

TYS Answers 2023 (ThatBioTutor Edition)

IMPT NOTE:

- for differences between 2023 and 2024 syllabus, see this list <u>here</u>. *Shaded black = out of syllabus from 2024 onwards -
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Question	Ans	Question	Ans
1	D	21	В
2	В	22	D
3	С	23	D
4	С	24	D
5	D	25	Α
6	В	26	С
7	В	27	В
8	D	28	Α
9	В	29	С
10	D	30	D
11	Α	31	Α
12	Α	32 *	A
13	Α	33 *	B
14	C	34	В
15	С	35	D
16	С	36	С
17	C	37	В
18	D	38	Α
19	В	39	Α
20	Α	40	D

Paper 2 random answers: (not checked yet by TBT) -

https://drive.google.com/file/d/1qmuJdhwSS1dXvbPPMgsGES5SbCvZlbRY/view?usp=drive_li nk

Q1

a)

- X pulmonary artery
- Y right ventricle
- Z tricuspid valve

b)

- During ventricular systole, muscles of Y, the right ventricle, contract.
- As blood pressure in right ventricle increases above that of the right atrium,
- Causing Z, the **tricuspid valve** to close, **preventing backflow** of blood into the **right atrium**.
- Blood pressure in right ventricle increases above that of the pulmonary artery, pulmonary semi-lunar valve is forced open, blood is sent to the lungs via the pulmonary artery.

c)

- Blood is pumped from **Y**, the **right ventricle**, to the lungs via the **pulmonary artery**.
- Blood then returns to the **left atrium** via the **pulmonary vein**, then enters the **left ventricle**,
- And is pumped out the **aorta** to the rest of the body. Blood enters the **kidneys** via the **renal arteries**,
- then branches out to **afferent arterioles** of nephrons, enters the **glomeruli**, then **efferent arterioles**, then branches into blood **capillaries**.

Q2

ai) Any 2 points:

- They have the same length
- They have the same centromere position
- They have the same gene loci
- •

aii)

- Body cells are diploid, hence chromosomes will be found in homologous pairs
- Gametes are **haploid**, **homologous chromosomes** would have separated during **Meiosis I**, **reduction division**, hence gametes only have **one copy** of each **chromosome**.

aiii)

Out of syllabus

b)



Q3

ai)

- To release energy through aerobic respiration,
- For cellular activities such as cell growth/repair

aii)

- Carbon dioxide
- Water

bi)

• As cell diameter **increases** from **10** to **80 μm**, mean number of mitochondria per cell **increases** from **80** to **700**.

bii)

Plant cell with greater density of mitochondria:

• (choose 1) root hair cells/companion cells

Reason: (choose 1)

- Root hair cells to release a lot of energy via aerobic respiration for active transport of mineral salts from a region of lower concentration in the soil to a region of higher concentration in their large central vacuoles
- Companion cells To release a lot of energy via aerobic respiration needed for sieve tube elements to transport manufactured food substances during translocation as active transport is involved

Plant cell with less density of mitochondria: (choose 1) Sieve tube elements/Xylem vessel elements

Reason: (choose 1)

- Sieve tube elements contain no mitochondria to have more space in the cell, to allow a more unobstructed flow of sap throughout the phloem
- Xylem vessel elements contain no cell parts except the cell wall, to allow an unobstructed flow of water and mineral salts from the roots to leaves.

Q4

a)

Feature	Liver	Pancreas
Is a target organ for glucagon		
Breaks down red blood cells	<mark>∕∕Out of</mark> syllabus)	
Is involved in homeostasis	\checkmark	
Produces bile	\checkmark	
Breaks down hormones	\checkmark	
Produces protease		\checkmark

b)

Running:

- During the run, muscles use up glucose for aerobic respiration to release energy for muscular contractions, causing blood glucose concentration to fall.
- In response, cells of the islets of Langerhans in the pancreas will release more glucagon,
- Which travels through the **bloodstream**, **stimulating** the **liver** to **convert more glycogen** to **glucose**, to **raise blood glucose concentration** back to **normal**.

Resting:

- As **glucose demand** from muscles **decreases** back to normal, excess remaining glucose in the bloodstream causes the **cells** of the **islets of Langerhans** in the **pancreas** to release less **glucagon**,
- And more insulin, increasing the **permeability** of **liver** and **muscle** cells to glucose so more glucose **diffuses** into them, and triggers conversion of **glucose** to **glycogen** in, **lowering blood glucose concentration** back to normal.

Q5

ai)

- Water moves out of cell B by **osmosis**, forming a **thin film of moisture**, which **evaporates** into **water vapour** in the **intercellular air spaces**.
- As this continues to occur, **water potential** of cell B decreases, and is now lower than that of cell A.
- Water flows from a **region** of higher **water potential** in cell A to a **region** of lower **water potential** in cell B, down the **water potential gradient**, via **osmosis**.
- Water moves from **xylem vessels** into cell A to **replace** the water lost, increasing its **water potential** to be higher than cell B once again.

aii)

- When a plant wilts, more water is lost via transpiration than is absorbed at the roots, mesophyll cells experience a net loss of water, causing their large central vacuoles to shrink.
- Severe water loss would cause its plasma membrane/cell surface membrane to pull away from the cell wall
- The cell is now **plasmolysed**

b)

- Seawater has a high **concentration** of **salt**, and **low water potential**.
- Water potential of the soil could become lower than that of the plants' root hair cells, water leaves via osmosis instead of entering the roots of the plant.
- more water is lost via **transpiration** than is **absorbed** at the **roots**, **mesophyll cells** experience a **net loss** of water, causing their **large central vacuoles** to **shrink**, the plant **wilts**.
- This causes the **guard cells** to **close stomata**, plants will not be able to take in sufficient **carbon dioxide/**This **reduces total leaf surface area**, plants will not receive sufficient **sunlight** for **photosynthesis**, hence eventually die.

