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TYS Answers 2017 (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	C	21	D
2	A	22	D
3	A	~~23~~*	~~B~~
4	D	24	C
5	B	25	A
6	D	26	A
7	C	27	B
8	B	28	A
9	B	29	B
10	C	30	D
11	A	31	B
12	A	~~32 *~~	~~C~~
13	C	~~33 *~~	~~A~~
14	B	34	C
15	C	35	C
16	A	36	A
17	C	37	C
18	B	38	D
19	A	39	A
20	A	40	B

**23: Option A, hair erector muscles, out of syllabus, but the other options are in syllabus*

Q1.

(a)

- It is the maintenance of a constant internal environment,
- Using negative feedback to counteract changes in the system to restore the set-point.

(b)

- A ductless gland that secretes hormones directly into bloodstream,
- which travel to, and alters the activity of one or more specific target organs.

(c)

(i)

- A: Glycogen
- B: Glucagon

(ii)

- During exercise, muscular contractions demand large amounts of energy generated by aerobic and anerobic respiration,
- Both of which involves oxidising glucose, hence muscle cells use up a lot of blood glucose and cause its concentration to fall.

Q2.

(a)

- C is one of the large intercellular air spaces that decrease the overall density of the leaf, so that it is less dense than water and allows the leaf to float.

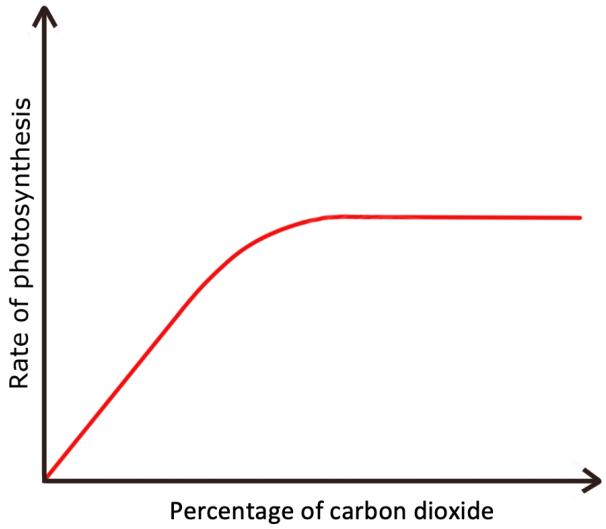
(b)

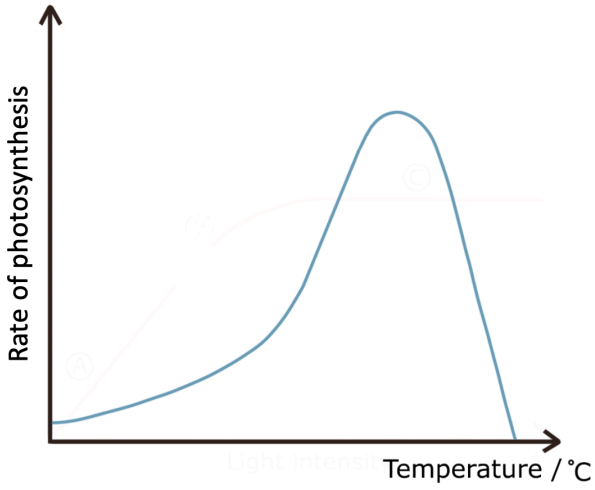
- They are positioned near the top of the leaf, just beneath the upper epidermis, so they can receive maximum sunlight for photosynthesis.

(c)

- Chlorophyll in chloroplasts absorb light energy and converts it into chemical energy,
- which is used to convert carbon dioxide and water into glucose and oxygen.
- ~~Using hydrogen atoms and chemical energy, carbon dioxide is reduced to form glucose during photosynthesis.~~

(d)





Q3.

