Energy

Mark Scheme 1

Level	International A Level
Subject	Biology
Exam Board	CIE
Topic	Energy and respiration
Sub Topic	Energy
Booklet	Theory
Paper Type	Mark Scheme 1

Time Allowed : **48 minutes**

Score : **/ 40**

Percentage : **/100**

Grade Boundaries:

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

1 **(a)** provides energy;
suitable examples;
e.g. muscle contraction, protein synthesis, DNA replication, cell movement, active transport

3

(b)

substrate level phosphorylation	cytoplasm (in glycolysis);
	matrix of mitochondria (in Krebs cycle);
oxidative phosphorylation	inner membrane of mitochondria/cristae;

2 max

(c) oxidative phosphorylation more than substrate level phosphorylation;
ref. to quantity, e.g. 32/34 vs. 4/6 per glucose;

2

(d) requires proton gradient produced by ETC;
with no oxygen ETC does not occur/no electron flow;
NAD cannot be reformed/NADH cannot be oxidised;
oxygen combines with electron/proton/oxygen final acceptor in ETC;

3 max

Total: 10

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

(ii) ecosystem **;** [1]

(iii) denitrification **;** [1]

(b) (i) *if more than one answer – take first answer only*

secondary consumer **;** **A** second consumer / 2° consumer
A third trophic level **R** carnivore [1]

(ii) *do not award marks unless it is clear there are energy losses in the crabs (not the mangrove)*
energy losses in
respiration **;**
movement / muscle contraction **;**
reproduction / AW **;**
digestion **;**
egestion / food not absorbed / loss in faeces **;**
excretion / loss in urine / ref to named excretory product **;**
ecdysis / moulting **;**
(named) inedible parts **;** *there is energy in shells*
dead crabs eaten by, other consumers / detritivores / decomposers **;** [max 2]

(c) **1** protein / amino acids, (in leaf litter) **;**
2 ref to, decomposition / decay / decomposers / saprobiotic bacteria or fungi **;**
3 <u>deamination</u> **;**
4 amino acid converted to, ammonia / ammonium **;**
5 ammonia / ammonium, converted / oxidised , to nitrite (ions) / NO_2^- **;**
6 nitrite (ions) / NO_2^-, converted to, nitrate (ions) / NO_3^- **;**
7 by, nitrification / nitrifying bacteria / named example **;** e.g. *Nitrosomonas / Nitrobacter*
8 nitrate (ions) / NO_3^-, taken up / absorbed, by mangrove / plant (roots) **;**
9 AVP **;** e.g. ammonia / ammonium, taken up [max 4]

[Total: 10]

3 **(a)** community **;**
niche **; A** role
second trophic level / first level consumers / primary consumer level **;**
A *other appropriate terms* [3]

(b) *loss (of energy-containing food in producers or in grazers) in*
indigestible parts / not being absorbed / faeces / egestion **;;**
one mark for producer, one mark for grazer

excretion (in, grazers / herbivores / primary consumers) **;**
respiration (in, grazers / herbivores / primary consumers) **;**
loss of energy in movement / AW (in, grazers / herbivores / primary consumers)**;**
AVP **;** e.g. heat energy [max 2]

[Total: 5]

4 **(a** 1. reduced, NAD / FAD ;

2. passed to ETC ;

3. inner membrane / cristae ;

4. hydrogen released (from reduced, NAD / FAD) ; **R** H_2

5. split into electrons and protons ;

6. electrons pass along, carriers / cytochromes ;

7. ref. energy gradient ;

8. energ released pumps protons into intermembrane space ;

9. proto gradient ;

10. protons pass through (protein) channels ;

11. ATP synthase / stalked particles ;

12. (ATP produced from) ADP and inorganic phosphate ;

13. electron transferred to oxygen ;

14. addition of proton (to oxygen) to form water / (oxygen) reduced to water ; [8 max]

(b) 15. organisms need energy, to stay alive / for metabolism / AW ;

16. ATP as, (universal) energy currency / described ;

17. light energy for photosynthesis ; **A** light dependent stage

18. light-dependent stage detail ;

19. light-independent stage detail ;

20. chemical energy ;

21. for anabolic reactions ;

22. named reaction; e.g. protein synthesis / starch formation

23. activation of glucose in glycolysis / described ;

24. active transport ;

25. detail; e.g. sodium - potassium pump /movement against a concentration gradient

26. mechanical energy / movement ;

27. detail ; e.g. muscle contraction / spindle

28. temperature regulation ;

29. A ; e.g. bioluminescence / electrical discharge [7 max]

[Total: 15]