MEGA LECTURE

AQA (GCSE Notes)

Chapter 2: Organisation

Q1. What are cells and why are they considered the basic building blocks of life?
Answer: Cells are the smallest units of life that carry out all the basic processes needed for organisms to live. They are considered the basic building blocks of life because all living things are made up of one or more cells. Cells contain structures that allow them to grow, reproduce, and respond to their environment. Without cells, there would be no way to form tissues, organs, or complete organisms.

Q2. Define a tissue and explain how it differs from an organ.
Answer: A tissue is a group of cells that have a similar structure and function. For example, muscle tissue is made up of muscle cells that work together to allow movement. An organ, on the other hand, is made up of several different types of tissues working together to perform a specific function. So, while a tissue is made of similar cells, an organ is made up of different tissues combined.

Q3. How are organs formed and what is their function in an organism?
Answer: Organs are formed when different types of tissues come together and work as a unit to carry out specific tasks. Each tissue in an organ plays a role in the overall function of that organ. For example, the heart has muscle tissue to pump blood and connective tissue to hold its shape. Organs help an organism survive by performing essential tasks like digestion, breathing, and circulation.

Q4. Describe how organs are organised into systems within the human body.
Answer: Organs are grouped into organ systems that work together to carry out major functions of the body. For example, the digestive system includes the mouth, stomach, intestines, and other organs, all of which help break down and absorb food. These systems depend on the smooth functioning of each organ and often work with other systems to maintain health and life.

Q5. Give an example of how a tissue works within an organ.
Answer: In the stomach, muscle tissue contracts to churn and mix food with digestive juices, helping to break it down. This tissue works alongside glandular tissue, which produces enzymes and acid needed for digestion. Both tissues are essential to the stomach's role in the digestive system, showing how tissues within an organ work together for a common purpose.

Q6. What is meant by the term ‘organ system’?
Answer: An organ system is a group of organs that work together to carry out a major function in the body. Each organ in the system performs a specific task that contributes to the overall job of the system. For example, the respiratory system includes the lungs, trachea, and diaphragm, all working together to supply the body with oxygen and remove carbon dioxide.

Q7. Explain how size and scale relate to cells, tissues, organs, and systems.

Answer: Size and scale refer to the levels of organisation in living things. Cells are the smallest units. Many similar cells form tissues, several tissues make up organs, and multiple organs work together as organ systems. Understanding this scale helps explain how small structures like cells contribute to large systems like the digestive or circulatory system in a body.

Q8. Why is it important for cells to work together as tissues?

Answer: When cells work together as tissues, they can perform tasks more efficiently than individual cells working alone. This cooperation allows the tissue to carry out a specific function, such as muscle contraction or nutrient absorption. Specialisation of cells within a tissue improves function and helps the body operate in a more organised and effective way.

Q9. Describe how different tissues in the stomach work together to perform digestion.

Answer: In the stomach, muscle tissue contracts to mix food, while glandular tissue produces digestive enzymes and acid to break down proteins. There is also epithelial tissue that lines the stomach and protects it from the acid. These tissues work together to ensure that food is physically and chemically digested so nutrients can be absorbed in the intestines.

Q10. Explain how organ systems work together to maintain life in an organism.

Answer: Organ systems interact to perform all functions necessary for survival. For example, the respiratory system brings in oxygen, which the circulatory system delivers to cells for respiration. The digestive system breaks down food, and the nutrients are carried by the blood. Systems depend on one another; if one fails, the body may not function properly, affecting overall health.

Q11. Describe the overall function of the human digestive system.

Answer: The digestive system breaks down food into smaller, soluble molecules that can be absorbed into the bloodstream. It includes organs like the mouth, stomach, and intestines. Enzymes help chemically break down the food, and muscle contractions help move it along the tract. The nutrients from the food are then absorbed and used for energy, growth, and repair.

Q12. Name the main organs involved in the human digestive system.

Answer: The main organs of the digestive system include the mouth, oesophagus, stomach, liver, pancreas, small intestine, and large intestine. Each of these plays a role in either the breakdown of food, the production of digestive enzymes, or the absorption and removal of waste. They all work in sequence to process the food we eat into usable nutrients.

Q13. Explain how the stomach contributes to the digestive process.

Answer: The stomach plays a key role in digestion by producing acid and enzymes that begin breaking down proteins. Its muscular walls churn the food to mix it with the digestive juices. This helps to turn the food into a semi-liquid form called chyme, which is easier for the intestines to digest and absorb. It also temporarily stores food before passing it on.

Q14. What role does the small intestine play in digestion and absorption?

Answer: The small intestine is the main site for digestion and absorption. It receives enzymes from the pancreas and bile from the liver to help digest fats, proteins, and carbohydrates. Its walls are lined with villi that increase the surface area for absorption. Nutrients pass through the walls of the intestine into the bloodstream to be used by the body.

Q15. How do enzymes speed up chemical reactions in the body?

Answer: Enzymes are biological catalysts that lower the activation energy needed for chemical reactions to take place. They allow reactions to happen faster and more efficiently without being used up. In the digestive system, they break down large molecules like proteins and carbohydrates into smaller ones that the body can absorb and use for energy and growth.

Q16. Describe the 'lock and key' theory for enzyme activity.

Answer: The 'lock and key' theory suggests that enzymes have a specific active site that matches the shape of their substrate, like a key fits into a lock. When the substrate fits into the active site, the enzyme can break it down into products. This theory explains why enzymes are specific and only work with particular molecules in the body.

Q17. How does temperature affect the activity of enzymes?

Answer: Enzyme activity increases with temperature up to a certain point because molecules move faster and collide more often. However, if the temperature gets too high, the enzyme's structure changes and the active site loses its shape. This is called denaturation, and it means the enzyme can no longer function. So, enzymes work best at an optimal temperature.

Q18. Why is pH important for enzyme function?

Answer: Enzymes work best at a specific pH level. If the pH is too high or too low, it can interfere with the bonds that hold the enzyme's shape. This changes the shape of the active site so the enzyme can no longer bind to its substrate. Each enzyme has an ideal pH depending on where it works in the body—for example, pepsin works best in acidic conditions.

Q19. What happens to enzyme activity if the pH is too high or too low?

Answer: If the pH is too high or too low, the enzyme may become denatured. This means that the shape of its active site changes and it can no longer bind to the substrate. As a result, the enzyme loses its ability to catalyse reactions, and the reaction rate slows down or stops completely. Maintaining the correct pH is essential for enzymes to work properly.

Q20. What is the function of amylase in the digestive system?

Answer: Amylase is an enzyme that breaks down starch, a complex carbohydrate, into simple sugars like maltose. This makes it easier for the body to absorb these sugars into the bloodstream. Amylase helps start the digestion of carbohydrates so they can eventually be converted into glucose, which the body uses for energy in cells.

Q21. Where is amylase produced and where does it act?

Answer: Amylase is produced in the salivary glands, the pancreas, and the small intestine. It begins working in the mouth where it breaks down starch in food as you chew. It continues to act in the small intestine after being released from the pancreas, helping to complete the breakdown of carbohydrates into simple sugars that can be absorbed.

Q22. What are the products of starch breakdown by amylase?

Answer: When amylase breaks down starch, it produces simple sugars, mainly maltose. Maltose is a disaccharide that can be further broken down into glucose by other enzymes. Glucose is the main sugar used by cells for energy. The breakdown of starch into sugars makes it easier for the body to absorb and use carbohydrates efficiently.

Q23. Name the enzymes that break down proteins and their products.

Answer: Proteins are broken down by enzymes called proteases. Examples include pepsin in the stomach and trypsin from the pancreas. These enzymes break proteins into smaller peptides and eventually into amino acids, which can be absorbed into the bloodstream. The amino acids are then used by the body to build new proteins and carry out important functions.

Q24. Where are proteases produced in the human body?

Answer: Proteases are produced in the stomach, pancreas, and small intestine. In the stomach, pepsin begins the breakdown of proteins in acidic conditions. The pancreas produces other proteases like trypsin, which act in the small intestine to continue breaking down proteins into amino acids. These enzymes are essential for digesting proteins in food.

Q25. What are lipases and what do they break down?

Answer: Lipases are enzymes that break down lipids (fats and oils) into glycerol and fatty acids. This process is important because fats need to be broken down into smaller molecules before they can be absorbed by the small intestine. Lipases are produced in the pancreas and work in the small intestine, especially after bile emulsifies the fats into small droplets.

Q26. What are the end products of lipid digestion?

Answer: The end products of lipid digestion are glycerol and fatty acids. Lipids, such as fats and oils, are broken down by the enzyme lipase in the small intestine. This breakdown is necessary because fats are large, insoluble molecules that must be turned into smaller, soluble ones to be absorbed through the walls of the intestine into the bloodstream for use in the body.

Q27. Why is digestion necessary before absorption of food molecules?

Answer: Digestion is necessary because most food molecules are too large and complex to pass through the walls of the intestine into the blood. Enzymes break them down into small, soluble molecules like glucose, amino acids, fatty acids, and glycerol. These smaller molecules can then be absorbed by the small intestine and used by the body for energy, growth, and repair.

Q28. How are the products of digestion used in the body?

Answer: The products of digestion are absorbed into the bloodstream and transported to cells. Glucose is used in respiration to release energy. Amino acids are used to build new proteins needed for growth and repair. Fatty acids and glycerol can be used as a source of energy or stored in the body. These products support many life processes and are vital for survival.

Q29. What happens to the glucose produced by digestion?

Answer: Glucose enters the bloodstream from the small intestine and is carried to body cells where it is used in cellular respiration. This process releases energy that the cells need to carry out their functions. Any extra glucose can be stored in the liver and muscles as glycogen, or if in excess, converted into fat for long-term energy storage.

Q30. What is the role of bile in digestion?

Answer: Bile helps in the digestion of fats. It is alkaline and neutralises stomach acid, creating the right pH for enzymes in the small intestine to work effectively. It also breaks up large fat droplets into smaller ones in a process called emulsification, which increases the surface area for lipase to act on, speeding up the breakdown of fats.

