

Life Processes

Class 10 - CBSE Science | Chapter 5 | Worksheet & Test Paper

15 MCQs | 8 board questions | 7 practice problems

Video lesson, notes and an interactive quiz: learn.ultimatetools.io

SECTION A - Multiple Choice Questions (1 mark each)

1. Which of the following is the correct sequence of events during photosynthesis?

- (a) CO₂ reduced → light absorbed → water splits into H and O
- (b) Water splits into H and O → CO₂ reduced → light absorbed
- (c) Light absorbed → chemical energy + water splits → CO₂ reduced
- (d) CO₂ absorbed → light absorbed → water released as vapour

2. The opening and closing of a stomatal pore is controlled by:

- (a) The epidermal cells
- (b) The guard cells
- (c) The amount of chlorophyll
- (d) The xylem vessels

3. Bread mould (Rhizopus) growing on a slice of bread shows which type of nutrition?

- (a) Parasitic
- (b) Holozoic
- (c) Autotrophic
- (d) Saprophytic

4. In Amoeba, food is digested in the:

- (a) Food vacuole
- (b) Pseudopodia
- (c) Cilia
- (d) Contractile vacuole

5. Why is the stomach lining not digested by its own hydrochloric acid and pepsin?

- (a) The acid is too dilute to cause any damage
- (b) Bile from the liver neutralises the acid in the stomach
- (c) Mucus secreted by the gastric glands protects the lining
- (d) The lining is made of dead cells that cannot be digested

6. The function of bile juice in digestion is to:

- (a) Digest proteins into amino acids
- (b) Digest starch into simple sugars
- (c) Absorb the digested food into the blood
- (d) Make the food alkaline and emulsify fats

7. Which enzyme, secreted by the pancreas, digests proteins?

- (a) Lipase
- (b) Trypsin
- (c) Pepsin
- (d) Amylase

8. The breakdown of glucose into pyruvate takes place in the:

- (a) Mitochondria
- (b) Chloroplast
- (c) Cytoplasm
- (d) Nucleus

9. During vigorous physical exercise, muscle cramps are caused by the accumulation of:

- (a) Ethanol
- (b) Pyruvate
- (c) Carbon dioxide
- (d) Lactic acid

10. Rings of cartilage are present in the trachea because they:

- (a) Keep the air passage from collapsing

- (b) Filter the dust particles out of the air
- (c) Increase the surface area for gaseous exchange
- (d) Carry the absorbed oxygen away to the blood

11. Which of these correctly describes the walls of the chambers of the heart?

- (a) The right atrium has the thickest muscular wall
- (b) The left ventricle has the thickest muscular wall
- (c) All four chambers have walls of equal thickness
- (d) The atria have thicker walls than the ventricles

12. Double circulation is essential in humans mainly because it:

- (a) It makes the heart beat more slowly and so saves energy
- (b) It allows the blood to be filtered twice before the kidneys
- (c) It keeps oxygenated and deoxygenated blood from mixing
- (d) It increases the amount of blood that is stored in the veins

13. Valves are present in veins because:

- (a) Veins carry blood away from the heart at high pressure
- (b) Veins have to filter the blood before it reaches the heart
- (c) Valves increase the speed at which blood flows in veins
- (d) Blood in veins is at low pressure and could flow backwards

14. The main driving force for the upward movement of water in a tall plant during the DAY is:

- (a) Transpiration pull
- (b) Root pressure
- (c) Translocation in the phloem
- (d) Gravity

15. Glucose is present in the filtrate formed in Bowman's capsule but is absent from normal urine. This is because glucose is:

- (a) Too large a molecule to be filtered out of the glomerulus
- (b) Selectively reabsorbed into the blood along the tubule
- (c) Broken down into urea inside the collecting duct
- (d) Removed by the ureter before urine reaches the bladder

SECTION B - Board-style Questions

1. Draw a labelled diagram of the human alimentary canal and name the part where (i) digestion of starch begins, (ii) protein digestion begins, (iii) digestion is completed and absorption occurs. [5 marks]

