Credit: Written by the collective effort of our tutors at ThatBioTutor. You are welcome to share these with anyone you'd like! Just don't sell them for profit :)

TYS Answers 2018 (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	**A**	21	**B**
2	**A**	22	**D**
3	**B**	23	**A**
4	**B**	24	**D**
5	**C**	25	**C**
6	**D**	26	**C**
~~**7 ***~~	~~**C**~~	27	**D**
8	**A**	28	**B**
9	**B**	29	**B**
10	**A**	30	**A**
11	**C**	~~31~~*	~~**C**~~
12	**B**	~~32 *~~	~~**D**~~
13	**C**	~~33 *~~	~~**A**~~
14	**D**	34	**C**
15	**A**	35	**D**
16	**B**	36	**A**
17	**C**	37	**C**
18	**C**	38	**B**
~~**19 ***~~	~~**B**~~	39	**D**
20	**D**	40	**D**

**Q31: Homologous chromosomes "form pairs in mitosis and meiosis" is out of syllabus, but the rest of the options are in syllabus.*

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Q1.

(a)

(i)

- Chromosome~~/chromatid~~

(ii)

- ~~3: Metaphase~~
- ~~4: Anaphase~~

(b)

(i)

- Plant 2.

(ii)

- Plant 1: AA
- Plant 3: aa

Q2.

(a)

(i)

Any 3:

- The liver carries out detoxification, where harmful substances such as alcohol are converted into harmless ones.
- Hormones are broken down at the liver after they have caused target organs to carry out the response.
- The liver produces bile, which is then stored in the gall bladder. Bile aids in fat digestion.
- ~~The liver stores iron from the breakdown of haemoglobin of old red blood cells, to be used for making new red blood cells.~~
- The liver carries out deamination, where amino groups are removed from excess amino acids and converted into urea.
- The liver aids in blood glucose regulation, converting glucose to glycogen when blood glucose concentration is too high, and vice versa when glucose levels are too low.
- ~~The liver synthesises blood proteins such as prothrombin and fibrinogen.~~

(ii)

- C (pancreas)

(iii)

Name:

- Bile

Function:

- **Bile salts** in bile **emulsify** large **fat droplets** into smaller ones,
- increasing the **surface area to volume ratio** for **pancreatic lipase** and **intestinal lipase** to digest **fats** into **glycerol** and **fatty acids.**

(b)

(i)

- 40°C

(ii)

- At 60°C, the high temperature has denatured rennin, the active site is no longer complementary to its substrate hence it is no longer able to cause the milk to form lumps.

(c)

- When milk forms lumps, it stays in the stomach longer for ~~pepsin~~ protease to digest more milk proteins into short polypeptides.
- More short polypeptides are broken into amino acids in the small intestine, hence more amino acids are absorbed into the bloodstream for assimilation for the growth of the young cow.

Q3.

(a)

(i)

- 3 minutes.

(ii)

- As temperature increases from 15 to 19°C, time taken for blood to clot decreases sharply from 24 to 13min.
- As temperature increases further from 19 to 35°C, time taken decreases gradually from 13 to 3min.

(b)

- To prevent further loss of blood from damaged blood vessels by sealing the wound
- To prevent the entry of harmful microorganisms into the wound from outside the body.

Q4.

(a)

Any 3:

- The alveolar wall is one-cell-thick, minimising the distance oxygen (O_2) and carbon dioxide (CO_2) have to travel, increasing diffusion rate.
- Alveoli are small and numerous, increasing their surface area to volume ratio, hence increasing the rate of diffusion of gases.
- They are also surrounded by a network of capillaries, which provide a continuous blood supply, so oxygenated blood is quickly carried away to maintain the concentration gradients for diffusion O_2 and CO_2.
- There is a thin film of moisture lining the alveolar air space, allowing gases to dissolve in it before diffusing across.

(b)

- ~~When carbon dioxide (CO_2) produced by cells diffuses into red blood cells, there is less carbonic anhydrase to combine it with water, forming less carbonic acid.~~
- ~~Less carbonic acid dissociates into less H^+ and less bicarbonate ions, which is carried in the blood plasma to the lungs.~~
- ~~At the lungs, less bicarbonate ions are converted back to CO_2, concentration gradient between blood plasma and alveolar air space is less steep, decreasing the rate of CO_2 that diffuses out of the blood.~~

(c)

- When the person is breathing in, pressure in alveoli decreases from 0.0 to -1.0 units from 0 to 1 seconds,
- Then increases back to 0.0 units from 1 to 2 seconds.

