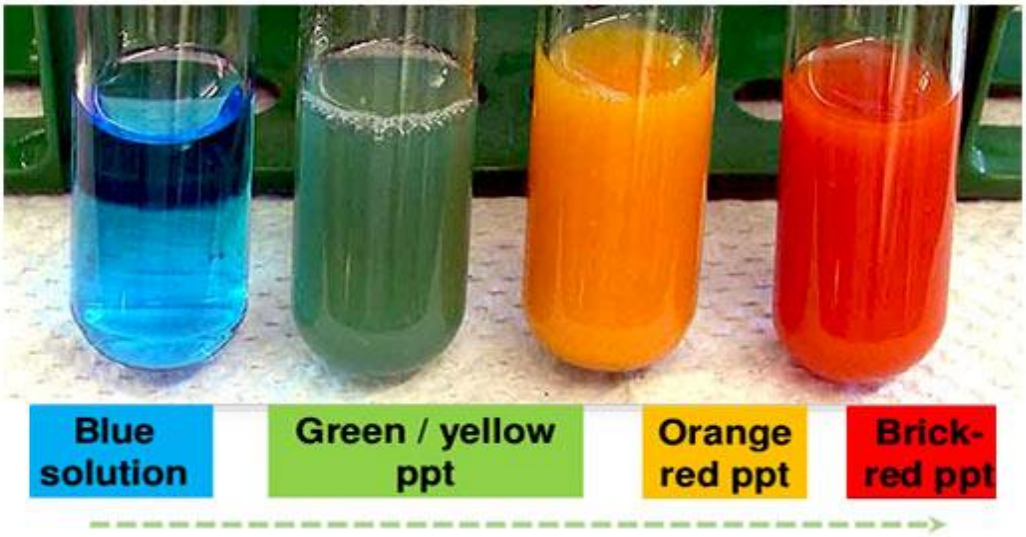
EXAM PAPERS PRACTICE

2.9 Practical:

BIOCHEMICAL (FOOD) TESTS

CHEMICAL	TESTS FOR ...?	HOW TO CARRY OUT THE TEST	RESULT	CHEMICAL	TESTS FOR ...?	HOW TO CARRY OUT THE TEST	RESULT
							
							

This is the Benedict's test. What do the colours represent?



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What are enzymes made up of?

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What do enzymes do?

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Explain what is meant by a biological catalyst.

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Why don't enzymes get used up in the reactions they catalyse?

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Describe the lock and key theory: (use these words in your answer – **Active site, substrate, complementary, specific shape, fit**)

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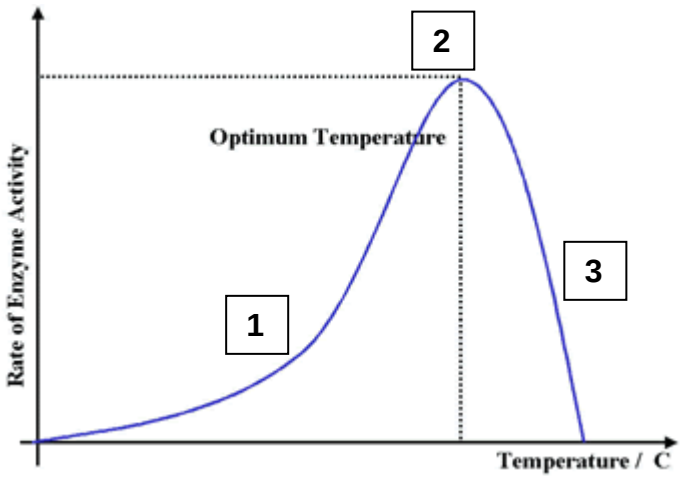
Draw a diagram of the lock and key theory:

Describe and explain what is happening in each part of the graph. Use these words to help you answer: **Collisions, quicker, increases, substrate, optimum temperature, decreases, denature, shape, active site, permanent**



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2.12 Practical: Design a simple experiment that shows how temperature affects the rate of reaction of an enzyme.

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Method

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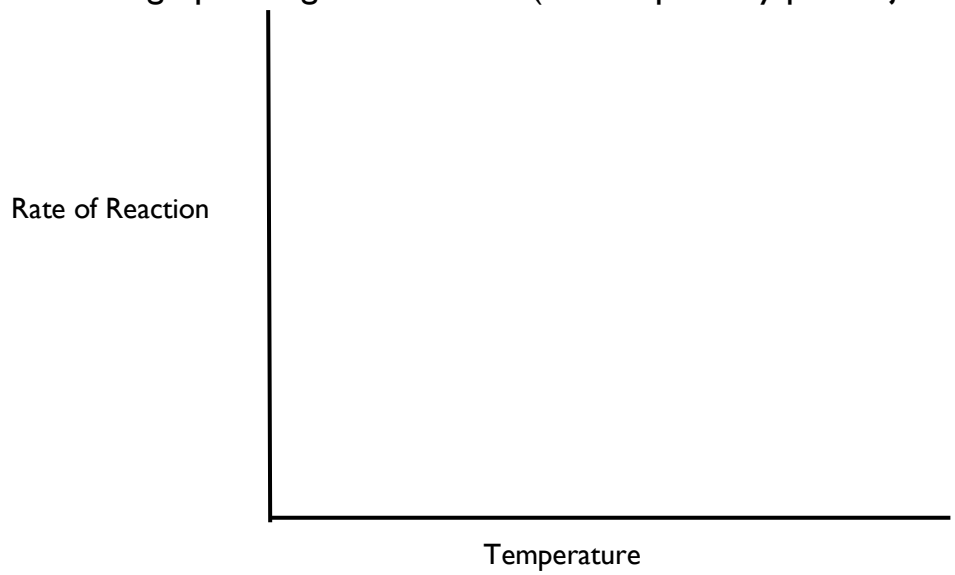
This is an example results table of catalase reacting with hydrogen peroxide producing oxygen. Complete the table for the rate of reaction to 2dp

	Temperature (°C)						
	10	20	30	40	50	60	70
Number of seconds to produce 10cm³ of oxygen	90	80	50	20	50	100	250
Rate of Reaction (1/time taken)	1/90 = 0.01	1/80 =	1/50 =				

Sketch a graph using these results (do not plot any points just draw a line of best curve)



What is the optimum temperature for this enzyme? Explain your answer using data

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How does pH affect the functioning of enzymes? (Use the words – **denature, shape, narrow range, optimum pH**)

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What would happen to enzymes that work in the acid of the stomach when they go into the small intestine where it is less acidic? Explain your answer

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2.14 Practical: Design a simple experiment that shows how pH affects the rate of reaction of an enzyme using potato chips and hydrogen peroxide.

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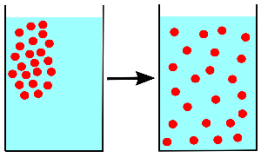
2.15– 2.17 Movement of Substances into and out of Cells

Define: (use these questions to guide you: Does the process require energy? Does it require a membrane? Does the process go with or against the concentration gradient?)

- Diffusion - .....



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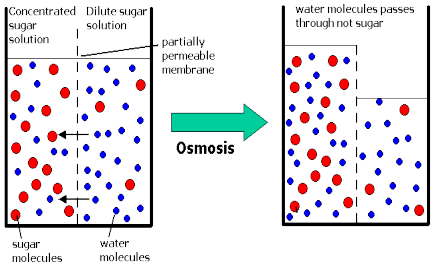
- Osmosis - .....



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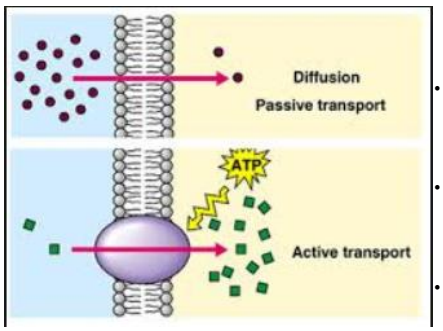
- Active Transport - .....



