

# Respiration

## Mark Scheme 6

Level	International A Level
Subject	Biology
Exam Board	CIE
Topic	Energy and respiration
Sub Topic	Respiration
Booklet	Theory
Paper Type	Mark Scheme 6

Time Allowed : 78 minutes

Score : / 65

Percentage : /100

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	77.5%	70%	62.5%	57.5%	45%	<45%

- 1 (a) (i) cytoplasm / cytosol ; [1]
- (ii) 1 NAD regenerated ;  
2 so glycolysis can continue ;  
3 to produce ATP ; [2 max]
- (iii) lactate dehydrogenase ; [1]
- (iv) *reaction* - condensation / polymerisation ;  
*bond* - glycosidic ; [2]
- (b) *in yeast*
- 1 decarboxylation / CO<sub>2</sub> removed ;  
2 ethanal (as intermediate step) ;  
3 ethanol produced ;  
4 two steps (from pyruvate) ;  
5 ethanol dehydrogenase ;  
6 not a reversible reaction / ethanol cannot be converted back to pyruvate ;  
7 *idea of process less energy efficient ;*  
*allow **ora** for mp1, mp4, mp5, mp6 and mp7* [4 max]
- (c) (i) carbon dioxide produced divided by oxygen consumed ;  
volume / number of moles (of both gases) ; [2]
- (ii) carbohydrate = 1.0 ;  
lipid = 0.7 ; [2]
- (iii) increase / go above one / infinity ; [1]

[Total: 15]

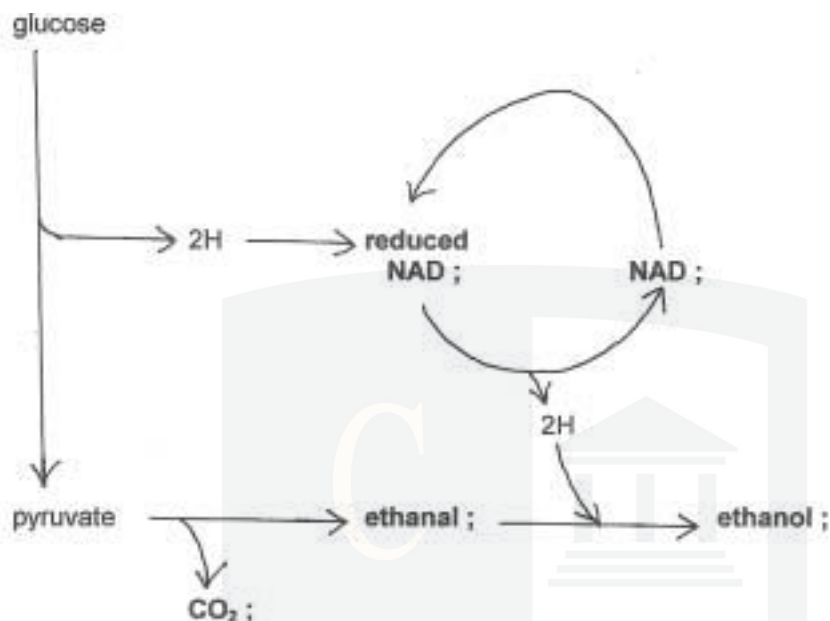
CHEMISTRY ONLINE  
— TUITION —

- 2 (a) (i) phosphorylation ; [1]
- (ii) lysis ; [1]
- (iii) dehydrogenation / oxidation ; *ignore reduction of NAD* [1]
- (b) provides activation energy / AW ;  
for it to split / AW ; [2]
- (c) 1. decarboxylated / carbon dioxide given off ;  
2. ethanal produced ;  
3. ethanal reduced ;  
4. by reduced NAD ;  
5. to ethanol ;  
6. dehydrogenase ; [4 max]

**[Total: 9]**

CHEMISTRY ONLINE  
— TUITION —

3 (a)



[5]

(b) *in mammals*

1. lactate produced / no ethanol produced ;
2. no, decarboxylation / carbon dioxide released ;
3. single step ;
4. lactate dehydrogenase ;
5. reversible ;

[3 max]

(c) *in anaerobic respiration*

1. only glycolysis occurs / Krebs cycle stops / link reaction stops ;
2. glucose, not fully broken down / still contains energy ;
3. pyruvate does not enter mitochondrion ;
4. (no oxygen) so no final electron acceptor (in ETC) ;
5. ETC stops ;
6. no oxidative phosphorylation ;

[3 max]

[Total: 11]

- 4 (a) 1 ATP as universal energy currency ;  
 2 light energy needed for photosynthesis ;  
 3 ATP used conversion of GP to TP ;  
 4 ATP used to regenerate RuBP ;  
 5 (energy needed for) ~~anabolic~~ reactions ;  
 6 protein synthesis / starch formation / triglyceride formation ;  
 7 activation energy ;  
 8 (activate) glucose in glycolysis ;  
 9 active transport ;  
 10 example ; e.g. sodium / potassium pump  
 11 movement / locomotion ;  
 12 example ; e.g. muscle contraction / cilia beating endocytosis /  
 13 exocytosis / pinocytosis / bulk transport ; temperature  
 14 regulation ; [9 max]
- (b) 15 idea of lipid > protein > carbohydrate / AW ; A lipid has more energy than  
 either protein or carbohydrate  
 16 comparative figures ; e.g. 39.4, 17.0 and 15.8 *accept any two*  
 17 kJ g<sup>-1</sup> / per unit mass ;  
 18 more hydrogen atoms in molecule, more energy ;  
 19 lipid have more, hydrogen atoms / C-H bonds ;  
 20 (most) energy comes from oxidation of hydrogen to water ;  
 21 using reduced, NAD / FAD ;  
 22 in ETC ;  
 23 detail of ETC ;  
 24 ATP production [6 max]

[Total: 15]

5	(a)	1	acetyl CoA combines with oxaloacetate ;	
		2	to form citrate ;	
		3	4C to 6C ;	
		4	decarboxylation / CO <sub>2</sub> released ;	
		5	dehydrogenation / oxidation / release of hydrogen ;	
		6	reduced NAD produced / NAD accepts hydrogen ;	
		7	reduced FAD produced / FAD accepts hydrogen ;	
		8	ATP produced ;	
		9	substrate level phosphorylation ;	
		10	series of, steps / intermediates ; <b>A</b> many named steps off a diagram	
		11	enzyme catalysed reactions ;	
		12	oxaloacetaetate regenerated ;	
		13	occurs in mitochondrial matrix ;	[9 max]
			<i>accept diagram</i>	
	(b)	14	coenzyme ;	
		15	for dehydrogenase ;	
		16	<u>reduced</u> ;	
		17	carries, electrons <u>and</u> protons / hydrogen / NAD	
		18	<u>from</u> Krebs cycle ;	
		19	and glycolysis ;	
		20	<u>to</u> ETC / electron carrier chain / oxidation ;	
		21	reoxidised / regenerated hydrogen removed ;	
		22	ATP produced ;	[6 max]
				<b>[Total: 15]</b>