Q31. Where is bile made and where is it stored?

Answer: Bile is made in the liver and stored in the gall bladder. From the gall bladder, it is released into the small intestine when food containing fat enters. Bile does not contain enzymes, but it plays a key role in preparing fats for digestion and in maintaining an alkaline environment in the small intestine.

Q32. How does bile help lipase work more effectively?

Answer: Bile emulsifies large fat droplets into smaller ones, which increases their surface area. This makes it easier for lipase enzymes to access the fat molecules and break them down into glycerol and fatty acids. Bile also neutralises stomach acid, creating an alkaline environment in the small intestine, which is the ideal condition for lipase to work efficiently.

Q33. What is emulsification and why is it important in digestion?

Answer: Emulsification is the process where bile breaks large fat droplets into smaller ones. This increases the surface area of the fat, allowing lipase enzymes to act more effectively and speed up the digestion of fats. Without emulsification, lipase would have less surface area to work on, making fat digestion slower and less efficient.

Q34. Explain how the alkaline nature of bile aids fat digestion.

Answer: The stomach contents entering the small intestine are acidic. Bile is alkaline, so it neutralises the acid to provide the right pH for enzymes, including lipase, to work. Enzymes like lipase need slightly alkaline conditions to function well, so bile helps create the optimal environment for fat digestion to take place efficiently.

Q35. How do digestive enzymes differ in terms of the substrates they act upon?

Answer: Digestive enzymes are specific to the type of molecule they break down. Amylase acts on starch to produce sugars. Proteases act on proteins to produce amino acids. Lipases act on fats (lipids) to produce glycerol and fatty acids. Each enzyme has a unique active site that fits only one specific substrate, making them highly specific in their action.

Q36. Give a word equation for the breakdown of starch.

Answer: Starch → Maltose. This word equation describes the action of amylase breaking down starch, a complex carbohydrate, into maltose, a simpler sugar. Maltose can later be broken down into glucose, which is then absorbed into the bloodstream and used by the body for energy in respiration.

Q37. Why are chemical symbol equations not required at this level?

Answer: Chemical symbol equations are not required at this level because the focus is on understanding the basic processes and functions of digestion rather than on the detailed chemical structures. Using word equations allows students to concentrate on the overall process and purpose of digestion without needing advanced knowledge of chemistry symbols or formulae.

Q38. Explain the importance of surface area in enzyme action.

Answer: A larger surface area allows enzymes to access more substrate molecules at once, increasing the rate of reaction. For example, when fats are broken into smaller droplets by bile, the surface area increases, making it easier for lipase to digest them. In the small intestine, villi also increase surface area to speed up absorption of the digested food.

Q39. What are soluble molecules and why must food be converted into them?

Answer: Soluble molecules are small enough to dissolve in water and pass through the walls of the digestive tract into the bloodstream. Food must be broken down into soluble molecules like glucose, amino acids, fatty acids, and glycerol because large, insoluble molecules like starch and proteins are too big to be absorbed into the body directly.

Q40. What would happen if the body did not produce bile?

Answer: Without bile, fats would not be emulsified, meaning their surface area would remain too small for efficient digestion by lipase. As a result, fat digestion would be slow and incomplete, leading to poor absorption of fatty acids and glycerol. Also, without bile's alkalinity, enzymes in the small intestine would not function properly, reducing overall digestive efficiency.

Q41. Why must enzyme action be specific to one type of molecule?

Answer: Enzymes are specific because each has a unique active site that only fits a particular substrate, like a key fits a lock. This ensures that enzymes catalyse only the correct reactions. If enzymes were not specific, they could affect other molecules and cause harmful reactions or break down substances that are needed by the body.

Q42. What could happen if an enzyme's active site changes shape?

Answer: If the active site changes shape, usually due to changes in temperature or pH, the substrate can no longer fit, and the enzyme becomes denatured. This means the enzyme can no longer catalyse its reaction, and the digestion process slows down or stops. This can lead to incomplete digestion and poor nutrient absorption.

Q43. Describe a method to investigate the effect of pH on enzyme activity.

Answer: To investigate pH effects, set up test tubes with a starch solution and amylase, each at a different pH using buffer solutions. Add iodine to a spotting tile. At regular intervals, take drops from each test tube and place them on the tile. When iodine no longer turns blue-black, starch has been broken down. Compare how quickly starch disappears at each pH to find the optimum pH.

Q44. Describe a method to investigate the effect of temperature on enzyme activity.

Answer: Prepare several test tubes with the same starch and amylase mixture. Place each in a water bath at a different temperature (e.g. 20°C, 30°C, 40°C, etc.). At intervals, take drops and test for starch using iodine. The temperature where starch is broken down fastest is the optimum. Too high temperatures may denature the enzyme and slow the reaction.

Q45. What calculation could you use to find the rate of an enzyme-catalysed reaction?

Answer: You can calculate the rate by using the formula: Rate = Amount of product formed ÷ Time taken. For example, if starch is broken down, you can measure the amount of sugar produced in a given time. This gives you a simple way to compare how fast the enzyme works under different conditions, such as varying temperature or pH.

Q46. Why is it important for enzymes to work quickly in digestion?

Answer: Enzymes need to work quickly so that food is broken down fast enough to be absorbed before it leaves the digestive system. If digestion is too slow, the body won't get enough nutrients, and food may pass through undigested. Quick enzyme action ensures that nutrients are available to support body functions, energy needs, and growth.

Q47. How does the structure of the small intestine help with absorption?

Answer: The small intestine is lined with millions of villi, which are finger-like projections that increase the surface area for absorption. Each villus has a rich blood supply and thin walls to allow fast diffusion of nutrients. The large surface area, good blood flow, and short diffusion distance all help to absorb digested food efficiently into the bloodstream.

Q48. What is the role of the circulatory system after digestion has occurred?

Answer: After digestion, the circulatory system transports the absorbed nutrients from the small intestine to the rest of the body. Glucose is carried to cells for respiration, amino acids are used to build proteins, and fats are stored or used for energy. The blood also carries waste products to the kidneys for removal. It connects the digestive system to the entire body.

Q49. How does the failure of one organ system affect the whole organism?

Answer: If one organ system fails, it can disrupt the functions of others. For example, if the digestive system cannot break down food, the body will lack nutrients, affecting energy levels and growth. This can weaken the immune system, impair organ function, and reduce the efficiency of the circulatory system. All systems rely on each other to keep the organism alive and healthy.

Q50. Why is a healthy diet and lifestyle important in preventing digestive system problems?

Answer: A healthy diet provides the right nutrients, fibre, and water needed for good digestion. A poor diet can cause problems like constipation, ulcers, or obesity. Regular exercise, hydration, and avoiding too much processed food support a healthy digestive system. A balanced lifestyle helps enzymes work properly and reduces the risk of diseases like diabetes or bowel disorders.

Q51. Describe the structure and function of the human heart.

Answer: The human heart is a muscular organ made up of four chambers: two atria at the top and two ventricles at the bottom. It has valves that prevent backflow of blood. The right side pumps deoxygenated blood to the lungs, and the left side pumps oxygenated blood to the rest of the body. The heart's muscular walls contract to push blood through the circulatory system, ensuring all body cells get oxygen and nutrients.

Q52. What is meant by a double circulatory system in humans?

Answer: A double circulatory system means that blood passes through the heart twice in one full circuit of the body. One circulation is from the heart to the lungs and back (pulmonary circulation), and the other is from the heart to the rest of the body and back (systemic circulation). This allows for efficient oxygen delivery and separation of oxygenated and deoxygenated blood.

Q53. Explain the role of the right ventricle in blood circulation.

Answer: The right ventricle receives deoxygenated blood from the right atrium and pumps it to the lungs through the pulmonary artery. In the lungs, carbon dioxide is exchanged for oxygen. The right ventricle has thinner walls compared to the left because it only needs to pump blood to the nearby lungs, not the entire body.

Q54. What happens to the blood when it passes through the lungs?

Answer: When blood passes through the lungs, it releases carbon dioxide and picks up oxygen through the process of gas exchange in the alveoli. The oxygen enters the red blood cells, and the carbon dioxide is expelled from the lungs when we exhale. The now oxygenated blood returns to the heart through the pulmonary vein.

Q55. Describe the function of the left ventricle in the circulatory system.

Answer: The left ventricle pumps oxygenated blood into the aorta and around the body. It has a thicker muscular wall than the right ventricle because it needs to generate high pressure to send blood to all parts of the body. This ensures that oxygen and nutrients are delivered to tissues efficiently.

Q56. Name the main blood vessels connected to the heart and describe their functions.
Answer: The main blood vessels are the vena cava, pulmonary artery, pulmonary vein, aorta, and coronary arteries. The vena cava brings deoxygenated blood into the right atrium. The pulmonary artery carries it from the right ventricle to the lungs. The pulmonary vein returns oxygenated blood from the lungs to the left atrium. The aorta carries oxygenated blood from the left ventricle to the body. Coronary arteries supply the heart muscle with oxygenated blood.

Q57. What is the function of the aorta?
Answer: The aorta is the largest artery in the body. It carries oxygen-rich blood from the left ventricle to all the organs and tissues of the body. It branches into smaller arteries that transport the blood throughout the body. Its thick walls help withstand the high pressure generated by the heart's contractions.

Q58. What is the function of the vena cava?
Answer: The vena cava carries deoxygenated blood from the body back to the heart. The superior vena cava returns blood from the upper part of the body, and the inferior vena cava returns blood from the lower part. Both empty into the right atrium, where the blood will then be sent to the lungs for oxygenation.

Q59. What is the role of the pulmonary artery?
Answer: The pulmonary artery carries deoxygenated blood from the right ventricle to the lungs. It is the only artery that carries deoxygenated blood. In the lungs, the blood releases carbon dioxide and absorbs oxygen through gas exchange in the alveoli before returning to the heart via the pulmonary vein.