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How and why do these factors affect the rate of the movement of substances into and out of cells?

Surface area to volume ratio: ……

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Temperature: ……

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Distance: ……

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Concentration gradient: ……

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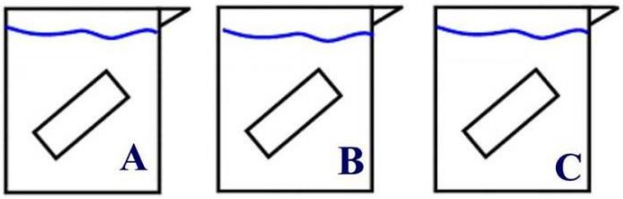
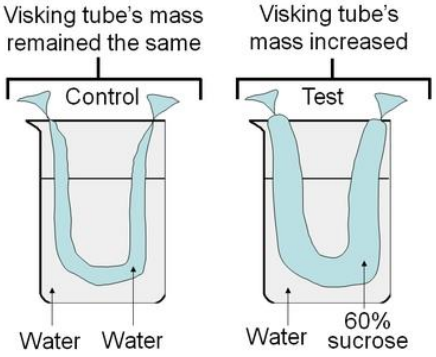
Describe an experiment to show the effect of osmosis on potato chips. *Use these words/pieces of equipment in your answer: weighing scales, core borer, different solutions of sugar concentration, potato.*



What is visking tubing?

Explain what is happening in this diagram of visking tubing.



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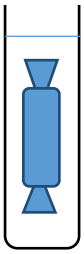
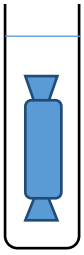
2.17 Practical: Investigate diffusion and osmosis using living and non-living systems

Potato cylinders in solutions of different concentrations	Visking tubing withsolutions of different concentrations
Describe what would happen to the mass and length of this potato chip if it is put into a dilute solution 	Describe what would happen to this visking tubing if it had a concentrated solution of glucose inside it with a dilute solution surrounding it 
Describe what would happen to the mass and length of this potato chip if it is put into a concentrated solution 	Describe what would happen to this visking tubing if it had a dilute solution inside it with a concentrated solution of glucose surrounding it 

How would you work out the concentration of the inside of potato cells using an experiment similar to this?

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2.18 – 2.23Nutrition in Flowering plants

What is Photosynthesis? What is needed for it to occur?

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Why is light needed for photosynthesis? (*Hint: light energy* ⟹ *chemical energy*)

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What is the word equation and balanced chemical symbol equation for photosynthesis?

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What does limiting factors mean?

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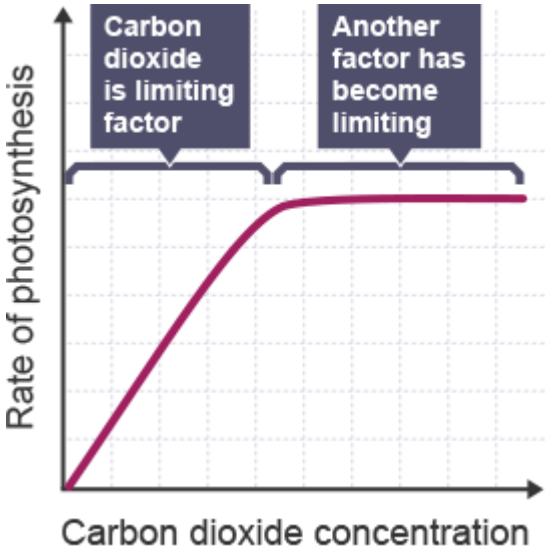
Explain this graph on carbon dioxide and the rate of photosynthesis



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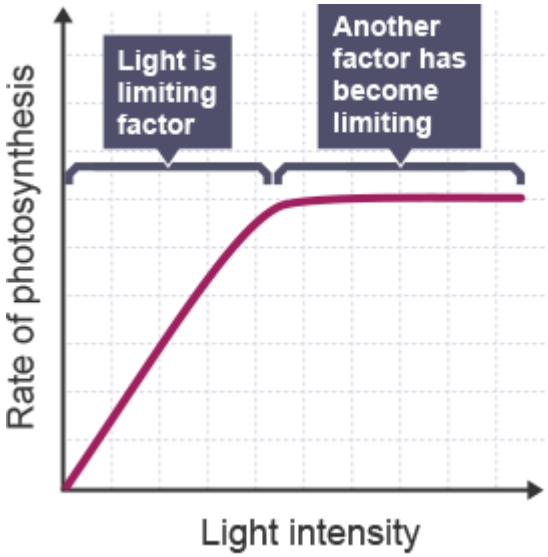
Explain this graph on light intensity and the rate of photosynthesis



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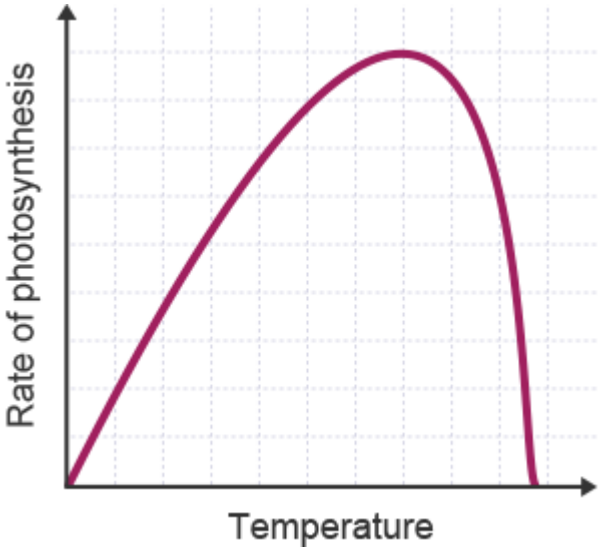
Explain this graph temperature and the rate of photosynthesis



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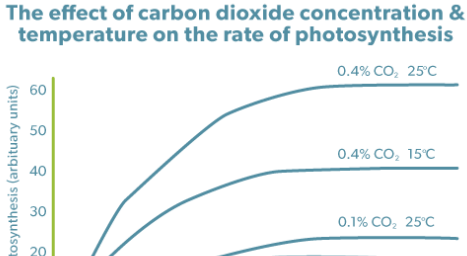
Describe what this graph is showing you. Use the data in the graph



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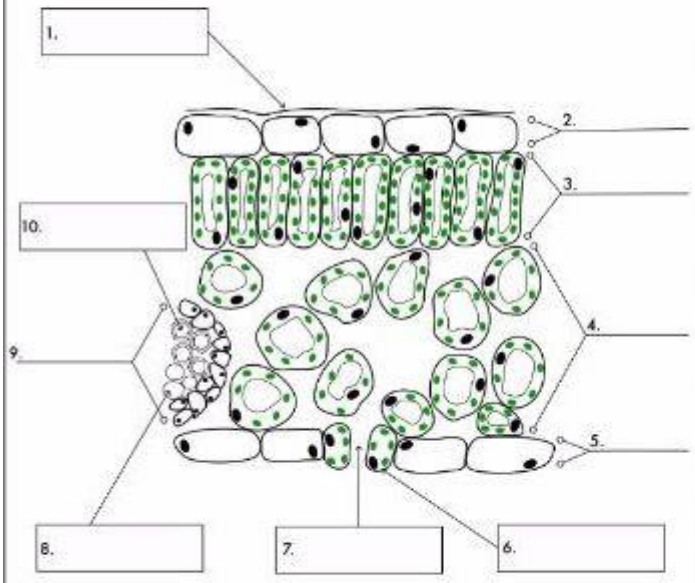
Complete this diagram

ADAPTATION OF THE LEAF TO PHOTOSYNTHESIS

FEATURES OF A LEAF

Label the parts of the leaf in the diagram below
Use the table on the right to help you if needed



FUNCTIONS OF THE LEAF PARTS

Complete the table below with how each feature of the leaf helps the plant photosynthesise efficiently

Leaf Part	How is it involved in Photosynthesis?
Waxy Cuticle	
Upper Epidermis	
Palisade Mesophyll	
Spongy Mesophyll	
Lower Epidermis	
Xylem	
Phloem	

Explain how the structure of the leaf is adapted for photosynthesis
Use some or all of these words to help you: **flat, vertical cells, air spaces, stomata, vascular bundle, chloroplasts, thin, waxy cuticle**

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Why do plants need magnesium ions?

