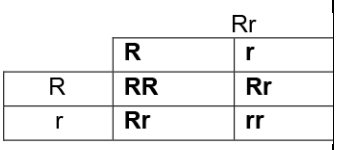
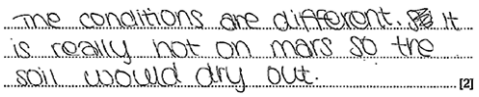
Mark scheme – Respiration (F)

Question			Answer/Indicative content	Marks	Guidance
1			A ✓	1 (AO1.1)	
			Total	**1**	
2			B	1 (AO 2.1)	**Examiner's Comments** **AfL** Very few candidates answered this challenging AO2.1 question correctly. Again, several did so by writing the number in the answer box rather than the letter. Candidates who wrote 2 were credited but it is something they should be encouraged to avoid and to only use letters A, B, C or D.
			Total	**1**	
3			B ✓	**1** (**AO** 2.2)	**Examiner's Comments** The assessment was designed to assess candidates' practical knowledge, AO2.2. By far the most common response was 'A' Benedict's reagent. Clearly candidates are used to using this reagent, but it is evident that few had any recognition of using Biuret reagent. Candidates had a lack of knowledge of how to test for protein and this needs to be developed.
			Total	**1**	
4			A ✓	**1** (**AO** 1.1)	
			Total	**1**	
5		i	use Benedicts (reagent) ✓ heat / boil ✓	3 (AO3 x 1.2)	

			no change in colour / stays blue / does not go red ✓		
		ii	Yes (no mark) blood sugar levels will be controlled/not rise ✓ idea of a sugar replacement ✓	2 (AO1 x 3.2a) (AO1 x 2.1)	If No chosen = 0 marks **IGNORE** blood sugar levels will decrease **ALLOW** less sugar eaten
			Total	**5**	
6			Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question. **Level 3 (5–6 marks)** Provides a detailed explanation linking cholesterol to heart disease. **AND** Provides a detailed analysis to explain if this link is supported by the graph. *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.* **Level 2 (3–4 marks)** Provides a detailed explanation linking cholesterol to heart disease. **OR** Provides a detailed analysis to explain if this link is supported by the graph. **OR** Provides a basic explanation linking cholesterol to heart disease. **AND** Provides a basic analysis of the information to explain if this link is supported by the graph. *There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.* **Level 1 (1–2 marks)** Provides a basic explanation linking cholesterol to heart disease. **OR** Provides a basic analysis of the information to explain if this link is supported by the graph.	6 (AO2 x 1.1) (AO2 x 2.1) (AO2 x 3.1b)	**AO1.1 Demonstrate knowledge and understanding of the importance of the blood supply to the heart muscle.** • coronary artery carries blood to heart/muscle • blood takes oxygen/glucose to the heart/muscle • heart/muscle carries out aerobic respiration/needs energy • energy is needed for the heart/muscle to contract **AO2.1 Apply knowledge and understanding of the requirements of the heart muscle** • cholesterol build up (partially) blocks the blood flow in the artery • this reduces blood/oxygen/glucose carried to the heart/muscle • heart/muscle carries out less aerobic respiration/less energy released • heart/muscle can't contract as forcefully **AO3.1b Analyse information and ideas to interpret the results on the study** **Support the link:** • men with heart disease had (on average) a higher blood cholesterol level. • Men without heart disease had (on average) a lower blood cholesterol level. • build-up of cholesterol can lead to heart disease **Doesn't support the link:** • considerable overlap between the two groups • men can still have heart disease with low blood cholesterol levels • Men without heart disease can still have high blood cholesterol levels

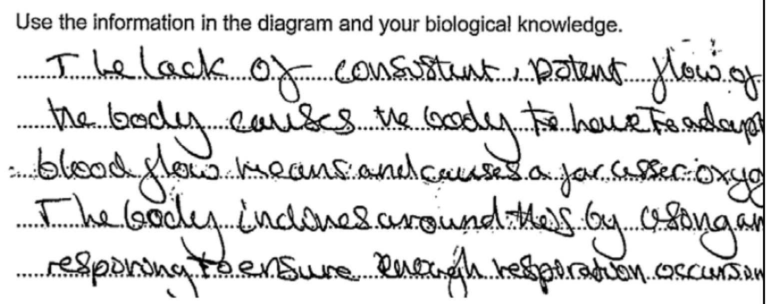
			OR Demonstrates knowledge of the importance of the blood supply to the heart muscle. *There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.* **0 marks** *No response or no response worthy of credit*		
			Total	**6**	
7	a		to let air / oxygen in ✓ for (aerobic) respiration ✓	2 (AO1 x 2.1) (AO1 x 1.1)	**DO NOT ALLOW** carbon dioxide **DO NOT ALLOW** anaerobic respiration
	b		to allow a valid comparison of the results✓	1 (AO3.1 b)	
	c	i	correct plots ✓✓ smooth curved line between points ✓	3 (AO3 x 2.2)	**ALLOW** +/- half a square All correct = 2 marks 3 or 4 plots correct = 1 mark **DO NOT ALLOW** sketchy line / line thicker than half a square
		ii	increases up to 10 days/70ºC ✓ then decreases ✓	2 (AO3.1 a)	**ALLOW** increases up to 9-11 days **ALLOW** increases by 44ºC
		iii	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 39 (ºC) award 2 marks** 70-31 ✓ = 39 (ºC)✓	2 (AO2.2) (AO1.2)	
		iv	normal compost is made by aerobic respiration✓ aerobic respiration releases more energy than anaerobic respiration✓	2 (AO2 x 2.1)	2 correct ticks = 2 marks 1 correct ticks = 1 mark 3 ticks two correct = 1 mark 3 ticks one correct = 0 marks 4 or more ticks = 0 marks
	d	i	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 8 (kg) award 3 marks**	3 (AO3 x 2.2)	