2. (a) What is emulsification and which juice brings it about? (b) State the two functions of the hydrochloric acid secreted in the stomach. (c) Why does the small intestine of a herbivore tend to be longer than that of a carnivore? [5 marks]

3. Explain the three possible fates of pyruvate in a cell. Name the site of each pathway and state one situation in which each occurs. [5 marks]

4. Draw a labelled diagram of the human respiratory system. Why is the exchange of gases in the alveoli so efficient? [5 marks]

5. (a) Why is it necessary to separate oxygenated and deoxygenated blood in mammals and birds? (b) Draw a labelled diagram of the human heart showing the four chambers and the direction of blood flow. [5 marks]

6. Compare the transport of materials in the xylem with that in the phloem, giving three points of difference. [3 marks]

7. Draw a labelled diagram of a nephron and explain how urine is formed. [5 marks]

8. What is meant by dialysis? Explain how an artificial kidney works and state one way in which it differs from a real kidney. [3 marks]

SECTION C - Practice Problems

1. A student observes that a potted plant kept in a dark cupboard for three days gives a negative result with the iodine test for starch. Explain the observation, and state what must be done before the experiment for the result to be valid.

Hint: Which of the four raw materials of photosynthesis was missing? And why do we 'destarch' a plant first?

2. A person's urine test shows the presence of glucose. Explain, in terms of the working of a nephron, which step has failed - and why glucose is normally absent from urine.

Hint: Filtration is not selective; the next step is.

3. Two athletes run a race. One runs a slow long-distance race and breathes comfortably; the other sprints at full speed and afterwards suffers severe muscle cramps. Explain, using the pathways of respiration, why only the sprinter gets cramps.

Hint: Compare the oxygen supplied to the muscles with the oxygen demanded in each case.

4. Explain why a fish taken out of water soon dies, even though it is now surrounded by air containing far more oxygen than water does.

Hint: Think about the organ a fish uses and what it needs in order to work.

5. A plant is given water containing a harmless dye through its roots. After some hours the dye appears in the leaves but not in the developing fruits. In a second experiment the dye is injected into a leaf and later appears in the fruits and the roots. Identify the tissue involved in each case and justify your answer.

Hint: One tissue moves material in only one direction; the other moves it both ways.

6. Name the three secretions of the gastric glands and give the function of each. What would happen to protein digestion if the stomach stopped producing hydrochloric acid?

Hint: One of the three does not act on food at all.

7. The alveoli of the lungs and the villi of the small intestine are found in completely different organ systems, yet their structure follows the same design principle. State that principle and give three structural features they share.

Hint: Both are surfaces across which something must pass into the blood.

ANSWER KEY

Life Processes - Class 10 CBSE Science

Section A - MCQ answers

1. (c) Light absorbed -> chemical energy + water splits -> CO₂ reduced

NCERT lists the three events as: (1) chlorophyll absorbs light energy, (2) light energy is converted into chemical energy and water molecules are split into hydrogen and oxygen, (3) carbon dioxide is reduced to carbohydrate. Note that NCERT also states these steps need not occur one immediately after the other.

2. (b) The guard cells

Each stoma is bounded by two guard cells. When water flows into them they swell, become curved and the pore opens; when they lose water they shrink and the pore closes.

3. (d) Saprophytic

Saprophytes secrete enzymes onto dead and decaying matter, digest it OUTSIDE the body, and then absorb the products. Parasites feed on a living host; holozoic organisms take in whole food and digest it inside.

4. (a) Food vacuole

Pseudopodia engulf the food particle and trap it in a food vacuole, where enzymes break it down. The contractile vacuole deals with excess water, not digestion.

5. (c) Mucus secreted by the gastric glands protects the lining

Gastric glands release HCl, pepsin AND mucus. The mucus coats and protects the stomach's own lining. Bile acts in the small intestine, not the stomach.

6. (d) Make the food alkaline and emulsify fats

Bile contains NO digestive enzyme. It makes the acidic food coming from the stomach alkaline so that pancreatic enzymes can act, and it emulsifies large fat globules into smaller ones so lipase can work on them.