Q60. Describe the function of the pulmonary vein.
Answer: The pulmonary vein carries oxygenated blood from the lungs back to the left atrium of the heart. It is the only vein that carries oxygen-rich blood. This blood will then be pumped by the left ventricle through the aorta to supply the body’s tissues.

Q61. What do the coronary arteries do?
Answer: Coronary arteries supply oxygenated blood directly to the heart muscle (myocardium). Since the heart is a muscle that constantly works, it needs its own blood supply to function properly. The coronary arteries branch off from the aorta shortly after it leaves the heart.

Q62. Why is it important that blood flows through the coronary arteries?
Answer: Without blood flow through the coronary arteries, the heart muscle would not get the oxygen and nutrients it needs. This can lead to chest pain or even a heart attack if part of the heart muscle dies. Constant oxygen supply is essential to keep the heart pumping effectively.

Q63. Name the structures involved in the human lungs used for gaseous exchange.
Answer: The main structures are the trachea, bronchi, bronchioles, and alveoli. Air travels down the trachea, splits into bronchi, then into smaller bronchioles, and finally reaches the alveoli. The alveoli are tiny air sacs where gas exchange between the air and blood occurs.

Q64. Describe the function of the trachea in the respiratory system.
Answer: The trachea, or windpipe, is a tube that carries air from the mouth and nose down into the lungs. It is supported by rings of cartilage to keep it open during breathing. It also has mucus and tiny hairs called cilia that trap dust and microbes, helping protect the lungs from infection.

Q65. What is the role of the bronchi in the respiratory system?
Answer: The bronchi are two tubes that branch from the trachea, one to each lung. They carry air into the lungs and further divide into smaller tubes called bronchioles. Like the trachea, they are lined with mucus and cilia to trap and remove particles before air reaches the alveoli.

Q66. Describe the structure and function of alveoli.
Answer: Alveoli are tiny air sacs in the lungs with very thin walls surrounded by a network of capillaries. They are the main site for gas exchange. Oxygen passes from the alveoli into the blood, and carbon dioxide passes from the blood into the alveoli to be exhaled. Their structure allows efficient gas exchange due to a large surface area and short diffusion distance.

Q67. Explain how the alveoli are adapted for efficient gas exchange.
Answer: Alveoli have a large surface area, thin walls, and are surrounded by capillaries, which provide a short distance for gas diffusion. Their moist lining helps dissolve gases, and the rich blood supply maintains a concentration gradient, making gas exchange fast and efficient.

Q68. What surrounds the alveoli and why is it important?
Answer: A network of capillaries surrounds each alveolus. These capillaries allow oxygen to diffuse into the blood and carbon dioxide to diffuse out of the blood into the alveolus. This close contact between alveoli and capillaries ensures efficient and rapid gas exchange.

Q69. How does oxygen move from the lungs into the blood?
Answer: Oxygen diffuses from the alveoli, where its concentration is high, into the blood in the capillaries, where its concentration is lower. It moves across the thin walls of the alveoli and capillaries and binds to haemoglobin in red blood cells, which carry it to the body's tissues.

Q70. How is carbon dioxide removed from the blood into the lungs?
Answer: Carbon dioxide diffuses from the blood in the capillaries into the alveoli because it is at a higher concentration in the blood than in the alveolar air. It then travels up through the bronchioles, bronchi, and trachea to be exhaled out of the body.

Q71. What is the natural pacemaker of the heart and where is it found?
Answer: The natural pacemaker is a group of cells located in the right atrium of the heart called the sinoatrial (SA) node. It sends out regular electrical impulses that make the heart muscle contract, causing the heart to beat at a steady rate.

Q72. What is the purpose of an artificial pacemaker?
Answer: An artificial pacemaker is a small electrical device implanted under the skin to regulate the

heartbeat. It is used when the heart's natural pacemaker does not work properly. It sends electrical signals to keep the heart beating at a normal and steady rhythm.

Q73. How do artificial pacemakers help people with heart conditions?
Answer: Artificial pacemakers help by correcting irregular heartbeats, such as those that are too slow or erratic. By sending electrical pulses to the heart, they ensure the heart beats regularly and efficiently, which improves blood circulation and reduces symptoms like fatigue or dizziness.

Q74. What are arteries and how are they adapted to their function?
Answer: Arteries carry blood away from the heart under high pressure. They have thick muscular walls and elastic fibres to handle the pressure and stretch as blood pulses through. Their small lumen helps maintain high pressure, allowing blood to reach all parts of the body quickly.

Q75. Describe the structure and function of veins.
Answer: Veins carry blood back to the heart at lower pressure. They have thinner walls and a larger lumen compared to arteries. Veins contain valves that prevent backflow of blood, helping it move in one direction despite the lower pressure. They rely on muscle movement to help push blood along.

Q76. How do valves in veins help blood flow?
Answer: Valves in veins prevent the backflow of blood. Since blood in veins flows at low pressure, it can easily flow in the wrong direction. The valves open to let blood move toward the heart and close if it starts to flow backward. This ensures one-way movement, especially from the lower parts of the body where blood must travel upward against gravity.

Q77. Describe the structure and role of capillaries.
Answer: Capillaries are the smallest blood vessels. Their walls are only one cell thick, allowing substances to pass in and out easily. They form networks that connect arteries and veins and are found near every cell in the body. Their main role is to allow the exchange of oxygen, carbon dioxide, nutrients, and waste between the blood and body tissues.

Q78. How do capillaries allow efficient exchange of substances?
Answer: Capillaries have thin walls made of a single layer of cells, which allows quick diffusion of substances. They are very narrow and close to cells, reducing the distance substances must travel. Their large surface area and slow blood flow give more time for oxygen, nutrients, and waste products to be exchanged between the blood and body cells.

Q79. Explain why arteries have thick muscular walls.
Answer: Arteries carry blood away from the heart under high pressure. Their thick muscular and elastic walls help them withstand this pressure and maintain blood flow. The muscle helps to control the diameter of the artery, regulating blood flow, while the elastic fibres allow the artery to stretch and spring back with each heartbeat.

Q80. Why do veins have thinner walls compared to arteries?

Answer: Veins carry blood at lower pressure than arteries, so they do not need thick walls. Instead, they have thinner walls and a larger lumen to help blood flow more easily. Since they do not experience the same force from the heart as arteries, thick muscular walls are not necessary. Valves in veins help control the direction of flow instead.

Q81. Compare the pressure of blood in arteries and veins.

Answer: Blood pressure is much higher in arteries than in veins. Arteries must carry blood directly from the heart, which pumps it forcefully, so they experience high pressure. In contrast, blood in veins flows more slowly and at low pressure, especially after it has passed through capillaries and is returning to the heart.

Q82. Explain how blood flows from the heart to the lungs and back again.

Answer: Blood flows from the right ventricle of the heart into the pulmonary artery, which carries deoxygenated blood to the lungs. In the lungs, gas exchange occurs, and the blood becomes oxygenated. The oxygenated blood then returns to the left atrium of the heart through the pulmonary vein, completing the pulmonary circulation.

Q83. What compound measure can be used to calculate the rate of blood flow?

Answer: The rate of blood flow can be calculated using the compound measure: volume of blood per unit of time. A typical formula is:

Rate of blood flow = Volume of blood / Time

This gives a result such as millilitres per minute (mL/min), allowing comparison of flow in different organs or conditions.

Q84. How could you calculate the rate of blood flow through an organ?

Answer: To calculate the rate of blood flow through an organ, measure the volume of blood passing through it in a certain time period. Use the formula:

Rate = Volume ÷ Time

For example, if 300 mL of blood flows through an organ in 10 minutes, the rate is 30 mL/min. This measure helps in understanding how well blood supplies the organ with nutrients and oxygen.

Q85. What is blood and what does it consist of?

Answer: Blood is a fluid connective tissue that transports substances around the body. It consists of four main components: plasma, red blood cells, white blood cells, and platelets. Plasma is the liquid part, carrying dissolved substances. Red blood cells transport oxygen, white blood cells fight infection, and platelets help in clotting.

Q86. Name the four main components of blood.

Answer: The four main components of blood are:

1. Plasma – the liquid that carries cells and substances.

2. Red blood cells – carry oxygen.

3. White blood cells – fight disease.

4. Platelets – help with clotting and stop bleeding.
   Each has a specific role in keeping the body healthy and maintaining homeostasis.

Q87. What is the function of plasma in the blood?
Answer: Plasma is the pale yellow liquid part of blood that carries nutrients like glucose and amino acids, hormones, antibodies, waste products such as carbon dioxide and urea, and other dissolved substances. It also carries the blood cells and distributes heat throughout the body, helping to regulate body temperature.

Q88. Describe the function of red blood cells.
Answer: Red blood cells carry oxygen from the lungs to the body tissues and transport carbon dioxide from the tissues back to the lungs. They contain a protein called haemoglobin, which binds to oxygen. Their flexible shape and small size allow them to pass through capillaries and deliver oxygen where it is needed.

Q89. How are red blood cells adapted to carry oxygen?
Answer: Red blood cells are adapted in several ways: they have no nucleus, leaving more room for haemoglobin; they are biconcave in shape, increasing their surface area for oxygen diffusion; and they are small and flexible, allowing them to move easily through capillaries and deliver oxygen efficiently to tissues.

Q90. What is the function of white blood cells?
Answer: White blood cells defend the body against infections and harmful microorganisms. They do this by engulfing pathogens, producing antibodies to target bacteria and viruses, or releasing antitoxins to neutralise poisons. They are an essential part of the immune system and help fight off illness.

Q91. How do white blood cells protect the body from disease?
Answer: White blood cells protect the body in several ways. Phagocytes engulf and digest invading microbes. Lymphocytes produce antibodies that target specific pathogens and mark them for destruction. They can also create memory cells that help the body respond quickly if the same pathogen attacks again.