			1500-1200 **OR** 300 ✓ 300/40 **OR** 7.5 ✓ = 8 (kg) ✓		**ALLOW** one mark for clear evidence of rounding incorrect answer correctly to the nearest whole number
		ii	less carbon dioxide is produced ✓	1 (AO3.1 b)	**ALLOW** less contribution to global warming / greenhouse effect / climate change
			Total	**16**	
8			fatty acids are obtained by breaking down/digesting larger molecules ✓ idea (originates) from lipids ✓	2 (AO2.1)	**ALLOW** using lipase / enzyme **ALLOW** triglycerides **ALLOW** lipids/fats/oils
			Total	**2**	
9		i	provide energy / release energy / produce ATP ✓	1 (AO1.1)	
		ii	carbon dioxide ✓ water ✓	2 (AO1.1)	**ALLOW** correct answers in either order **ALLOW** correct formulae in either order **IGNORE** oxygen and glucose when shown as reactants **IGNORE** energy
		iii	exothermic ✓	1 (AO1.1)	
			Total	**4**	
10	a		clots the blood ✓ prevents bleeding / allows wounds to heal / forms a scab ✓	2 (AO 1.1)	**IGNORE** clump blood **ALLOW** prevents pathogens getting into the body **Examiner's Comments** There was some confusion in the responses describing the role of platelets whereby candidates thought platelets had a role in the specific immune response. Only higher ability candidates gained a mark here.
	b		 ratio 3 : 1 ✓	3 (AO 2.1) (AO 3.2b)	correct gametes = one mark correct genotypes of offspring = 1 mark **ALLOW** ECF for ratio **ALLOW** 3 in 4 **Examiner's Comments** The majority of candidates achieved two or three marks correctly

					identifying the gametes and genotypes. Most went onto correctly identifying the ratio if they achieved the gametes mark. Very few candidates achieved the error carried forward mark.
	c		**Any three from:** variation with some rats resistant and some who are not ✓ (resistant rats) more likely to survive/less likely to be killed ORA ✓ (resistant rats more likely) reproduce ORA ✓ pass on the allele / gene for resistance ORA ✓	3 (AO 2.1)	**IGNORE** selective breeding **ALLOW** mutation for resistance **ALLOW** offspring produced / breed together **ALLOW** pass on advantageous gene **IGNORE** trait is passed on / genes are passed on **Examiner's Comments** Candidates had to apply their knowledge of natural selection to explain why the percentage of resistant rats was increasing. There were a range of marks given for this question. Most none scoring responses were too vague and not using key terms. Most candidates did not appreciate that there was variation for resistance within the population.
	d		**Any two from:** (stops/less) respiration ✓ (no/less) energy/ATP ✓ key process interrupted e.g. cell metabolism/protein synthesis/chemical reactions/active transport ✓	3 (AO 2.1)	**Examiner's Comments** This question was one of the most challenging application of knowledge and understanding questions. The most common awarded mark was appreciation that energy release would be affected. A lot of responses were very general and would say the rat can't breathe or can't get any oxygen.
			Total	**11**	
11		i	(no) microorganisms (in the soil) ✓ no decay (takes place) ✓	2 (AO 1.1) (AO 2.1)	**AW** microbes, decomposers, saprophytes, detritivores, bacteria, fungi **AW** decomposition, rotting, break down **ALLOW** not enough nitrifying bacteria to replace nitrates / no nitrates released by nitrifying bacteria = 2 **IGNORE** no organisms to recycle the minerals **Examiner's Comments** Very few candidates were able to apply their knowledge of microbes and decay to this question, and found it challenging to answer. Many candidates misinterpreted the question and talked about lack of oxygen for life or that Mars is too dry for life. This is demonstrated with Exemplar 4 which was given 0 marks. **Exemplar 4**  the conditions are different, as it is really hot on mars so the soil would dry out. [2]

