



education

Department:
Education
PROVINCE OF KWAZULU-NATAL

LEARNER DOCUMENT

SOLUTIONS

TERM 2

GRADE 11

LIFE SCIENCES

2020

PHOTOSYNTHESIS

A. MARKING GUIDELINES

Activity 1

1.1

- 1.1.1 C ✓✓ (2)
1.1.2 B ✓✓ (2) **(4)**

1.2

- 1.2.1 (a) Stroma ✓ (1)
(b) Ribosome ✓ (1)
1.2.2 It stores the starch ✓ (1)
1.2.3 Granum / Grana / Thylakoid ✓ (1) **(4)**

Activity 2

2.1

- 2.1.1 Glucose ✓ (1)
2.1.2 Chloroplast ✓ (1)
2.1.3 Photolysis ✓ (1)
2.1.4 Stroma ✓ (1)
2.1.5 Starch ✓ (1)
2.1.6 Chlorophyll ✓ (1)
2.1.7 Radiant energy ✓ (1)
2.1.8 A only ✓✓ (2)
2.1.9 B only ✓✓ (2) **(11)**

2.2

- 2.2.1 (a) C ✓ (1)
(b) A ✓ (1)
(c) B ✓ (1)
2.2.2 B ✓ (1)
2.2.3 A and C ✓✓ (2) **(6)**

Activity 3

3.1

- 3.1.1 Adenosine diphosphate ✓ (1)
- 3.1.2 ATP or adenosine triphosphate ✓ (1)
- 3.1.3 -It is the energy carrier in living systems/cells ✓ (1)
-Or it provides energy for all cellular activities ✓ (Any 1) (1) **(4)**

Activity 4

4.1

- 4.1.1 Sodium hydroxide/Soda lime/Potassium hydroxide ✓ (1)
- 4.1.2 Removes carbon dioxide from the air in the jar ✓ (1)
- 4.1.3 The leaf turns blue-black ✓ (1)
- 4.1.4 -as the leaf was outside the jar, it was exposed to carbon dioxide ✓ (1)
-and could undergo photosynthesis/produce starch ✓ (1)
- 4.1.5 Dark phase /light independent phase ✓ (1)
- 4.1.6 Stroma ✓ (1)
- 4.1.7 To ensure that the starch at end of the investigation was produced ✓
during the experiment ✓ (2) **(9)**

4.2

- 4.2.1 Graph C ✓ (1)
- 4.2.2 Due to carbon dioxide concentration ✓ (1)
- 4.2.3 Temperature ✓ (1)
- 4.2.4 The graph will show a steady increase in the rate up to 40°C ✓
further increase in temperature will let it fall dramatically ✓ (2)
- 4.2.5
-At higher temperatures the enzymes become completely
denatured/functionless ✓ (1)
-When the temperature is increased to 40°C the temperature is
optimum for maximum photosynthesis ✓ (1) **(7)**