Q92. What is the role of platelets in the blood?
Answer: Platelets are small fragments of cells that help the blood to clot at the site of a wound. When a blood vessel is damaged, platelets gather at the site, stick together, and release chemicals that help form a clot, which stops bleeding and prevents harmful microbes from entering the body.

Q93. How do platelets help to prevent blood loss?
Answer: Platelets quickly respond to injuries by gathering at the broken blood vessel and forming a plug. They release substances that activate clotting factors in the plasma, leading to the formation of a blood clot. This clot seals the wound and prevents further blood loss while tissue repair begins.

Q94. Why is it important to observe blood cells under a microscope?
Answer: Observing blood cells under a microscope helps us identify and study the different types, such as red and white blood cells and platelets. It allows students and scientists to understand their shapes, count them, detect abnormalities, and observe how diseases or conditions like anaemia affect them.

Q95. Describe how different blood cells can be identified in diagrams.
Answer: In diagrams, red blood cells are shown as biconcave discs without nuclei. White blood cells are larger, have irregular shapes, and contain a visible nucleus. Platelets are tiny fragments with no nucleus. Labels and key colours in diagrams help distinguish each type and understand their roles.

Q96. Explain why red blood cells do not have a nucleus.
Answer: Red blood cells lack a nucleus to maximise the space available for haemoglobin, the molecule that carries oxygen. This allows them to transport more oxygen in each cell. It also gives them their biconcave shape, which increases the surface area for faster diffusion of oxygen and carbon dioxide.

Q97. How does the shape of a red blood cell help its function?
Answer: Red blood cells are biconcave discs, which means they are thinner in the centre than at the edges. This shape increases their surface area to volume ratio, allowing efficient oxygen absorption and release. It also helps them bend and squeeze through narrow capillaries to reach all body tissues.

Q98. Evaluate the risks involved in using donated blood products.
Answer: Using donated blood products can save lives, but there are risks such as allergic reactions, fever, and infections if the blood is not properly screened. There's also the risk of incompatibility if blood types are not matched correctly. However, modern screening methods have greatly reduced these risks, and the benefits usually outweigh them.

Q99. How can transfusions of blood be life-saving?
Answer: Blood transfusions can replace lost blood during surgery, injury, or childbirth, restoring the body's oxygen and nutrient supply. They can also be used to treat conditions like anaemia or certain cancers. Transfusions support organ function and help prevent shock or death due to severe blood loss.

Q100. Describe how the components of blood work together to support body functions.
Answer: Plasma transports nutrients, hormones, and waste. Red blood cells deliver oxygen and remove carbon dioxide. White blood cells fight infection and support the immune system. Platelets prevent bleeding by clotting blood at wounds. Together, these components ensure that cells get what they need and stay protected, keeping the body functioning well.

Q101. What causes coronary heart disease and how does it affect the heart?
Answer: Coronary heart disease (CHD) is caused by a build-up of fatty substances, like cholesterol, in the walls of the coronary arteries. This condition is called atherosclerosis. Over time, these fatty deposits narrow the arteries, making it harder for oxygen-rich blood to reach the heart muscle. This can lead to chest pain (angina), shortness of breath, and even heart attacks if the arteries become completely blocked.

Q102. Explain how a build-up of fatty material affects blood flow in coronary arteries.
Answer: The build-up of fatty materials, known as plaques, narrows the coronary arteries. This reduces the internal diameter of the arteries, limiting how much blood can pass through. As a result, less oxygen and nutrients are delivered to the heart muscle, especially during physical activity when the heart needs more oxygen. This reduced flow can cause pain, tiredness, or damage to the heart muscle.

Q103. Why does reduced blood flow in coronary arteries lead to a lack of oxygen in heart muscle?
Answer: The coronary arteries supply oxygen-rich blood to the heart muscle. When these arteries are narrowed or blocked due to fatty deposits, the flow of oxygenated blood is reduced. This means the heart muscle doesn't get the oxygen it needs to function properly, leading to pain, tiredness, and in severe cases, heart attacks where parts of the heart muscle die due to lack of oxygen.

Q104. What is the purpose of using stents in coronary heart disease?
Answer: Stents are small mesh tubes inserted into narrowed or blocked coronary arteries. Their purpose is to keep the artery open and maintain proper blood flow. This helps prevent the artery from narrowing again and reduces the risk of heart attacks and chest pain. Stents are usually placed during a procedure called angioplasty.

Q105. How do stents help reduce the symptoms of coronary heart disease?
Answer: Stents help widen narrowed coronary arteries and improve blood flow to the heart muscle. By restoring better blood circulation, stents reduce symptoms like chest pain and shortness of breath. They also help prevent heart attacks and improve the patient's ability to perform daily activities without discomfort.

Q106. What are statins and how do they help in treating heart disease?
Answer: Statins are medicines that help lower the level of cholesterol in the blood. They work by blocking a substance your body needs to produce cholesterol. Lowering cholesterol reduces the risk of fatty deposits building up in the arteries, which helps prevent coronary heart disease, heart attacks, and strokes. Statins are usually taken daily as part of long-term treatment.

Q107. Describe the role of cholesterol in the development of coronary heart disease.
Answer: Cholesterol is a fatty substance found in the blood. Too much low-density lipoprotein (LDL) cholesterol can lead to the build-up of fatty plaques inside the coronary arteries. These plaques narrow the arteries and reduce blood flow to the heart. Over time, this can cause coronary heart disease, angina, and even heart attacks if the artery becomes completely blocked.

Q108. What are the possible side effects of taking statins?
Answer: While statins are generally safe, they can have some side effects. Common side effects include muscle pain or weakness, digestive problems, and headaches. In rare cases, they may cause liver damage or a serious muscle condition called rhabdomyolysis. Regular check-ups and blood tests are often needed to monitor for side effects during treatment.

Q109. What are the advantages of using stents to treat narrowed arteries?

Answer: Stents provide immediate relief by quickly opening up narrowed arteries, allowing better blood flow to the heart muscle. They are less invasive than open-heart surgery, have a short recovery time, and are often effective in reducing chest pain and preventing heart attacks. Stents also help many patients return to normal activities sooner than with surgery.

Q110. Compare the benefits and risks of using statins versus stents.

Answer: Statins help lower cholesterol over time and prevent further artery narrowing. They are used for long-term prevention but do not instantly relieve blocked arteries. Stents, on the other hand, quickly open narrowed arteries, offering fast symptom relief. However, stents involve a surgical procedure with some risks like infection or clotting. Statins have fewer immediate risks but can cause side effects if used long-term.

Q111. What problems can occur when heart valves become faulty?

Answer: Faulty heart valves can cause blood to flow in the wrong direction or become blocked. This can lead to breathlessness, fatigue, chest pain, swelling in the legs, and irregular heartbeat. Over time, the heart may become enlarged or weakened because it has to work harder to pump blood, which can lead to heart failure if not treated properly.

Q112. Describe how a faulty heart valve affects blood flow through the heart.

Answer: A faulty heart valve can either leak (regurgitation) or become narrowed (stenosis). If it leaks, some blood flows backward instead of forward. If it's narrowed, it limits the amount of blood that can flow through. Both conditions make the heart work harder to circulate blood, reducing the efficiency of blood flow and possibly leading to symptoms like tiredness and shortness of breath.

Q113. What are the differences between biological and mechanical valve replacements?

Answer: Biological valves are made from animal or human tissue and are less likely to cause blood clots but wear out faster and may need replacing after 10–15 years. Mechanical valves are made from metal or carbon and last much longer, but patients must take blood-thinning medicine for life to prevent clots. The choice depends on the patient's age, lifestyle, and medical needs.

Q114. Why might a patient need a heart valve replacement?

Answer: A heart valve replacement is needed when a valve is severely damaged or not working properly, leading to problems like breathlessness, tiredness, or chest pain. If the faulty valve affects blood flow significantly, the heart can't pump efficiently. Replacing the valve restores normal blood flow and helps improve the patient's health and quality of life.

Q115. What are the risks involved in heart valve replacement surgery?

Answer: Like all major surgeries, valve replacement carries risks. These include infection, blood clots, bleeding, stroke, or reaction to anaesthesia. There's also a risk the new valve may fail over time. Patients receiving mechanical valves also face the long-term risk of blood clot formation, which is why they need blood thinners.

MEGA LECTURE

Q116. When might a heart transplant be needed?

Answer: A heart transplant may be needed when a person has severe heart failure that cannot be treated by medication, surgery, or other treatments. This usually happens when the heart is so weak that it can no longer pump enough blood to meet the body's needs. Common causes include advanced coronary heart disease, cardiomyopathy, or severe valve disease.

Q117. What is the difference between a heart transplant and using an artificial heart?

Answer: A heart transplant involves replacing the patient's damaged heart with a healthy one from a donor. An artificial heart is a mechanical device that temporarily takes over the heart's job. Transplants are permanent treatments, while artificial hearts are usually used as a temporary solution while waiting for a transplant or as a last resort when a transplant isn't possible.

Q118. Describe two situations where an artificial heart might be used.

Answer: An artificial heart might be used in two main situations: first, as a temporary support for patients awaiting a heart transplant, helping to keep them alive until a suitable donor is found. Second, it may be used for patients who cannot have a transplant due to health problems but need help pumping blood because their heart is too weak to function properly.

Q119. What are the advantages of using an artificial heart while waiting for a transplant?

Answer: Using an artificial heart can keep the patient alive and stable while waiting for a donor heart. It helps maintain proper blood flow and reduces the risk of organ failure caused by poor circulation. This gives the patient time to recover from other health problems and increases the chances of surviving transplant surgery when a donor heart becomes available.

Q120. List some potential disadvantages of using an artificial heart.

Answer: Artificial hearts can cause blood clots, bleeding, and infection. They may require the patient to stay in hospital or be connected to machines. The device can also wear out or stop working, and carrying external power sources can be uncomfortable. Regular check-ups and monitoring are needed, and the cost of treatment can be high.

