ZHSS 2024 Prelim Paper 2 Answers

Section A [70 marks]

Q/no.	Answer	Mark
1ai	• Cell wall	[1]
1aii	• Deoxyribonucleic acid / DNA	[1]
1aiii	• Attaching/sticking to surfaces of host cells/objects (for infection/colonisation). • Joining other bacteria to exchange genetic material (i.e., gene transfer). Any 1	[1]
1b	• Kissing. • Sexual activity/intercourse. • Sharing of eating utensils. • Touching surfaces contaminated by infected person then puts hand in mouth. Any 2	[2]
1c	• Bacteria will evolve to become resistant to antibiotics / May increase the number of antibiotic-resistant strains of the bacteria. • May cause antibiotics to become less effective/ineffective when it is used to treat severe cases. • Antibiotics do not shorten the illness / reduce the duration of symptoms (diarrhoea, fever, stomach cramps).	[2]

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<tr><td></td><td>• Antibiotics can prolong the time a person carries the bacteria, which increases the risk of infecting others. Any 3</td><td></td></tr>
<tr><td>1d</td><td>• Nucleus controls cell activities/cell growth/repair of worn-out parts / essential for cell division / contains DNA/genetic material/chromosomes/chromatin.
• Chloroplast contains chlorophyll for photosynthesis.
• Vacuole contains cell sap which stores dissolved substances/sugars/minerals salts/amino acids.
• Mitochondrion is the site of aerobic respiration to provide energy for the cell.
• Golgi body/apparatus chemically modifies substances made by the ER / stores and packages substances in vesicles for secretion out of the cell.
• Rough endoplasmic reticulum transports proteins made by ribosomes to Golgi body/apparatus for secretion out of the cell.
• Smooth endoplasmic reticulum synthesises fats/steroids/hormones / detoxification/converts harmful substances into harmless substances.
Any 3</td><td>[4]</td></tr>
<tr><td>2a</td><td><table>
<tr><th>Diffusion</th><th>Active transport</th></tr>
<tr><td>• Does not require energy.</td><td>Requires energy.</td></tr>
<tr><td>• Molecules/particles/substances move from a region of higher concentration to a region of lower</td><td>Molecules/particles/substances move from a region of lower concentration to a region of higher concentration / against a concentration gradient.</td></tr>
</table></td><td>[3]</td></tr>
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<tr><td></td><td><table>
<tr><td>concentration / along a concentration gradient.</td><td></td></tr>
<tr><td>• Occurs regardless of the presence of a <u>partially permeable membrane</u>.</td><td>Occurs in the presence of a partially membrane.</td></tr>