Activity 5

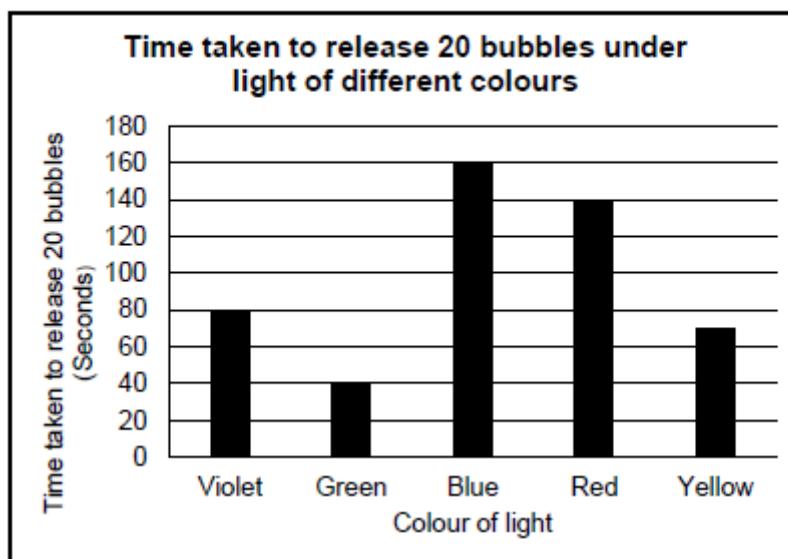
5.1

- 5.1.1 Destarch the plant ✓ (1)
- 5.1.2 (a) Leaf A ✓ (1)
(b) Leaf B ✓ (1)
- 5.1.3 Absorbs carbon dioxide ✓ (1)
- 5.1.4 Iodine solution ✓ (1) **(5)**

5.2

- 5.2.1 Blue-black ✓ (1)
- 5.2.2 (a) colour of light ✓ (1)
(b) rate of photosynthesis ✓ (1)
(c) the light intensity/the pondweed/the time exposed ✓ (1)
- 5.2.3 $490/5 \checkmark = 98s \checkmark$ (2)

5.2.4



Mark allocation for the graph

Bar graph drawn (T)	1
Title of graph (both variables included)	1
Correct scale for X-axis (equal width and spacing of the bars) and Y-axis (S)	1
Correct label and unit for X-axis and Y-axis (L)	1
Plotting of bars (P)	0: No bars plotted correctly 1: 1 to 4 bars plotted correctly 2: all 5 bars plotted correctly

NOTE: If a line graph is drawn – marks will be lost for the 'type and scale'.
If a histogram is drawn – marks will be lost for 'type of graph and correct scale'.

5.3

- 5.3.1 (a) Waterplants are structurally adapted to perform photosynthesis under water. ✓ (1)
- (b) Addition of small amounts of sodium bicarbonate increases the concentration CO_2 ✓ to bring about a steady rate of photosynthesis. (1)
- 5.3.2 By counting the number of bubbles released in a minute (unit time) ✓ (1)
- 5.3.3
- As the intensity of light increases ✓
 - the rate of photosynthesis increases proportionately up to a certain point. ✓
 - A further increase in light intensity ✓
 - will cause no further increase in the rate of photosynthesis. ✓
- (Any 3) (3)
- 5.3.4
- When the light intensity increases ✓
 - the temperature increases proportionately ✓ which
 - limits the performance of various enzymes ✓ and
 - hence limit the rate of photosynthesis. ✓
- (4) (10)

Activity 6

6.1

- 6.1.1 Increases ✓ (1)
- 6.1.2 Greenhouse ✓ (1)
- 6.1.3 Adenosine Triphosphate ✓ (1)
- 6.1.4 Chemical ✓ (1)
- 6.1.5 Atmosphere ✓ (1) (5)

Activity 7

7.1

- 7.1.1 Oxygen ✓ (1)
- 7.1.2 - Take a glowing wooden splint ✓ and insert it in the mouth of the test tube
- If it ignites, ✓ the gas is oxygen (2)
- 7.1.3 - To release carbon dioxide ✓ into the water
- for photosynthesis to take place. ✓ (2)
- 7.1.4 - To see the oxygen which is a colourless gas ✓ (1)
- 7.1.5 - Increase the light intensity ✓
- so that the plant absorbs more light energy ✓ to increase the rate of photosynthesis
- Increase the temperature to optimum ✓
- will increase the rate of photosynthesis ✓ and therefore the rate of this experiment (4) (10)
- 7.2 B ✓ ✓ (2) (2)

Activity 8

8.1

8.1.1 D ✓ ✓

(2) (2)

8.2

8.2.1 Rate of photosynthesis ✓

(1)

