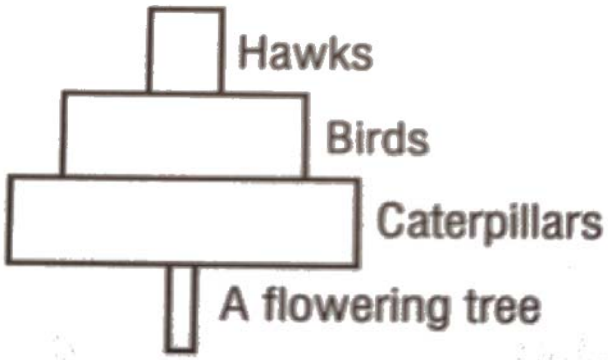
SECONDARY 4 EXPRESS BIOLOGY

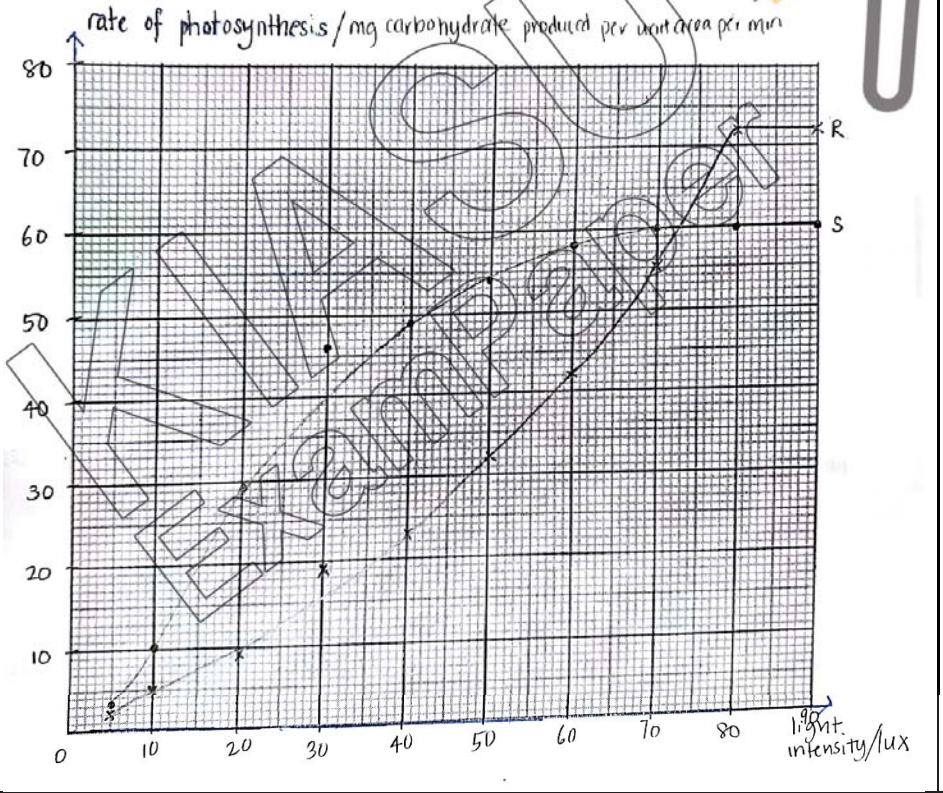
PRELIMINARY EXAMINATION, 2018

SUGGESTED MARK SCHEME P2

Section A				
		Answers	**Marks**	**Remarks**
1	**(a)**		[1]	
	(b)	1. Leaves that contain insecticides are eaten by the caterpillars. As these insecticides are not <u>biodegrable/are not broken down</u>, they accumulate in the bodies of caterpillars./ bioaccumulation ; 2. As birds feed on the caterpillars and hawks feed on these birds, the concentration of insecticides increases along the food chain. ; 3. Highest concentration of insecticides will be found <u>in hawks</u>. ; 4. This is known as <u>bioamplication/bioaccumulation</u> ; **Reject: indigestible**	[1] [1] [1] [1]	Point 1 is a must Point 2, 3 and 4, any 2 Max 3 marks
	(c) (i)	1. Initially, the grasshopper population increases as there are less predators feeding on them and they can <u>reproduce</u> more. ; 2. However, their population decreases later dramatically due to the <u>competition for food</u>. ; 3. The flowering plant is the only producer of food in this food web/does not produce enough food for the growing population. ;	[1] [1] [1]	
	(c) (ii)	1. Initially, the caterpillar population remains constant because they belong to two different food chains / snakes do not prey on them./have not lost source of food or predator ; 2. However, both grasshoppers and caterpillars feed on the same food source (leaves of flowering plant), an increase in the population of grasshopper provides competition for food with the caterpillars. ; Or No snakes, grasshopper population increases, more food for birds, bird population increases, more caterpillars are eaten	[1] [1]	