Q121. Why must the risks and benefits of different heart disease treatments be evaluated?

Answer: Every treatment has advantages and possible side effects or risks. Evaluating them helps doctors and patients choose the best option based on the patient's health, age, and lifestyle. For example, surgery might be effective but risky for older patients. Medicine may be safer but take longer to work. Choosing the right treatment improves results and quality of life.

Q122. Explain how mechanical devices can be used to support the heart.

Answer: Mechanical devices like artificial hearts or ventricular assist devices (VADs) can help the heart pump blood when it's too weak. VADs support the left or right side of the heart or both, depending on the need. These devices can be used temporarily or permanently and help maintain circulation in people with heart failure or after surgery.

Q123. How might recovery from heart surgery be supported with technology?
Answer: Recovery can be supported with machines that monitor heart rate, oxygen levels, and blood pressure. Pacemakers can help control irregular heartbeats. Ventilators might support breathing after surgery. Robotic systems and imaging tools can help during surgery to make it safer. Physiotherapy devices and apps also help track exercise and recovery progress at home.

Q124. Why is it important to consider quality of life when choosing a treatment option?
Answer: Quality of life matters because a treatment may improve health but also bring discomfort, stress, or side effects. For example, some patients may prefer a less risky treatment even if it doesn't cure the disease completely. Considering how treatment affects daily life, mobility, and comfort helps choose the best option for long-term well-being.

Q125. Define health in terms of physical and mental well-being.
Answer: Health is a state of complete physical and mental well-being. This means not just being free from disease but also feeling good in body and mind. A healthy person can perform daily tasks, manage stress, and enjoy life. Good health includes balanced nutrition, regular exercise, enough sleep, and emotional support.

Q126. What is the difference between communicable and non-communicable diseases?
Answer: Communicable diseases are those that can spread from one person to another through viruses, bacteria, or other pathogens. Non-communicable diseases cannot be passed from person to person and are usually caused by genetics, lifestyle, or environmental factors. Communicable diseases include things like flu or tuberculosis, while non-communicable diseases include diabetes or heart disease.

Q127. Give two examples each of communicable and non-communicable diseases.
Answer: Two examples of communicable diseases are influenza and tuberculosis. They spread through contact or air. Two examples of non-communicable diseases are type 2 diabetes and cancer. These are caused by factors like poor diet, genetics, or smoking and cannot be spread between people.

Q128. How can diet affect a person's physical health?
Answer: A balanced diet provides the nutrients the body needs to function properly. Poor diet, such as eating too much fat, sugar, or salt, can lead to obesity, high blood pressure, or heart disease. Lack of nutrients like vitamins and minerals can also weaken the immune system, affect growth, and lead to conditions like anaemia or rickets.

Q129. How can stress influence mental and physical health?
Answer: Stress can lead to mental health problems like anxiety or depression. It can also cause physical issues such as headaches, high blood pressure, or weakened immunity. Long-term stress may increase the risk of heart disease and affect sleep, digestion, and overall well-being. Managing stress is important for both mental and physical health.

Q130. What does it mean when diseases interact with each other?

Answer: When diseases interact, one disease can make another worse or increase the chances of getting it. For example, people with a weak immune system due to HIV are more likely to catch other infections. Similarly, someone with diabetes may have a higher risk of heart disease. Interactions can make diagnosis and treatment more complicated.

Q131. Explain how immune system defects increase the risk of infectious diseases.

Answer: The immune system protects the body against infections. If it has defects, such as those caused by inherited conditions or diseases like HIV, it cannot fight off infections properly. This means that even common germs can cause serious illness. People with weak immune systems often get sick more easily and take longer to recover.

Q132. How can viruses lead to cancer development?

Answer: Some viruses can damage the DNA in cells, leading to uncontrolled cell growth, which causes cancer. For example, human papillomavirus (HPV) can lead to cervical cancer, and hepatitis B or C can increase the risk of liver cancer. These viruses interfere with normal cell processes, which can lead to tumour formation over time.

Q133. What is the link between immune reactions and allergic responses?

Answer: Allergic responses happen when the immune system overreacts to something harmless, like pollen or dust. Instead of ignoring it, the body treats it as a threat and produces a reaction, such as sneezing, swelling, or a rash. This is an abnormal immune response, and it can range from mild to severe, like anaphylaxis.

Q134. How can a long-term physical illness lead to mental illness?

Answer: Living with a long-term physical illness can affect a person's emotions and mental health. They may feel stressed, anxious, or depressed due to pain, tiredness, or changes in daily life. Conditions like cancer or arthritis can limit independence and social activities, leading to loneliness and a lower mood, which may develop into mental illness.

Q135. Why is it important to study how diseases interact?

Answer: Understanding how diseases interact helps doctors give better care. One disease might worsen another or change how treatment works. For example, diabetes can increase the risk of heart disease. Studying these links helps with earlier diagnosis, better treatment plans, and improving the patient's overall health and quality of life.

Q136. How can epidemiological data be used to understand health trends?

Answer: Epidemiological data involves studying how often diseases happen and who is affected. It helps scientists spot patterns and causes of illnesses in a population. This information is used to plan health services, prevent disease outbreaks, and guide health campaigns. For example, it can show whether smoking is linked to cancer in certain groups.

Q137. What is the importance of sampling in health studies?
Answer: Sampling allows scientists to study a small group of people to learn about a larger population. It saves time and resources while still giving useful information. A good sample should represent the wider population fairly. Proper sampling helps researchers find reliable patterns in health data and make accurate conclusions.

Q138. Describe how a scatter diagram could show a link between smoking and heart disease.
Answer: A scatter diagram plots individual data points for two variables, such as number of cigarettes smoked and number of heart disease cases. If the points go upwards together, it suggests a positive correlation: as smoking increases, heart disease cases increase. This helps show a possible link between the two factors.

Q139. How can bar charts be used to compare the rates of different diseases?
Answer: Bar charts show data in the form of rectangular bars. Each bar represents a different disease, and the height of the bar shows how common it is. Bar charts make it easy to compare disease rates across groups, like age or gender. They help highlight which diseases are most common and need more attention.

Q140. What are the benefits of using histograms in presenting health data?
Answer: Histograms show how data is distributed across ranges, like age or blood pressure levels. They are useful when data is continuous. Unlike bar charts, the bars touch each other, showing that the data is in ranges. Histograms help identify trends, such as whether most people fall into a healthy range or are at risk.

Q141. How would you construct a frequency table for the number of people with asthma in a population?
Answer: To construct a frequency table, first decide the groups you want to study, such as age ranges or cities. Then count how many people in each group have asthma and write that number next to the group. This table helps summarise the data and makes it easier to spot trends or compare groups.

Q142. Explain how to interpret a scatter diagram that shows a positive correlation.
Answer: A scatter diagram with a positive correlation shows that as one variable increases, the other does too. The data points trend upward from left to right. For example, if exercise level and fitness score are plotted, a positive correlation means people who exercise more tend to have higher fitness scores.

Q143. What is meant by correlation and how does it apply to disease research?
Answer: Correlation means a relationship between two variables. In disease research, it shows whether two things are linked, like smoking and lung disease. If both increase together, that's a positive correlation. If one goes up and the other down, it's negative. It helps scientists find possible causes or risk factors for diseases.

Q144. Give an example of two variables in health studies that may show a correlation.
Answer: One example is the number of hours spent sitting and the risk of obesity. If sitting time increases and so does body weight, this shows a positive correlation. Another example is fruit intake and vitamin C levels—more fruit might mean higher vitamin levels. These patterns help identify health risks or benefits.

Q145. Why is it important to convert between numerical and graphical data in science?
Answer: Converting between numerical and graphical data helps scientists understand and explain patterns more easily. Graphs make complex data clearer and quicker to understand. For example, a chart can show a rise in flu cases over time better than a long list of numbers. It also helps when sharing results with others.

Q146. How might scientists use data to support the claim that exercise reduces heart disease?
Answer: Scientists could collect data on people's exercise levels and compare it with how many of them have heart disease. If the data shows that people who exercise more have lower rates of heart disease, it supports the claim. They can also use graphs, surveys, and long-term studies to show a clear link.

Q147. How do scientists ensure that their health data samples are reliable?
Answer: Scientists make sure their samples are large enough and include a variety of people to represent the population. They also avoid bias by selecting people randomly and checking that their methods are fair and consistent. They may repeat studies and compare results with other research to confirm reliability.

Q148. What is a control group and why is it important in health research?
Answer: A control group is a group in an experiment that does not receive the treatment being tested. It's used as a comparison to see if the treatment works. By comparing the results of the control group with the treated group, scientists can see whether any changes are due to the treatment or something else.

Q149. How can bias be reduced when collecting data on disease incidence?
Answer: Bias can be reduced by using random sampling, making sure data collectors don't influence responses, and using clear, fair questions. It's also important to include people from different backgrounds. Checking the methods carefully and repeating studies can help reduce errors and make the results more accurate.

Q150. Why is understanding health data important for public health decisions?
Answer: Health data helps governments and health organisations understand which diseases are common, who is most affected, and where support is needed. This helps them plan services, create health campaigns, and use resources wisely. Without accurate data, they might miss problems or spend money in the wrong places.

Q151. What is a non-communicable disease and how is it different from a communicable disease?
Answer: A non-communicable disease is a disease that cannot be passed from one person to another. It is usually caused by lifestyle factors, genetic conditions, or environmental influences. In contrast, communicable diseases are caused by pathogens like bacteria or viruses and can spread between individuals. Non-communicable diseases include heart disease and cancer, while communicable diseases include flu and tuberculosis.

Q152. How does an unhealthy diet increase the risk of non-communicable diseases?
Answer: An unhealthy diet high in fat, sugar, and salt can lead to obesity, high blood pressure, and high cholesterol. These increase the risk of developing non-communicable diseases like type 2 diabetes, heart

disease, and stroke. A lack of essential nutrients can also weaken the immune system and overall body function, making it harder for the body to stay healthy.