8.2.2 0,14% ✓

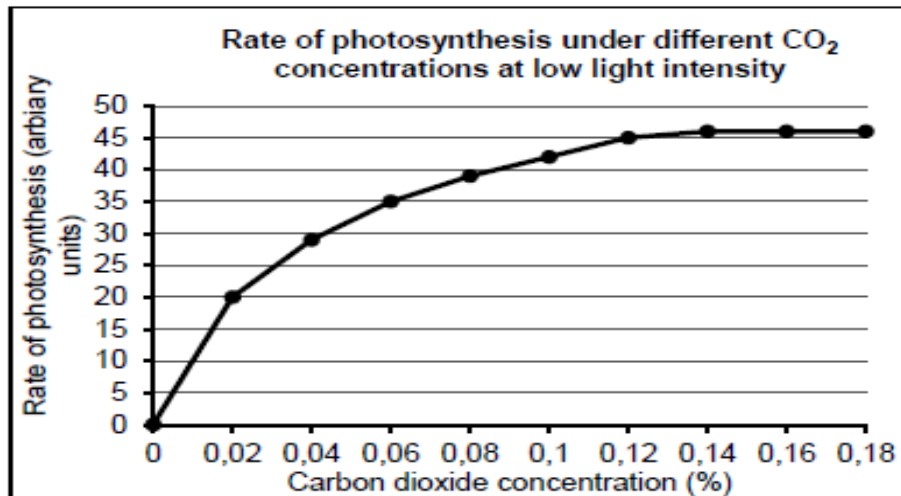
(1)

8.2.3 - Amount of water ✓
- Temperature ✓
- Light ✓

8.2.4 (Mark the first TWO only)

(Any 2)

(2)



Mark allocation for the graph:		
Line graph is drawn		1
Title of the graph (includes both variables)		1
Correct scale for x-axis and y-axis		1
Correct labels and units for the x-axis and the y-axis		1
Plotting of the points	0 points correct	0
	1–5 points correct	1
	All points correct	2
Only low light intensity graph is drawn		1

(7) (11)

8.3

- 8.3.1 To demonstrate that light energy ✓ is necessary for photosynthesis. ✓ (2)
- 8.3.2 The presence/absence of starch ✓ (1)
- 8.3.3 (Dilute) iodine solution ✓ (1)
- 8.3.4 (a) No colour change / remain reddish brown ✓ (1)
- (b) Turns blue-black ✓ (1)
- 8.3.5 (a) Carbohydrases ✓ (1)
- (b) Salivary glands ✓ (1)
- 8.3.6 (a) Oxygen ✓ / O₂ (1)
- (b) Oxygen ✓ / O₂ (1) **(10)**

Activity 9

9.1

- 9.1.1 A ✓ ✓ (2) **(2)**

ANIMAL NUTRITION

Activity 1

1.1

- | | | | |
|-------|---------------|-----|------------|
| 1.1.1 | Egestion✓ | (1) | |
| 1.1.2 | Digestion✓ | (1) | |
| 1.1.3 | Assimilation✓ | (1) | |
| 1.1.4 | Absorption✓ | (1) | (4) |

Activity 2

2.1

- | | | | |
|-------|---|-------------|------------|
| 2.1.1 | a) Stomach ✓ | (1) | |
| | b) Colon ✓ / Large intestine | (1) | |
| | c) Anus ✓ | (1) | |
| | d) Small intestine ✓ / Duodenum | (1) | (4) |
| 2.2.2 | a) B ✓ | (1) | |
| | b) A ✓ | (1) | |
| | c) C ✓ | (1) | (3) |
| 2.2.3 | - Storage✓
- Deamination✓
- Detoxification✓ | (Any 2) (2) | (2) |

Activity 3

3.1

- | | | | |
|-------|--|------------|------------|
| 3.1.1 | Oesophagus✓ | (1) | |
| 3.1.2 | Peristalsis✓ | (1) | |
| 3.1.3 | P- Liver/ Pancreas✓ (Any order)
Q- Pancreas/ Liver✓ (Any order) | (1)
(1) | |
| 3.1.4 | Stomach✓ | (1) | (5) |

