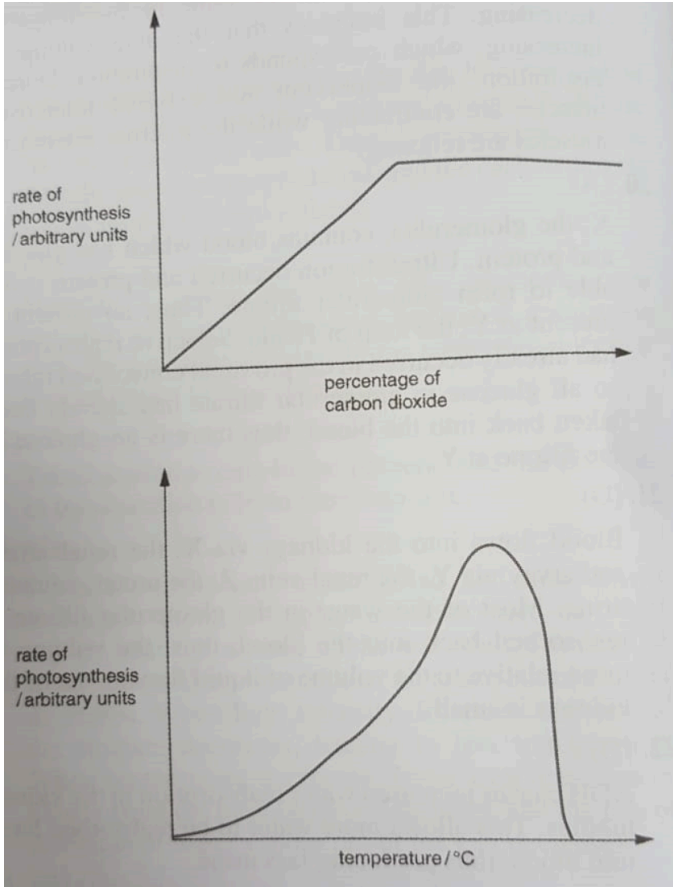
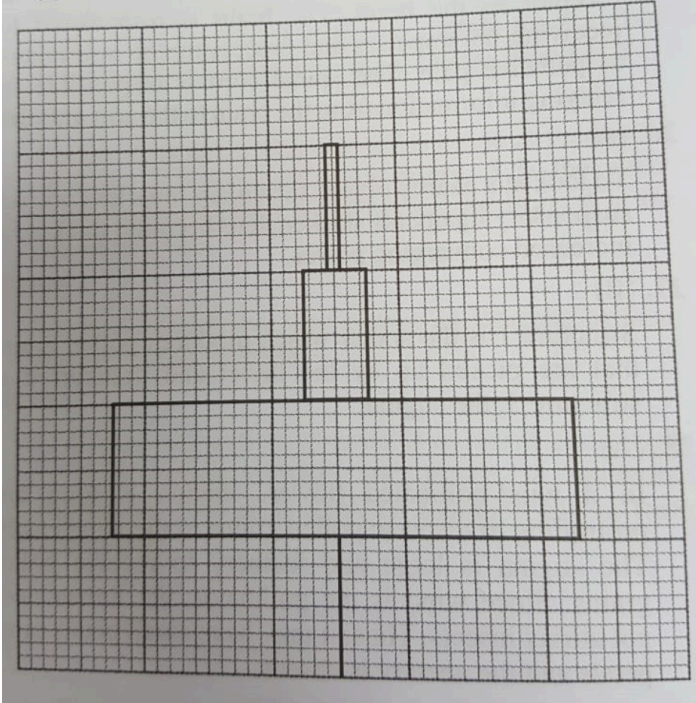


