

Answers BIO2020-EOY-4

Qn	Answers					Remarks		
1	C	11	B	21	C	31	C	
2	B	12	C	22	A	32	A	
3	A	13	C	23	D	33	C	
4	D	14	B	24	B	34	A	
5	D	15	B	25	C	35	D	
6	D	16	C	26	D	36	C	
7	B	17	B	27	D	37	A	
8	B	18	D	28	C	38	B	
9	D	19	B	29	A	39	A	
10	A	20	C	30	A	40	D	
1a	• C: absence of cell wall; E: presence of cell wall • C: no central vacuole; E: presence of central vacuole • C: absence of chloroplast; E: presence of chloroplasts • C: no fixed shape; E: fixed shape (Any 2 AND must have comparisons)							
1b	• No nucleus; more space to hold haemoglobin • Biconcave in shape; increase surface area to volume ratio for gaseous diffusion / oxygen uptake					Reject: more space to hold oxygen Some students incorrectly identified the RBC as egg cell		
1c	• D: long axon / numerous dendrons facilitate nerve impulse transmission • F: root hair extension provides a large surface area to volume ratio to facilitate absorption of water (and mineral salts)					Reject: passing of signals		
1d	• cell A: 0 • cell B: 23 • cell D: 46					Many students answered 46 for cell A, failing to draw connection with their answer of absence of nucleus in the RBC in 1(b).		
2a	• Acts as a control to ensure that no starch is present/plant has been destarched at the beginning of the experiment.					Some students gave vague answers like to show the independent variable affecting the dependent variable. Other students simply stated as control without explain the purpose.		

2b	- No starch is formed in leaf B, but starch is formed in leaf C (particularly along the veins) - Sucrose passes into the leaf lamina through the petiole - Sucrose is converted to/stored as starch	Conceptual error – sucrose turning starch blue-black. Careless mistake – photosynthesis occurring (experiment was carried out in darkness). A number gave incomplete answers, either not stating that the sucrose diffused into the leaf through the petiole, or stating that the phloem transported the sucrose (petiole or in the leaf?)
2c	- Only patches of blue black colour on the leaf OR only patches of the leaf have starch - Upper epidermis have fewer stomata, hence less sucrose take up by the leaf OR fewer places can take up sucrose (to convert it to starch)	Student errors include no stomata on the upper epidermis, hence cuticle would have prevented diffusion of substances.
2d	- Without air/oxygen, the leaf cannot change sucrose into starch in darkness - Conversion of sucrose into starch requires energy, which is released from the aerobic respiration of the leaf.	Conceptual error – in the absence of air, diffusion cannot occur. Careless mistake – photosynthesis cannot occur in the absence of carbon dioxide
3a	- A: aorta - B: pulmonary artery	A number of students thought that B referred to the pulmonary vein
3b	- Coronary arteries bring oxygen and glucose to the cardiac muscles for respiration to provide energy for contraction - Hence heart pumps blood less powerfully around the body.	Conceptual error – less blood to heart vs less blood to heart muscles/cells Some students just answered effect as heart attack without offering an explanation why the muscles would stop working.
3c	A larger area of the heart will be deprived of oxygen and glucose and thus will not be able to contract/function	Conceptual error – incorrectly identified as coronary vein; and thus coronary artery carries oxygenated blood, while coronary vein carries deoxygenated blood; one is connected to the atria, the other to the ventricle, hence blood cannot be pumped out
3d	No problem with tissue rejection OR operation is simpler/easier/less risky than heart transplant	
3e	Having a high fat diet OR smoking cigarettes	There were some vague answers like fast food or unhealthy food, i.e., did not account for the high fat diet.

4a	• Wind pollinated • Anthers hanging out / pendulous – allow pollen grains to be blown away • Feathery stigma – provides greater surface area for pollen grains to land	A number of students did not account for structure to function. Reject: hairy stigma
4b	• Pollen Type P • Small so that it can be blown away by wind to long distances	Reject: rough to attach to stigma
4c	• E: C • Function: site of fertilisation • F: C • Function: site of egg/ovum production	Students named the parts instead of using letters. Students also did not recognise the demand of the question – common function. Hence many just stated that it is a passage way only. Incorrect would also be that it contains (rather than produce) the egg. (To fertilise the egg vs For fertilisation)
4d	• Condom / diaphragm (Accepted spermicide, though effectiveness is only 70%) • Stops the entry of sperm into G.	Examples of contraceptive methods like cervical cap, IUD, vasectomy that were not applied outside G were listed.
5a	• G – F – A – C – E – B – D	
5bi	• Meiosis	
5bii	• Four new daughter cells from one parent cell • Each daughter cells have half the number of chromosomes as in parent cells • There are two cell divisions • Formation of bivalent or homologous pairings (Any 2)	Reject: forming 4 haploid daughter cells alone (did not account for diploid parent) Reject: presence of homologous chromosomes An example of an incomplete answer include citing specific stages, like there were 2 anaphase, without accounting for the reason why there were 2 such phases.
5c	• D: haploid • G: diploid (both correct to score 1 m)	
5d	• DNA replication OR Chromosomes duplicated (to produce a replica of itself)	Reject: doubled
6ai	• 12.5%	A number of students did not recognise the 'double' condition.
6aii	• Both are heterozygous with only one dominant allele. Only homozygous dominant individuals die young.	Many did not account for why having only 1 dominant allele allows better survival.