Activity 4

4.1

- | | | | |
|-------|--------------------|-----|--|
| 4.1.1 | Villus✓ | (1) | |
| 4.1.2 | Small intestines✓ | (1) | |
| 4.1.3 | Epithelium cells✓ | (1) | |
| 4.1.4 | connective✓ | (1) | |
| 4.1.5 | Blood capillaries✓ | (1) | |
| 4.1.6 | Glucose✓ | (1) | |
| 4.1.7 | Amino acids | (1) | |
| 4.1.8 | Lacteal✓ | (1) | |

4.1.9	Fatty acids ✓	(1)
4.1.10	Glycerol ✓	(1) (10)

Activity 5

5.1

5.1.1	A villus ✓	(1)
5.1.2	Columnar epithelium ✓ Lacteal vessel ✓	(1) (1)
5.1.3	Small intestine ✓	(1)
5.1.4	<ul style="list-style-type: none"> • It is long, ✓ which means it has a very large surface area for absorption ✓ • It has many folds ✓ which enlarges the surface area for maximum absorption of nutrients ✓ • Has millions of villi and micro-villi ✓ which enlarge the surface area even further ✓ • Has circular and longitudinal muscles ✓ responsible for the movement of food by peristalsis. ✓ • Is a coiled tube which slows down the movement of food ✓ (increases transit time) to ensure maximum absorption of nutrients. ✓ • The thin-walled ✓ villi (outer walls of villi are lined by a single layer of columnar epithelium) facilitate easy absorption. ✓ • Absorptive surface is kept moist ✓ by digestive juices and mucus to facilitate diffusion of nutrients. ✓ • Villi are well supplied with blood capillaries and lacteals ✓ to ensure that absorbed nutrients are quickly transported away ✓ (Mark the first TWO only) (Any 2 X2) 	(4)
5.1.5	C ✓	(1)
5.1.6	<ul style="list-style-type: none"> - The capillary flows in at D ✓ - Then absorption of nutrients will take place ✓ - From the small intestine into the capillaries in the villus ✓ - When the blood leaves at C, it will be rich with nutrients ✓ 	(4) (13)

Activity 6

6.1

6.1.1	To create a similar condition to that of the body ✓ It is the optimum body temperature ✓	(2)
6.1.2	(i) mass/amount of sample ✓ (ii) amount of gastric juice released in the stomach ✓	(1) (1)
6.1.3	(i) fried eggs ✓ (ii) scrambled eggs ✓	(1) (1)

6.1.4 Absorption

- Glucose ✓ in small intestine ✓ moves
- and by active transport ✓ which requires energy ✓
- and by diffusion ✓ passive/ no energy required ✓
- through the columnar epithelial cells ✓
- into the blood capillaries ✓
- of the villus. ✓

(Max 4)

Max. 4

Transportation

- The blood capillaries in the villi join together ✓
- and eventually form the hepatic portal vein ✓
- This blood vessel carries the product to the liver ✓
- Processed nutrients, ✓ leave the liver in the hepatic veins ✓
- The hepatic veins join up with the inferior vena cava ✓
- that takes the blood to the heart ✓
- The heart then will pump the nutrient-rich blood to the whole body/cells/tissues ✓
- via the aorta ✓

(Max 4)

(8) ~~(14)~~

Activity 7

7.1

- 7.1.1 (a) Pancreas ✓ (1)
(b) Insulin ✓ (1)
(c) Glucagon ✓ (1)
- 7.1.2 Diabetes Mellitus (1)
- 7.1.3 Negative Feedback Mechanism ✓ (1) **(5)**

Activity 8

8.1

- 8.1.1 It is the cellular imbalance between the supply of nutrients and energy ✓ and the body's demand for them to ensure growth, maintenance, and specific functions. ✓ (2)
- 8.1.2 Kwashiorkor ✓ (1)
- 8.1.3 - Gastric glands ✓ in the stomach ✓
- secretes gastric juices ✓ which
- contain the enzyme proteases. ✓
- that hydrolyse/digest proteins ✓
- into polypeptides/peptides ✓
- and eventually into amino acids. ✓
- Protease only function best in an acidic medium. ✓ (5) **(8)**