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Why do plants need nitrate ions?

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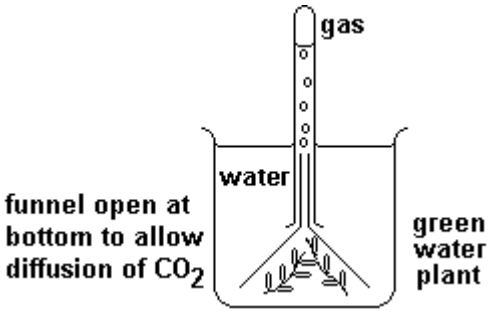
2.23 Practical: How can you test to see if oxygen is being produced by photosynthesis?



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What could you do to this experiment to see how light affects the production of bubbles?

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The leaf starch test tests for the presence of starch. How can starch show that photosynthesis has taken place?

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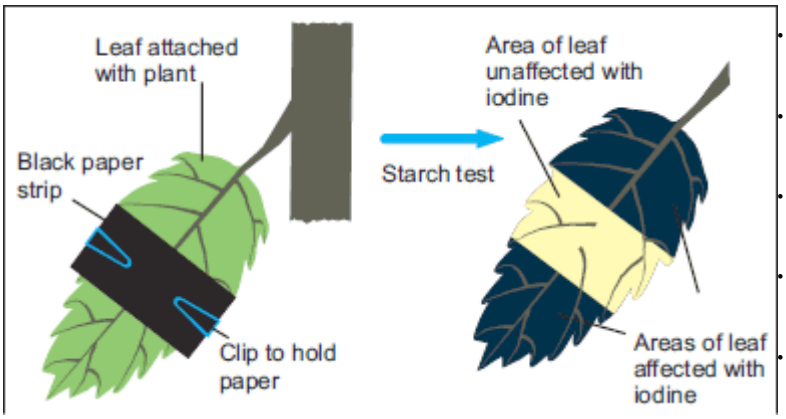
Explain this experiment. How does it show light is needed for photosynthesis?



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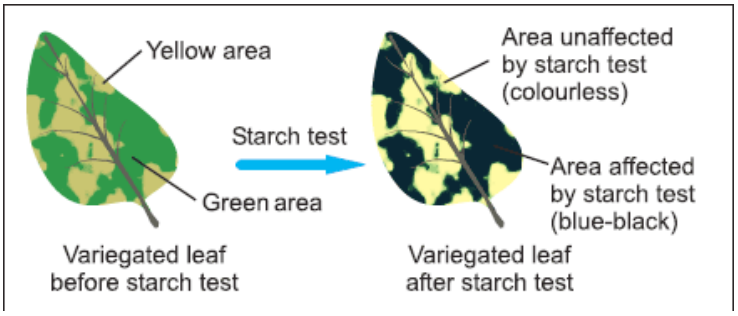
Explain this experiment. How does it show chlorophyll is needed for photosynthesis?



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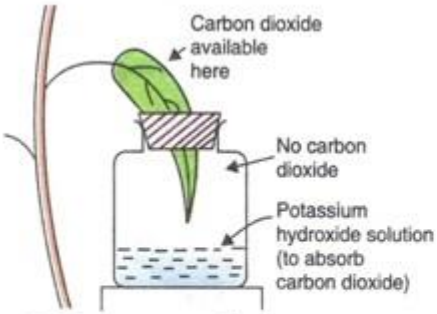
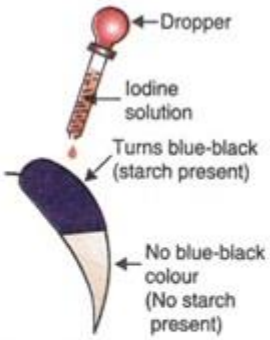
Explain how this experiment shows that carbon dioxide is needed for photosynthesis



(*a*) The upper part of leaf has carbon dioxide around it but the lower half of the leaf has no carbon dioxide available to it.

(*b*) Chlorophyll removed leaf (after boiling in alcohol).



(*c*) Iodine solution being poured on decolourised leaf.

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2.24 – 2.33 Nutrition & Digestion in Humans

What is a balanced diet?

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Identify sources and describe functions of:

Nutrient	Sources	Function
Carbohydrate		
Protein		
Lipid		
Vitamin A		
Vitamin C		
Vitamin D		
Calcium		
Iron		
Water		
Dietary Fibre		

Why do energy requirements vary with activity levels, age and pregnancy?

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Describe the structures and functions of the alimentary canal:

Mouth: ……

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Oesophagus: ……

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Stomach: ……

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Small intestine (*duodenum and ileum*): ……

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Large intestine (*colon and rectum*): ……

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Pancreas: ……

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Write the definitions for:

Ingestion: ……

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Digestion: ……

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Absorption: ……

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Assimilation: ……

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Egestion: ……

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Describe peristalsis in the gut using diagrams (like a cartoon):

Explain why peristalsis happens.

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What do digestive enzymes do?

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Where in the digestive system are digestive enzymes produced?

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What do amylase and maltase work on and what are the products?

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What do proteases do and what are the products?

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What do lipases do and what are the products?

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What is the role of the liver and gall bladder in digestion?

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Describe how bile works.

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How is the small intestine adapted for absorption?

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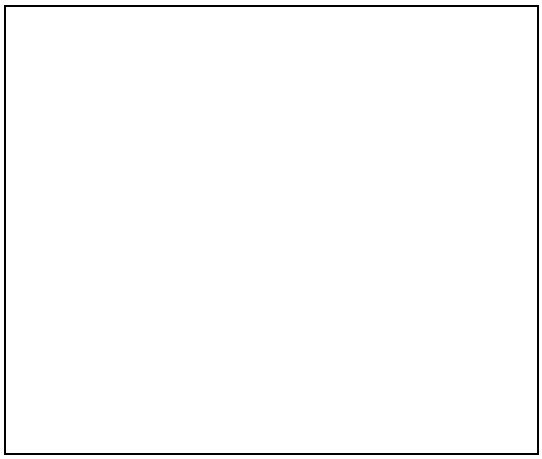
Draw and describe the structure of the villus (*include: blood supply, thin walls, capillary network*)



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How does the structure of the villus help with the absorption of the products of digestion in the small intestine?

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2.33 Practical: Describe an experiment you would do to investigate the energy content in a food sample (draw a small diagram to help you)

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2.34 – 2.39 Respiration

What is respiration?

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What is the role of ATP?

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Compare the differences of aerobic and anaerobic respiration in this handy table provided.

Aerobic	Anaerobic

What is the word equation **and** balanced chemical symbol equation for aerobic respiration?

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What is the word equation for anaerobic respiration in animals and plants?

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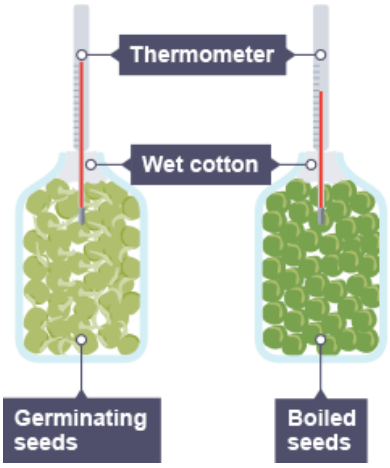
2.39 Practical: (a) How does this experiment show that seeds respire? (Why was the right hand side boiled? What does the difference in temperature mean?)