Q153. Explain how smoking affects the risk of developing cardiovascular diseases.
Answer: Smoking damages the lining of the arteries, leading to the build-up of fatty material that narrows the arteries. It also increases blood pressure and heart rate, making the heart work harder. Smoking raises the risk of blood clots and reduces oxygen in the blood, all of which increase the risk of heart attacks, strokes, and other cardiovascular diseases.

Q154. In what way can regular physical activity reduce the risk of heart disease?
Answer: Regular physical activity strengthens the heart, improves circulation, and helps maintain a healthy weight. It lowers blood pressure, reduces bad cholesterol levels, and increases good cholesterol. Exercise also helps control blood sugar and reduces stress, all of which reduce the risk of developing heart disease and improve overall heart health.

Q155. How does alcohol misuse affect the function of the liver?
Answer: Alcohol is processed by the liver, and drinking too much over time can damage liver cells. This can lead to fatty liver, inflammation (alcoholic hepatitis), and eventually scarring (cirrhosis), which stops the liver from working properly. A damaged liver cannot filter toxins from the blood, leading to serious health problems.

Q156. What are the long-term effects of alcohol on brain function?
Answer: Long-term alcohol use can shrink brain tissue and damage nerve cells. This may lead to memory loss, poor concentration, and difficulty making decisions. Over time, it can cause mental health problems like depression and anxiety, and in severe cases, brain damage and permanent cognitive decline known as alcohol-related dementia.

Q157. How can smoking and alcohol use during pregnancy harm the unborn baby?
Answer: Smoking during pregnancy reduces oxygen supply to the baby and can cause low birth weight, premature birth, and developmental issues. Alcohol use can lead to foetal alcohol syndrome (FAS), which causes physical and learning disabilities. Both substances increase the risk of miscarriage, stillbirth, and long-term health problems in the child.

Q158. What are risk factors and how are they linked to disease development?
Answer: Risk factors are conditions or behaviours that increase the chance of developing a disease. These include things like smoking, poor diet, lack of exercise, or exposure to harmful chemicals. The more risk factors a person has, the higher their chances of getting a disease such as cancer, diabetes, or heart disease.

Q159. Name three lifestyle-related risk factors and the diseases they are linked to.
Answer: 1) Smoking – linked to lung cancer and heart disease. 2) Poor diet – linked to obesity and type 2 diabetes. 3) Lack of exercise – linked to heart disease and stroke. These lifestyle choices affect how the body functions and can lead to serious health problems over time.

Q160. How can substances in the environment act as risk factors for disease?
Answer: Substances like air pollution, asbestos, and harmful chemicals can damage cells and organs when people are exposed over time. For example, breathing in polluted air can lead to asthma or lung cancer. Long-term exposure to harmful substances in workplaces or homes increases the risk of developing diseases.

Q161. What is meant by a causal mechanism in disease research?
Answer: A causal mechanism explains how a risk factor directly causes a disease. It shows the step-by-step process inside the body. For example, smoking introduces harmful chemicals that damage lung tissue, which can cause mutations in cells and lead to cancer. Proving this process helps confirm the link between a behaviour and a disease.

Q162. Give an example of a risk factor with a proven causal link to a disease.
Answer: Smoking has a proven causal link to lung cancer. The chemicals in cigarette smoke damage the DNA in lung cells, which can cause them to grow uncontrollably and form a tumour. This has been shown through many studies and supported by clear biological evidence of how smoking harms the lungs.

Q163. Why is it difficult to prove a causal relationship for some risk factors?
Answer: It is difficult because many diseases have more than one cause, and people may be exposed to many risk factors at once. Some links may appear due to coincidence or other hidden factors. Also, it can take many years for a disease to develop, making it hard to trace the exact cause without long-term studies.

Q164. What is the relationship between obesity and Type 2 diabetes?
Answer: Obesity is a major risk factor for type 2 diabetes. Extra fat, especially around the abdomen, makes the body's cells less sensitive to insulin. This means sugar stays in the blood instead of being used for energy. Over time, this leads to high blood sugar levels and the development of type 2 diabetes.

Q165. How does smoking damage the lungs and lead to disease?
Answer: Smoking introduces harmful substances like tar and chemicals into the lungs. These damage the airways and small air sacs, making breathing harder. Smoking also causes inflammation and leads to diseases such as chronic bronchitis, emphysema, and lung cancer. Over time, the lungs lose their ability to take in oxygen properly.

Q166. What is the link between smoking and the development of lung cancer?
Answer: Cigarette smoke contains cancer-causing substances that damage the cells in the lungs. With repeated exposure, the cells can change and begin to grow out of control, forming a tumour. Smoking is the main cause of lung cancer and is responsible for most cases worldwide, making the link very strong and well-proven.

Q167. How can alcohol use lead to damage of the nervous system?
Answer: Alcohol affects how the brain sends signals to the body. Heavy drinking over time can damage nerves and brain tissue, leading to problems with movement, coordination, memory, and decision-making. In

serious cases, it can cause permanent nerve damage and brain conditions such as Wernicke-Korsakoff syndrome.

Q168. Why is it important to understand the combined effects of multiple risk factors?
Answer: People often have more than one risk factor at the same time. These factors can work together and increase the overall risk of disease more than any one factor alone. Understanding this helps doctors give better advice and treatments, and helps people make better lifestyle choices to reduce their risk.

Q169. How do poor lifestyle choices impact health at a national level?
Answer: Poor lifestyle choices like unhealthy eating, smoking, and lack of exercise lead to more cases of chronic diseases. This increases the demand on healthcare services and costs the country more money. It also reduces productivity as more people take time off work due to illness, affecting the economy and public health.

Q170. What are the global consequences of widespread non-communicable diseases?
Answer: Globally, non-communicable diseases are a leading cause of death. They strain healthcare systems, especially in poorer countries, and reduce life expectancy. These diseases slow economic development and increase poverty as families spend money on treatment and lose income when someone becomes too sick to work.

Q171. What is the human cost of living with a chronic non-communicable disease?
Answer: Living with a chronic disease can mean long-term pain, tiredness, and emotional stress. It may limit daily activities, reduce quality of life, and cause financial hardship due to treatment costs and lost income. It can also affect relationships and independence, leading to mental health issues like depression.

Q172. How do non-communicable diseases affect the economy of a country?
Answer: Non-communicable diseases increase healthcare costs, reduce worker productivity, and increase disability rates. People may retire early or take long sick leave. This reduces the available workforce and increases government spending on health and welfare. In the long term, this slows economic growth and puts pressure on public resources.

Q173. What is a carcinogen? Give one example.
Answer: A carcinogen is any substance that can cause cancer. It does this by damaging the DNA in cells, which may lead to uncontrolled cell growth. One example is asbestos, a material once used in buildings. When inhaled, asbestos fibres can damage lung tissue and lead to cancer like mesothelioma.

Q174. How does ionising radiation increase the risk of cancer?
Answer: Ionising radiation has enough energy to damage DNA in cells. This damage can lead to mutations, which may cause the cells to grow and divide uncontrollably, forming a tumour. Sources include X-rays, radioactive materials, and too much exposure to the sun's UV rays. Long-term exposure increases the risk of developing cancer.

Q175. What is the difference between correlation and causation in health data?
Answer: Correlation means there is a relationship between two factors, but it does not prove that one causes the other. Causation means one factor directly causes the other. For example, there may be a correlation between ice cream sales and sunburns, but sunburns are caused by sunlight, not ice cream. In health research, proving causation requires more detailed evidence.

Q176. How can scientists use scatter diagrams to study disease risk?
Answer: Scientists use scatter diagrams to show the relationship between two variables, such as smoking and lung cancer rates. Each point represents data from one source, like an individual or group. If the points show a clear trend, like increasing cancer rates with more smoking, it suggests a correlation. This helps scientists identify possible risk factors for diseases.

Q177. Why is it useful to present disease data in bar charts or histograms?
Answer: Bar charts and histograms make it easier to see patterns and compare data. Bar charts are useful for comparing different categories, like disease rates in different age groups. Histograms show how data is spread across a range, such as ages of people diagnosed with a disease. These visual tools help explain information clearly and quickly.

Q178. How can a line graph help track trends in non-communicable disease over time?
Answer: Line graphs show how something changes over time. For example, a line graph of heart disease cases over 10 years can show whether cases are increasing or decreasing. This helps researchers, doctors, and health officials understand long-term trends, evaluate public health efforts, and plan for future healthcare needs.

Q179. What is the purpose of using sampling in health studies?
Answer: Sampling allows researchers to study a small group of people instead of the whole population. This saves time and resources. If done correctly, the sample can represent the population accurately and give useful information about health trends, disease risks, and treatment outcomes. It's a key part of reliable scientific research.

Q180. How can researchers ensure their sample represents a population accurately?
Answer: Researchers can use random sampling to avoid bias and make sure the sample includes people of different ages, genders, and backgrounds. The sample size should be large enough, and the selection process should avoid favouring certain groups. This helps ensure the data collected gives a fair picture of the whole population.

Q181. How might researchers identify a correlation between alcohol use and liver disease?
Answer: Researchers can collect data on alcohol consumption and compare it to liver disease rates in the same group of people. If liver disease becomes more common as alcohol intake increases, they may observe a positive correlation. A scatter diagram can show this trend visually. Further studies can help confirm the strength of the link.

Q182. What is meant by interpreting data between graphical and numerical forms?
Answer: Interpreting data between graphical and numerical forms means understanding information shown in charts or graphs and relating it back to numbers, or vice versa. For example, looking at a bar chart of disease rates and identifying the exact number in each bar. It helps with analysing and communicating health data accurately.

Q183. What are the benefits of using data tables in studying disease risk?
Answer: Data tables organise information clearly, making it easier to compare different variables such as age, lifestyle, or disease rates. They help spot trends and draw conclusions. Tables can also support further analysis, like creating graphs or calculating averages. They are useful for both researchers and healthcare planners.