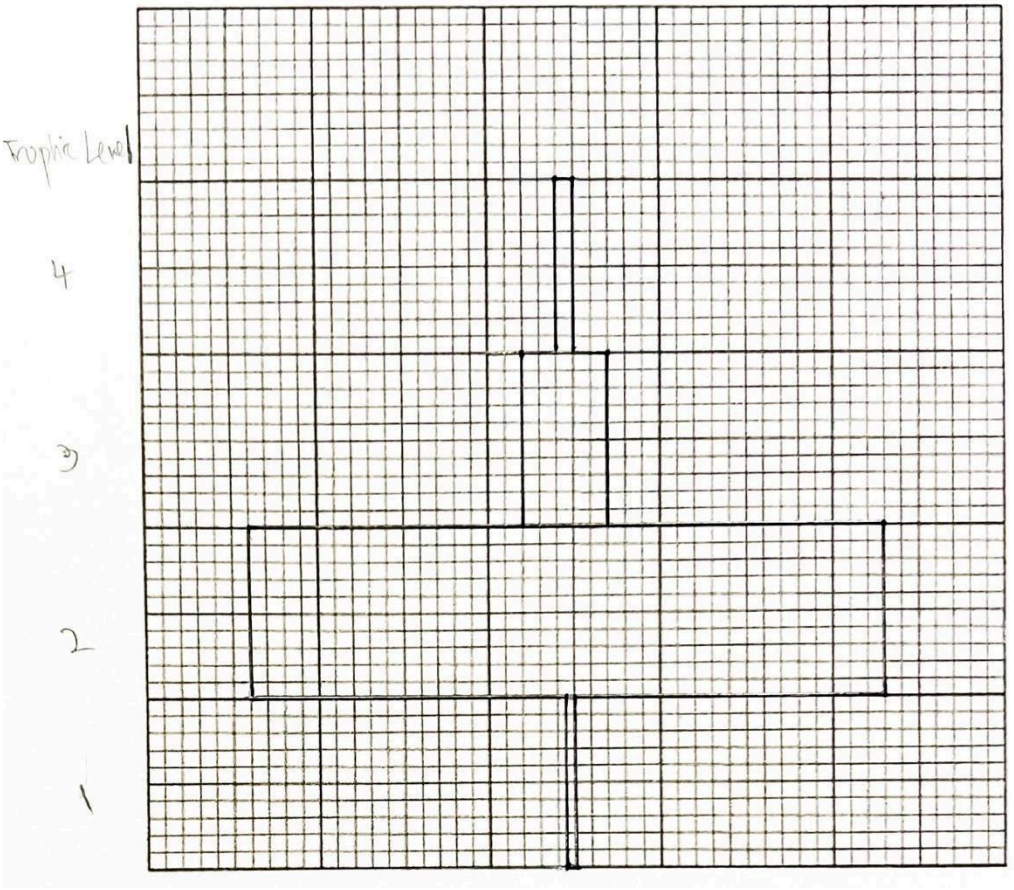
(a)

- It takes up the first trophic level in the food web, it makes it own food from inorganic materials like carbon dioxide, and passes energy up the food web to the rest of the organisms.

(b)

- Trophic level 2: 74 (9 + 36 + 29)
- Trophic level 3: 10 (4 + 6)
- Trophic level 4: 2

(c)



Q4.

(a)

- Before the experiment, weigh each plant using an electronic balance. After every 24 hours, weigh each plant again.
- Subtract each day's new weight from the previous day's weight to track the mass lost each day for each plant.

(b)

- Transpiration.

(c)

- Plant E was entirely enclosed in a plastic bag, water vapour accumulated within, increasing humidity so transpiration rate was the lowest.
- Plant D and F had their leaves exposed, but D had more leaves hence more total surface area for water loss through more stomata in leaves, hence D loses the most mass.

(d)

- To prevent any loss of mass due to evaporation of water from the soil in the pots themselves, hence ensuring any drop in mass was due to water loss via transpiration.

Q5.

(a)

- The type of reproduction in which there is one parent which produces genetically identical offspring,
- without the fusion of nuclei of male and female gametes.