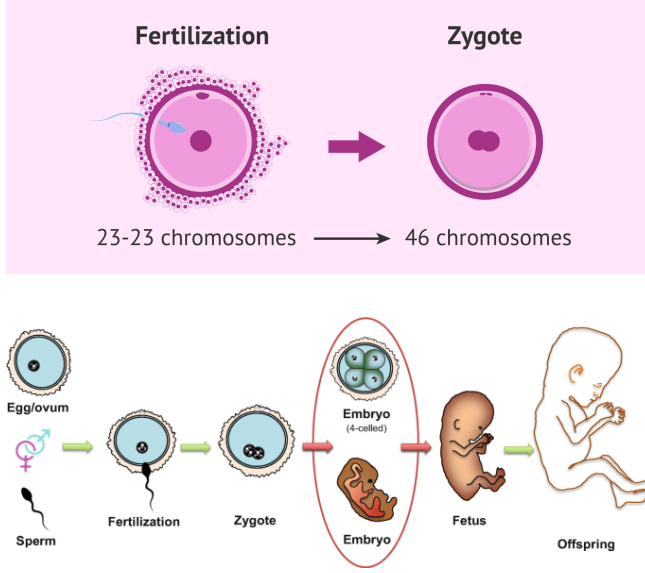
SUGGESTED MARK SCHEME – BIOLOGY 2017

Qn No	Answers	Mark	Feedback
1(a)	maintenance of a close to constant internal environment; within narrow and acceptable limits	1 1	
1(b)	glands which secrete chemical substances called hormones directly into bloodstream , without a duct , in minute amounts; hormone travels to one or more target organs to influence a change in growth, development and activity of the organism,	1 1	
1(c)(i)	A: glycogen B: glucagon	1 1	
1(c)(ii)	exercise is an energy-consuming process □ requires large amount of energy release for muscle contraction; high respiration rate in muscle cells requires large amounts of glucose since glucose is a respiratory substrate ; thus blood glucose concentration decreases	1 1	Most candidates correctly identified the substances A and B ; some did not make the link between respiration and the use of glucose. Incorrect references to 'producing' energy were seen in weaker responses.
2(a)	contains air for gaseous exchange with the environment for photosynthesis and respiration; OR increase buoyancy of the leaf so that it can float on the surface of water;	1	Many candidates knew that intercellular air spaces have a role in gas exchange. The context was often linked to exchange with the environment.
2(b)	exposed to the most amount of light for maximum rate of photosynthesis	1	Good responses referred to maximum light.
2(c)*	green pigment found in the chloroplast to help trap light , converting light energy to chemical form	1	

	splitting water molecules in the light-dependent stage of photosynthesis, releasing oxygen as by-product leading to formation of glucose in later/ light-independent stage	1	
2(d)	 The image contains two line graphs. The top graph has 'percentage of carbon dioxide' on the x-axis and 'rate of photosynthesis / arbitrary units' on the y-axis. The curve starts at the origin, rises linearly, and then levels off into a horizontal line. The bottom graph has 'temperature / °C' on the x-axis and 'rate of photosynthesis / arbitrary units' on the y-axis. The curve starts at the origin, rises to a peak, and then falls sharply towards the x-axis.	1	
3(a)*	any one from 1. occupies the first trophic level of the food web; 2. autotrophic, converts light energy to chemical energy; 3. source of food for consumers	1	

3(b)	74; 10; 2;	1 1 1	A common error was to count the number of species instead of the number of organisms
3(c)	 size is at least 50% of grid bars proportionate to numbers each trophic level accurately labelled	1 1 1	Good responses included a scale for their drawings and clearly labelled the trophic levels.
4(a)	Measure the initial mass of D, E and F before placing the set-ups in its respective environmental conditions. At the end of the experiment, measure the final mass of each set-up.	1	

	For each set-up, calculate the loss in mass by subtracting final mass from initial mass.	1	
4(b)	transpiration	1	
4(c)	Plant D. Plant D has more leaves than F $\square$ greater surface area from which water can be lost from; Leaves of D were exposed to wind while leaves of E were contained within a humid environment, limiting water loss by transpiration due to decreased water vapour concentration gradient; Thus plant D will lose more water than E and F by transpiration.	1 1	
4(d)	To ensure that any loss of water from the set-ups can only occur through the leaves by transpiration and not by evaporation from the moist soil.	1	
5(a)	The process resulting in the production of genetically identical offspring; from one parent, without the fusion of gametes.	1 1	Weaker responses confused asexual reproduction with self-fertilisation.

