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TYS Answers 2015 (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	**B**	21	**B**
2	**C**	22	**D**
3	**B**	23	**B**
4	**B**	24	**A**
5	**B**	25	**D**
6	**B**	26	**A**
7	**D**	27	**C**
8	**B**	28	**B**
9	**D**	29	**A**
10	**C**	30	**D**
11	**B**	31	**C**
12	**C**	~~32~~	**B**
13	**C**	~~33~~	**B**
14	**B**	34	**A**
15	**B**	35	**A**
16	**A**	36	**D**
17	**D**	37	**A**
18	**C**	38	**A**
19	**C**	39	**A**
20	**C**	~~40~~	**B**

Q1.

(a)

- A: Starch
- B: Maltose
- C: Salivary amylase

(b)

- (i) Temperature
- (ii) pH

(c)

- Gallstones prevent bile from being secreted into the small intestine, bile salts in bile cannot emulsify large fat droplets into smaller ones,
- Their surface area to volume ratio is too small for lipase to effectively digest triglycerides into glycerol and fatty acids,
- So fat digestion is slowed/impaired.

Q2.

(a)

- The process that involves the fusion of nuclei of male and female gametes
- to form a diploid zygote,
- producing genetically different offspring.

(b)

- The pollen grain is rough and spiky, which helps it to get trapped between the furs on bodies of insect pollinators such as bees.
- When an insect rubs an anther when visiting a flower the pollen grains will stick to them and be carried to other flowers when the insect leaves.

(c)

(i)

- Pollen tube.

(ii)

- The pollen tube grows from the pollen grain, secreting enzymes to digest a path through the stigma, style and ovary wall.
- The pollen tube enters an ovule via the micropyle.
- The pollen tube (absorbs sap and) bursts, releasing ~~two~~ a male sex nuclei, ~~one of~~ which fuses with the ovum, forming a diploid zygote.

Q3.

(a)

- 40 - 16 = **+**24

(b)

- The insect does not have homeostasis of its internal body temperature and does not regulate it.
- The insect can survive at a wide range of temperatures/enzymes involved in metabolic reactions in the insect can function at a wide range of temperatures.

(c)

- (Draw a horizontal line at 37°C from 20°C to 36°C of air temperature)

(d)

- When body temperature increases above normal, sweat glands secrete more sweat,
- More water in sweat evaporates, hence more latent heat is lost, decreasing body temperature back to normal.
- When body temperature decreases below normal, sweat glands secret less sweat, reducing heat loss to help body temperature increase back to normal.

Q4.

(a)

- A: Aorta
- B: Pulmonary vein

(b)

- C is a semi-lunar valve, it closes during ventricular diastole to prevent backflow of blood from the pulmonary artery back to the right ventricle.

(c)

- Blood from body organs returns to the heart via the vena cava, then enters the right atrium.
- Right atrium contracts during atrial systole, blood pressure is now higher than that of the right ventricle hence blood moves into there, opening the tricuspid valve.
- Right ventricle contracts during ventricular systole, blood pressure is now higher than that of the pulmonary artery hence blood moves into there, closing the tricuspid valve to prevent backflow.
- Ventricular systole also causes pulmonary semi-lunar valve to open, forcing blood into the pulmonary artery towards the lungs.

Q5.

(a)

- It decreased from 100 to 10 units, a decrease of 90 units.

