ZHONGHUA SECONDARY SCHOOL
2019 PRELIMINARY EXAMINATION
Secondary 4E Biology

PAPER 1
MULTIPLE-CHOICE QUESTIONS [40 MARKS]

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

PAPER 2 SECTION A
STRUCTURED QUESTIONS [50 MARKS]

Qn	Marking Point	Mark
1a	For an X at the point where graph for shade leaf **intersects x axis**	1
1b	The shade leaf did not produce or uptake CO_2 at a higher light intensity than the sun leaf OR Higher rate of photosynthesis / CO_2 uptake in the sun leaf than the shade leaf at higher light intensity The rate of photosynthesis increases more rapidly / (at a faster rate) in the sun leaf CO_2 uptake is greater in the shade leaf at low light intensity More respiration occurred in the sun leaf at lower light intensity CO_2 uptake levels off in the shade leaf	1 1 1 1 Any 2
1c	The increase in temperature increases the rate of enzyme- controlled reactions involved in photosynthesis / more successful collisions in the chloroplast so there is more chemical reaction taking place Increasing temperature will increase the rate of photosynthesis And carbon dioxide uptake increases	1 1 1
1d	Immerse aquatic plant in five different concentrations of sodium hydrogencarbonate solutions Fixed light intensity / similar plant size and type Count number of (oxygen) bubbles released by leaf in five minutes	1 1 1
2a	Heart rate = 60 / 0.8 = 75 bpm	1
2bi	H	1
2bii	D	1
2c	Muscles in ventricular wall contract at A leading to increased pressure in ventricles Causing semi-lunar valves to open Blood then rushes from ventricles to aorta / pulmonary artery	1 1 1
2d	Low oxygen content in blood due to mixing of oxygenated and deoxygenated blood	1

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3a	Accept 1.06 to 1.08	1
3b	Rate = 50/6 = 8.33 Correct units = mg/dl h^{-1}	1 1
3c	The bath fluid contains the same concentration of mineral salts No net movement of these substances	1 1
3d	Trend should show a straight horizontal line/constant Proteins are too large to pass through selectively permeable tubing, hence no change in concentration	1
3e	Change to machine • Increase the number of coils of tubing • Increase length and decrease diameter of tubing Accept others • Decrease protein intake in diet → less urea to be removed	 1 1 1
4a	The mother and fetus can be of different blood groups which can cause blood clumping / agglutination **Reject coagulation / clotting** The high pressure of the mother's blood can kill the fetus.	1 1 Any 1
4b	• The placenta is like the small intestine as it allows the diffusion of digested food substances / digested nutrients such as glucose / amino acids / fats from the mother's blood to the fetal blood. • The placenta is like the lungs as it allows the transport of oxygen from the mother's blood to the fetal blood and carbon dioxide from the fetal blood to the mother's blood. • The placenta is like the kidney as it allows transport of urea / nitrogenous waste from the fetal blood to the mother's blood.	1 1 1
4c	A pregnant mother, • should not smoke • should not drink alcohol • should not take non-medicinal drugs • should have a well-balanced or healthy diet • should carry out regular / light exercise	 1 Any 2
5a	Mitosis	1
5b	Tissue	1
5c	Y chromosome is only in males / female is XX; injected cells have travelled to brain; Replication / cell division has occurred / tissue has formed; Cells present after time period	1 1 1 1 Any 3
6a	Parental Phenotype Yellow x Yellow Parental Genotype Aa × Aa (**R** if wrong symbols used) Gametes A a A a F1 Genotype AA Aa Aa aa F1 Phenotype 3 yellow : 1 grey	1 1 1 1 1
6b	AA (e.c.f. for use of incorrect symbols) ; With reference to 1 in 4 being AA ; When the offspring with lethal combi dies, it leaves ratio 2 yellow : 1 grey	1 1 1