Activity 9

9.1

- 9.1.1 Pure vegetarian ✓ (1)

- Every level per unit volume in the diet is lowest✓, hence requiring intake of large amounts of food. ✓
- digestion is generally incomplete✓, therefore less absorption of food is absorbed✓
- (Mark the first ONE only) (Any 1 x 2) (2)
- 9.1.2 -very young children grow rapidly✓ and
 - is difficult for them to consume enough vegetarian/ bulk food✓
 - insufficient nutrients/ proteins/carbohydrates/vitamins/mineral✓
 - causes malnutrition/kwashiorkor✓ / marasmus ✓ Any 2) (2)
- 9.1.3 Plants/ part of plants/ specific name of plants/ supplements/ tablets✓ (1)
- 9.1.4 $10\ 000/40\ 000 \times 100 = 25\%$ ✓ (3) **(9)**

CELLULAR RESPIRATION

CLASSWORK/HOMEWORK

ACTIVITY 1

1.
 - 1.1 Cellular respiration – is the breaking down of glucose (organic compounds) so as to gradually release energy to all cells ✓
 - 1.2 Aerobic respiration - is the process of cellular respiration that takes place in the presence of O₂✓
 - 1.3 Anaerobic respiration - is the process of cellular respiration that takes place in the absence of O₂✓

OR

Anaerobic respiration – is the biochemical pathway taken by the process of cellular respiration in the absence O₂✓
 - 1.4 Co-enzymes - are the non-protein partner that are carriers of high energy Hydrogen atoms in the oxidative phosphorylation stage of respiration ✓

OR

Co-enzymes - are organic compounds that act as Hydrogen acceptors / carriers during cellular respiration✓
 - 1.5 ATP - is an energy carrier✓
 - 1.6 Oxygen (O₂) - is the gas needed /required for the process of cellular respiration✓

OR

Oxygen (O₂) - is the final acceptor of Hydrogen atoms✓
 - 1.7 Glycolysis – is a stage of cellular respiration that takes place in the cytoplasm / cytosol ✓

OR

Glycolysis – is anaerobic phase of respiration that occurs in the cytosol✓
 - 1.8 Mitochondrion - is the organelle in a cell at which Kreb's cycle occurs✓
 - 1.9 Kreb's Cycle - is a cyclic series of reactions that takes place in the mitochondrion✓

OR

Kreb's Cycle - is a phase of cellular respiration in which CO₂ is evolved✓

OR

Kreb's Cycle - is a phase of respiration which releases a large amount of energized hydrogen atoms✓
 - 1.10 Ethanol – is a product, other than CO₂ of alcoholic fermentation in plants ✓

OR

Ethanol – is an organic product of anaerobic respiration in plants✓
 - 1.11 Lactic acid – is an organic acid builds up in the muscle cells due to anaerobic respiration✓

1.12 Carbon dioxide(CO₂) - is a gas given off as a by-product during the process of cellular respiration✓

OR

Carbon dioxide(CO₂) - is a Gas evolved during process of cellular respiration✓

(12)

ACTIVITY 2

2

- 2.1 - Cellular respiration is the process at which glucose (organic compound) is broken down ✓
- So as to gradually release energy✓
- In a controlled way✓
- Oxygen(O₂) is required (needed) ✓
- Carbon dioxide (CO₂) is released as a by-product✓
- The released energy✓
- Is stored in ATP (energy carrier) molecules✓ (7)

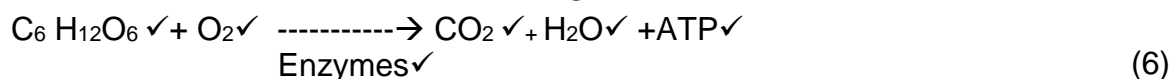
- 2.2 In the cytoplasm✓ (2)
Mitochondrion ✓