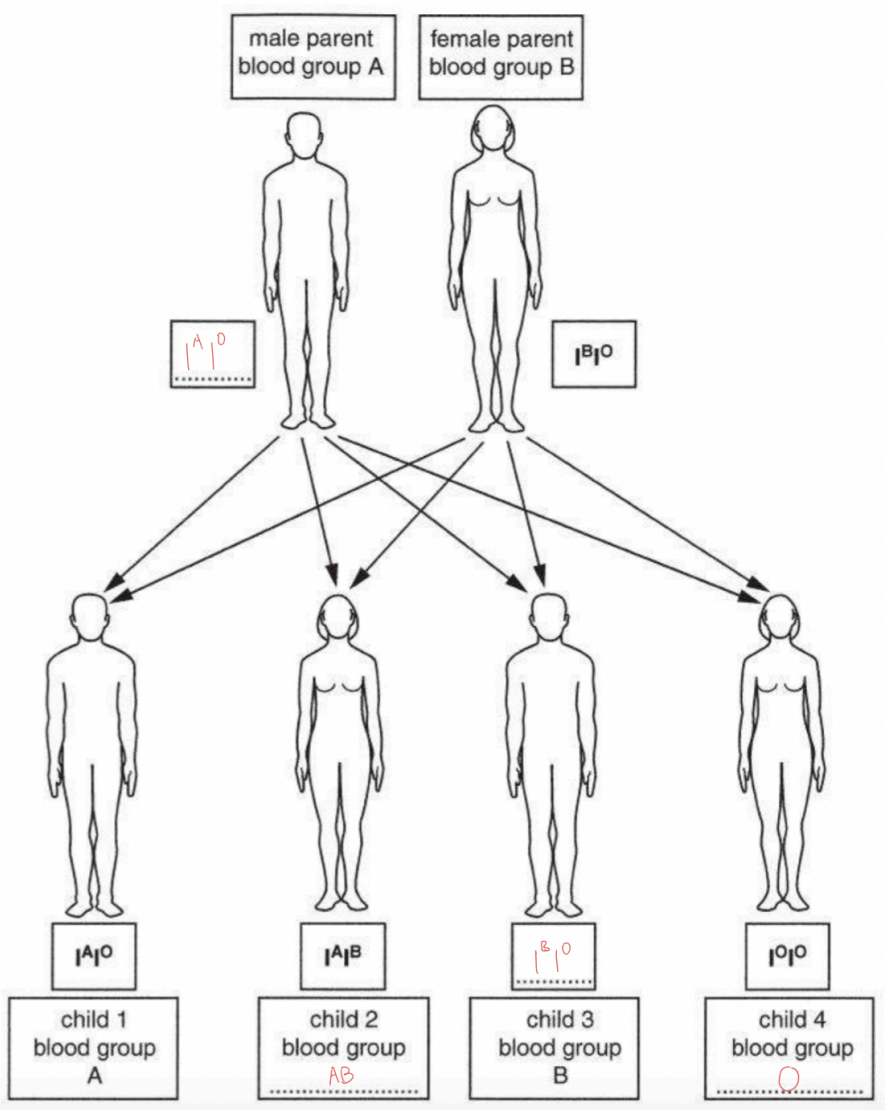
(b)

- While fasting, the person has not eaten a meal with carbohydrates for a long period of time,
- Blood glucose falls below normal, which are detected by the cells of islets of Langerhans in the pancreas,
- Which respond by reducing secretion of insulin into the bloodstream, as there is less need to convert glucose into glycogen in liver and muscle cells.

(c)

- ~~During exercise, emotions of excitement and stress are aroused, which are detected by the hypothalamus,~~
- ~~Which sends nerve impulses to the adrenal glands, causing them to secrete adrenaline into the bloodstream, preparing the body for a fight-or-flight response.~~
- ~~Heart rate increases and blood glucose levels increase, supplying oxygen and nutrients to muscles faster, so the person can meet the higher energy demand for the exercise.~~

Q6.


male parent
blood group A
female parent
blood group B
I^AI^O
I^BI^O
I^AI^O
I^AI^B
I^BI^O
I^OI^O
child 1
blood group
A
child 2
blood group
AB
child 3
blood group
B
child 4
blood group
O

(b)

- I^A and I^B

Q7.

(a)

(i)

- Consumers are organisms that obtain food by feeding on other organisms.

(ii)

- The feeding position that an organism occupies in a food chain.

(b)

(i)

Plankton → Small fish → Large fish → Fishermen

(ii)

- When chemical waste is expelled into seawater, seawater now contains 2p.p.b. of mercury.
- Plankton take in mercury compounds but cannot excrete them, hence it accumulates in plankton, bioaccumulation has occurred.
- Small fish which feed on plankton now ingest the mercury too, and it accumulates in them too up to 200p.p.b.

Q8.