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<tr><td>2bi</td><td>• <u>All the glucose and amino acids</u>, and <u>some salts</u> are selectively <u>reabsorbed</u> from the tubules/nephron into the <u>blood/capillaries</u>.
• Glomerular filtrate (in tubules) has a higher <u>water potential</u> than the blood (in capillaries).
• <u>Water</u> molecules leaves the glomerular filtrate through the <u>partially permeable membrane</u> of cells and into the <u>blood</u> by osmosis.
• <u>Most water</u> is <u>reabsorbed</u> at the loop of Henle by osmosis and forms part of the urine</td><td>[4]</td></tr>
<tr><td>2bii</td><td>• ADH <u>increases the permeability of the cells</u> in the walls of the collecting duct (V).
• <u>More water</u> is <u>reabsorbed</u> from the collecting duct into the <u>blood</u> capillaries.</td><td>[2]</td></tr>
<tr><td>3a</td><td>• When a <u>stimulus</u> disrupts a system/body, a <u>sequence of events/corrective mechanism</u> will occur.
• This results in the <u>reverse effect</u> of the stimulus and <u>restore</u> the system/body to its <u>original</u> state.</td><td>[2]</td></tr>
<tr><td>3bi</td><td>• Sweat gland.</td><td>[1]</td></tr>
<tr><td>3bii</td><td>• When body temperature rises <u>above normal</u>, <u>arterioles</u> in the skin <u>dilate</u>.</td><td>[3]</td></tr>
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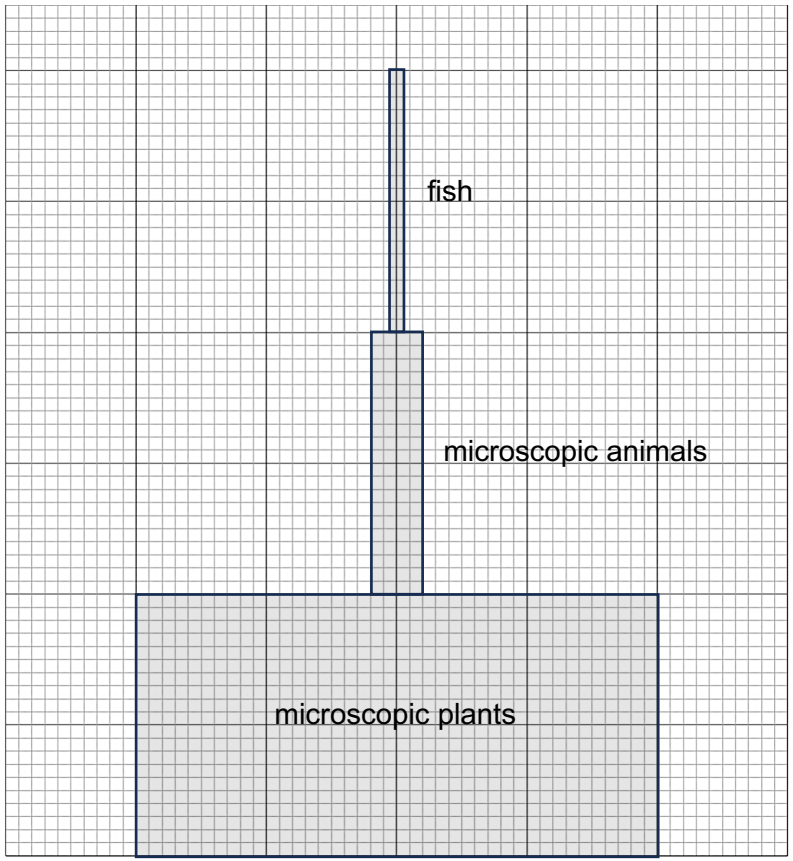
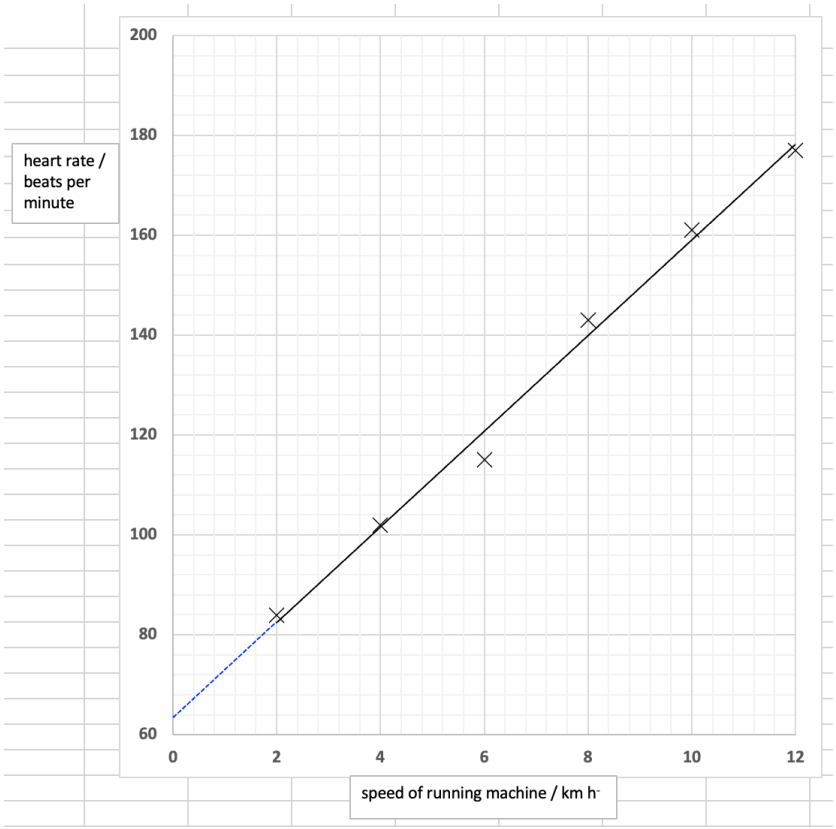
	• This allows more blood to flow through blood capillaries near the skin surface. • More heat will be lost through the skin by conduction, convection and radiation and body temperature will decrease back to normal.	
3biii	• Fat tissues do not contain thermoreceptors/temperature receptors to detect changes in body temperature. • Fat tissues do not actively respond to temperature changes in the body. • Any 1	[1]
4a	• During photosynthesis, light energy is absorbed by chlorophyll in the chloroplasts. • The energy is used to convert carbon dioxide into glucose (chemical energy). • Glucose is converted to cellulose to synthesise cell wall / Glucose is converted to sucrose and transported by the phloem to storage organs and excess stored as starch	[4]
4b	**Similarity** • Blue cobalt chloride paper on the upper surfaces of leaves from both plants took more time to turn pink than the lower surfaces. • Fewer stomata on upper surfaces than lower surfaces, so water vapour took a longer time to exit. **Difference** • Blue cobalt chloride paper on leaves of plant Q took less time to turn pink than on leaves of plant R. • Leaves of plant Q have more stomata than leaves of plant R. / Plant Q has larger leaves than plant R, so more stomata are present on the leaves of plant Q than on the leaves of plant R.	[4]