2	**(a)**	The healthy child has more villi /more protrusion patient has fewer villi / The healthy child's villi are longer / patient has shorter villi / Patient's villi are not properly formed/ Healthy child has villi separated/ Healthy child has larger surface area for villi;	[1]	Any 1 point **Reject: Villi has more folds,**
	(b)	1. Microvilli provide a larger surface area to volume ratio for food to be absorbed faster. ; 2. Each villus is supplied with a network of blood capillaries to maintain a steep diffusion gradient for rapid diffusion of food substances. ; 3. The villi are thin walled / one cell thick walls of villi provide a short diffusion distance for digested food to pass through the walls quickly. ; 4. The small intestine is long to allow more time for digested food to be absorbed ; 5. Mitochondria are found in the cells of the epithelium to help in the absorption via active transport.	[1] [1] [1] [1] [1]	Any 3 points
	(c)	1. Enzymes are specific in action / Each protein must be digested by one specific enzyme. ; 2. Each enzyme has an active site. 3. The shape of the active site is complementary to shape of substrate / only allows a particular substrate to fit in to form an **(enzyme-substrate complex) not necessary** ; 4. Hence, the enzyme which digests protein in the meat cannot digest protein in gluten. ;	[1] [1] [1] No mark	
3	**(a)**	1. Anthers, outside flower / exposed, to allow wind to carry pollen away / 2. Long / flexible filaments/pendulous stamens, to allow wind to dislodge the pollens / 3. No / small petals, to allow anthers to be exposed to the wind / less energy is channelled to produce large petals and more energy channelled to make pollens instead 4. Anthers large to produce large quantities of pollen	[1] [1]	Any 2 points
	(b)	1. (Genetic) mutation occurs in the corn borer ; (there are variation in some corn borers) 2. Mutated Corn borers more likely to survive / have selective advantage ; 3. These corn borers grow into adults and are likely to breed / reproduce ; 4. Hence, the mutated gene / resistance alleles are passed on to the next generation ; 5. This leads to increase in frequency of allele for resistance ;	[1] [1] [1]	Any 3 points
	(c)	rr	[1]	
	(d)	1. When non-resistant borers from outside breed with resistant borers, many offspring will not be resistant ; 2. Because many of the offspring will be Rr / heterozygous/less will be rr ; 3. Detail e.g. results of rr / RR **and** rr x Rr	[1] [1]	Max 2 points

4	**(a)**	**A**: renal artery **C**: glomerulus (A:blood capillaries) **Accept: similar spelling**	[1], [1]	
	(b)	1. During ultrafiltration at the glomerulus, small molecules are filtered out into the proximal convoluted tubule ; 2. Glucose molecules are small enough to move into/ pass into the Bowman's capsule. ; 3. However, glucose molecules are useful and all are selectively reabsorbed into the blood capillaries. ; 4. Proteins are too large to enter the Bowman's capsule therefore remain in the bloodstream ;	[1] [1] [1] [1]	
5	**(a) (i)**	Alveoli / air sacs ; **Reject: alveolar wall**	[1]	
	(ii)	emphysema ;	[1]	
	(b)	1. Tar and irritants present in the cigarette smoke paralyses cilia lining the air passages ; 2. Dust particles trapped in the mucus lining the air passages cannot be removed ; 3. Increasing the risk of chronic bronchitis and emphysema ; 4. Tar causes lung cancer ;	[1] [1] [1] [1]	Any 2 from point 1, 2 or 3 if point 4 is given as one of the answer
	(c)	1. Carbon monoxide combines with haemoglobin to form (**carboxyhaemoglobin**) **– no need write this** ; 2. Hence it reduces the ability of haemoglobin to carry oxygen to the rest of the body cells / decreases oxygen level in the blood;	[1] [1]	
6	**(a)**	1. number of infected people increases steeply from 1990 until 1996 / 1997 ; 2. peaks at 3.5 million / any figure between 3 to 4 million ; 3. decrease from 1996 / 1997 ; 4. number of new cases in 2008 is greater than in 1990 ;	[1] [1] [1] [1]	Any 3 points With at least 1 mention of the data
	(b)	1. reduce risk of infection by using condoms / protection during sexual intercourse ; 2. abstinence ; 3. not sharing needles / using sterile needles ; 4. treat blood (products) / testing potential blood donors or donated blood ; 5. increase accuracy in contact tracing ; 6. increased awareness of precautions / risks / transmission ; 7. increased use of antiviral drugs to reduce transmission ; 8. some strains are less infective than others ; 9. less reporting of new cases ;	[1] [1]	Any 2 points

7	**(a)**	asexual reproduction 1. Asexual reproduction results in the production of genetically identical offspring. ; 2. Since the transgenic bacterium already contains the insulin gene, by reproducing asexually, many identical copies of this bacteria are produced and hence more insulin gene can be produced. ;	[1] [1] [1]	
	(b)	Diabetes mellitus	[1]	
	(c)(i)	6	[1]	
	(c)(ii)	Shade any 2 chromosomes of the same size	[1]	
	(c)(iii)	The chromosome number became half / 3/ chromosome numbers become haploid ; So that when the nucleus of the female gamete fuse with the nucleus of the male gamete, diploid number of chromosomes in the zygote / species is restored.	[1] [1]	
Section B				
8	**(a)**		[1] [1] [1]	Axis correct Points Correct best fit graphs drawn
	(b)	Plant S ; At low light intensity (0 to 40 lux), the rate of photosynthesis increases at much faster rate compared to plant R. ; Or Plant 2 is able to produce 29 mg of carbohydrate at 20 lux but plant R needs more than 40 lux of light **(accept this type of answer as above)**	[1] [1]	