(b)

- After fertilisation, 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 2 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.

Q6.

(i)

- 1400cm^3

(ii)

- As exercise intensity increases, the volume of each breath increases gradually from 0.5 to 1.5au, then increases sharply from 1.5 to 3.0au.

(iii)

- 26 breaths per minute x 1700cm^3 = 44,200cm^3

(b)

- Aerobic respiration.

Q7.

(a)

- Name: Cardiac/Heart muscle.
- Function: It allows the heart to contract and relax, pumping blood around the body for cells to receive oxygen and nutrients while carbon dioxide and metabolic waste products to be removed.

(b)

(i)

- 5.6 dm^3 per minute

(ii)

- 19 – 7 = 12 minutes

(iii)

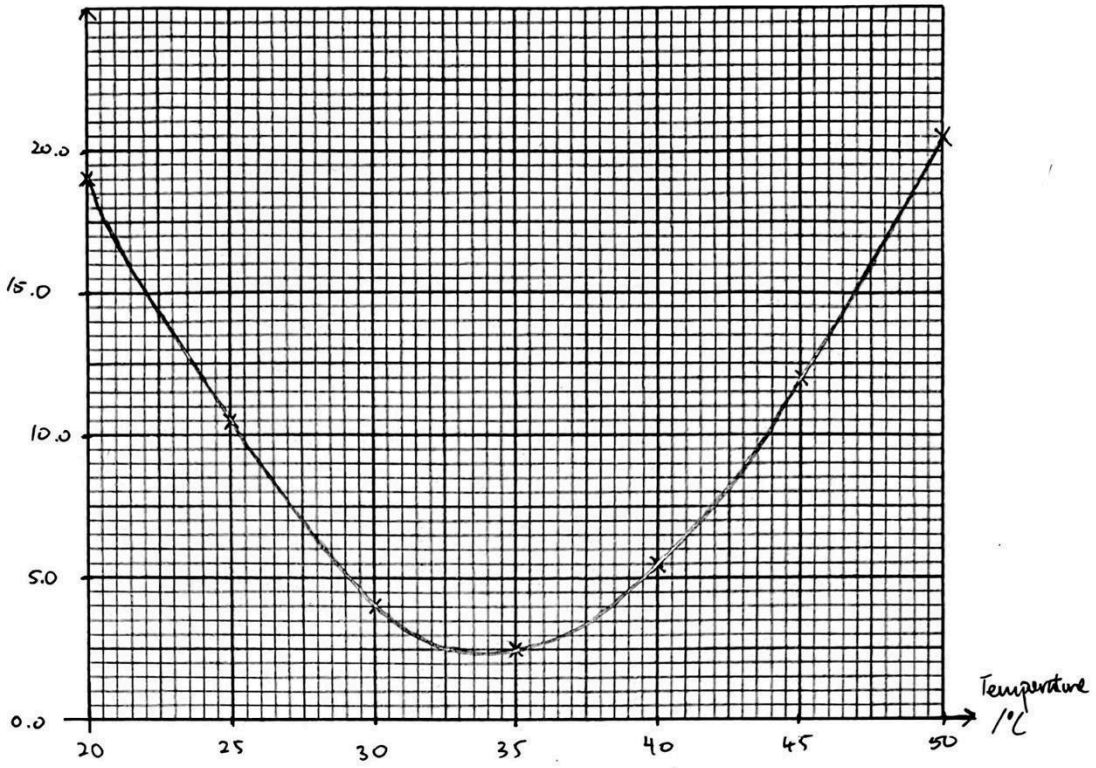
- (168 - 66)/66 = 155% (nearest whole)

(iv)

- From 2 to 3 minutes, heart rate increases very sharply from 66 to 140 beats per minute (bpm), an increase of 74bpm.
- From 3 to 6 minutes, heart rate increases at a decreasing rate from 140 to 170bpm, and increase of 30bpm.
- From 6 to 7 minutes, heart rate remains constant at the maximum heart rate of 170bpm.