5ai	 • Drawn to scale accurately. • Occupies more than half the grid, all trophic levels have the same height and labelled.	[2]

5aii	• Metabolic heat / heat released during respiration • Uneaten body parts • Faeces • Excretory products Any 2	[2]
5aiii	• Eutrophication enhances the growth of algae and water plants, causing an increase in their numbers. • Overgrowth of algae and floating water plants prevent light energy from reaching the submerged plants. • Submerged plants are unable to carry out photosynthesis and die • Dead plants are decomposed by aerobic bacteria and fungi which grow rapidly and uses up the dissolved oxygen in the lake. Any 3, in correct order	[3]
5bi	• Decomposers	[1]
5bii	• $C_6H_{12}O_6$, H_2O	[1]
6a	• Complementary base pairing	[1]
6b	• Genes carry the genetic code that is used to synthesise specific polypeptides, • by transcription and translation. • Polypeptides are folded into proteins in cells, and the cells are used to form organs.	[3]

6c	**Social** • (-) Access may be limited to those who can afford, leading to potential social inequalities. • (-) Cultural and religious beliefs. (A: examples) • (-) Economic impact on healthcare costs, pharmaceutical industries, and agricultural sectors. • (+) Alleviation of critical shortage of human organs for transplantation, potential to save many lives. • (+) Improved quality of life for patients with organ failure as they need not be limited by treatments that are temporary (e.g. dialysis). • (+) Could lead to development of new medical technologies and treatments, stimulating economic growth (medical tourism) and job creation in healthcare sector. **Ethical** • (-) Concerns about animal rights / moral status of animals (exploitation of animals for human gains, killing of animals to extract organ, testing on animals). • (-) Potential for disease transmission and immunological rejection. • (-) Allocation of organs fairly and equitably is challenging. • (-) Patients may not have the capacity to fully understand the risks and benefits / make autonomous decisions. • (+) Alleviation of critical shortage of human organs for transplantation, potential to save many lives. Any 1 from each category (no repetition)	[2]

7a	• When <u>muscles of the left atrium contract</u>, oxygenated blood is <u>forced/pumped</u> through the bicuspid valve into the left <u>ventricle</u>. • When <u>muscles of the left ventricle contract</u>, blood is <u>forced</u>/pumped through the semilunar valve into the <u>aorta</u> and around the body.	[2]

7bi		[4]

