1 (ii)	lag phase: (dry) yeast adapting to the environment / AW; yeast are reproducing / dividing; log phase: no <u>limiting factors</u>; enough / plenty of, (named) nutrients; stationary phase: no more reproduction; <u>limiting factors</u>; none / reduction in, (named) nutrients; build-up of, toxic waste / alcohol; reference to carrying capacity;	**max 3**	e.g. glucose, sugar, ammonia, ammoni (compounds), minerals **A** low alcohol / toxin, concentration / correct pH **A** no growth of yeast (cells) **A** competition for nutrients **A** wrong pH
(e)	(named) alcohol production (for consumption); alcohol for fuel; bread making / making dough rise; yeast extract / probiotics / nutrient supplements; e.g. vegemite production of carbon dioxide; bioremediation;	**max 2**	**A** brewing / wine **I** baking unqualified
		[Total: 17]	

	Answer	Marks	Guidance for Examiners
2 **(a)**	<table><tr><td>structure</td><td>letter from Fig. 1.1</td></tr><tr><td>left lung</td><td>**D**</td></tr><tr><td>bronchus</td><td>**J**</td></tr><tr><td>diaphragm</td><td>**E**</td></tr><tr><td>intercostal muscle</td><td>**H**</td></tr><tr><td>rib</td><td>**C**</td></tr><tr><td>trachea</td><td>**B**</td></tr></table>	[5]	*Only one letter per box; if more than one letter no mark* *If letter crossed out but not rewritten mark it* **JEHCB**
(b) (i)	3750 **;** *no mark for working alone*	[1]	*if the answer is not in the table look for it in the space for working*
(ii)	number of breaths (per minute) / different rate of breathing **;** exhaled breath has a higher temperature **;**	[max 1]	**A** faster, slower, change in frequency **ignore** depth (as in the table) / heavier
(iii)	water vapour / H_2O / any **named** rare *or* inert gas *or* pollutant **;**	[1]	*names, correct symbols or formulae for any of the following*: H_2, Ar, He, Xe, Ne, Rn, Kr, SO_2, O_3, CO, NO_2, N_2O, CH_4, NH_3, I_2
(iv)	*in breathed out air* **1** after exercise less oxygen and more carbon dioxide / ora **;** **2** use of data with % to quantify (for either oxygen or carbon dioxide) **;** *explanation in terms of the following increasing* **3** more oxygen, absorbed / is needed / used up **;** **4** more carbon dioxide, produced **;** **5** more gas exchange **;** **6** more respiration **;** **R** more anaerobic respiration **7** more energy required **;** **8** repaying / AW, oxygen debt **;**	[max 3]	**MP2** oxygen – 17.2 to 15.3% / 1.9% carbon dioxide – 3.6 to 5.5% / 1.9% **R** inhaled **R** exhaled **R** produce energy

<table>
<tr><th colspan="3">Question</th><th>E Answers</th><th>Marks</th><th>Additional Guidance</th></tr>
<tr><td>3</td><td>(a)</td><td></td><td>
<table>
<tr><td>cell</td><td colspan="2">end products of respiration</td></tr>
<tr><td></td><td>aerobic</td><td>an</td></tr>
<tr><td>yeast</td><td>c
dioxide/CO_2
+
water/H_2O ;</td><td>carbon dioxide/CO_2 +
alcohol/ethanol/C_2H_5OH ;</td></tr>
<tr><td>human
muscle
cell</td><td>carbon
dioxide/CO_2
+
water/H_2O ;</td><td>lactic acid lactate/

$C_3H_6O_3$/$CH_3CH(OH)COOH$
/
$CH_3CH(OH)COO$;</td></tr>
</table>
</td><td>[4]</td><td>ignore ATP/energy</td></tr>
<tr><td></td><td>(b)</td><td>1
2
3
4
5
6
7

8
9
10
11

12
13</td><td>muscles <u>contract</u> ;
need more energy ;
increase in need for oxygen ; ORA
removal of (more) carbon dioxide ;
(increase in) <u>aerobic</u> respiration ;
<u>anaerobic</u> respiration also occurs ;
developing <u>oxygen debt</u>,/oxygen not supplied fast enough ;
(production of) lactate/lactic acid ;
increase in stroke volume (of heart) ;
increase in, blood flow/glucose/oxygen, to muscles ;
blood pressure increase because heart rate/stroke volume increases ;
removal of heat ;
ref to adrenaline ;</td><td>[max 5]</td><td>ignore ‘breathing rate’, ‘ventilation rate’, ’oxygen absorption’, ‘heart rate’, ‘blood pressure’ (all are in the Table)

R repaying oxygen debt (occurs after exercise)</td></tr>
<tr><td></td><td></td><td></td><td></td><td>[Total: 9]</td><td></td></tr>
</table>

4	**(a)**	$C_6H_{12}O_6$ 2 $C_3H_6O_3$		[2]	***ignore*** word equation ***ignore*** energy / ATP **R** if 2 is not included for $C_3H_6O_3$ **R** O_2, CO_2, H_2O on either side
	(b)	biceps contracts triceps relaxes		[2]	**accept** ref to <u>antagonistic</u> pair of muscles
	(c)		*During:* **1** oxygen consumption increases as exercise starts **2** levels off / increase slows down during the race **3** data quote for consumption during the race *After:* **4** starts to decrease, immediately at the end of the race / at 18 minutes **5** gradually decreases after exercise **6** rate returns to original / resting level **7** data quote for consumption after exercise	[max 4]	Units must be stated at least once e.g. of Mpt 3: **A** plateaus between 2.1 – 2.4 dm^3 min^{-1} Maximum is 2.4 dm^3 min^{-1}, 3 – 4 mins /at start / 5 to 8 or 9 mins to reach maximum e.g. of Mpt 7: **A** Resting rate at 0.25 dm^3 min^{-1}, 9 – 10 mins / at 18 to 27 or 28 min to reach original level
	(d)	**1** <u>oxygen debt</u> **2** not enough oxygen supplied (to muscles) during exercise **3** to muscles **4** anaerobic respiration **5** lactic acid produced **6** lactic acid, broken down / respired / converted to glucose / CO_2 and water / oxidized **7** requires (extra) oxygen **8** oxygen restored to haemoglobin **9** AVP. e.g. restored to myoglobin (in muscles)		[max 5]	**A** lactate for lactic acid throughout the answer Mpt 6 **R** removed **Ig** lowers pH, muscles stiff / cramps
			[Total: 13]		