7. (b) Trypsin

Pancreatic juice contains trypsin (proteins) and lipase (emulsified fats). Pepsin is a protein-digesting enzyme too, but it is secreted by the STOMACH, not the pancreas.

8. (c) Cytoplasm

This first step is common to both aerobic and anaerobic respiration and always occurs in the cytoplasm. Only the FURTHER breakdown of pyruvate into CO₂ and water occurs in the mitochondria.

9. (d) Lactic acid

When oxygen supply to the muscles falls short, pyruvate is converted to lactic acid instead of being fully oxidised. The build-up of lactic acid causes cramps. Ethanol is produced by yeast, not by human muscle.

10. (a) Keep the air passage from collapsing

The cartilage rings give the trachea rigidity so the airway does not collapse when air pressure inside falls. Dust is filtered by hair and mucus in the nasal passage; exchange happens in the alveoli.

11. (b) The left ventricle has the thickest muscular wall

Ventricles have thicker walls than atria because they pump blood out of the heart, and the left ventricle is thickest of all because it must pump oxygenated blood to the ENTIRE body.

12. (c) It keeps oxygenated and deoxygenated blood from mixing

Passing through the heart twice keeps the two kinds of blood separate. Warm-blooded animals need this efficient, high oxygen supply to release enough energy to maintain a constant body temperature.

13. (d) Blood in veins is at low pressure and could flow backwards

Veins collect blood from the organs at low pressure, so valves ensure one-way flow towards the heart. Arteries, carrying blood away under high pressure, do not need valves.

14. (a) Transpiration pull

Root pressure operates mainly at night, when transpiration is low. During the day, evaporation of water from the leaves creates transpiration pull, which draws the whole water column up the xylem.

15. (b) Selectively reabsorbed into the blood along the tubule

Filtration at the glomerulus is non-selective, so glucose does get filtered. As the filtrate travels along the tubule, useful substances - glucose, amino acids, salts and most of the water - are selectively reabsorbed into the blood.

Section B - Model answers

1. Draw a labelled diagram of the human alimentary canal and name the part where (i) digestion of starch begins, (ii) protein digestion begins, (iii) digestion is completed and absorption occurs.

The diagram should show, in order and labelled: mouth (buccal cavity), oesophagus, stomach, small intestine, large intestine, anus, along with the liver and the pancreas. (i) Digestion of starch begins in the MOUTH, where salivary amylase acts on starch. (ii) Protein digestion begins in the STOMACH, where pepsin acts in the acidic medium produced by hydrochloric acid. (iii) Digestion is completed in the SMALL INTESTINE, and absorption also

takes place there through the villi.

2. (a) What is emulsification and which juice brings it about? (b) State the two functions of the hydrochloric acid secreted in the stomach. (c) Why does the small intestine of a herbivore tend to be longer than that of a carnivore?

(a) Emulsification is the breaking of large globules of fat into smaller droplets so that enzymes can act on them more easily. It is brought about by BILE JUICE, secreted by the liver. (b) Hydrochloric acid (i) creates the acidic medium needed for the enzyme pepsin to work, and (ii) kills the germs present in the food. (c) Herbivores eat grass, which is rich in cellulose. Cellulose takes longer to digest, so a longer small intestine is needed to complete digestion and absorption.

3. Explain the three possible fates of pyruvate in a cell. Name the site of each pathway and state one situation in which each occurs.

Glucose is first broken down in the CYTOPLASM into pyruvate. (1) In the ABSENCE of oxygen, in yeast, pyruvate is converted into ethanol and carbon dioxide - this is fermentation, and it takes place in the cytoplasm; it occurs during the making of alcohol. (2) When there is a LACK of oxygen in our muscle cells, pyruvate is converted into lactic acid in the cytoplasm; this occurs during vigorous exercise and causes cramps. (3) In the PRESENCE of oxygen, pyruvate is broken down completely in the MITOCHONDRIA into carbon dioxide and water, releasing much more energy; this is aerobic respiration and occurs under normal conditions.