5(b)	1. Zygote moves down the fallopian tube to uterus (develop) by sweeping action of cilia (describe) of the tube and by peristaltic action (describe); 2. Zygote divides by mitosis to form a ball of cells called embryo; (development) 3. Embryo implants itself in the thickened endometrium+ maintained by progesterone released by corpus luteum; 4. Embryonic villi grow from embryo into endometrium → forming placenta 5. Formation of amniotic sac (survive) and amniotic fluid which ensure survival by protecting the fetus from..... 6. Umbilical cord attaches embryo to placenta, where diffusion of useful substances occurs from maternal blood to foetal blood, and diffusion of waste from foetal to maternal blood occurs (survive).	1 1 1 1 1	Weaker responses did not always correctly differentiate between the terms zygote, embryo and fetus.  These weaker responses also showed some misconceptions about the relationship between the placenta, umbilical cord and amniotic sac.
6(a)(i)	1400	1	
6(a)(ii)	As exercise intensity increased, the volume of each breath increased.	1	
6(a)(iii)	When exercise intensity = 2 a.u. □ volume of each breath = 1700 cm³ Total volume of air breathed in one minute = 1700 x 26	1	

	= 44200 cm ³	1	
6(b)	respiration	1	
7(a)	cardiac muscle tissue contracts to pump blood out of left ventricle relaxes to enable left ventricle to fill with blood	1 1	Most candidates were able to identify the tissue in Fig. 7.1 and describe its function. Weaker candidates identified the tissue as pericardium or left ventricle and did not make it clear that force or pressure was required to move the blood.
7(b)(i)	5.6	1	
7(b)(ii)	19 – 7 = 12 minutes	1	
7(b)(iii)	increase in HR from 2 mins to 5 mins: 168 – 66 = 102 bpm percentage increase: 102/66 x 100% = 155%	3	
7(b)(iv) *	During exercise, from 2 minutes to 4 minutes, heart rate increased rapidly from 66 to 160 bpm...how many times or by how many units - MANIPULATE THE DATA! from 4 minutes to 6 minutes, the heart rate increases gradually from 160 to the maximum of 170 bpm. From 6 minutes to 7 minutes, the heart remained constant at 170 bpm.	1 1 1	

Qn No	Answers	Mark	Feedback
-------	---------	------	----------

8(a)	<table><caption>Data points from the graph</caption><thead><tr><th>Temperature/°C</th><th>Time taken to become colourless / minute</th></tr></thead><tbody><tr><td>20</td><td>18.5</td></tr><tr><td>25</td><td>11</td></tr><tr><td>30</td><td>4.5</td></tr><tr><td>35</td><td>3</td></tr><tr><td>40</td><td>6</td></tr><tr><td>45</td><td>12.5</td></tr><tr><td>50</td><td>21</td></tr></tbody></table> size is at least 50% of grid provided axes labelled, with units points accurately plotted, allow 1 misplot curve of best fit / point-to-point	Temperature/°C	Time taken to become colourless / minute	20	18.5	25	11	30	4.5	35	3	40	6	45	12.5	50	21	1 1 1 1	
Temperature/°C	Time taken to become colourless / minute																		
20	18.5																		
25	11																		
30	4.5																		
35	3																		
40	6																		
45	12.5																		
50	21																		
8(b)	when milk fat was digested by lipase, glycerol and fatty acids were produced; fatty acids neutralised the sodium carbonate solution → making it less alkaline, below pH 8; causing phenolphthalein to turn colourless	1 1 1																	