Q8.

(a)



(b)

- Lipase breaks down fats in the milk, forming glycerol and fatty acids.
- The acidic fatty acids neutralise the sodium alkaline carbonate, lowering the pH of the solution.
- Once enough fatty acids are produced, the pH will drop below 8, causing phenolphthalein to turn from pink to colourless.

(c)

- At 55°C, the high temperatures denatured lipase, and it lost the shape of its active site, it was no longer able to catalyse the breakdown of fats.

(d)

- When time taken is the lowest point on the graph of 2.5minutes, temperature is 35°C, which is the optimum temperature of lipase,
- At this temperature, reaction rate was the fastest as lipase was most active.

Q9.

(a)

- 1600 + 700 + 200 = 2500

(b)

- The water formed within the body as a product of metabolic reactions,
- such as during aerobic respiration.

(c)

- At 5°C, sweat glands become less active and secrete less sweat, hence less water is lost through sweat.
- Due to an increase in metabolic rate in response to internal body temperature being too cold, higher rate of aerobic respiration produces more metabolic water, hence more water is lost in urine.
- Cold air is less humid than warm air, it draws more water from the thin film of moisture of the alveoli, so more water is lost through breathing out.

- Water lost through faeces will be unaffected by the change in temperature (as it is dependent on diet).

(d)

- When a person drinks too little water, osmoreceptors in the hypothalamus detect the decrease in the blood's water potential.
- The hypothalamus causes the pituitary gland to secrete more ADH, which travels via the bloodstream to kidney nephrons,
- Causing cells in the walls of collecting ducts to become more permeable to water. More water is reabsorbed back into the blood, reducing water loss through urine.

Either Q10.

(a)

- DNA is a double helix made from two anti-parallel polynucleotide chains.
- Each nucleotide consists of a deoxyribose sugar, phosphate group, and a nitrogenous base.
- There are four bases, where Adenine pairs with Thymine, Guanine pairs with Cytosine.
- Hydrogen bonds form between complementary base pairs, holding the two strands together.
- Sequences of nucleotides along the strands that code for specific polypeptides are called genes.
- DNA is loosely packed and coiled around proteins in the nucleus, forming chromatin.

(b)

- A restriction enzyme is used to cut a section of DNA from the donor organism containing the target gene, creating sticky ends.
- The same restriction enzyme is used to cut a plasmid, creating sticky ends.
- Plasmid and target gene are mixed, allowing them to anneal via complementary base pairing at the sticky ends.
- DNA Ligase is added to seal them together, resulting in a recombinant plasmid.
- Mix this with the recipient organism such as bacteria, and heat shock/electric shock treatment is applied, creating pores in the plasma membrane to allow the recombinant plasmid to enter.
- The transgenic organism will then transcribe and translate the target gene and produce the protein as part of its metabolic processes.

Or Q10.

(a)

- Codominance is when the alleles for a particular trait are different,
- And both get expressed in an organism and influence phenotype.
- In blood groups, when a person is heterozygous with the genotype I^AI^B,
- The I^A allele is expressed as there will be A antigens on the red blood cells' plasma membranes,
- And the I^B allele is also expressed as there will be B antigens on the red blood cells' plasma membranes too.
- Resulting in a blood group of type AB, which is a case of codominance.

(b)

- Mutation is a sudden change in the structure of a gene or chromosome number.
- Gene structure can be altered due to a change in sequence of DNA nucleotides, such as in the sickle-cell allele.
- This results in a different mRNA being produced after transcription, hence a different sequence of amino acids in the polypeptide after translation, resulting in an abnormal haemoglobin protein, causing sickle-cell anaemia.
- Chromosomes number can change such as in Down Syndrome, where non-separation during meiosis I or II in one parent, after fusion with a normal gamete from the other parent, leads to the zygote having an extra chromosome 21, and hence total 47 chromosomes instead of 46.