Life Processes: Growth, Photosynthesis & Respiration

Class X | Science (Biology) | CBSE Board

SECTION A: Multiple Choice Questions

Choose the most appropriate answer from the given options.

Q1. Which of the following are the end products of aerobic respiration?

(A) Glucose and Oxygen
(B) CO_2 and ATP only
(C) CO_2, H_2O, and ATP
(D) Lactic acid and CO_2

Q2. The green colour of leaves is due to the presence of:

(A) Carotenoids
(B) Chlorophyll
(C) Xanthophyll
(D) Anthocyanin

Q3. The 'powerhouse of the cell' responsible for releasing energy through respiration is:

(A) Mitochondria
(B) Chloroplast
(C) Ribosome
(D) Nucleus

Q4. In plants, gaseous exchange during photosynthesis mainly occurs through:

(A) Root hair cells
(B) Lenticels
(C) Stomata
(D) Xylem vessels

Q5. The total number of ATP molecules produced per glucose molecule during complete aerobic respiration is:

(A) 2 ATP
(B) 38 ATP
(C) 18 ATP
(D) 10 ATP

Q6. The correct balanced equation for photosynthesis is:

(A) $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$

(B) $6CO_2 + 6O_2 \rightarrow C_6H_{12}O_6 + 6H_2O$
(C) $C_6H_{12}O_6 + 6H_2O \rightarrow 6CO_2 + 6O_2$
(D) $6H_2O + 6O_2 \rightarrow C_6H_{12}O_6 + CO_2$

Q7. Yeast converts glucose into ethanol and CO_2 in the absence of oxygen. This process is called:
(A) Aerobic respiration
(B) Photosynthesis
(C) Anaerobic respiration
(D) Transpiration

SECTION B: Case Study Questions

Read the following passage carefully and answer the questions that follow:

A biology student set up two identical potted plants (Plant A and Plant B) under the following conditions:

Condition	Plant A	Plant B
Light	Full sunlight (bright)	Full sunlight (bright)
CO_2 concentration	Normal atmospheric (0.04%)	Doubled (0.08%)
Water supply	Adequate	Adequate
Temperature	25°C	25°C
Observation	Good growth; normal photosynthesis rate	Faster growth; higher rate of photosynthesis

After two weeks, Plant B showed significantly greater biomass and leaf area than Plant A. The student concluded that increasing CO_2 concentration enhances photosynthesis. However, their teacher pointed out that multiple factors interact to control the rate of photosynthesis, and that in real-world conditions, a single factor rarely acts alone.

Q1. According to the passage, which conclusion can be drawn about the factors affecting photosynthesis?
(A) Only CO_2 concentration determines the rate of photosynthesis
(B) Light is the only limiting factor for photosynthesis
(C) Rate of photosynthesis depends on multiple interacting factors
(D) Temperature has no role in photosynthesis

Q2. During photosynthesis, the energy transformation that takes place is:
(A) Chemical energy → Light energy
(B) Light energy → Chemical energy
(C) Mechanical energy → Chemical energy

(D) Thermal energy → Light energy

Q3. If a third plant (Plant C) was kept in dim light with doubled CO_2 (same as Plant B), which outcome is MOST likely?

(A) Plant C grows faster than Plant B because CO_2 is doubled
(B) Plant C shows the same growth as Plant A
(C) Plant C shows less growth than Plant B, because light becomes the limiting factor
(D) CO_2 concentration is the limiting factor in Plant C

Q4. Which of the following correctly describes what happens inside the chloroplast during photosynthesis?

(A) Only light-dependent reactions occur in the stroma
(B) Only dark reactions occur in the thylakoid membrane
(C) Both light-dependent (thylakoid) and light-independent/Calvin cycle (stroma) reactions occur
(D) ATP is produced only in the stroma

Q5. The increased biomass of Plant B is primarily because photosynthesis produces glucose. Name the process by which this glucose is broken down in the plant's cells to release energy. Write the substrate, site of the reaction, and two main products.

SECTION C: Short Answer Questions

Answer the following questions in 3–5 sentences each.

Q1. Differentiate between autotrophic and heterotrophic nutrition with one example each.

Q2. Write the chemical equation for aerobic respiration. Identify the site where this reaction occurs in the cell.

Q3. What is the role of guard cells in gaseous exchange? How do they regulate the opening and closing of stomata?

Q4. Where in the chloroplast do the light-dependent reactions occur? Where does the Calvin cycle (dark reactions) take place?

ANSWER KEY & MARKING GUIDE

Q. No.	Answer / Key Points
MCQ 1	(C) CO_2 and H_2O
MCQ 2	(B) Chlorophyll
MCQ 3	(A) Mitochondria
MCQ 4	(C) Stomata
MCQ 5	(B) 38 ATP
MCQ 6	(A) $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$
MCQ 7	(C) Anaerobic respiration
CS Q1	(C) Rate of photosynthesis depends on light intensity, CO_2 conc., temperature & water
CS Q2	(B) Light energy → Chemical energy
CS Q3	(D) CO_2 conc. is the limiting factor in Experiment B
CS Q4	(C) Both light-dependent and light-independent reactions occur
CS Q5	See marking scheme – award 1 mark each for: substrate, products, site (mitochondria), O_2 required, $CO_2 + H_2O$ released, ATP produced
SA 1	Autotrophs make own food (photosynthesis); Heterotrophs depend on others
SA 2	$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$ + Energy (ATP); site: mitochondria
SA 3	Guard cells change shape due to osmosis, opening/closing stomata; regulates gas exchange & transpiration
SA 4	Light reactions: thylakoid membranes; Calvin cycle: stroma of chloroplast