(d)

- During inspiration, the diaphragm contracts and flattens downwards.
- The internal intercostal muscles relax, while external intercostal muscles contract, moving the ribcage up and out.
- As a result, thoracic volume increases and the volume of the lungs increase.

Q5.

(a)

(i)

- 173.5

(ii)

- (180.0 - 175.5)/180.0 = 2.5%

(iii)

- Urea

(b)

- A is the glomerulus, and the lumen of efferent arteriole is smaller than the afferent arteriole,
- Generating high (hydrostatic) blood pressure which forces out most of the blood plasma and its dissolved substances during ultrafiltration.
- B is a venule, bringing substances that have been selectively reabsorbed along the nephron such as glucose and amino acids to the renal vein and back to the rest of the body.

Q6.

(a)

- A is a leaf vein, and it contains the vascular bundle consisting of xylem and phloem.
- The xylem carries water and mineral salts from the roots to the leaf cells, and phloem carries manufactured food substances such as sucrose and amino acids from the leaf to the rest of the plant.

(b)

(i)

- Sucrose

(ii)

- Phloem

(iii)

- 65cm/2.5h = 26cm/h

Q7.

(a)

- P is aerobic respiration, where carbon compounds such as glucose are broken down, releasing carbon dioxide to the atmosphere so it can be re-used for photosynthesis.
- Q is Photosynthesis, where carbon dioxide in the atmosphere is converted into carbon compounds such as glucose, which can then be transferred to other consumers which eat these producers in food chains.
- S is combustion of fossil fuels, releasing energy for human use, and carbon dioxide into the atmosphere which can later be used by plants for photosynthesis.

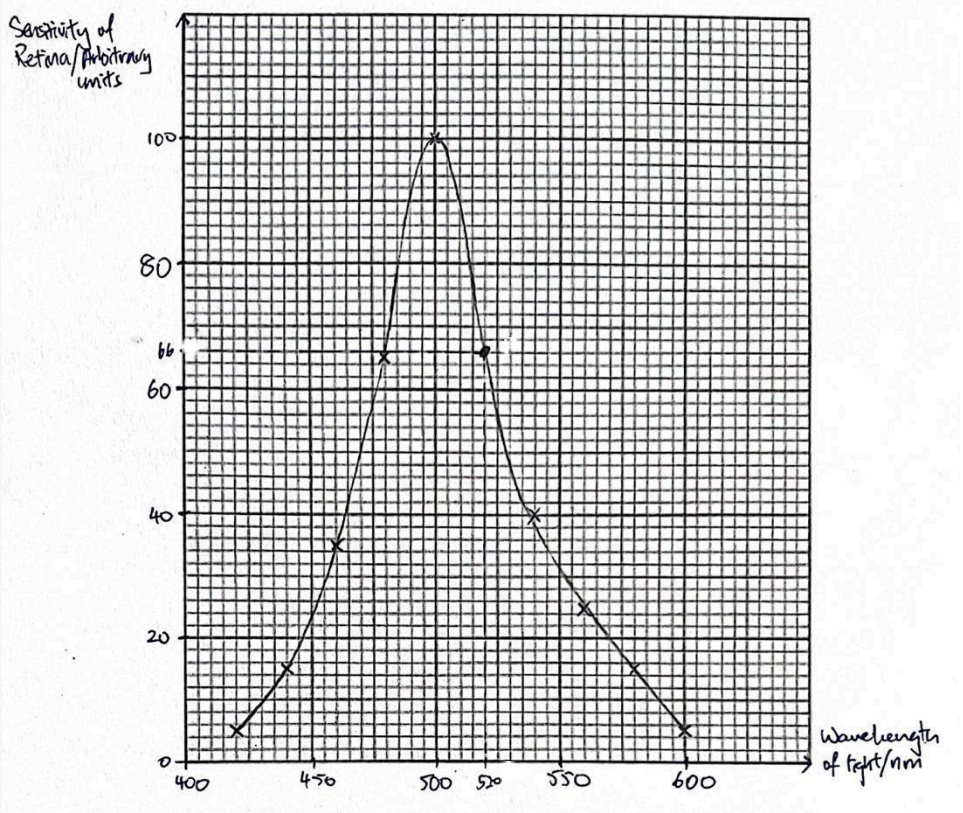
(b)

- They are decomposers which break down organic matter such as faeces and dead organisms, releasing carbon trapped in the carbon compounds to the atmosphere as carbon dioxide,
- so it can be re-used for photosynthesis, making carbon available for other organisms in the food chain once again.

Q8.