Q6

a)

- P larynx
- Q bronchi
- R trachea

b)

- When breathing in, the **diaphragm contracts** and **flattens**, while the **ribcage** moves **upwards** and **outwards** due to the **contraction** of **external intercostal muscles**.
- Both these actions increase **thoracic volume**, causing **air pressure** in **lungs** to fall below **atmospheric pressure**, causing **air** to flow into the **lungs**.

c)

Tar:

- Tar is a carcinogen, which increases the risk of lung cancer.
- Tar also paralyses cilia, so dust particles and pathogens trapped in mucus cannot be expelled. This can result in chronic bronchitis and emphysema.

Carbon monoxide:

- **Carbon monoxide** binds **irreversibly** with **haemoglobin** such that it cannot transport oxygen anymore, reducing the ability of blood to transport oxygen.
- Carbon monoxide also damages **innermost layer** of blood vessels, increasing the rate **fatty deposits** accumulate in **arteries**, hence increasing chances of **heart attacks**.

Q7.

a) Oceans

b(i)

Land use	Mass of carbon released into the atmosphere in 1990/millions of tonnes	Mass of carbon released into the atmosphere in 2015/millions of tonnes
Urban	0.0	0.5
Industrial farming	2.9	64.3
Small-holder farming	20.7	49.1
Undeveloped land	12.0	13.6
Tall shrubs	4.1	9.2
Degraded peat swamp	12.1	9.4

b(ii)

• (49.1 - 20.7)/20.7 * 100 = 137% (3sf)

b(iii)

- As peat is made of dead plant remains that have not fully **decomposed**, when peat is drained, **microorganisms** feed on the peat and **decompose** it,
- Releasing carbon dioxide as decomposers undergo aerobic respiration.
- The peat swamp forest used to accumulate carbon compounds in the peat under the living vegetation for indefinite periods of time, but a drained one only stores carbon in the living vegetation.
- As it is now **releasing** more **carbon dioxide** to the **atmosphere** than it takes in, it is now a **carbon source**.

Q8 Either

ai) Any 3 points:

- Menstrual cycle length **varies** between women of different ages/even within the same age, and do not have a fixed duration.
- The **mean** menstrual cycle length is at its **maximum** at age 21 years, where it lasts 30 days.
- Mean menstrual cycle length generally decreases from about 30 days to 26.7 days as women age from 18 to 45 years.
- The **maximum** cycle length for women aged 18 to 45 was 31 days while the **minimum** cycle length was 26.7 days.
- (Any other valid trend/observation in data)

aii)

- Less time is needed to collect data from many individuals as they are entering it into the app themselves at their own time.
- Participants may be **more willing to enter data into the app anonymously** compared to talking to a stranger in-person about their menstrual cycle.
- Apps make it **easy to collect data from many individuals from around the world**, and the data may be more representative of all races and ethnicities.
- (Any other valid point)

b)

- From days 1-5, **oestrogen** and **progesterone** levels are too low to maintain the uterine lining, it breaks down, **menstruation** occurs.
- From days 6-14, increasing **oestrogen** levels secreted from **ovaries** causes the uterine lining to be **repaired** and **grow thicker**.
- From days 14-21, increasing **progesterone** secreted from the **ovaries** cause the uterine lining to **further grow and thicken**,
 - And more **blood vessels** grow within the lining, to prepare for **implantation** of an **embryo**.
- From days 22-28, **oestrogen** and **progesterone** decline, and the cycle **repeats**.

Q8 Or

- a)
- A nephron is the basic functional unit of the kidney, it filters and removes metabolic waste products and toxic substances from the blood to form urine.
- Lumen of efferent arteriole is smaller than that of the afferent arteriole, generating high blood pressure which forces out most of the blood plasma and its dissolved substances, such as glucose, amino acids, mineral salts, and urea into the Bowman's capsule during ultrafiltration.
- The proximal convoluted tubule and distal convoluted tubule are long and twisted, increasing the duration that the filtrate passes through/there is an extensive network of capillaries around the proximal convoluted tubule, distal convoluted tubule and Loop of Henle,
- increasing the amount of useful substances such as **glucose**, **amino acids**, and some **mineral salts** that **are selectively reabsorbed** from **filtrate** back into **bloodstream**.

b)

- Excess ADH in the blood causes the **cells** in the **walls** of **collecting ducts** to be **more permeable to water**,
- hence more water is **reabsorbed** from **filtrate** back into blood, and **excess water** is **not excreted**.
- The higher amount of water in the blood lowers the salt concentration in the blood.

c)

- As SIADH patients age increased from 0-20 to 61-80 years, number of patients with SIADH **increased** from 1 to 48, and as age increased to 81-100 years, number of patients with SIADH **decreased sharply** to 4.
- Majority of SIADH patients were aged 61-80, and this age group made up about 65.8% of patients.
- As age of SIADH patients increase from 0-20 to 61-80 years, number of patients increases at an increasing rate.
- (Any other valid point)