Qn	Marking Point	Mark
7a	producer / 1st / 1 ; (primary) consumer / herbivore / 2nd / 2	1 1
7b	plant releases oxygen ; fish uses this (oxygen) for (aerobic) respiration lay eggs on weed / provides cover / nesting ;	1 1 1 1
7c	Decomposition Bacteria	½ ½
7d	Eutrophication/algal bloom on water surface **blocks off sunlight, leading to death of submerged water plants** **increased decay** (of plants / waste products of fish) leading to increased numbers of bacteria **more oxygen used** by decomposers for respiration leading to death of fish / animals	1 1 1

PAPER 2 SECTION B
LONGER STRUCTURED QUESTIONS [30 MARKS]

8a	axes labelled with correct units suitable linear scales accurate plotting of points on a single set of axes for both graphs lines drawn	1 1 1 1
8b	1600 At 1600, light intensity is 100%, **stomata are widely open**, causing maximum water transpiration, Rate of water absorption also increases to the maximum to **replace the amount of water loss** At the same time at high light intensity, the rate of water absorption increases as the **photosynthetic rate of plant increases**.	1 1 1 1
8c	No Rate of transpiration is higher than rate of absorption, causing plant to wilt. [Quote data]: Over 24 hours, 71g (17.75 g/h per 4 hourly period) of water is lost through transpiration while only 17.25 g/h per 4 hourly period) of water is absorbed.	1 1
9ai	in nucleus (human) / within nuclear membrane ORA ; in cytoplasm (bacteria) ; thread-like + plasmid(s) (bacteria) ; genes / chromosomes paired (human)	1 1
9aii	Use of **same restriction enzyme** to isolate human insulin gene and to cut bacterial plasmid Formation of **complementary sticky ends** results in pairing between human insulin gene and plasmid Use of DNA ligase to seal bonds between insulin gene and plasmid to form recombinant DNA, **J**	1 1 1

9aiii	Fermenter / bioreactor	1
9b	potential advantages (Any 2) increased yield / more profitable / grow quicker / reduce famine able to grow in environmental extremes / grow in new areas ; more predictable results than selective breeding / more certain able to transfer (beneficial) genes / features between species nutritionally improved / visually improved / desirable outcome e.g. uniform shape disease / pest resistance potential dangers (Any 2) risk of genetic spread to other species may be patented / costs too much possible risk to health of other species possible risk to genes of other species	 1 1 1 1 1 1 1 1 1 1
10a	population of red scale pest long after treatment is even greater than before treatment ; insecticide causes mutation + mutated red scale are immune to insecticide; insecticide kills non-resistant red scale, leaving naturally resistant red scale to reproduce + over time, population of resistant red scale increases; insecticide kills natural predators + less predation/ selection pressure on red scale, red scale population increases; ecological balance after treatment disrupted eg. reproduction rate of red scale higher than predator/ predators affected by effects of bioaccumulation;	1 1 1 1 1
10b	Use of aerobic and anaerobic bacteria and fungi **aerobic conditions** in percolating filter tank due to pumping of air bubbles **anaerobic conditions** in digester tank; **bacteria secretes enzymes** to decompose/ digest organic matter in wastes; useful / water-soluble matter absorbed and used by bacteria; treated effluent and sludge contains lower concentration of organic matter and harmful pathogens	1 1 1 1 1
O10a	Circular muscle **behind the bolus** contracts + longitudinal muscle relaxes oesophagus constricts; **Below the food bolus**, circular muscle relaxes + longitudinal muscle contracts – oesophagus widen; Squeezes and pushes the bolus downward; by peristalsis	1 1 1 1
O10b	Circular muscles of the iris contract + radial muscle relaxes; Pupil becomes smaller	1 1
O10c	**External intercostal muscles** of the rib cage **contract** + internal intercostal muscles relax; Raised the ribcage upwards and outwards; (Together with the help of a lowered diaphragm) **Volume** in thoracic (chest) cavity **increases + pressure lower than in lungs;** Lungs expand, causing pressure in lungs to be lower than the atmospheric pressure	1 1 1 1