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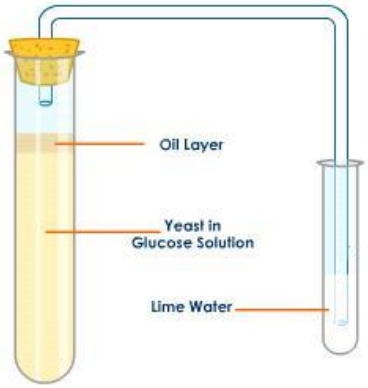
(b) How would this experiment show carbon dioxide is produced during respiration?



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What is the oil layer for?

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2.40 – 2.45 Gas exchange in flowering plants

Why is diffusion essential for gas exchange in living organisms?

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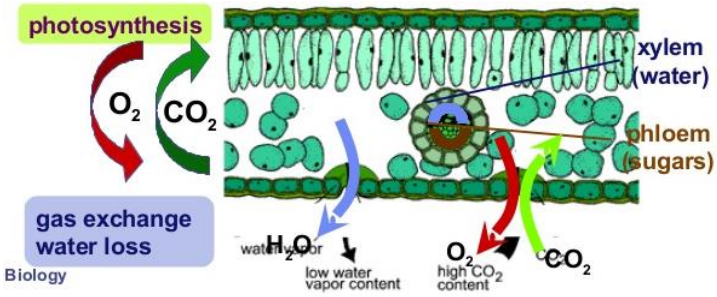
Describe gas exchange in a leaf



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How is the leaf adapted for gas exchange? (*This is a different question to how it is adapted for photosynthesis; use these words: air spaces, stomata, spongy mesophyll, oxygen, carbon dioxide, water vapour*)

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What is the role of stomata in gas exchange? How do they work?

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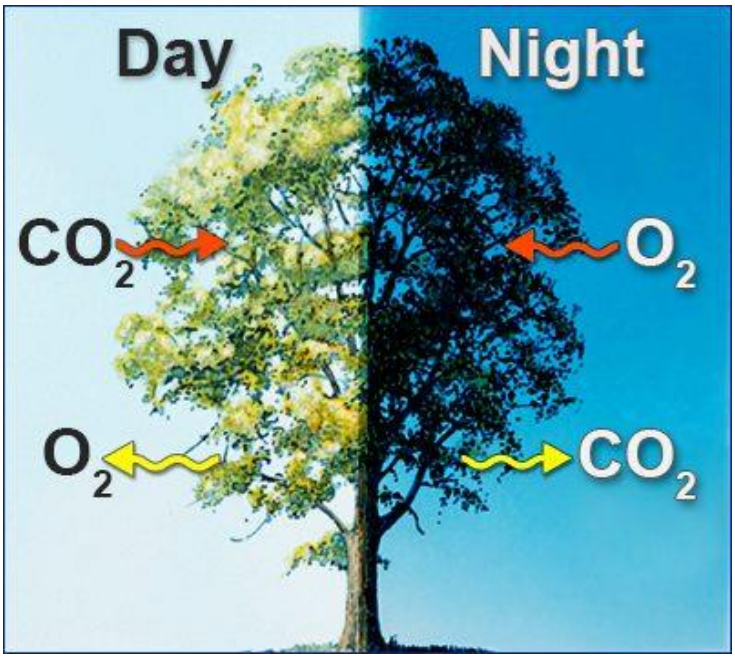
TRUE or FALSE: if the statement is false correct it

- All plant cells photosynthesise ……
- All plant cells respire ……
- Photosynthesising cells do not require oxygen ……

- Answer: F, T, F

The next few questions will be based on the following diagram. It shows the net flow of gasses in a plant during the day and night.



(i) Describe and explain what is happening to the tree during the night time?

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(ii) What would happen during the day if there was no carbon dioxide? Explain your answer

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(iii) What would happen to the uptake of carbon dioxide if the light intensity was increased?

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(iv) If the plant is still respiring during the day why is there a net flow of carbon dioxide into the plant?

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What differences will there be between these limiting factors at different times of the day: Circle the correct words

	Just after dawn (early morning)	In the mid afternoon
Temperature	**HIGHER/LOWER**	**HIGHER/LOWER**
Carbon dioxide concentration in air	**HIGHER/LOWER**	**HIGHER/LOWER**
Light intensity	**HIGHER/LOWER**	**HIGHER/LOWER**

Explain how the differences of these factors will affect the rate of photosynthesis in the morning compared to the afternoon

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2.45 Practical: This is what hydrogen carbonate indicator is:

Hydrogencarbonate indicator

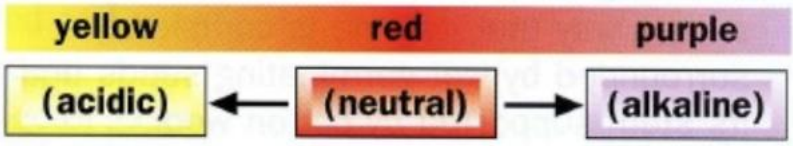
Hydrogen carbonate indicator:

- routinely used to measure CO_2 levels in aquatic systems.
- red in equilibrium with atmospheric air
- becomes more orange/yellow with increased CO_2
- changes from red through magenta to deep purple as CO_2 is removed.

Science & Plants for Schools

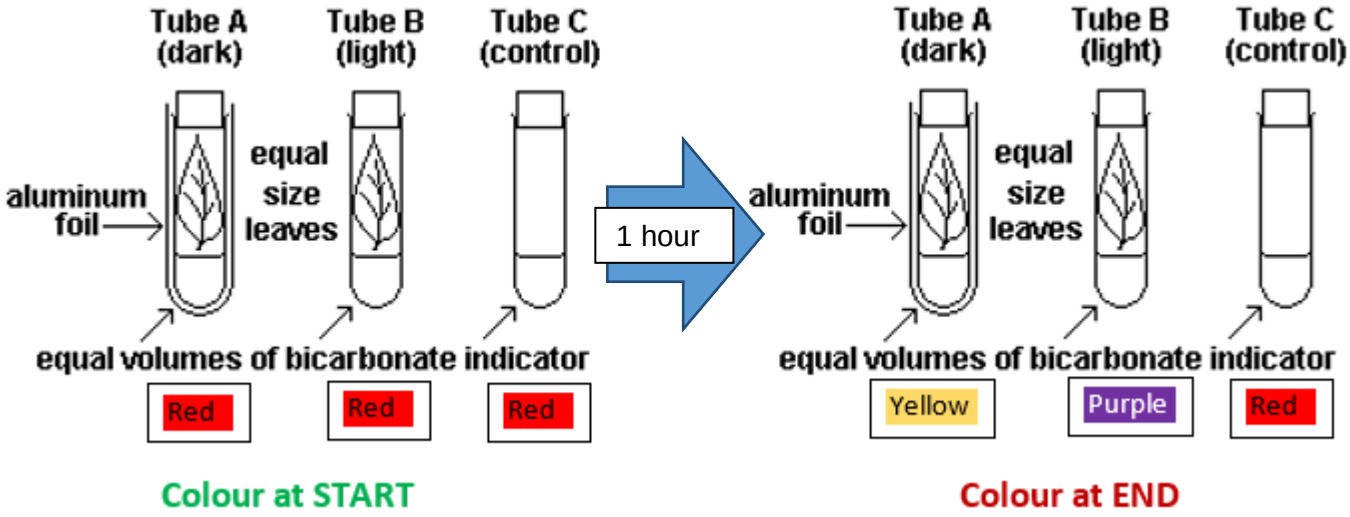
What is hydrogen carbonate indicator?