- 2.3 - Aerobic✓ cellular respiration takes place in presence O₂✓
- Anaerobic✓ cellular respiration takes place in absence O₂✓ (4)

- 2.4 (a) Glucose✓ Oxygen✓ Enzymes✓ (3)
(b) Carbon dioxide✓ (CO₂) Water ✓ (H₂O) ATP✓ (3)

- 2.5 Glucose✓ + Oxygen✓ -----→ Carbon dioxide✓ + Water✓ + ATP✓
Enzymes✓

OR



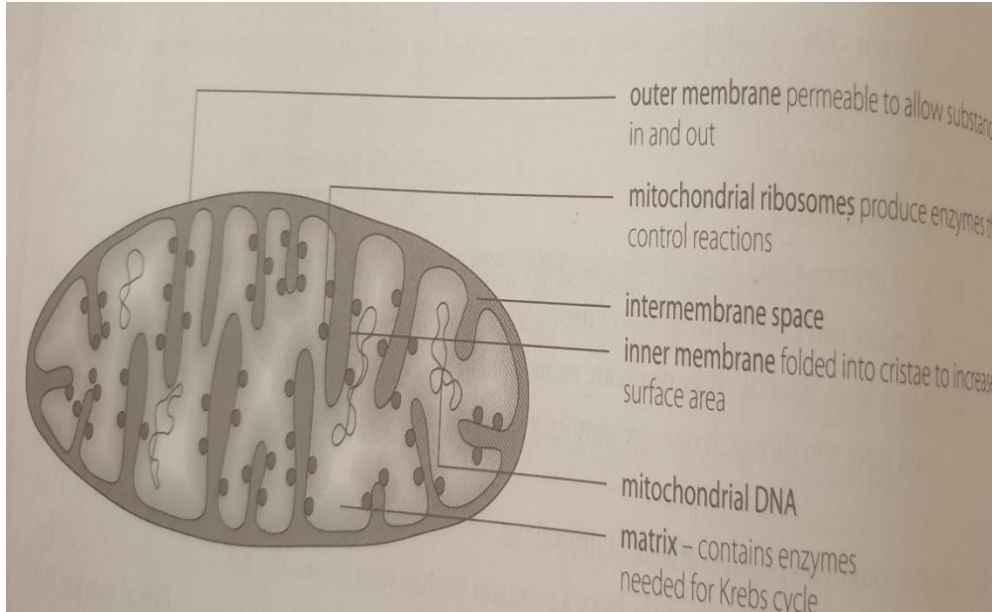
- 2.6 - To constantly supply cells with of energy ✓ in the form of ATP
To perform the following processes:
- Synthesis of organic molecules✓ within cells
- Growth✓
- Cell division ✓
- Contraction of muscle fibres✓
- Movement ✓
- Transport of substances✓ within the body
- Active transport of substances ✓(movement of substances against the concentration gradient). (8) **(33)**

ACTIVITY 3

3. 3.1 Aerobic respiration is a process of cellular respiration that takes place in the presence of O_2 ✓✓ (2)

3.2 Glucose ✓ Oxygen ✓ Enzymes ✓ (3)

3.3



Structure of the Mitochondrion ✓

Mark allocation

Caption	1
Representative of mitochondrion	1
Any 4 correct labels	4

3.4 - Inner membrane is folded ✓
to increase surface area ✓ in which chemical reaction occur.
- Presence of ribosomes ✓
to make enzymes ✓ needed/ required to catalyse the reactions
- Permeable membranes ✓
to allow the easy entry and exit of various substances ✓
- Presence of enzymes ✓ in the matrix
to facilitate the Kreb's cycle ✓/ the part of cellular respiration that occurs
within the mitochondrion (8)

3.5 Occurs in the cytoplasm ✓ of the cell
requires oxygen ✓ to take place
glucose (6 Carbon compound) is split into ✓
two (3 Carbon) compounds ✓
called pyruvic acids ✓
small amount of energy is released ✓ that
is used to form ATP ✓
high energy H-atoms are also released ✓ and
are transported to the third phase ✓ of aerobic cellular respiration (10)