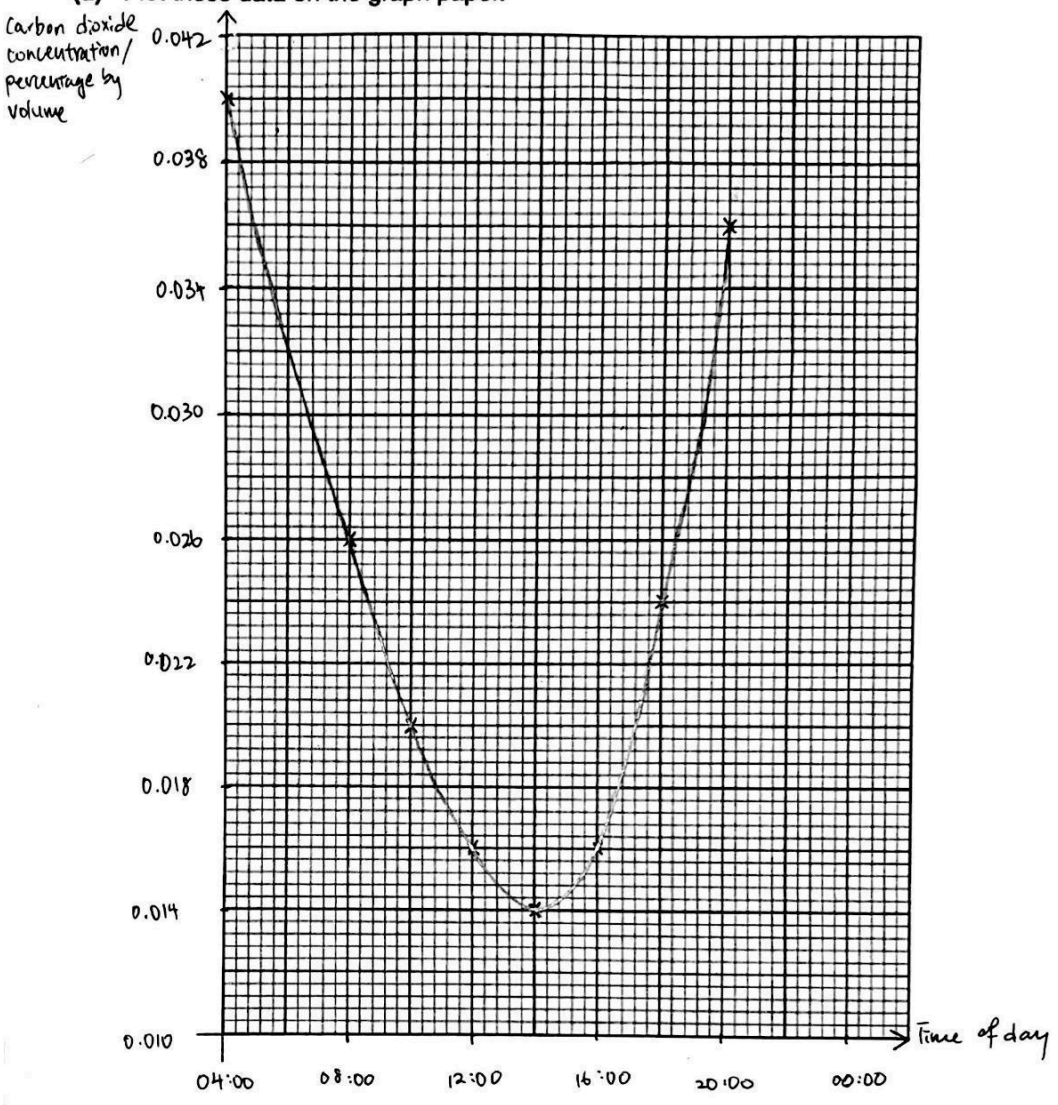
(a)

(i)

time of day	04:00	06:00	08:00	10:00	12:00	14:00	16:00	18:00	20:00
carbon dioxide concentration /percentage by volume	0.040	0.320	0.026	0.020	0.016	0.014	0.016	0.024	0.036

*Note: Anomaly. Will NOT include in graph.