4. Draw a labelled diagram of the human respiratory system. Why is the exchange of gases in the alveoli so efficient?

The diagram should be labelled: nostrils, nasal passage, trachea (showing rings of cartilage), bronchi, bronchioles, alveoli, lungs and diaphragm. The exchange of gases in the alveoli is efficient because: (i) the alveoli provide a very large surface area - about 80 m² when spread out; (ii) their walls are extremely thin, so gases diffuse across easily; and (iii) the walls contain an extensive network of blood capillaries, so oxygen is carried away and carbon dioxide brought in continuously, maintaining the concentration gradient.

5. (a) Why is it necessary to separate oxygenated and deoxygenated blood in mammals and birds? (b) Draw a labelled diagram of the human heart showing the four chambers and the direction of blood flow.

(a) Mammals and birds are warm-blooded: they must maintain a constant body temperature, which requires a great deal of energy. That energy comes from the efficient aerobic oxidation of food, which needs an efficient supply of oxygen. Separating oxygenated from deoxygenated blood prevents the two mixing and ensures the body receives blood with a high oxygen content. (b) The diagram must label the four chambers (right atrium, right ventricle, left atrium, left ventricle), the septum and the valves, AND the four great vessels, which carry marks: the VENA CAVA bringing deoxygenated blood in from the body, the PULMONARY ARTERY taking it to the lungs, the PULMONARY VEINS returning oxygenated blood from the lungs, and the AORTA carrying it out to the body. Arrows should trace: vena cava → right atrium → right ventricle → pulmonary artery → lungs → pulmonary veins → left atrium → left ventricle → aorta.

6. Compare the transport of materials in the xylem with that in the phloem, giving three points of difference.

(1) MATERIAL: xylem transports water and dissolved minerals, whereas phloem transports the food (mainly sucrose) prepared in the leaves. (2) DIRECTION: transport in xylem is upward (unidirectional), from the roots to the rest of the plant, whereas phloem transports material in both directions - upwards and downwards. (3) ENERGY: movement in xylem is a physical process using root pressure and transpiration pull and does not require energy from the plant, whereas translocation in phloem uses energy from ATP: sucrose is loaded into the phloem using ATP, which raises the osmotic pressure of the tissue so that water enters from the xylem, and the pressure built up drives the food to tissues where the pressure is lower.

7. Draw a labelled diagram of a nephron and explain how urine is formed.

The diagram should label the glomerulus, Bowman's capsule, the tubule and the collecting duct. Urine formation has two main steps. FILTRATION: blood enters the glomerulus, a cluster of thin-walled capillaries, under pressure; water and small dissolved molecules - including glucose, amino acids, salts and urea - are forced out into Bowman's capsule. SELECTIVE REABSORPTION: as this filtrate flows along the tubule, the useful substances (glucose, amino acids, salts and most of the water) are reabsorbed into the surrounding blood capillaries. The remaining fluid, containing urea and excess water and salts, is urine. It passes through the collecting duct into the ureter, then to the urinary bladder, and is finally released through the urethra.

8. What is meant by dialysis? Explain how an artificial kidney works and state one way in which it differs from a real kidney.

Dialysis is the process of removing nitrogenous waste from the blood by artificial means when a person's kidneys have failed. In an artificial kidney, blood from the patient's artery is passed through tubes made of a selectively permeable membrane, which are surrounded by a dialysing fluid. This fluid has the same osmotic composition as blood plasma EXCEPT that it contains no nitrogenous wastes, so urea and other wastes diffuse out of the blood into the fluid. The cleaned blood is returned to the patient's vein. DIFFERENCE: an artificial kidney has NO reabsorption step - a natural kidney selectively reabsorbs glucose, amino acids, salts and water back into the blood, whereas the machine only removes wastes by diffusion.

Section C - Solutions

1. A student observes that a potted plant kept in a dark cupboard for three days gives a negative result with the iodine test for starch. Explain the observation, and state what must be done before the experiment for the result to be valid.

In the dark the plant received no SUNLIGHT, one of the essential requirements of photosynthesis. Without light energy, chlorophyll cannot absorb energy, water is not split, and carbon dioxide is not reduced to carbohydrate - so no starch is formed and iodine gives no blue-black colour. Before the experiment the plant must be DESTARCHED by keeping it in the dark for two to three days, so that any starch already stored in the leaves is used up; otherwise the old starch would give a positive result and the experiment would prove nothing.