It is a liquid which reacts with carbon dioxide. It changes colour, depending on whether there is a lot of CO2 dissolved in it, or not.



Extra CO2 is present | Normal levels of CO2 | Low / No CO2 present

Explain the results of this experiment



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Why is there a control experiment?

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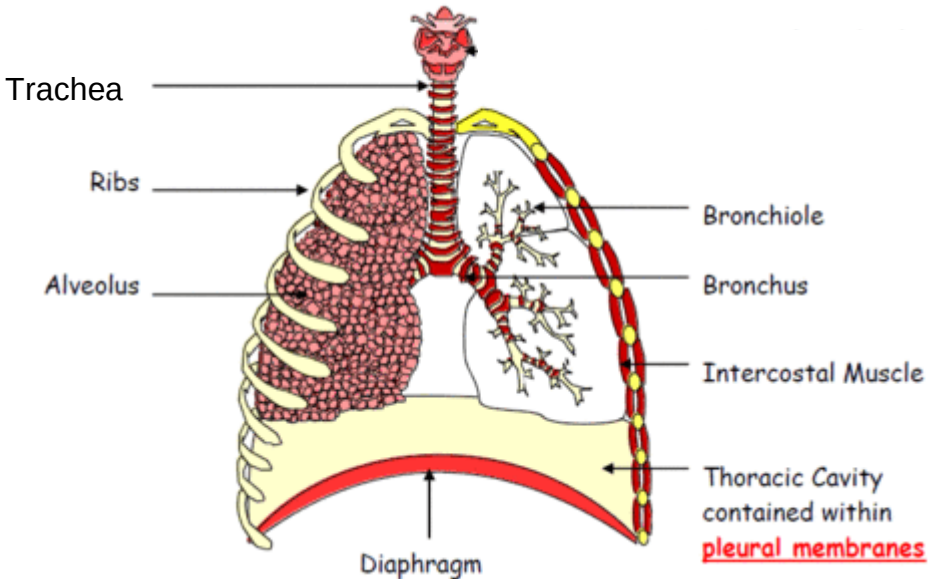
2.46 – 2.50 Gas exchange in humans

This is a diagram of the human thorax:



Describe these parts of the thorax:

- Trachea (including the cartilage rings): ……

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- Ribs: ……..

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- Diaphragm: ……...

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- Bronchi: ……

  ……...

- Bronchioles: ……

  ……...

- Alveoli: ……

  ……...

- Intercostal muscles: ……..

  ……...

- Pleural membranes: ……..

  ……...

Describe the action of the intercostal muscles when humans:

- Inhale: ……...

  ……...

- Exhale: ……...

  ……...

Describe the action of the diaphragm and explain how it helps humans: (*how does it change air pressure inside the lungs?*)

- Inhale: ……...

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- Exhale: ……...

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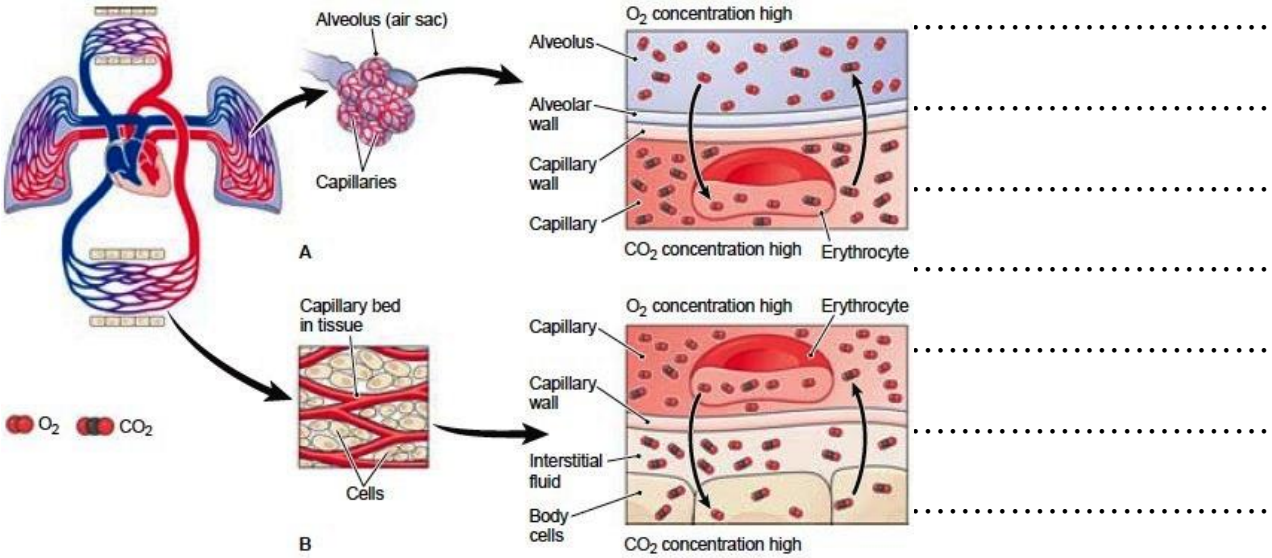
Describe how gas exchange happens in the lungs and tissues of animals. Use the diagram to help you.



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Explain how the alveoli are adapted for gas exchange by diffusion: (*include: thin alveoli walls, thin capillary walls, moist surface, large surface area, oxygen & carbon dioxide*)

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Tar, nicotine, many carcinogens (cancer causing chemicals), and other chemicals can be found in the smoke from cigarettes. What do these chemicals do to the lungs and circulatory system?

- Tar – include how it affects the cilia in the bronchi and bronchioles and how this can lead to bronchitis and chest infections:

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- Nicotine – include how it affects blood pressure and can contribute to heart disease:

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- Carcinogens – what will these chemicals do to the body?

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- Carbon monoxide – how does this affect the ability of the blood to carry oxygen and how will it affect a developing foetus? (*use these words: haemoglobin, carboxyhaemoglobin*)

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What is emphysema?

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How are the alveoli affected by emphysema?

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How can smoking cause coronary heart disease?

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2.50 Practical: (a) The following questions are based on a simple experiment to investigate how exercise affects breathing:

(i) How would you design an experiment to show the effect of exercise on breathing?

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(ii) What would your variables be?

- Independent variable: ……...
- Dependent variable: ……..
- Control variables: …….

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(iii) Describe the difference in the breathing rates between these two pupils (A and B) after the exercise

Time from start of experiment	Breathing rate / breaths per minute	
	Pupil A	Pupil B
1	13	13
2	14	12
3	13	12
Rate after 3 minutes of vigorous exercise		
7	28	17
8	24	13
9	17	12
10	14	12

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(iv) Why does the breathing rate need to rise during exercise?

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(v) Which of the pupils is more fit? Explain your reasoning

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(b)

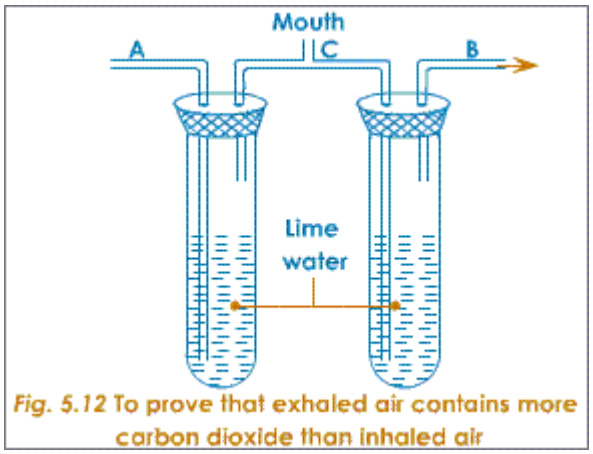

Fig. 5.12 To prove that exhaled air contains more carbon dioxide than inhaled air

Explain how this experiment proves that there is more carbon dioxide in exhaled air than inhaled air.