	(c) (i)	1. Since above 80 lux, the rate of photosynthesis is constant for both plants, light intensity is <u>no longer the limiting factor ;</u> 2. Since carbon dioxide is essential for photosynthesis to take place/it might be a limiting factor, the rate of photosynthesis might increase when its concentration is increased ;	[1] [1]	
	(c) (ii)	1. Photosynthesis is an enzyme dependent process ; 2. Increasing the temperature to 40 °C might increase the enzyme activity which will in turn increase the rate of photosynthesis ;	[1] [1]	
		3.		
	(d)	Wilting is caused when leaf cells lose their turgidity / became flaccid 1. Stomata closes, carbon dioxide diffusion into cells may decrease ; 2. leaf folds up, reducing exposed surface, light energy absorbed may reduce; 3. Less water for photosynthesis; Rate of photosynthesis falls	 [1] [1] [1]	Ignore first sentence Any 2 points
9	**(a)**	1. Left ventricle has thicker / more muscle than the right ventricle ; 2. Left ventricle pumps blood to the rest of the body / systemic circulation which is a longer distance / further away / at higher pressure ; 3. Right ventricle only pumps blood to the lungs which is a short distance from the heart ;	[1] [1] [1]	Reject : ventricle wall needs to withstand high pressure
	(b)	1. When pressure in right atrium is greater / higher than pressure in the ventricles, the valves open to allow blood to flow from right atrium into right ventricle ; 2. When the right ventricle contracts, the pressure in right ventricle is greater than pressure in right atrium, causing the valves to close ; 3. Hence, the blood can only flow in one direction which is to the pulmonary arteries ;	[1] [1] [1]	
	(c)	1. fat / cholesterol / deposited in, plaque formed in wall of artery narrows lumen of artery ; 2. blood flow reduced / restricted (in coronary arteries) and less oxygen / glucose, supplied to heart muscle for aerobic respiration **(to release energy)-not necessary** ; 3. heart attack / heart failure / cells in heart might die ;	[1] [1] [1]	Reject: no oxygen flows to heart muscles

10	**Either**			
	(a)	When the body temperature drops, 1. it stimulates temperature receptors in our skin, which send	 [1]	 Point 1 is a

		nerve impulses to the hypothalamus. The hypothalamus will send nerves impulses to the relevant body parts to bring about the following changes: 2. less active sweat glands/sweating stops (**Accept**: inactive) 3. less evaporation of water in sweat and less heat of vaporisation is lost from the body (**Reject**: no evaporation) 4. Vasoconstriction of arterioles/ blood vessels (**Reject**: capillaries/veins) 5. Results in less blood to capillaries and less heat is lost by convection, radiation and conduction 6. Increase in metabolic rate to increase the amount of heat released within the body 7. Shivering might occur which generates heat 8. Hair erector muscles contract, causing the hairs to stand. This helps to trap a layer of air which can reduce heat loss as air is an insulator of heat	 [1] [1] [1] [1] [1] [1] [1]	must Point 2 to 8, any 6 points
	(b)	Negative feedback is 1. A change in level / of set point/ in norm triggers /causes / a response / reaction / sequence of events ; 2. Which leads to restoration to original level ; 3. An example is when water potential in the body increases above norm, it is detected by the receptor in the body. The body will respond and returns the water potential to the norm. ; Or point 3, students can give any other relevant examples (temperature regulation, glucose regulation)	 [1] [1] [1]	
10	**Or**			
	(a)	1. Plants contain carbon in the form of organic matter such as starch / protein/fat/cellulose. ; 2. Glucose in the plant is used during respiration, releasing carbon dioxide into the atmosphere. ; 3. Animal feed on plant and carbon is incorporated into body tissues (fats, proteins, glycogen) ; 4. Glucose in the animal is used during respiration to release carbon dioxide into the atmosphere. ; 5. Death of animal / plant result in decomposition ; 6. Respiration by decomposers release carbon dioxide into the atmosphere ; 7. Combustion of fossil fuels release carbon dioxide into the atmosphere ; 8. Photosynthesis by green plants remove carbon dioxide from the atmosphere to form glucose / organic matter again ;	[1] [1] [1] [1] [1] [1] [1]	Any 7 points
	(b)	1. Respiration of living organisms, <u>energy is lost as heat</u> to the environment ; 2. Egested/excreted materials/dead organisms/uneaten body parts contain trapped chemical energy ; 3. Living organisms cannot use heat energy to do work / cannot be recycled ;	[1] [1] [1]	