(a) Plot these data on the graph paper. **[4]**



(b)

(i)

- 0.040 – 0.014 = 0.026

(ii)

- Carbon dioxide (CO_2) concentration decreases at a decreasing rate from 0.040 at 04:00 to 0.014 at 14:00.
- The sun is rising from 04:00, increasing light energy to be absorbed by chlorophyll and converted into chemical energy.
- Photosynthesis rate increases, amount of CO_2 taken in by the rice plants to be used to produce glucose ~~and reduced into glucose~~ increases,
- Thus concentration of CO_2 in the air above the rice plants falls until the lowest point at 14:00 when the sun is highest in the sky and photosynthesis rate is greatest.

(iii)

- Light intensity is increasing, photosynthesis rate may exceed rate of aerobic respiration, hence a net movement of O_2 out of leaves to the air above the rice plants.

Q9.

(a) Choose 2:

Nicotine:

- It is addictive, and stimulates adrenaline secretion,
- Which in turn increases blood pressure, as well as the ease of blood clotting, hence increasing risk of heart attacks.

Carbon monoxide:

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

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.

(b)

- Reaction time increases from 309ms when the person has not drunk alcohol, to 319ms at 30mg per 100cm^3, and increases again to 340ms at 70mg per 100cm^3.
- As alcohol is a depressant, it slows down brain functions hence decreasing reaction speed and increasing reaction time,
- If someone drank alcohol then drives, they would take longer to react to avoid an accident on the road,
- Increasing the chance of an accident, hence drink driving is dangerous and should be avoided.

Either Q10.

(a)

- Both xylem and phloem transport useful substances throughout the plant for cells to use in cellular activities.

- The xylem transports water and mineral salts, while the phloem carries manufactured food substances such as sucrose and amino acids during translocation.
- The xylem transports substances in one direction, from roots to the leaves, while the phloem transports substances in both directions, up and down the plant.
- The xylem does not require energy when transporting substances, while the phloem requires energy when transporting substances as active transport is involved.
- The xylem has lignified walls to strengthen it, so it provides structural support to the plant, while the phloem does not have lignified walls and does not provide structural support.
- The xylem's vessel elements have no end walls hence there is a completely unobstructed flow of water, while phloem's sieve tube elements have porous end walls called sieve plates, resulting in a partially obstructed flow of substances.

(b)

- As temperature increases, the thin film of moisture lining mesophyll cells evaporates faster into the intercellular air spaces, more water vapour diffuses out of the leaf, increasing transpiration rate.
- As the environment's light intensity increases, stomata open, water vapour diffuses out of the leaf faster, increasing transpiration rate.
- As humidity increases, concentration gradient of water vapour the intercellular air spaces of the leaf and the surrounding air becomes less steep, water vapour diffuses out slower, decreasing transpiration rate.
- Conversely, faster wind speed reduces humidity, hence increasing transpiration rate.

Or Q10.

(a)

- The increased light intensity is detected by photoreceptors in the retina, generating nerve impulses which are carried by a sensory neurone in the optic nerve to the brain.
- Nerve impulses are transmitted ~~across a synapse~~ to a relay neurone in the brain, then ~~across another synapse~~ to a motor neurone which carry them to the iris.
- They trigger the radial muscles in the iris to relax, and the circular muscles in the iris to contract.
- Thus the pupil constricts, allowing less light in to prevent damage to the retina.

(b)

- When looking at a near object, ciliary muscles in the eye contract, causing suspensory ligaments to slacken.
- They release their pull on the lens, the lens becomes thicker and more convex.
- ~~Focal length of the lens decreases, so that light rays from the near object are sharply focussed on the retina.~~
- Light rays from the near object are sharply focussed on the retina, producing a clear image.

- When looking at a far object, ciliary muscles in the eye relax, causing suspensory ligaments to become taut.
- They tighten their pull on the lens, the lens becomes thinner and less convex.
- ~~Focal length of the lens increases, allowing light rays from the far object to be sharply focussed on the retina, producing a clear image.~~
- Light rays from the far object are sharply focussed on the retina, producing a clear image.