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2.51 – 2.52 Transport in organisms

What does surface area to volume ratio mean?

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How do unicellular organisms get their nutrition and oxygen? (Use the word diffusion in your answer)

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How do unicellular organisms get rid of their waste? (Use the word diffusion in your answer)

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Why is surface area to volume ratio important to the rate of diffusion?

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Why do multicellular organisms rely on transport systems to transport gases, nutrients, and minerals?

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2.53 – 2.58 Transport in flowering plants

What is transported in: (use the words: sucrose, amino acids, water, *named* mineral ions/salts, as well as any other substances you can)

- Phloem: …….

  ……...

- Xylem: ……...

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What are the differences between Xylem and phloem?

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In what direction can the flow of substances in the phloem go?

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Where does the phloem transport the products of photosynthesis?

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In what direction does the flow of substances in the xylem go?

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By which process do root hair cells absorb water?

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Why do root hair cells have a higher mineral salt content than the surrounding soil?

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What would happen if there was a higher mineral salt concentration in the soil surrounding the roots than inside the root hair cells?

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What is transpiration?

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What is the transpiration stream?

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Transpiration is affected by humidity, wind speed, temperature, and light intensity. Explain how and why transpiration is affected by:

- Changes in humidity: ……

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  ……...

- Wind speed: ……

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- Temperature: ……...

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- Light intensity: ……..

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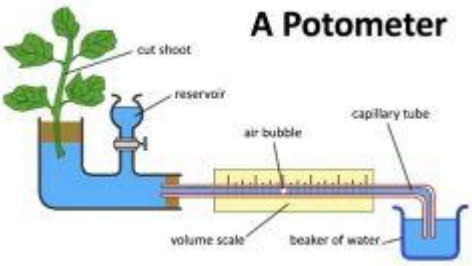
2.58 Practical: What is a potometer and what does it do?



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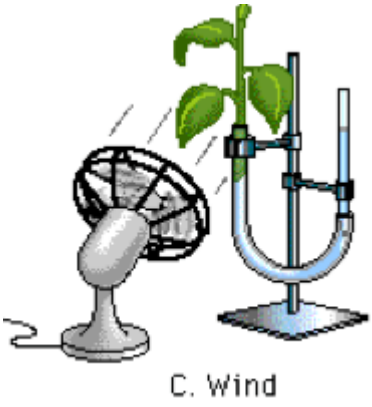
Describe how this experiment will investigate the rate of transpiration



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How would you change this experiment if you were investigating how temperature, humidity or light intensity affected the rate of transpiration?

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2.59 – 2.69 Transport in humans – blood

Describe what blood is made up of:

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Why is plasma such an important part of the blood? (*use: carbon dioxide, digested food, urea, hormones, and heat energy*)

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How are red blood cells adapted to their function? (*include: their shape, absence of a nucleus, and presence of haemoglobin*)

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What 2 ways does the immune system respond to disease?

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Draw, label and describe in the boxes below the action of a phagocyte ingesting a pathogen

1.	2.
3.	4.

Draw, label and describe how lymphocytes and antibodies work in the boxes below:

1.	2.
3.	4.

Describe what a vaccination is:

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Explain how vaccinations work? (Use**memory cells** in your answer)

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Describe what a platelet is

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Explain the role of platelets in blood clotting

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How does blood clotting protect us from microorganisms?

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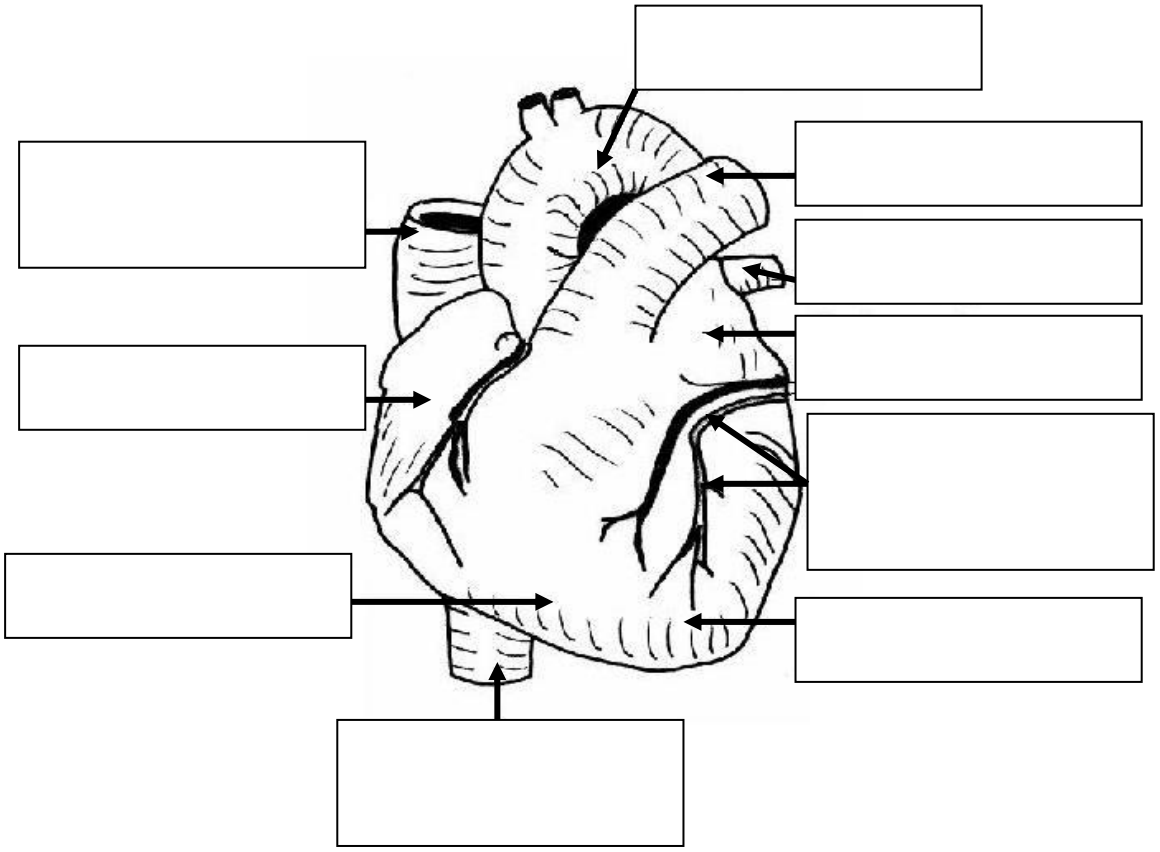
Label the outline of the heart:

Complete the diagram by adding the following labels

aorta left ventricle inferior vena cava pulmonary artery

left atrium superior vena cava pulmonary vein

coronary veins and arteries right atrium right ventricle



Through which blood vessels does:

Oxygenated blood flow through ……

Deoxygenated blood flow through ……

What do the coronary arteries do?

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Why is the left ventricle wall thicker than the right?

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What is the role of the valves in the heart?

