Respiration

Mark Scheme 3

Level	International A Level
Subject	Biology
Exam Board	CIE
Topic	Energy and respiration
Sub Topic	Respiration
Booklet	Theory
Paper Type	Mark Scheme 3

Time Allowed : **60 minutes**

Score : **/ 50**

Percentage : **/100**

Grade Boundaries:

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

CHEMISTRY ONLINE TUITION

1 **(a** *Active transport or anabolic reactions*

1. ATP provides energy (linked to either) ; i*gnore ref. to energy currency alone*

active transport
2. movement against concentration gradient ;

3. carrier / transport, protein (in membrane) ; *ignore pump*

4. binds to (specific) ion ;

5. protein changes shape ;

anabolic reactions
6. synthesis of complex substances from simpler ones ;

7. starch / cellulose / glycogen, from, monosaccharides / named monosaccharides / named sugar ;

8. glycosidic bonds ;

9. lipid / triglyceride, from fatty acids and glycerol ;

10. ester bonds ;

11. polypeptides / proteins, from amino acids ;

12. peptide bonds ;

13. other named polymer from suitable monomer ;

14. appropriate named bond ; *5 max*

[7 max]

(b) *general*
15. reduced NAD produced in glycolysis ; ***A*** glycolysis described

16. small amount of ATP produced in glycolysis ;

in yeast cells
17. pyruvate converted to ethana

18. carbon dioxide released / decarboxylation ;

19. ethanal, reduced / accepts

20. by reduced NA

21. ethanol forme

in mammalian cells
22. pyruvate converted to lactat

23. by reduced ;

24. in, liver / muscle, cell

25. AVP

26. e.g. reversible in mammal / irreversible in yeast / single step in mammal / more than 1 in yeast / reoxidised NAD allows glycolysis to continue / named enzyme

*only award **either** mp19 **or** mp23* [8 max]

[Total: 15]

CHEMISTRY ONLINE TUITION

2 **(a) (i)** denitrification **;** [1]

(ii) nitrate required for, amino acid / protein / nucleic acid, production in plants **;**
A other relevant named N-containing biochemicals
nitrogen (gas) not useable form for (most) plants **;**

removal of nitrate
slows / AW, growth of plants **;** **A** reduces crop yield **A** plants need nitrates for growth
decreases fertility of soil / fertilisers need to be added to soil **;** [2]

(b) (i) nitrification **;** [1]

(ii) *P. stutzeri* / bacteria, can be (added to the water and) used to, remove nitrate / carry out denitrification **;**
detail **;** e.g. use of filter bed
ref. to leave for sufficient time to remove nitrates
nitrogen escapes to air [2]

(c) 1 air / oxygen, will not get into soil **;**
2 lack of oxygen reduces uptake of ions by plants / AW **;**
3 ref. saprobiotic bacteria and fungi / nitrifying bacteria / (some) nitrogen fixing bacteria, are aerobic **;**
4 ref. reduced populations (of bacteria in mp 2) **;**
5 example of effect on nitrogen cycle **;;**
6 e.g. slower rate / AW, of decomposition / dec
nitrogen fixation cannot occur (as rapidly)
nitrification cannot occur / nitrate will not be produced / less nitrate produced
(more) denitrification will occur
7 crops / plants, will use up remaining nitrate **;**
8 ref. leaching of, nitrates / other nutrients, for growth or (only) low levels of nitrates / other nutrients, for growth remain in soil **;** **A** ref. leaching reducing soil fertility
9 AVP **;** e.g. named example of another nutrient, with role
will take time to, recover nitrate levels / resume nitrogen fixation **;**
fertilisers (previously) applied washed away **;** [max 4]

[Total: 10]

CHEMISTRY ONLINE TUITION

3 **(a)** active transport ;
ribose ;
water ;
hydrolysis ; **A** dephosphorylation
heat ; [5]

(b) **(i)** (converted to) glycogen / lipid ;
(used in) glycolysis / respiration ; [1 max]

(ii) *anaerobic*
1. less ATP / only 2 ATP ;
2. per mol glucose ;
3. lactate still contains energy / only glycolysis involved / stages other than glycolysis not involved ;
4. not sustainable / cannot go on indefinitely / AW ; [2 max]

(iii)

process	p location
glycolysis	cytoplasm / cytosol ;
link reaction	mitochondrial matrix ;
Krebs cycle	mitochondrial matrix ;
oxidative phosphorylation	inner mitochondrial membrane / cristae ;

[4]

(iv) 1. cannot pass through phospholipid bilayer ;
2. too big to fit through (glucose's) protein channel ;
3. no specific transport protein ;
4. AVP ; e.g. used up as soon as it is made [2 max]

(v) oxygen debt ; [1]

[Total:15]

CHEMISTRY ONLINE — TUITION —

4 **(a) (i)** decarboxylation **;** [1]

(ii) dehydrogenation / oxidation **;** [1]

(iii) substrate level phosphorylation **;** [1]

(b) **K** – reduced NAD **;** **A** NADH etc.
L – oxaloacetate **;** [2]

(c) 1. hydrogens split into protons and electrons **;**
2. electrons pass along ETC **;**
3. energy released used to pump protons **;**
4. (from matrix) to intermembrane space **;**
5. inner membrane impermeable to protons **;**
6. proton gradient forms **;**
7. protons move down gradient **;**
8. through ATP, synthase / ATP synthetase **;** **R** ATPase
9. enzyme rotates **;**
10. ATP produced **;** [5 max]

[Total: 10]

CHEMISTRY ONLINE
TUITION