

Question number	Answer	Marks	Guidance
1 a	Award marks for well-drawn graph correctly labelled.	6	
1 b	peas started to grow and respire aerobically small amount of energy transferred to surroundings warming them, so flask temperature increased	1 1 1	
1 c	bcause peas were dry and not growing there was no respiration, so no energy transferred and no warming effect	1 1 1	
1 d	as a control so changes in flask temperature linked to changes in room temperature could be dismissed	1 1	
1 e i	Peas were dead and not respiring so no energy transferred and no warming effect	1 1 1	
1 e ii	Peas had gone mouldy mould was respiring anomaly for example, sun on thermometer, poor reading	1 1 1 1	
2 a	Correct axes labels and scales Correct plotting of data on four bar charts	5	
2 b i	heart has greater volume and pumps more blood at each beat heart beats more slowly at rest	1 1 1	

2 b ii	lungs are bigger and have better blood supply more efficient gas exchange	1 1	
3 a	breakdown of glucose in cell using oxygen to release energy that can be used by cell carbon dioxide and water are waste products	1 1 1	
3 b	breakdown of glucose in cell in the absence of oxygen to release small amount of energy to be used by cell lactic acid is waste product	1 1 1	
3 c	In a human the waste product is lactic acid glucose → lactic acid in a yeast cell the waste products are ethanol and carbon dioxide glucose → ethanol + carbon dioxide	1 1 1 1	
3 d	amount of oxygen needed to convert lactic acid produced during period of anaerobic exercise in muscles to carbon dioxide and water	1 1 1 1	

3 e	<p>Heart and breathing rates increase as exercise commences to bring more oxygen into body.</p> <p>Heart and lung capacity bigger in fit individual than in unfit individual so heart and breathing rate will not increase as much in fit individual, who can bring more air into body and pump more oxygenated blood around body with each breath or heartbeat than unfit individual.</p> <p>Muscles of fit individual bigger with better blood supply than those of unfit individual</p> <p>so they will contract more efficiently and use aerobic respiration for longer.</p> <p>Fit individual will build up smaller oxygen debt than unfit individual during same amount of exercise, and will be able to convert lactic acid to carbon dioxide and water faster as they bring more oxygen into their body, reducing oxygen debt more quickly.</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	
4 a	<p>Aerobic respiration releases more energy to allow muscles to contract more efficiently.</p> <p>Athletes want to prolong this before switching to less efficient anaerobic respiration.</p>	<p>1</p> <p>1</p> <p>1</p>	
4 b	<p>Red blood cells carry oxygen to tissues.</p> <p>More red blood cells can supply more oxygen prolonging aerobic respiration and enabling muscles to work more effectively.</p>	<p>1</p> <p>1</p> <p>1</p>	
4 c	<p>It increases red blood cells in body just before performance allowing more oxygen to be carried to working muscles and prolonging efficient aerobic respiration.</p>	<p>1</p> <p>1</p>	

4 d	Muscles start anaerobic respiration where glucose is incompletely broken down to form lactic acid. Less energy is released and lactic acid builds up in muscle cells, which may cause muscle fatigue.	1 1 1 1	
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