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Describe how valves work

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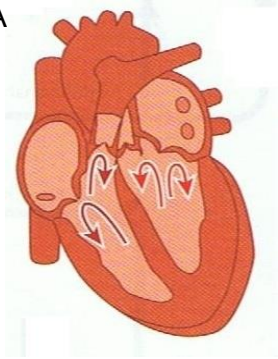
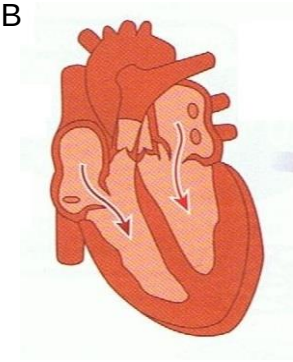
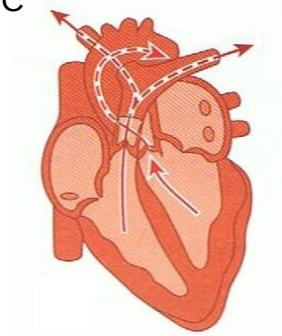
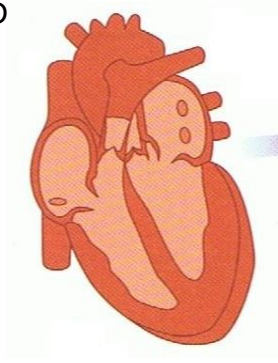
Number the pictures and notes so that they provide a description of the cardiac cycle

A 	Blood enters the atria. However, initially it cannot pass into the ventricles...
	... which closes the atrio-ventricular valves. This stops blood returning to the atria.
B 	... because the atrio-ventricular valves (the bicuspid and the tricuspid valves) are closed.
	...valves in these blood vessels. The cycle then begins again as the atria start to fill with blood
C 	The walls of the atria contract. This raises the pressure of the blood in the atria which....
	As the ventricles empty, higher pressure in the aorta and pulmonary artery closes the...
D 	... forces open the atrio-ventricular valves. Blood passes through these valves into the ventricles.
	... is ejected into these two arteries. The pulmonary artery carries blood to the lungs. The aorta has branches that carry blood to all other parts of the body.
E 	When the ventricles are full, they contract. This increases the pressure of the blood in the ventricles...

How does the heart rate change during exercise?

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Why does the heart rate change?

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What does adrenaline do to the heart rate?

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What is the purpose of adrenaline?

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In the table below draw and describe the structure and role of the blood vessels

	Artery	Vein	Capillary
Draw and label the blood vessel			
Describe how the blood vessel is adapted to do			

its function			
What is the role of the blood vessel in the body			

Why do veins have valves?

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What is the difference between a single and double circulatory system?

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What are the advantages of having a double circulatory system?

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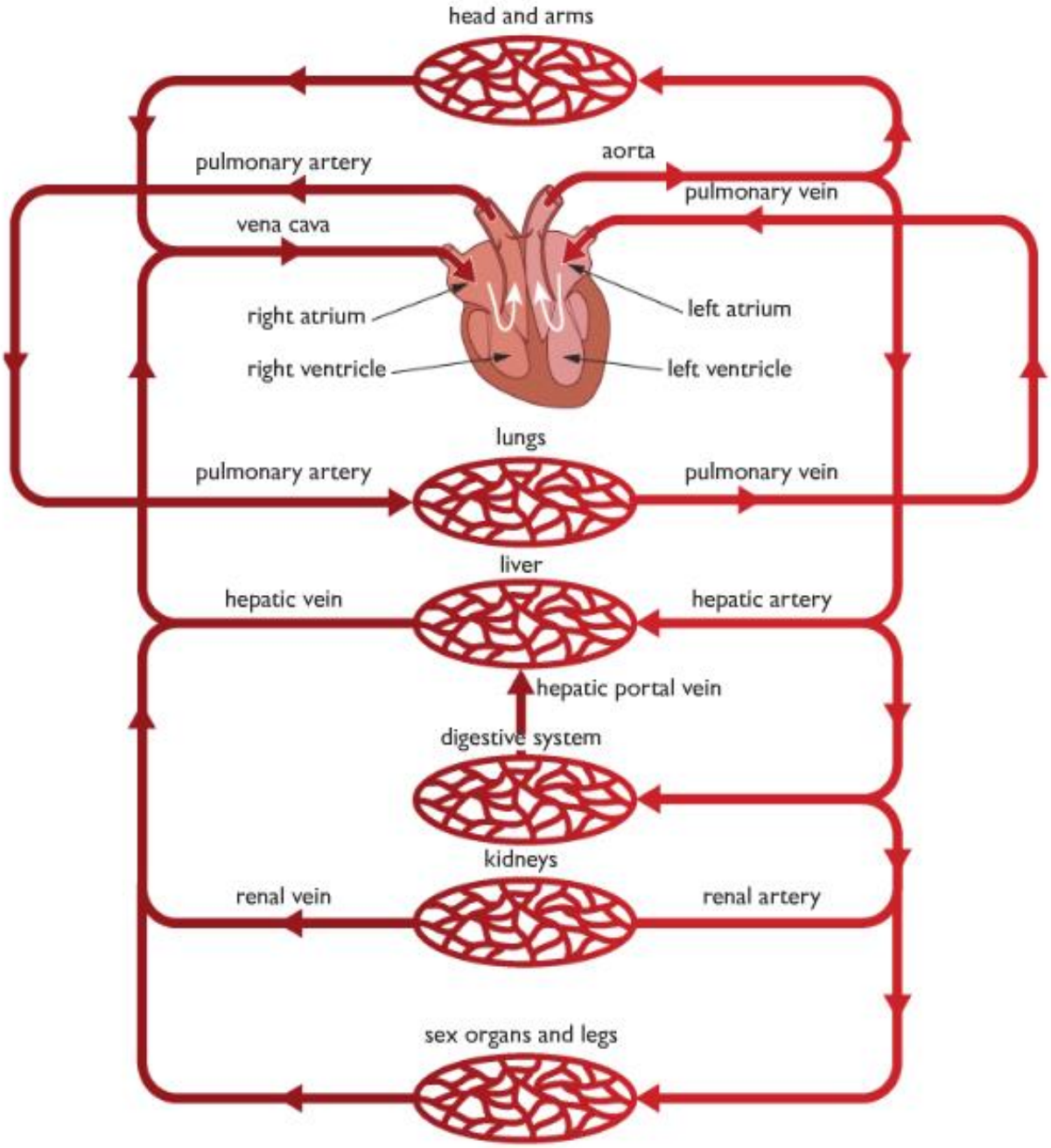
Remember this diagram!!!Note which direction the blood flows


head and arms
pulmonary artery
aorta
pulmonary vein
vena cava
right atrium
left atrium
right ventricle
left ventricle
lungs
pulmonary artery
pulmonary vein
liver
hepatic vein
hepatic artery
hepatic portal vein
digestive system
kidneys
renal vein
renal artery
sex organs and legs

2.70 Excretion in Flowering Plants

Why is carbon dioxide a waste product of metabolic reactions?

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Why is oxygen considered a waste product of photosynthesis?

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How do plants lose these gasses?

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2.71 – 2.79Excretion in Humans

What are the three main organs of excretion?

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What are the excretory products of these three organs?

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What are the two main roles of the kidney?

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Draw the structure of the urinary system (include the kidneys, ureters, bladder and urethra)

Sketch the structure of a nephron (include Bowman's capsule, glomerulus, convoluted tubules, loop of Henlé and collecting duct)

What is ultrafiltration?

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How does ultrafiltration happen in the Bowman's Capsule?

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How is the glomerular filtrate similar to blood plasma?

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How is the glomerular filtrate different to blood plasma?

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Where is water reabsorbed in the nephron?

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What is selective reabsorption?

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Where does selective reabsorption occur?

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Why does selective reabsorption occur?

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What is the role of ADH?

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How does ADH do its role?

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What does urine contain?

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2.80 – 2.82 Coordination and response in organisms

Give some examples organisms, plants and animals, respond to changes in the environment

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Why do organisms respond to changes in the environment?

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What does homeostasis mean?

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What internal conditions in organisms are examples of homeostasis?

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Define these terms which are required for a coordinated response:

- Stimulus: ……...
- Receptor: ……..
- Effector: ……

2.83 – 2.85 Coordination and response in Flowering Plants

What types of stimuli do plants respond to?

