Tanjong Katong Girls' School
Secondary 4 Preliminary Examinations 2024
Answer Key

Biology 6093/01

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

Biology 6093/02

Question		Answer	Marks
1	**(a)**	One-cell thick wall + decrease diffusion distance, increase rate of diffusion of gases; Close proximity to a blood capillary + decrease diffusion distance, increase rate of diffusion of gases;	Max 1m
	(b)	Microvilli;	1m
	(c)	Lacteal;	1m
	(d)	Oxygen; Glucose / amino acids / water / vitamins / minerals;	2m
2	**(a)**	B is <u>thicker, more elastic, more muscular</u> than A; (*vice versa*)	1m
	(b)	*Arrows must show the following to get 1m:* *1. right atrium to right ventricle* *2. right ventricle to pulmonary artery* *3. left atrium to left ventricle* *4. left ventricle to aorta*	1m
	(c)	Tricuspid valve; <u>Closes</u> during ventricular systole + prevent blood from entering right atrium;	2m
	(d)(i)	(60 / 0.8) = 75;	1m

	(d)(ii)	<table><tr><td>time / s</td><td colspan="2">at rest</td><td colspan="2">during exercise</td></tr><tr><td></td><td>atrium</td><td>ventricle</td><td>atrium</td><td>ventricle</td></tr><tr><td>0.0 – 0.1</td><td>■</td><td></td><td>■</td><td></td></tr><tr><td>0.1 – 0.2</td><td></td><td>■</td><td></td><td>■</td></tr><tr><td>0.2 – 0.3</td><td></td><td>■</td><td></td><td>■</td></tr><tr><td>0.3 – 0.4</td><td></td><td>■</td><td></td><td></td></tr><tr><td>0.4 – 0.5</td><td></td><td></td><td></td><td></td></tr><tr><td>0.5 – 0.6</td><td></td><td></td><td>■</td><td></td></tr><tr><td>0.6 – 0.7</td><td></td><td></td><td></td><td>■</td></tr><tr><td>0.7 – 0.8</td><td></td><td></td><td></td><td>■</td></tr><tr><td>0.8 – 0.9</td><td>■</td><td></td><td></td><td></td></tr><tr><td>0.9 – 1.0</td><td></td><td>■</td><td></td><td></td></tr><tr><td>1.0 – 1.1</td><td></td><td>■</td><td>■</td><td></td></tr><tr><td>1.1 – 1.2</td><td></td><td>■</td><td></td><td>■</td></tr></table> *Ventricle contraction – 1 or 2 rectangles, as long as lesser than 3* *All chambers relaxation – 1 or 2 or 3 rectangles, as long as lesser than 4* *Must shade until the end*	1m
3	**(a)(i)**	A – glomerulus; B – collecting duct;	2m
	(a)(ii)	Afferent arteriole's <u>lumen</u> is bigger than efferent arteriole's; Creates a <u>high hydrostatic/blood pressure in the glomerulus</u> to force small substances out;	2m
	(b)	Maintain a <u>steep concentration gradient between fluid and blood</u>; (*must write properly*) Allows waste products to diffuse out of blood into fluid; (*reject: "if" answers e.g. if the fluid is not changed…*)	2m
4	**(a)**	$6CO_2 + 6O_2 \rightarrow C_6H_{12}O_6 + 6O_2$; (*light energy and chlorophyll written on the arrow*);	2m
	(b)	Carbon, hydrogen, oxygen;	1m
	(c)	Proteins in water flea is <u>digested into amino acids</u>; Amino acids is used for growth and repair of cells;	2m
5	**(a)**	Rate of transpiration is higher in environment A than B + 9.8 gh^{-1} vs 4.7 gh^{-1}; Or Rate of transpiration in environment A is higher than B by 5.1 gh^{-1}; Increase in humidity lowers rate of transpiration; Gentler / lower concentration gradient between water vapour of air spaces of leaves and environment; (*must write properly*)	3m
	(b)	Did not take into account light intensity;	1m