Q184. What is the purpose of using frequency tables in public health studies?
Answer: Frequency tables show how often a particular event or characteristic appears in a dataset, such as how many people in each age group have asthma. This helps public health officials understand how common certain diseases are, identify high-risk groups, and plan prevention and treatment strategies accordingly.

Q185. What can a scatter diagram tell us about the relationship between smoking and cancer?
Answer: A scatter diagram can show if there is a pattern between the amount people smoke and the number of cancer cases. If the dots on the graph trend upward, it suggests that more smoking is linked to more cancer cases. This shows a positive correlation, which can guide further research on smoking as a risk factor.

Q186. What is cancer and how does it develop in the body?
Answer: Cancer is a disease where cells grow and divide uncontrollably. It starts when the DNA in a cell is damaged and the cell doesn't repair itself or die as it should. These abnormal cells keep growing and form a lump called a tumour. If not treated, they can spread and interfere with how the body works.

Q187. Describe the process that leads to uncontrolled cell growth in cancer.
Answer: Uncontrolled cell growth happens when the genes that control cell division are damaged. Normally, cells divide in a controlled way, but in cancer, this control is lost. The damaged cells keep dividing even when the body doesn't need them. Over time, this forms a tumour, and the cells can invade nearby tissues or spread to other parts of the body.

Q188. What is the difference between a benign and a malignant tumour?
Answer: A benign tumour is non-cancerous. It grows slowly, does not spread to other parts of the body, and is often harmless. A malignant tumour is cancerous. It grows quickly, invades nearby tissues, and can spread to other parts of the body through the blood or lymph system. Malignant tumours are more dangerous.

Q189. How do malignant tumour cells spread in the body?
Answer: Malignant tumour cells can break away from the original tumour, enter the bloodstream or lymphatic system, and travel to other parts of the body. There, they can form new tumours called secondary tumours. This process is called metastasis and makes cancer harder to treat, as it affects more than one area.

Q190. What are secondary tumours and how are they formed?
Answer: Secondary tumours form when cancer cells from a malignant tumour spread to another part of the body. These cells travel through the blood or lymph system, settle in a new location, and start growing into a new tumour. These are still cancerous and usually more difficult to treat than the original tumour.

Q191. Why are benign tumours generally less dangerous than malignant ones?
Answer: Benign tumours do not spread to other parts of the body, grow slowly, and are usually easy to remove. They don't invade nearby tissues or cause damage in the same way malignant tumours do. Because they stay in one place and are less aggressive, they usually pose less risk to health.

Q192. How can lifestyle choices influence the risk of developing cancer?
Answer: Certain lifestyle choices increase the risk of cancer. Smoking, drinking too much alcohol, eating unhealthy foods, and not exercising can lead to changes in the body that cause cancer. On the other hand, avoiding tobacco, eating a healthy diet, staying active, and limiting alcohol can lower the risk.

Q193. Name two lifestyle-related risk factors for cancer and the types they are linked to.
Answer: 1) Smoking – linked to lung cancer, mouth cancer, and throat cancer. 2) Alcohol – linked to liver cancer and breast cancer. These risk factors contain harmful substances or cause damage in the body that can lead to cancer over time, especially with long-term use or exposure.

Q194. What is the role of genetic factors in the development of some cancers?
Answer: Some people inherit faulty genes that increase their risk of cancer. These genetic mutations can make it easier for cells to grow uncontrollably. For example, BRCA gene mutations increase the risk of breast and ovarian cancer. However, not everyone with these genes will develop cancer—it often depends on other factors too.

Q195. Why is early detection of cancer important for treatment success?
Answer: Early detection means the cancer is found before it has grown large or spread to other parts of the body. Treatment is usually more effective at this stage, and the chances of recovery are much higher. It also means less aggressive treatment may be needed, reducing side effects and improving quality of life.

Q196. Describe one method used to detect cancer at an early stage.
Answer: One common method is cancer screening, such as mammograms for breast cancer. A mammogram is an X-ray of the breast that can detect lumps or changes before symptoms appear. Regular screenings help find cancer early so treatment can start sooner and be more successful.

Q197. How can public health campaigns reduce cancer risk in the population?
Answer: Public health campaigns raise awareness about risk factors like smoking, poor diet, and lack of exercise. They encourage people to make healthier choices and promote early screening. Campaigns can also push for policies to limit harmful substances, like banning smoking in public places, which helps reduce cancer cases in the population.

Q198. Why is it important to continue research into cancer causes and treatments?
Answer: Continued research helps us understand what causes cancer, find new ways to prevent it, and develop better treatments. New research can lead to earlier detection methods, more effective drugs, and improved survival rates. It also helps reduce side effects and offers hope to people living with cancer.

Q199. What is the difference between cancer prevention and cancer treatment?
Answer: Cancer prevention focuses on stopping cancer from developing, using steps like avoiding tobacco, eating healthy, and regular screening. Cancer treatment happens after cancer is found and includes methods like surgery, chemotherapy, or radiation to remove or destroy the cancer. Prevention aims to reduce risk, while treatment deals with the disease.

Q200. How can a person reduce their personal risk of developing cancer?
Answer: A person can reduce their cancer risk by not smoking, eating a balanced diet, exercising regularly, avoiding too much alcohol, protecting their skin from the sun, and going for regular check-ups. These healthy habits lower exposure to known risk factors and help keep the body strong to fight off disease.

Q201. What is a tissue and how is it defined in plants?
Answer: A tissue is a group of cells that work together to carry out a specific function. In plants, tissues are collections of similar cells that perform roles like support, transport, or photosynthesis. Plant tissues are organised into systems that help the plant grow, take in nutrients, move water and food, and respond to the environment.

Q202. Name five plant tissues and describe the general role of each.
Answer: 1) **Epidermal tissue** – covers and protects the surface of the plant. 2) **Palisade mesophyll** – contains many chloroplasts for photosynthesis. 3) **Spongy mesophyll** – helps with gas exchange and also carries out some photosynthesis. 4) **Xylem tissue** – transports water and minerals from roots to leaves. 5) **Phloem tissue** – transports sugars made in the leaves to the rest of the plant.

Q203. How is the epidermal tissue of a plant adapted for its function?
Answer: Epidermal tissue forms the outer layer of cells and is usually transparent to let light through for photosynthesis. In some cases, it has a waxy cuticle to reduce water loss. It also forms root hairs to increase surface area for water and mineral absorption. The cells fit tightly together to protect against pathogens.

Q204. What is the function of the palisade mesophyll in the leaf?
Answer: The palisade mesophyll is the main site of photosynthesis in the leaf. It contains many chloroplasts that absorb sunlight and use it to make food (glucose) for the plant. These cells are located just below the upper epidermis where they get the most light.

Q205. How is the structure of the palisade mesophyll related to its function?
Answer: The palisade mesophyll cells are packed tightly together and located near the top of the leaf to absorb maximum light. They contain many chloroplasts to carry out lots of photosynthesis. The tall, column-shaped cells give a large surface area to absorb light efficiently.

Q206. What is the role of the spongy mesophyll in a leaf?
Answer: The spongy mesophyll helps with gas exchange in the leaf. It has large air spaces between cells, allowing gases like carbon dioxide and oxygen to move easily. These cells also have some chloroplasts, so they carry out photosynthesis, although less than the palisade layer.

Q207. How does the structure of the spongy mesophyll support gas exchange?
Answer: The spongy mesophyll has loosely packed cells and many air spaces, which allow gases to move between the stomata and the photosynthesising cells. This structure helps carbon dioxide reach cells for photosynthesis and allows oxygen to leave the leaf easily.

Q208. What is the function of xylem tissue in plants?
Answer: Xylem tissue carries water and dissolved minerals from the roots to the rest of the plant, especially to the leaves. This water is needed for photosynthesis and to keep the plant firm. Xylem also supports the plant because its walls are thick and strong.

Q209. How is xylem tissue adapted for water transport?
Answer: Xylem cells are long, hollow tubes with no end walls, which allows water to flow freely. Their walls are strengthened with lignin, which gives support and prevents them from collapsing. They also don't have a nucleus or cytoplasm, so there is no blockage to the water flow.

Q210. What is the function of phloem tissue in plants?
Answer: Phloem tissue transports dissolved sugars, mainly sucrose, from the leaves to the rest of the plant. This includes areas of growth like roots, stems, and developing fruits. This process is called translocation and it moves food in both directions depending on the plant's needs.

Q211. How is phloem tissue adapted to carry dissolved sugars?
Answer: Phloem is made of sieve tube elements and companion cells. The sieve tubes have holes to allow sugar to move from one cell to the next. They have no nucleus, but the companion cells next to them control the activity. These cells help load and unload sugars into the phloem.

Q212. Where is meristem tissue found in a plant and what is its function?
Answer: Meristem tissue is found at the tips of roots and shoots and in buds. It contains unspecialised cells that divide rapidly. These cells can become any other type of plant cell, allowing the plant to grow and repair itself. This tissue helps the plant increase in length and develop new organs.

Q213. Why is the leaf considered an organ in a plant?
Answer: The leaf is made up of different tissues that work together to perform photosynthesis, which is a vital function. It includes epidermal tissue for protection, mesophyll for photosynthesis, and vascular tissues (xylem and phloem) for transport. Because it performs a specific function using several tissues, it is called an organ.

Q214. What is the role of guard cells in a leaf?
Answer: Guard cells control the opening and closing of stomata. They help regulate gas exchange by

allowing carbon dioxide in for photosynthesis and letting oxygen and water vapour out. They also help reduce water loss by closing the stomata when the plant is short of water.

Q215. How do guard cells help control water loss in a plant?
Answer: When the plant has enough water, guard cells take in water and swell, opening the stomata. When water is scarce, they lose water and shrink, closing the stomata. This reduces the amount of water vapour that escapes from the leaf and helps the plant conserve water.