		ii	plants release oxygen by photosynthesis ✓ organisms in the soil / microbes / animals release carbon dioxide by respiration ✓	2 (AO 2.2)	**ALLOW** correct word (or symbol) equations for photosynthesis linked to plants and respiration linked to organisms in the soil / microbes / animals **AW** microbes, decomposers, saprophytes **IGNORE** breathe out carbon dioxide **IGNORE** plants will respire and give out carbon dioxide **ALLOW** 1 mark for plants release oxygen/photosynthesise and microbes give out carbon dioxide/respire if no other marks are awarded. **Examiner's Comments** Candidates had to apply their knowledge and understanding of gases given off by plants in photosynthesis and organisms in carrying out respiration to explain why air would no longer needed to be added after a while. Most non-scoring responses were too vague and just stated gases as in the stem of the question.
			Total	**4**	
12	a	i	sucrose ✓	1 (AO 3.2a)	**Examiner's Comments** Candidates in the main were able to interpret the graph in this AO3.2 question.
		ii	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 12 award 2 marks** 6.0 ÷ 0.5 ✓ = 12 ✓	2 (AO 2.2)	**Examiner's Comments** **AfL** This AO2.2 question was reasonably well answered. However, because candidates often did not include working out they often scored 2 marks or nothing. Several candidates did a subtraction, 6 - 0.5 rather than dividing. This is another example of where a candidate who is encouraged to show their working out may well obtain at least 1 mark rather than none.
		iii	glucose ✓	1 (AO 3.2a)	**Examiner's Comments** Candidates in the main were able to interpret the graph in this AO3.2 question.
		iv	(Yeast B) doesn't ferment fructose ✓	2 (AO 3.1a)	**ALLOW** (Yeast B) does not use up fructose / fructose levels decrease slightly / fructose levels remain high / higher yield of fructose / fructose levels remain constant **ALLOW** reverse arguments for Yeast A **DO NOT ALLOW** fructose is produced

			(Yeast B) produces some fermented products ✓		**ALLOW** fermented products increased **DO NOT ALLOW** fermented products produced from fructose **DO NOT ALLOW** produces high levels of fermented products **IGNORE** fermented product level stays the same / less fermented product than A **Examiner's Comments** Some candidates did not answer this AO3.1 question. This may be due to it being the last question but could be that they were unsure how to respond. Many candidates who did respond had the right ideas but did not articulate clearly enough, saying that there was more fermented product in yeast B or similar.
	b		alcohol / ethanol **and** carbon dioxide ✓	1 (AO 1.1)	**ALLOW** either order **ALLOW** correct formulae **Examiner's Comments** In this AO1.1 recall question, candidates seemed to either know this or got both products incorrect.
	c		**Any two from:** alcohol produced in yeast (not humans) / ORA✓ lactic acid produced by humans (not yeast) / ORA✓ carbon dioxide produced by yeast (not humans) / ORA✓	2 (AO 1.1)	If any incorrect product is stated, then max 1 mark. If yeast or humans are not stated assume answer refers to yeast **IGNORE** reference to oxygen debt / ATP production **Examiner's Comments** In general, if candidates had scored a mark on (a), they often scored marks for this AO1.1 question as well. Some candidates managed to write enough to score 1 mark, as they knew humans produced lactic acid. However, quite a few thought yeast was a plant, or that oxygen was produced.
			Total	**9**	
13			blood vessels / arteries are blocked/narrowed ✓ (heart muscle) gets less blood ✓ (heart muscle) gets less oxygen ✓	**3 (AO 2.1)**	**ALLOW** atheroma / plaque formed **IGNORE** no blood **IGNORE** no oxygen **IGNORE** references to blood circulation to body cells **Examiner's Comments** Over half of candidates scored at least one mark here mainly for less blood flow (to the heart muscle). A lot of candidates got confused with the blood flow to the heart muscle with blood flow to the body cells, therefore not gaining credit. Exemplar 8 demonstrates this confusion and is not credited any marks. **Exemplar 8**

					
			Total	**3**	
14			above 60 °C the enzymes in the decomposers had denatured (1)	1	
			below 30 °C the enzymes in the decomposers were working too slowly (1)	1	
			Total	**2**	
15			produces acids = (1) but produces fatty acids = (2)	2	
			Total	**2**	
16			above 60 °C the enzymes in the decomposers had denatured (1)	1	
			below 30 °C the enzymes in the decomposers were working too slowly (1)	1	
			Total	**2**	
17			produces acids (1) but produces fatty acids (2)	2	
			Total	**2**	
18	a		oxygen (1)	1	
	b		respiration (is also occurring) (1)	1	
			some oxygen is used up (in respiration) / AW (1)	1	**allow** idea that oxygen given out is the net production
			Total	**3**	
19			B	1	
			Total	**1**	
20			D	1	
			Total	**1**	

21			B	1	
			Total	**1**	
22			C	1	
			Total	**1**	
23			A	1	
			Total	**1**	