3.6 ATP✓/ Energy CO₂✓ H₂O✓ (3)

ACTIVITY 4

- 4.1 (2)
- (1)
- (2) **(5)**
- 4.2 4.2.1 To investigate whether carbon dioxide is released during respiration ✓✓ (2)
- 4.2.2 A - Germinating seeds ✓
B - Damp cotton wool/ porous stopper✓ (2)
- 4.2.3 - The cotton must not touch the lime water✓
since the lime water will affect the germinating seeds. ✓
- The cotton wool/ porous stopper must be kept moist✓
to allow the seeds to germinate✓
- The test tube must be tightly sealed✓
to prevent CO₂ from the atmosphere entering✓/ or CO₂ released by
the germinating seeds escaping. (Any 2 x 2) (4)
- 4.2.4 - It is used to indicate whether CO₂ is produced or not✓
- If it is produced the lime water will turn milky✓
- If it not, it will remain clear ✓ (3)
- 4.2.5 Set up an identical apparatus but use boiled seeds which have been
sterilized instead of germinating seeds which are rapidly respiring✓✓ (2) **(13)**

ACTIVITY 5

5. 5.1 Anaerobic respiration Process of cellular respiration that takes place in
the absence of O₂ ✓✓
- OR**
- Biochemical pathway taken by the process of cellular respiration in the
absence O₂ ✓✓ (2)
- 5.2 - It occurs in the absence of oxygen✓
- Glucose is partially broken down✓
- much less energy is released✓ in the form of ATP and
- in animal cells, lactic acid is formed✓ and it is
- called lactic acid it is usually fermentation
- in yeast cells, alcohol is produced✓ and it is
- called alcoholic fermentation (5)
- 5.3 - Making wine ✓
- In baking✓
- Beer making✓

- To produce daily products for example yoghurt, cheese, sour milk ✓
Mark the first THREE only (Any 3) (3)

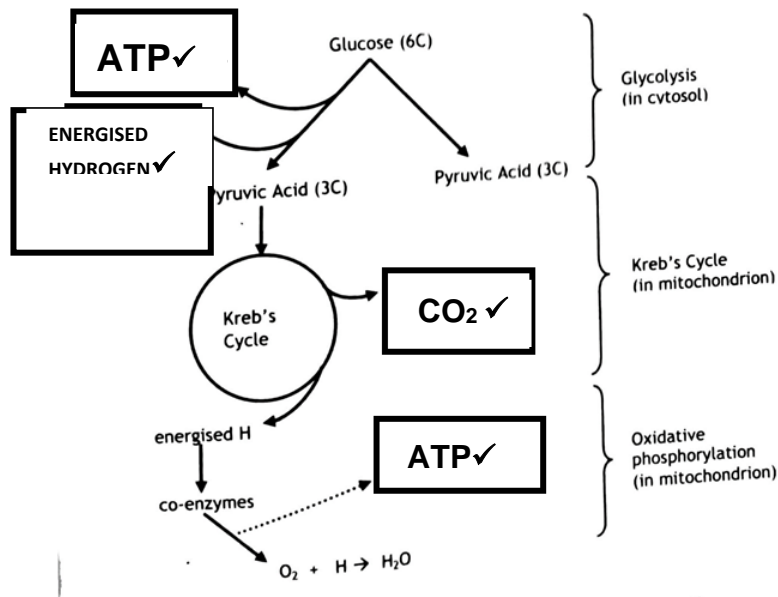
5.4

Aerobic Respiration	Anaerobic Respiration
- Large amount of energy is released ✓ – due to the complete breakdown of glucose	- Small amount of energy released ✓ - due to the incomplete breakdown of glucose.
- End products are carbon dioxide and water ✓	- End products are carbon dioxide and ethanol in fungi / plants or lactic in animals ✓

(1 for table + 4) (5) (15)

ANNEXURE

Solutions for Teaching Tool 3



(4)