Q216. What are stomata and what is their role in plant function?
Answer: Stomata are small openings mostly found on the underside of leaves. They allow gases like carbon dioxide, oxygen, and water vapour to move in and out of the leaf. This is important for photosynthesis, respiration, and transpiration. They are opened and closed by guard cells.

Q217. How do stomata open and close?
Answer: Stomata open when guard cells take in water, swell, and bend to create a gap. They close when guard cells lose water and become floppy, closing the gap. This opening and closing is controlled by light, water availability, and internal signals from the plant.

Q218. What is the relationship between stomata and transpiration?
Answer: Transpiration is the loss of water vapour through the stomata. When stomata are open, water evaporates from the leaf surface and escapes through the stomata. This helps pull more water up from the roots. If stomata are closed, transpiration slows down to prevent water loss.

Q219. How is a transverse section of a leaf useful for studying plant tissues?
Answer: A transverse section (cross-section) of a leaf shows the different layers of tissues, like the epidermis, palisade, spongy mesophyll, and vascular bundles. This view helps students and scientists see how the tissues are arranged and understand how they work together in the leaf.

Q220. How is the root hair cell adapted for absorption of water?
Answer: Root hair cells have a long, thin extension that increases the surface area for absorbing water from the soil. They have thin cell walls to allow water to pass through easily. They also have lots of mitochondria to provide energy for active transport of mineral ions.

Q221. What process allows root hair cells to absorb water from the soil?
Answer: Water enters root hair cells by osmosis. Osmosis is the movement of water from a high concentration in the soil to a lower concentration inside the root hair cell, through a partially permeable membrane. This keeps the plant supplied with water for photosynthesis and other functions.

Q222. How do root hair cells take in mineral ions from the soil?
Answer: Mineral ions are taken in by active transport. This process moves the ions from the soil, where their concentration is low, into the root hair cells, where the concentration is higher. This requires energy, which comes from respiration in the mitochondria of the root hair cells.

Q223. Explain how xylem and phloem work together in the transport system of a plant.
Answer: Xylem carries water and minerals from the roots to the leaves, while phloem transports sugars made in the leaves to the rest of the plant. Together, they form a transport system that moves nutrients, water, and food around the plant to where they are needed for growth, repair, and storage.

Q224. Describe the pathway of water from the roots to the leaves in a plant.
Answer: Water is absorbed by root hair cells and passes through the root cortex to reach the xylem. It then moves up the xylem vessels through the stem to the leaves. In the leaves, water moves into the mesophyll cells and then evaporates into air spaces, finally leaving the leaf through the stomata.

Q225. What is transpiration and why is it important for the plant?
Answer: Transpiration is the process of water evaporating from the surface of leaves and being lost through the stomata. It is important because it helps pull water and minerals up from the roots, cools the plant, and maintains the flow of water needed for photosynthesis and nutrient transport.

Q226. What environmental factors affect the rate of transpiration?
Answer: The main environmental factors that affect transpiration rate are temperature, humidity, light intensity, and air movement. These factors influence how quickly water evaporates from the leaf surface and exits through the stomata. Higher temperature and light, lower humidity, and stronger wind usually increase the rate of transpiration.

Q227. How does temperature affect transpiration rate?
Answer: As temperature increases, water molecules gain more energy and evaporate faster from the surface of the leaf. This speeds up the rate of transpiration. Higher temperatures can also cause stomata to open more widely, which increases water loss, especially on hot, dry days.

Q228. Explain how humidity can influence the rate of transpiration.
Answer: Humidity refers to the amount of water vapour in the air. When humidity is high, the air is already full of water, so there is less difference between the moisture inside the leaf and the air outside. This slows down evaporation and reduces transpiration. In dry air (low humidity), transpiration increases.

Q229. What effect does air movement have on transpiration rate?
Answer: When there is more air movement or wind, the moist air around the leaf is blown away and replaced by drier air. This increases the concentration gradient between the inside and outside of the leaf, causing water to evaporate faster and speeding up the rate of transpiration.

Q230. How does light intensity affect the rate of transpiration?
Answer: Higher light intensity causes stomata to open wider to allow more carbon dioxide in for photosynthesis. When the stomata are open, more water vapour can escape, increasing the rate of transpiration. On a bright sunny day, transpiration is usually faster than on a cloudy day.

Q231. What is the role of lignin in xylem vessels?
Answer: Lignin is a strong, waterproof substance found in the walls of xylem vessels. It strengthens the cell

walls, helping the xylem stay open and resist collapse under the pressure of water movement. Lignin also gives structural support to the plant, especially in stems.

Q232. What is translocation and where does it occur in a plant?
Answer: Translocation is the movement of sugars and other dissolved food substances through the phloem. It happens from the leaves (where food is made during photosynthesis) to other parts of the plant, like growing tissues and storage organs such as roots. This process can move substances up or down the plant.

Q233. Why is translocation important for the survival of a plant?
Answer: Translocation ensures that all parts of the plant receive the sugars and nutrients they need for energy and growth. It moves food to growing regions and to storage areas. Without translocation, the plant couldn't distribute energy where it's needed, which would affect growth and survival.

Q234. How is phloem tissue structured to support translocation?
Answer: Phloem tissue is made of sieve tube elements and companion cells. Sieve tubes have small holes (sieve plates) to allow the flow of dissolved sugars between cells. Companion cells help control the movement of substances and provide energy for active transport, supporting the process of translocation.

Q235. What are sieve plates and what is their role in phloem tissue?
Answer: Sieve plates are the porous end walls between sieve tube cells in the phloem. They allow the flow of sugar-rich sap from one cell to the next. These holes help maintain a continuous pathway for the movement of dissolved substances during translocation.

Q236. How can the rate of transpiration be measured in an experiment?
Answer: The rate of transpiration can be measured using a potometer, which tracks how quickly a plant takes up water. As water evaporates from the leaves, the plant draws in more water, and the movement of a bubble in a capillary tube can be measured over time to estimate the transpiration rate.

Q237. What data would you collect when measuring transpiration with a potometer?
Answer: You would collect data on the distance the air bubble moves in the capillary tube over a set time. You may also record environmental factors such as temperature, humidity, light, and wind conditions to see how they affect transpiration. Repeated readings help calculate an average rate.

Q238. How could you calculate the average transpiration rate from repeated measurements?
Answer: To calculate the average transpiration rate, you add all the individual measurements of water uptake (e.g. distance moved by the air bubble) and divide by the number of readings. This gives a more reliable value that accounts for small errors or variations during the experiment.

Q239. Describe how you would use a microscope to investigate stomata distribution.
Answer: To investigate stomata distribution, take a thin layer of epidermis from a leaf, place it on a slide with a drop of water, and cover it with a coverslip. Use a light microscope to view the stomata. Count the number of stomata in a specific area using the microscope's field of view and repeat on different parts of the leaf.

Q240. Why might stomata be found more on the underside of a leaf?
Answer: Stomata are usually more common on the underside of leaves to reduce water loss. The underside is cooler and shaded, which slows down evaporation. Having fewer stomata on the top side also protects against water loss due to direct sunlight and wind.

Q241. How can you calculate the surface area of a leaf for a transpiration investigation?
Answer: You can trace the outline of the leaf onto graph paper and count the number of squares inside the outline. Each square represents a set area (e.g. 1 cm^2). Add up the total area covered by the leaf. This helps to compare transpiration rates fairly between different leaves.

Q242. What is the significance of using compound measures when studying transpiration?
Answer: Compound measures combine more than one variable, such as water loss per cm^2 per minute. This allows for fair comparisons between leaves of different sizes or experiments done over different times. It helps standardise the data and improve accuracy in drawing conclusions.

Q243. How would you use a graph to show the effect of light on transpiration rate?
Answer: You would plot a graph with light intensity on the x-axis and transpiration rate on the y-axis. By measuring the transpiration rate at different light levels, you can see if there is a trend or pattern, such as the rate increasing with more light. A line graph is most suitable.

Q244. What graph would best display the relationship between humidity and transpiration?
Answer: A line graph would be best to show how changes in humidity affect transpiration rate. Plot humidity levels on the x-axis and transpiration rate on the y-axis. This type of graph clearly shows if there is a correlation, such as higher humidity causing lower transpiration.

Q245. How would you extract and interpret data from a table showing transpiration rates?
Answer: Look for values that show how transpiration changes with different conditions. Compare data across rows or columns to find patterns. For example, check how transpiration changes with increasing temperature. Use the numbers to draw conclusions or create a graph for clearer visual interpretation.

Q246. Why do plants need both water and dissolved minerals transported to the leaves?
Answer: Water is needed for photosynthesis, to keep cells turgid, and to transport substances. Minerals like magnesium and nitrates are needed to make chlorophyll and proteins. Without both water and minerals, plants can't grow properly or make their own food.

Q247. How do the stem and leaves work together to move substances in a plant?
Answer: The stem contains xylem and phloem vessels that transport water, minerals, and sugars. Water is pulled up the stem to the leaves, where it is used in photosynthesis. The sugars made in the leaves are then moved through the stem to other parts of the plant by the phloem.

Q248. What is the function of the plant's organ system made up of roots, stems, and leaves?
Answer: This organ system allows the plant to take in water and minerals (roots), transport substances

(stem), and carry out photosynthesis (leaves). Each part has a special role, but they work together to keep the plant alive, growing, and making food.

Q249. Why is active transport important in the uptake of mineral ions by root hair cells?
Answer: Mineral ions in the soil are often in lower concentration than inside the root hair cells. Active transport uses energy to move these ions into the plant against the concentration gradient. This allows the plant to take in the nutrients it needs, even when they are scarce in the soil.

Q250. How do structural adaptations in leaves support photosynthesis and water regulation?
Answer: Leaves are flat and wide to capture more sunlight. The upper surface has a waxy cuticle to reduce water loss. Palisade cells are packed with chloroplasts for photosynthesis. Stomata and guard cells control gas exchange and water loss. All these features help the plant make food efficiently and manage water.