8(c)	at 55°C, lipase was denatured by the high temperature; milk fat is not digested and fatty acids are not produced	1	
8(d)	Optimum temperature of the enzyme is the temperature where enzyme activity is the maximum/highest (at 35°C → time is shortest at 2.5min) enzyme-substrate complexes formed; Fatty acids produced will be highest at this temperature; Time taken to cause phenolphthalein to turn colour would be the shortest	1 1	
9(a)	Total water gain = 1600 + 700 + 200 = 2500 cm ³ per day	1	
9(b)*	metabolic water is water produced as a result of cellular chemical reactions; such as respiration, condensation reaction in the formation of bonds	1 1	
9(c)	In a cold environment, less sweat is produced as there is less need to lose latent heat via evaporation of water in sweat; As less water in blood is used to form sweat, water potential of blood increases; Osmoregulation of blood occurs → more water is loss in urine As temperature decreases, relative humidity increases; less water vapour evaporate from the thin layer of moisture on alveoli wall Osmoregulation does not involve the digestive system; water loss in faeces will remain more or less the same	1 1 1 1	
9(d)	(stimulus) When water potential in blood drops below norm, (receptor) The hypothalamus detects this change and (effector) Pituitary gland secretes more anti-diuretic hormone; (effector) This causes more water to be reabsorbed back into bloodstream in kidneys; Causing blood water potential to rise back to normal	1 1 1	

10E(a)	1. DNA is made up of 2 anti-parallel polynucleotides/ nucleic acids coiled to form a double helical shape; 2. subunits of DNA are nucleotides, 3. consisting of a phosphate group, deoxyribose sugar and a nitrogenous base; 4. nitrogenous bases have 4 variants: adenine, thymine, cytosine or guanine base; 5. complementary base pairing rules between bases of the two strands: adenine with thymine, cytosine with guanine. 6. hydrogen bond formed between complementary bases on opposite strands hold the two strands together	1 1 1 1 1 1	
10E(b)*	Isolation idea: Scientists isolate the human DNA containing gene of interest and a bacterial plasmid. Restriction enzyme: The human gene is cut using a suitable restriction enzyme. The plasmid is cut using the same restriction enzyme. This produces complementary sticky ends on the human DNA fragment and the bacterial plasmid. DNA ligase: The human DNA fragment containing gene of interest is mixed with the bacterial plasmid and inserted into it using DNA ligase forming recombinant plasmid. Transformation: Recombinant plasmid/DNA is inserted into bacterial cell after weakening the cell membrane with heat → bacteria is transformed (now considered a transgenic organism) and now contains and can express the gene to make the protein	1 1 1 1	
10O(a)*	Co-dominance refers to a type of inheritance where two or more alleles are equally dominant and exert their effects (phenotype) on the organisms. Blood type → 3 alleles (multiple alleles) □ I^A, I^B and I^O Where I^A and I^B are dominant over I^O (the recessive allele);	1 1 1	Many good responses were seen; few candidates did not use the correct notations for blood group alleles. In these cases, the genotypes and phenotypes were often confused.

	Presence of either I^A or I^B will express blood type A and B respectively; For blood type O to be expressed, two copies of I^O are needed Presence of both I^A and I^B alleles will express both A and B antigen on red blood cell → AB phenotype as only 1 copy of each is needed to express the trait.	1 1 1	
10O(b)*	Mutation refers to random and spontaneous change in the structure/bases of a gene or in the chromosomal mutation (number or large parts of the chromosome lost or added); Rate of mutation is greatly increased when exposed to mutagens, for example alpha beta gamma radiation etc. An example of a gene mutation is sickle-cell anaemia; A change in structure of gene causes a change in 3D shape of haemoglobin making the cell sickle-shaped An example of a chromosome mutation is Down's syndrome; Non-disjunction/failure of chromosomes or chromatids to separate that occur during anaphase of meiosis in the formation of gametes will cause an extra copy of chromosome-21.	1 1 1 1	The majority of candidates tended to define and give an example of only one type of mutation, commonly Down's syndrome caused by the presence of an extra chromosome. Definitions of gene mutations were often vague. The most common examples for gene mutation were sickle cell haemoglobin and albinism.