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TYS Answers 2016 **(ThatBioTutor Edition)**

IMPT NOTE:

- For differences between 2023 and 2024 syllabus, see this list [here](#).
- ***Shaded black = out of syllabus from 2024 onwards**

Question	Ans	Question	Ans
1	D	21	D
2	A	22*	D
3	D	23	C
4	D	24	D
5	A	25	C
6	B	26	D
7	B	27	B
8	B	28	D
9	C	29	C
10	D	30	B
11	A	31	E
12	B	32	C
13	C	33	D
14	C	34	A
15	C	35	A
16	B	36	C
17	B	37	A
18	C	38	C
19	B	39	C
20	C	40	B

***Q22: Structure 4, hair erector muscle, is the only part of this question that is out of syllabus.**

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Q1.

(a)

- A: Fibrin thread
- B: Red blood cell

(b)

- When blood vessels are damaged, platelets and damaged tissues release Thrombokinase.
- Thrombokinase converts Prothrombin to Thrombin, in the presence of Calcium ions.
- Thrombin then converts Fibrinogen to Fibrin, forming long insoluble Fibrin threads, which trap red blood cells, forming a clot at the site of injury.
- When blood vessels are damaged, platelets are activated, which trigger the conversion of soluble fibrinogen into insoluble Fibrin,
- Forming long insoluble Fibrin threads which trap red blood cells, forming a clot at the site of injury.

(c)

- The blockage prevents blood carrying oxygen and nutrients such as glucose to the brain cells,
- Brain cells cannot undergo aerobic respiration to release energy for cellular activities hence die,
- Resulting in a stroke.

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Q2.

(a)

- Row 1: Salivary amylase
- Row 3: Short polypeptides
- Row 4: Small intestine/pancreas

(b)

- Mouth: B. It has highest rate of activity at pH 7, hence that is its optimum pH,
- And the mouth has pH of 7, hence this enzyme would likely be found there.
- Stomach: A. It has highest rate of activity at pH 2, hence that is its optimum pH,
- And the stomach has pH of 2 due to the hydrochloric acid that is secreted there.

Q3.

(a)

- A sudden change in the structure of a gene or chromosome number.

(b)

(i)

- 1: dd
- 2: Dd

(ii)

- 3: Pp
- 4: pp

(iii)

- 50%

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Q4.

(a)

(i)

- Root hairs

(ii)

- They assist the root hair cells in absorbing water via osmosis and mineral salts via active transport,
- from the surrounding soil to the cell sap of root hair cells.

(iii)

- The root hairs are long, elongated protrusions, increasing the surface area to volume ratio of root hair cells,
- Hence increasing the absorption of water and mineral salts from the soil into their cell sap.

(b)

- Name: Xylem
- Function: It transports water and mineral salts that have been absorbed at the roots upwards to the leaves.

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Q5.

(a)

(i)

- A: Mitochondrion
- B: Smooth Endoplasmic Reticulum

(ii)

- It is the site of aerobic respiration, where glucose is oxidised into carbon dioxide and water, releasing energy which is used for cellular activities.

(b)

- A plant cell has chloroplasts while the animal cell above does not.
- A plant cell has 1 large central vacuole, while the animal cell has many small vacuoles.
- A plant cell has a cell wall while the animal cell does not.

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Q6.

- 1: Fruit bats
- 2: Banana plants

1st arrow: Macaws → Pythons

2nd arrow: Banana plants → Monkeys

(b)

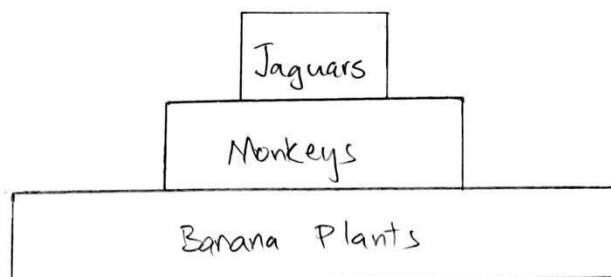
- Trophic level is the feeding position that an organism occupies in a food chain.
- For example, orchids, seeds, banana plants and bamboo plants are producers in the first trophic level. They are fed on by macaws, fruit bats and monkeys, which are the primary consumers who occupy the second trophic level.

(c)

Choose 2:

- Energy is lost as heat to the surroundings due to cellular respiration.
- Chemical energy is also trapped within carbon compounds in undigested food waste that is egested, and in excreted substances such as urine.
- When an organism dies, chemical energy is also trapped in the uneaten parts, such as its bones.

(d)



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Q7.

(a)

(i)

- As concentration of ADH in blood plasma increases, urine concentration increases.
- ADH reaches kidney nephrons, causing collecting ducts to become more permeable to water,
- More water is reabsorbed from filtrate to the blood, hence increasing urine concentration.

(ii)

- As concentration of ADH in blood plasma increases, rate of flow of urine through the ureter decreases.

(b)

- Vigorous exercise leads to a lot of sweating, hence the body loses water and water potential decreases below normal.
- Osmoreceptors in the hypothalamus detect this, and send nerve impulses to trigger the pituitary gland to release more ADH into the blood to conserve water, hence ADH concentration increases.