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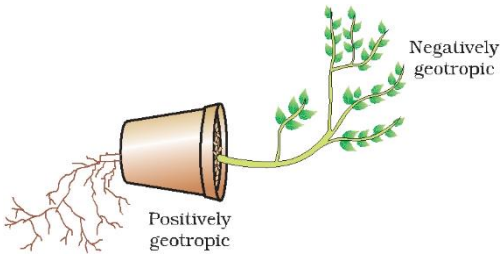
Describe what geotropic responses are in shoots and roots



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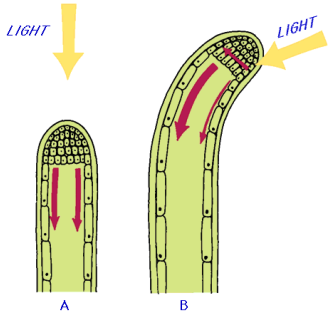
Describe what happens to plant stems in light



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What is the bending towards the light called? ……

How does auxin control the way shoots and stems respond to light?

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2.86 – 2.95 Coordination and response in humans

What is:

- Nervous communication: (*hint: it's not when you talk if you are scared* ☺)

  ……...

  ……...

- Hormonal communication:

  ……...

  ……...

Complete this table

	Nervous communication	Hormonal communication
Similarities	• • • •	• • • •
Differences	• • • • •	• • • • •

What does the central nervous system (CNS) comprise of?

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Name 5 sense organs: (you can name more than 5 if you like *but don't brag too much about how many you know*☺)

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How do these sense organs communicate with the CNS?

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Describe the route of an electrical impulse from a receptor in a sense organ to the CNS and then to an effector

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Why does the CNS need to respond rapidly to changes in the environment?

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What are reasons for having the myelin sheath surrounding the axons of neurons?

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What are synapses?

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Describe the action of how an electrical impulse is converted to a chemical impulse back to an electrical impulse at a synapse using neurotransmitters

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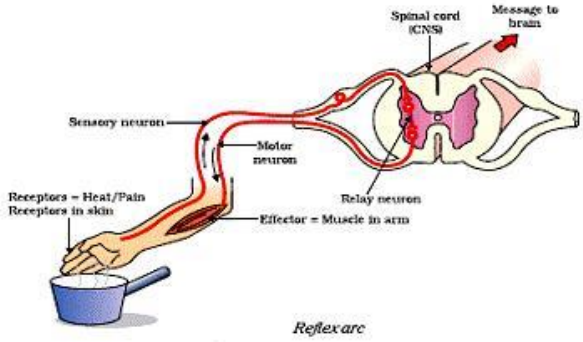
Describe this reflex arc, how is this reflex arc beneficial to humans?



Reflex arc

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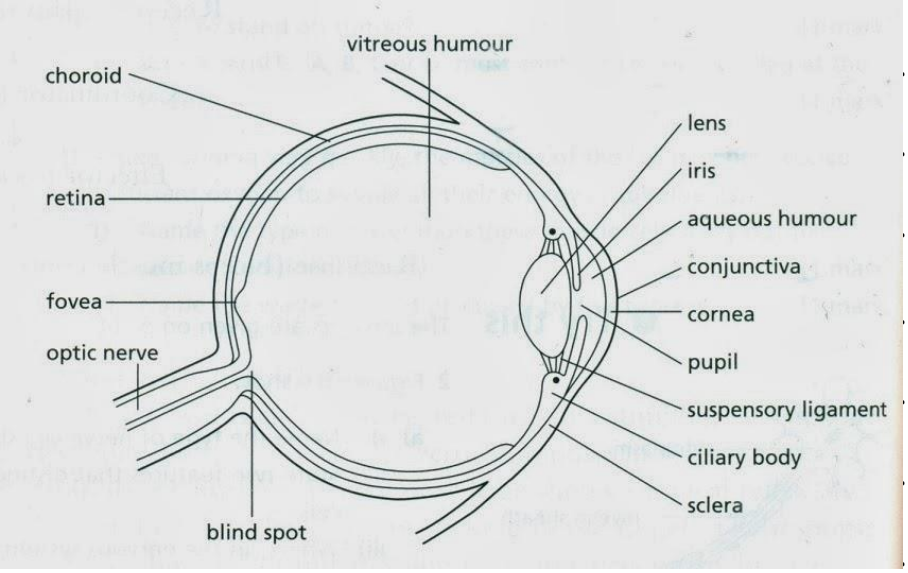
Describe the structure and function of the eye as a receptor using this diagram
What does each part do?



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Why is there a blind spot?

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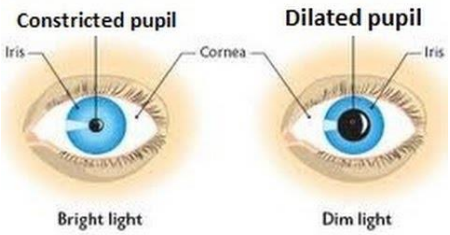
How and why does the eye respond to different light intensities (the iris reflex)? (*use: radial muscles, circular muscles, pupils*)



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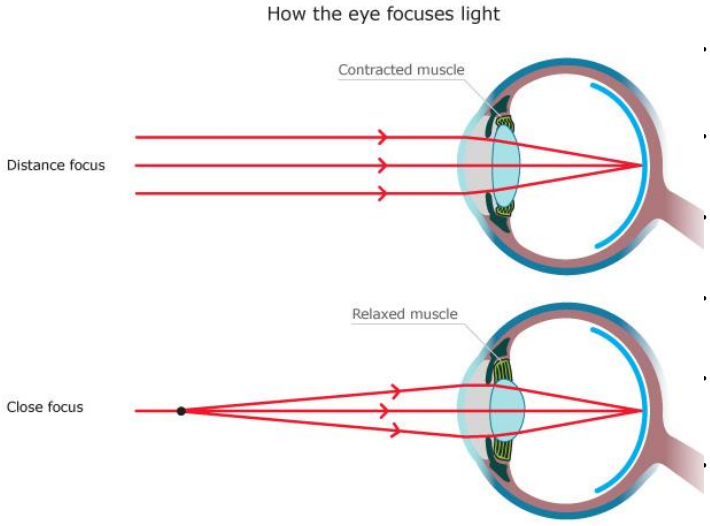
How does the eye undergo accommodation (focus on near and distant objects)? (*use: ciliary muscles, suspensory ligaments, lens*)



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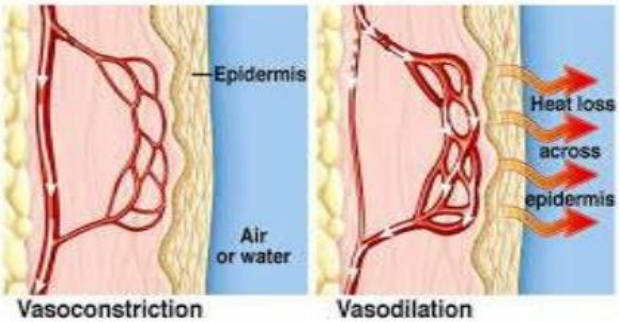
Skin helps regulate body temperature so that the body stays at the same temperature. How does it do this? Use the diagrams to help explain

Vasoconstriction – arteriole closes

Vasodilation – arteriole opens



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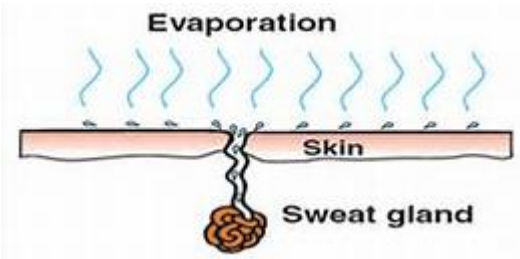
How does sweating help regulate body temperature?



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What are the sources, roles and effects of these hormones?

	Source	Role/function	Effects
ADH			
Adrenaline			
Insulin			
Testosterone			

Progesterone			
Oestrogen			
FSH			
LH			