(a)

(i)



(ii)

- 100 - 15 = 85units

(iii)

- As wavelength of light increases from 420 to 500nm, sensitivity of retina increases rapidly from 5 to 100 units.
- As wavelength of light increases from 500 to 600nm, sensitivity of retina decreases rapidly from 100 to 5 units.

(iv)

- From graph: 66 (or similar values, based on your graph)

(b)

- As light was shined in the person's eye, the increased light intensity was detected by photoreceptors in the retina, which sent nerve impulses to the brain,
- Which in turn sent nerve impulses to the iris muscles. Circular muscles contracted, radial muscles relaxed,
- Causing the pupil to constrict, hence the decrease in pupil diameter.

(a)

Any 3:

- Diffusion and osmosis involve substances moving down the concentration gradient and water potential gradient respectively, while active transport involves substances moving against the concentration gradient.
- Diffusion and osmosis do not require energy while active transport requires energy.
- Diffusion does not require a partially permeable membrane while osmosis and active transport require one.
- Diffusion and active transport can involve various molecules, but osmosis only involves movement of water molecules.
- Diffusion can occur in gaseous environments, while osmosis and active transport require aqueous medium.

(b)

(i)

- Cell B was placed in a solution with higher water potential than its cell sap, hence water entered by osmosis, making the cell swell and become turgid.
- Cell C was placed in a solution with lower water potential than its cell sap, hence water exited by osmosis, making the cell shrink and become plasmolysed.

(ii)

- Cell B

(iii)

- Mineral salts are pumped using energy from a region of lower concentration in the soil, to a region of higher concentration in root hair cells, via active transport.
- This results in root hair cells having lower water potential than the surrounding soil, so that water flows in passively via osmosis,
- Allowing the plant to uptake water, which is used in metabolic processes such as photosynthesis.

Either Q10.

(a)

- ~~In the presence of light, chlorophyll absorbs light energy,which is then converted into chemical energy.~~
- ~~Photolysis of water occurs, water is split into hydrogen and oxygen atoms,~~
- ~~forming oxygen as a by-product which diffuses out of the stomata of leaves.~~
- ~~Using hydrogen atoms and chemical energy, carbon dioxide which diffuses in via stomata is reduced to form glucose,~~
- ~~which can be converted to other substances such as sucrose and amino acids, and starch which is a store of energy.~~
- Photosynthesis is the process whereby carbon dioxide and water are converted into glucose and oxygen, in the presence of light energy and chlorophyll.
- This process is catalysed by enzymes, and is affected by limiting factors such as light intensity, carbon dioxide concentration and temperature.
- In the presence of light, stomata open to allow carbon dioxide to diffuse into intercellular air spaces of the leaf,
- while oxygen, the by-product, diffuses out.
- Glucose is then used for aerobic respiration at mitochondria to release energy for metabolic activities,
- Converted to starch/fats for energy storage, converted to cellulose to build cell walls, and converted to amino acids to form proteins.

(b)

- On a warm day, temperature of enzymes involved in photosynthesis is closer to their optimum temperature than on a cold day.
- Kinetic energy of enzyme and substrate molecules involved in photosynthesis is higher,
- increasing their chances of collision. Enzyme-substrate complexes form faster,
- processes such as photolysis of water and carbon dioxide being reduced into glucose occurs faster, hence photosynthesis rate is higher.

Or Q10.

(a)

- During fertilisation, the nucleus a sperm fuses with the nucleus of an ovum, forming a diploid zygote.
- The zygote is moved from the oviduct towards the uterus, by peristaltic action of the oviduct walls and the sweeping action of cilia.
- Meanwhile, the zygote divides by mitosis into an embryo, which embeds itself into the uterine lining during implantation, where it develops into a foetus.

(along with any 3 more points):

- Finger-like projections called villi, containing the blood vessels from the embryo, grow into the uterine lining, forming the placenta.
- The placenta secretes progesterone and oestrogen, maintaining the thickness of uterine lining.
- In the placenta, oxygen and nutrients diffuse from maternal to foetal capillaries, and are delivered to the foetus via the umbilical cord, while metabolic waste products such as urea and carbon dioxide are removed.
- The amniotic sac develops, containing amniotic fluid that protects foetus from physical injury/allows for movement for muscular development/trains the foetus' digestive system.

(b)

- The placenta secretes oestrogen and progesterone, to maintain the thickness of the uterine lining throughout pregnancy.
- Within the placenta, oxygen and nutrients diffuse from maternal to foetal capillaries,
- while metabolic waste products such as urea and carbon dioxide diffuse from foetal to maternal blood vessels.
- The placenta allows some antibodies to diffuse from maternal to foetal blood, giving the foetus immunity to those diseases.