



2 (a)	increased blood flow <i>or</i> heart, pumps/beats, faster ; more, oxygen/glucose (for muscles)/carbon dioxide removed ; more energy released by respiration ; for muscle contraction ;	max [2]	ignore increased, pulse rate/heart rate R 'energy produced' / 'energy created'
(b)	increase in, time/exercise intensity/effort, increase in lactic acid concentration ; increase is, steady/proportional ; after exercise lactic acid concentration continues to increase ; after exercise/near end of exercise, concentration levels off/AW ; appropriate use of data ;	max [3]	units must be used at least once
(c) (i)	the release of a relatively small amount of energy ; by the breakdown of glucose ; in the absence of oxygen/without oxygen ;	max [2]	R 'produce/AW, energy' ignore 'use' unqualified ignore air / fermentation unqualified
(ii)	(by) diffusion ;	[1]	
(iii)	(blood) plasma ;	[1]	
(d)	<i>in trained cyclists</i> lower <u>anaerobic</u> respiration/ more <u>aerobic</u> respiration ; less lactic acid produced (during exercise) ; because more oxygen supplied to muscles ; less <u>oxygen debt</u> ; less oxygen required, to oxidise/breakdown, lactic acid ; (breakdown) to glucose/carbon dioxide and water ; quicker, removal/breakdown, of lactic acid ; appropriate comparative data quote with units ;	max [4]	
		[Total: 13]	



3 (a)	(chemical) <u>reactions</u> that breakdown, (named) nutrient(s) ; to, release / transfer, energy ; inside cells ;	max [2]	R produces / creates / AW, energy
(b)	biceps contracts ; pulls on forearm / radius ; ref to the tendon ; bends / flexes, the arm ; triceps relaxes ;	max [3]	
(c) (i)	increase in muscle contraction ; increase in demand for, energy / ATP ; increase in rate of respiration ; <u>aerobic</u> respiration ; heart beats faster / breathes faster <i>or</i> breathes deeper ;	max [4]	<i>For MP1, 2 and 3 'more' / increase must be given at least once</i>
(ii)	line decreases immediately at 20 min ; line reaches $0.2 \text{ dm}^3 \text{ min}^{-1}$ at 30 min ;	[2]	
(iii)	<ol style="list-style-type: none">1 <u>oxygen debt</u> ;2 (during exercise) oxygen not supplied fast enough (from lung/heart) ;3 to muscles ;4 <u>anaerobic</u> respiration occurred during exercise ;5 lactic acid produced ;6 builds up in muscle / not carried away fast enough in blood ;7 extra oxygen required after exercise ;8 lactic acid is, broken down / respired / oxidised / converted to glucose ;	max [4]	