7bii	• Based on graph in 7ai, showing extrapolated dotted line on graph.	[1]
7biii	• As speed of running machine/running speed increases, there is a greater demand for energy for muscular contractions. • Rate of aerobic respiration increases to supply more energy. • More oxygen is needed for aerobic respiration. • Heart rate increases to transport oxygen faster to the muscles. Any 3	[3]
8ai	• Mitosis is a type of cell division that produces genetically identical cells. • Chromosome number of cells is maintained.	[2]
8aii	• Mitosis produces new cells, which are needed for plant growth • Mitosis produces new cells, which are needed for the plant to produce flowers/fruits. • Mitosis produces new cells to replace cells that are dead/damaged / to repair tissues. • Mitosis allows for asexual reproduction to occur, so that beneficial qualities are passed on to the offspring. • Mitosis allows for asexual reproduction to occur, so that the plant can colonise an area faster. Any 3	[3]

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<td>8aiii</td>
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Mitosis is involved in the repair/thickening/maintaining thickness of the uterine lining.
Occurs when oestrogen and progesterone concentrations increase.

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<td>[2]</td>
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<tr>
<td>8b</td>
<td>
<table>
<tr><th>Humans</th><th>Flowering plants</th></tr>
<tr><td>• Sperms are deposited in the vagina during sexual intercourse.</td><td>Pollen grains are deposited on stigma during pollination.</td></tr>
<tr><td>• Sperms swim on their own up the uterus into the oviduct/fallopian tube to the egg/ovum.</td><td>Germination of pollen tube brings the male gamete to the female gamete/egg/ovum in the ovule.</td></tr>
<tr><td>• Egg/ovum is released from ovary and moves along the oviduct/fallopian tube.</td><td>Female gamete/egg remains in the ovule.</td></tr>
<tr><td>• Wall of ovary is not digested.</td><td>Wall of ovary is digested by enzymes secreted by tip of pollen tube.</td></tr>
<tr><td>• Egg/ovum is surrounded by outer membrane/layer of cells, which are digested by enzymes secreted by sperm/acrosome.</td><td>Ovum is not surrounded by outer membrane/layer of cells.</td></tr>
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Any 3
</td>
<td>[3]</td>
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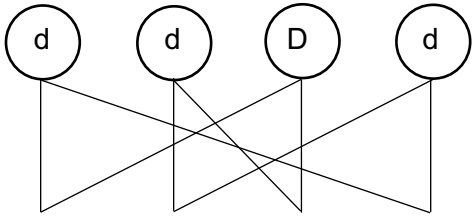
Paper 2 Section B [10 marks]

Q/no.	Answer	Mark
9a	• Alcohol travels from the mouth → oesophagus → stomach → small intestine/ileum. • Absorbed into the blood capillaries in the villi of the ileum. • Transported via the hepatic portal vein to the liver.	[3]
9b	• Alcohol dehydrogenase is the lock and alchol is the key • Shape of alcohol is complementary to the shape of the active site of alcohol dehydrogenase. • Alcohol fits into the active site of alcohol dehydrogenase to form an enzyme-substrate complex, like how a key fits into a lock, catalyzing the reaction	[3]
9c	• (66 – 24) ÷ 3 • = 14 mg / 100 cm^3 / h	[2]
9d	• Increased reaction time / react slower / impaired coordination • Reduced self-control / impaired judgement • Slurred speech • Drowsiness • Mood swings / initial euphoria Any 2	[2]

10a	• **Dominant allele** is a form of a gene that expresses the phenotype in both homozygous and heterozygous form. • **Heterozygous** refers to an individual having two different alleles for a particular gene.	[2]
10b	• Chromosome is made of DNA, while gene is a segment of DNA/specific sequence of DNA. • FBN1 gene is found at a locus/specific position on chromosome 15.	[2]
10c	• Retina contains photoreceptors, which produces nerve impulses when they are stimulated by light. • Nerve impulses are transmitted by the sensory neurones via the optic nerve to the brain, which interprets the nerve impulses.	[2]

10d	**Sara** × **Jones** **Parental phenotype** **unaffected** **affected** Parental genotype dd Dd Gametes  F_1 genotype Dd dd Dd dd F_1 phenotype Affected Unaffected Affected Unaffected Ratio 1 affected : 1 unaffected • Parental genotype • Lines representing fertilisation • F_1 genotype, F_1 phenotype • 50% / 0.5	[4]