6aiii	• Correct genetic diagram (1HH:2Hh:1hh) • Correct labels (parents, gametes, offspring genotypes & phenotypes) • 75% will survive beyond puberty because they are Hh or hh	Labels were missing in some of the students' answers. Some were confused by the term 'affected' while question asked for 'survived'.
6bi	• Male – the sex chromosomes (pair 23) are different in length	Many students identified the presence of X & Y chromosomes without explaining why one is an X chromosome while the other is a Y chromosome.
6bii	• 3 copies of chromosome 21 instead of the usual 2	Some students listed '3 pairs of chromosome 21'.
6biii	• Radiation / X-ray / UV light • Mutagens / mustard gas / formaldehyde • Older women giving birth	Incorrect answers include LSD, inbreeding, eating GM food, giving birth when old.
7a	• Higher rate of oxygen consumption means higher rate of aerobic respiration • Releasing more heat energy to counter heat loss to the environment/maintain body temperature • Higher percentage of body fat acts as an insulating layer, reducing heat lost to the environment	Some students listed higher metabolism instead of aerobic respiration, thus releasing heat. Metabolism does not account for the increase consumption of oxygen.
7b	• Scale – at least half the page + user friendly + main grids labelled • Line of Best Fit • Axes – correct headers and units (X: distance from skin surface/ mm; Y: body temperature/ °C) • Plots – 7 points plotted correctly (allow for 1 error)	Some students plotted their graphs with a scale of 4.
7c	• To read from graph (Must show working on graph for both values)	Many students still did not show the full working on the graph.
7d	• Heat loss from skin to water is low • As temperature difference between skin and water is small	A number of students did not account for the lack of a gradient, and thus the explanation of less heat loss was insufficient.
7e	• More blood flows through Y • More blood flows near skin surface so that more heat can be lost (through conduction, convection and radiation)	Conceptual error: basking in the sun to gain heat. Conceptual error: Loss of latent heat. Reject: use of vasodilation/ vasoconstriction without explaining what happens

8a	• The stimulus (change in light intensity) is detected by the receptors in the retina • Impulse is sent by the sensory neurone in the optic nerve to the brain, then to the effector (iris) via the motor neurone. • The circular muscles of the iris contract AND the radial muscles of the iris relax • Pupil becomes smaller, this reduces the amount of light going into the eye • In addition, the eye might squint OR a hand may be brought up to shield the eye from the bright light	Reject: receptor as eye – too vague A number of students also indicated that the impulse is sent to the spinal cord, not recognising that the eyes are in the head.
8b	• The islets of Langerhans in the pancreas increases the secretion of the hormone insulin • Increasing the permeability of cell membranes to glucose thus increasing the rate of glucose uptake by cells • Stimulating the liver and muscle cells to convert glucose into glycogen for storage • Increasing oxidation of glucose during tissue respiration	Some students answered that glucose is converted to glucagon (instead of glycogen) The increase in tissue respiration was often missed out by students.
9a	• The epithelial cells of the villus has numerous microvilli to increase surface area to volume ratio for absorption. • The villus has thin walls or membranes / epithelium is only one cell thick to allow for faster rate of absorption. • In each villus, there is a lacteal / lymphatic capillary, surrounded by blood capillaries. • Carbohydrates and proteins are digested into glucose and amino acids. These diffuses (+ active transport) into the villus and is transported away by the blood capillaries away from the intestine. • Fat is broken down into fatty acids and glycerol and diffuse into the epithelium. These recombine to form minute fat globules which enter the lymphatic capillaries which transports fat away from the intestine. • Presence of many mitochondria for active transport of digested food substances	A number of students mentioned that many villi increases SA/VR for absorption, without recognising the question is about one villus. Conceptual error: villus is one cell thick vs epithelium of villus is one cell thick Conceptual error: fatty acids and glycerol moves into the lacteal and reforms as fat

9b	• At the tissues, carbon dioxide diffuses out of the cells into the capillaries, into the blood, and into the red blood cells. • Carbon dioxide reacts with water in the red blood cells to form carbonic acid. This reaction is catalysed by the enzyme carbonic anhydrase. • The carbonic acid is then converted into hydrogencarbonate ions which diffuses out of the red blood cells. (Most of the carbon dioxide is carried as hydrogencarbonate ions in the blood plasma.) • A small amount of carbon dioxide is also carried and dissolved in the red blood cells. • In the lungs, hydrogencarbonate ions diffuse back into the red blood cells and are converted into carbonic acid, and then into water and carbon dioxide. This is also catalysed by the enzyme carbonic anhydrase. • The carbon dioxide then diffuses out of the blood capillary walls, across the epithelium of the lungs, and into the alveoli (max of 5)	Many students incorrectly explained at length how blood is transported from the tissue to the lungs without recognising the question is about carbon dioxide transport. The remaining students often did not cite the role of carbonic anhydrase in the lungs.
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