2. A person's urine test shows the presence of glucose. Explain, in terms of the working of a nephron, which step has failed - and why glucose is normally absent from urine.

Filtration at the glomerulus is NOT selective - glucose, being a small molecule, is always forced out of the blood into Bowman's capsule along with water, salts, amino acids and urea. Normally it is entirely taken back into the blood during SELECTIVE REABSORPTION as the filtrate travels along the tubule, which is why healthy urine contains no glucose. Glucose in the urine therefore means the reabsorption step has failed, or has been overwhelmed because the blood glucose level is too high (as happens in diabetes).

3. Two athletes run a race. One runs a slow long-distance race and breathes comfortably; the other sprints at full speed and afterwards suffers severe muscle cramps. Explain, using the pathways of respiration, why only the sprinter gets cramps.

In both athletes glucose is first broken down in the cytoplasm into pyruvate. For the long-distance runner, breathing keeps pace with demand, so oxygen reaches the muscle cells and pyruvate is broken down completely in the MITOCHONDRIA into carbon dioxide and water, releasing a large amount of energy and leaving no harmful product. In the sprinter, the muscles demand energy far faster than oxygen can be supplied, so respiration in those cells becomes ANAEROBIC: pyruvate is converted into LACTIC ACID. The accumulation of lactic acid in the muscles is what causes the cramps.

4. Explain why a fish taken out of water soon dies, even though it is now surrounded by air containing far more oxygen than water does.

A fish breathes using GILLS, which are adapted to absorb oxygen DISSOLVED IN WATER. The gill filaments have a very large surface area and are supported by the water around them. Out of water the filaments stick together and collapse under their own weight, so the surface area available for exchange falls drastically; the gill surface also dries out, and gases can only diffuse across a moist surface. Therefore, despite being surrounded by oxygen-rich air, the fish cannot absorb it and dies of suffocation.

5. A plant is given water containing a harmless dye through its roots. After some hours the dye appears in the leaves but not in the developing fruits. In a second experiment the dye is injected into a leaf and later appears in the fruits and the roots. Identify the tissue involved in each case and justify your answer.

In the first experiment the dye travelled in the XYLEM. Xylem carries water and dissolved minerals UPWARD only, from the roots to the leaves, driven by root pressure and transpiration pull - so the dye reaches the leaves but is not carried onward into the fruits. In the second experiment the dye travelled in the PHLOEM. Phloem carries the food prepared in the leaves by TRANSLOCATION, using energy from ATP, and it moves material in BOTH directions - so the dye can travel both upward to the fruits and downward to the roots.

6. Name the three secretions of the gastric glands and give the function of each. What would happen to protein digestion if the stomach stopped producing hydrochloric acid?

The gastric glands secrete: (1) HYDROCHLORIC ACID, which makes the medium acidic so that pepsin can act, and kills germs in the food; (2) PEPSIN, the enzyme that begins the digestion of proteins; and (3) MUCUS, which protects the inner lining of the stomach from the acid. If hydrochloric acid were not produced, the medium in the stomach would not be acidic. Pepsin only works in an acidic medium, so it would remain inactive and protein digestion in the stomach would not begin. Germs in the food would also survive.

7. The alveoli of the lungs and the villi of the small intestine are found in completely different organ systems, yet their structure follows the same design principle. State that principle and give three structural features they share.

The shared principle is that a surface used for EXCHANGE OR ABSORPTION into the blood must maximise surface area and minimise the distance materials have to travel. Shared features: (1) both are numerous tiny projections/sacs, which enormously increase the SURFACE AREA (the alveoli give about 80 m²); (2) both have very THIN walls, so the diffusion distance is short; (3) both carry a rich supply of BLOOD CAPILLARIES, which carry the absorbed substance away and so maintain the concentration gradient. In the alveoli oxygen passes into the blood and carbon dioxide passes out; in the villi digested food passes into the blood.