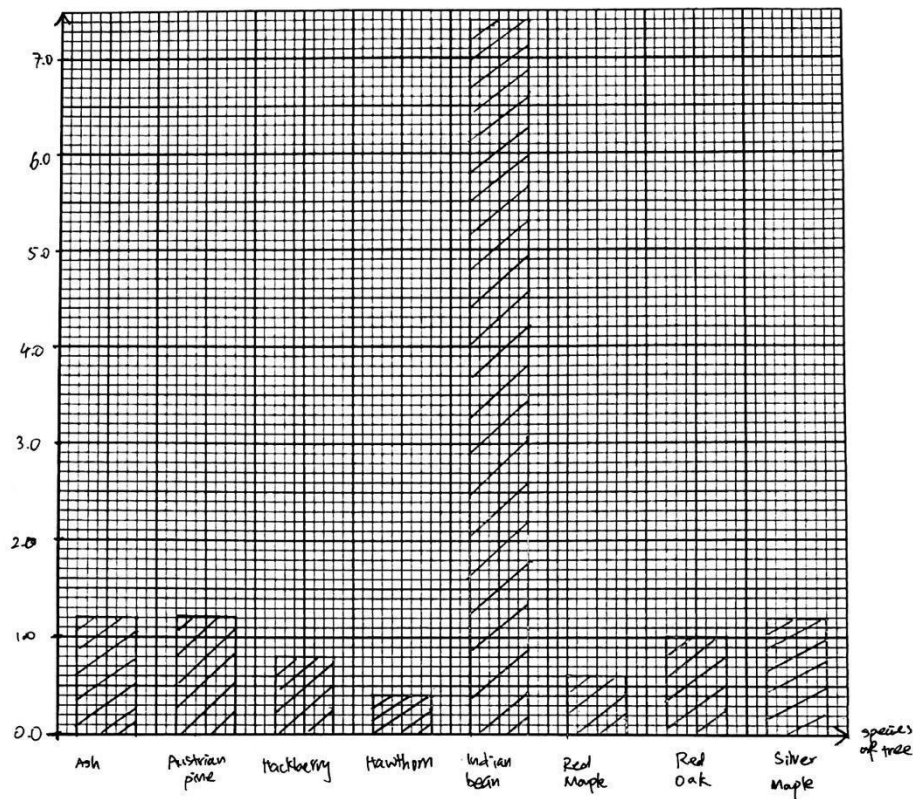
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Q8.

(a)

- Hackberry: $12.8/16 = 0.8$
- Red oak: $1.0 \times 16 = 16.0$

(b)



(c)

- Measure the height of the tree each year, and obtain growth rate each year by calculating the increase in height from the previous year.

(d)

- Light is needed for photosynthesis, where glucose will be formed and used to build new cell parts such as the cellulose cell walls for the growth of trees.
- In natural environments, sunlight is only available during daytime and absent at night, hence light significantly limits the growth of trees.

(e)

Choose 2:

- Concentration of carbon dioxide in the air
- Temperature
- Availability of mineral salts in the soil

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Q9.

(a)

- Excess amino acids are broken down into urea at the liver via deamination,
- Urea exits the liver and is transported to the kidneys.
- Urea is forced out of the glomerulus at kidney nephrons into the Bowman's capsule,
- And becomes part of urine, which collects in the bladder,
- Which is excreted from the body via the urethra.

(b)

- Carbon dioxide (CO_2) diffuses from cells into the tissue fluid, then into capillaries.
- CO_2 diffuses into a red blood cell, carbonic anhydrase combines it with water, forming carbonic acid.
- Carbonic acid dissociates into a H^+ ion and a bicarbonate ion, which diffuses out of the cell and is carried in the blood plasma to the lungs.
- At the lungs, the reverse process occurs, bicarbonate ions are converted back to CO_2 , which diffuses from blood into alveoli air spaces and is exhaled.

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Either Q10.

(a)

Choose total 5 points:

- In both aerobic and anerobic respiration, glucose is broken down into smaller molecules.
- In both aerobic and anerobic respiration, energy is released which is used for cellular activities
- Both aerobic and anerobic respiration are used during vigorous exercise for muscular contractions
- Aerobic respiration uses oxygen as a reactant, while anaerobic respiration does not require oxygen.
- Aerobic respiration releases a large amount of energy, while anaerobic respiration releases a small amount of energy.
- Aerobic respiration produces carbon dioxide and water, while anaerobic respiration does not, instead produces lactic acid.
- Products of aerobic respiration do not need to be removed by the liver, while that of anaerobic respiration, lactic acid, is removed at the liver.

(b)

- Anaerobic respiration occurs when there is insufficient oxygen to keep up with the energy demanded by cells,
- such as by muscle cells during vigorous exercise for muscular contractions.
- In such cases, anaerobic respiration occurs to release additional energy on top of that released by aerobic respiration,
- Releasing lactic acid as a by-product. **As lactic acid accumulates, it causes muscular pain, cramps and fatigue in muscles,**
- **Such that muscular activities cannot be maintained at a high level for long, and performance declines.**
- **During rest, lactic acid is transported to the liver, where it is removed from the body. lactic acid is removed from muscles and transported via bloodstream to liver, where they are converted back to glucose.**

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Or Q10.

(a)

- Endocrine glands are ductless glands that secrete their products, hormones, directly into the bloodstream.
- For example, when the pituitary gland secretes more ADH, it enters the bloodstream directly without the use of ducts.
- It is carried to the kidneys, which are the target organs, and reaches nephrons,
- Causing the cells of the walls of collecting ducts to become more permeable to water so that more water is reabsorbed back into the blood.

(b)

- When blood glucose rises above the norm, cells in the islets of Langerhans in the pancreas detect this, and secrete more insulin into the bloodstream.
- Insulin increases the permeability of cells in the liver and muscles to glucose so more glucose diffuses into them, and triggers conversion of glucose into glycogen.
- This lowers blood glucose back to normal, insulin secretion reduces back to normal.
- When blood glucose falls below the norm, cells in the islets of Langerhans detect this and secrete more glucagon into the bloodstream.
- Glucagon triggers the conversion of glycogen into glucose in liver cells, which is released to the bloodstream.
- This raises blood glucose back to normal, glucagon secretion reduces back to normal.