	(c)	Prevent evaporation of water from the soil;	1m
6	**(a)**	Double helix structure; 2 strands of polynucleotides that are anti-parallel; 2 strands / each base pair held together by hydrogen bonds; Sugar-phosphate backbone of each strand; Each nucleotide consists of sugar, phosphate group and nitrogen-containing base; 4 types of bases adenine, thymine, cytosine, guanine; Each base pair is either adenine to thymine, or cytosine to guanine;	Max 3m
	(b)	(*circle correctly the lower strand including the bases*);	1m
	(c)	A – transcription; Nucleus;	2m
7	**(a)**	(*pondweed → snails → small fishes + "stable shape"*); (*labels + same width*);	2m
	(b)	90% of energy is lost from one trophic level to the next; (*must write properly*) Only 10% is successfully transferred into the organism; Energy is lost by heat energy from respiration / uneaten body parts e.g. ____ / undigested body parts e.g _____; Energy availability at the 5th trophic level is too small to ensure organism to survive;	Max 3m
	(c)(i)	Eutrophication;	1m
	(c)(ii)	Algae blocks sunlight from penetrating into the depths of the pond; Producers deeper in pond unable to photosynthesise; No photosynthesis + no oxygen production; OR Respiration of all organisms depletes oxygen concentration;	Max 2m
8	**(a)**	Type B; Cross C2 creates only offspring of type B + allele of type A is recessive / allele of type B is dominant;	2m
	(b)	Type A parent is homozygous recessive; Type B parent is heterozygous; Offspring inherit 1 allele from type A and 1 allele from type B; 50% chance to create a heterozygous offspring OR ratio of getting type A to type B is 1:1;	Max 3m
	(c)	Discontinuous variation;	1m
	(d)	Mutation creates variation in wing patterns; Variations enables the butterfly to adapt to environment + escape from predators / camouflage into the surroundings; Grow to maturity + reproduce successfully; Pass the genes in wing pattern to the next generation;	Max 3m

9	**(a)(i)**	Increase from 29 billion metric tons to (approx.) 35 billion metric tons; OR Increase in 6 billion metric tons; From 2008 to 2009 + decrease by 1 billion metric tons; From 2019 to 2020 + decrease by 2 billion metric tons; (capped at 2m)	2m
	(a)(ii)	Deforestation; Burning of fossil fuels;	2m
	(a)(iii)	COVID pandemic + less human activity e.g. public transport;	1m
	(b)	Carbon dioxide is a greenhouse gas + traps heat; Higher temperature, melting of ice in polar regions + raise sea levels / release trapped pathogens; Higher temperature, bleaching of corals + decrease biodiversity; Higher concentration of carbon dioxide in water + decrease pH; Dissolves calcium compounds of shell fishes; Climate change + erratic weather conditions; Climate change + vulnerabilities in some animals e.g. polar bears (temperature) and bees (reproduction cycles of plants);	Max 5m
10	**(a)**	Allows more time for pectinase to break down pectin and release the apple juice;	1m
	(b)	*Axes + units;* *Appropriate scale + origin;* *Plots;* *Best-fit line;*	4m
	(c)	Increase temperature + increase kinetic energy of enzyme and substrate molecules; Increase collision rate of enzyme and substrate molecules; Increase formation of enzyme-substrate complex; Increase formation of product molecules;	Max 3m
	(d)	Biological/organic catalyst + protein; Speed up chemical reactions without itself chemically altered after the reaction;	2m
11	**(a)**	Through droplets in the air / airborne transmission + when individual talks / sneezes / coughs; The droplets inhaled by another individual; Exchange of body fluids during sexual intercourse; Baby receiving milk from mother through breastfeeding; Direct contact through mucous membranes e.g. conjunctivitis / HFMD / chicken pox; Transmitted through ingestion of contaminated food / water e.g. cholera, typhoid;	Max 4m

	(b)	HIV destroys/lowers a person's immune system by destroying white blood cells; Hence the body is unable to produce antibodies to protect the person from foreign pathogens; Person infected might not display signs and symptoms for a long time and may unknowingly transmit the virus during this period of time; Social stigma and discrimination against people who are affected will deter affected individuals from seeking medical treatment; Lack of awareness and education about HIV transmission / HIV prevention / misconceptions about viral infections; High-risk behaviours from affected individuals through sharing of unsterilised needles / sharp instruments due to lack of resources, education, awareness, etc; Limited access to healthcare in low-income / remote areas; Virus is able to mutate rapidly which slows down the research on a vaccine against HIV infection; Hard to track movement of people on a global scale, which can spread the infection; (any four)	Max 6m
12	**(a)**	<u>Advantage</u> Only 1 parent is required; High chance that beneficial qualities is passed down to offspring; Does not require external pollinators e.g. wind / insect; High chance of pollination due to close proximity of male and female parts; Less energy is used to produce lesser pollen grains; (any three) <u>Disadvantage</u> Less genetic variation due to only 1 parent; Less adapted to changes in environment; Long-term, offspring becomes weaker and more susceptible to diseases; (any three)	Max 6m
	(b)	Germination of pollen grain + growth of pollen tube containing male gamete; Pollen tube penetrates through the style by secreting digestive enzyme; Pollen tube enters micropyle of ovule; Pollen tube absorbs sap in ovule and burst + release male gamete into the ovule; Male gamete fuses with female gamete to form zygote; (capped at 4m)	Max 4m