

Respiration

Mark Scheme 7

Level	International A Level
Subject	Biology
Exam Board	CIE
Topic	Energy and respiration
Sub Topic	Respiration
Booklet	Theory
Paper Type	Mark Scheme 7

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%

Question	E	Answers	Marks
1 (a)		<p>(carbohydrates)</p> <p>1 less reduced / less hydrogen / less C-H bonds ; $R H_2$</p> <p>2 for, aerobic respiration / ETC / NAD / ATP ;</p> <p>3 less energy ;</p> <p>4 per, unit mass / mole ; <i>accept figs for 3 and 4</i></p> <p>5 carbohydrate has lower energy density ;; <i>accept as alternative to 3 & 4 for 2 marks</i></p>	3 max
(b)		<p>carbohydrate = 1.0 ;</p> <p>lipid = 0.6 – 0.8 ;</p>	2
(c)		<p>RQ remains stable between 3°C and 10°C / AW ;</p> <p>rise between 10°C and, 20°C / 25°C ;</p> <p>0.74 to, 0.76 / 0.8 ; <i>accept difference for figs marks</i></p> <p>sharp rise, between 25°C and 27°C / after 25°C ;</p> <p>0.8 to 0.91 / peaks at 0.91 ; 3 max</p> <p>at low temperatures hamster uses lipids ;</p> <p>reason ; e.g. more heat generated from lipid respiration</p> <p>at higher temperatures more carbohydrates are used ;</p>	4 max
(d)		anaerobic respiration / conversion of carbohydrate to fats as animal hibernates;	1

[Total: 10]

CHEMISTRY ONLINE
— TUITION —

- 2 (a) Describe the transfer of energy to ATP during photosynthesis. [6]
- (b) Describe the process of oxidative phosphorylation. [9]

[Total: 15]

- (a)
- 1 light absorbed by chlorophyll / AW ;
 - 2 ref. photosystems ;
 - 3 ref. harvesting clusters / accessory pigments ;
 - 4 reaction centre / P680 / P700 ;
 - 5 excitation of electrons / AW ;
 - 6 ETC ;
 - 7 idea of different energy levels ;
 - 8 $\text{ADP} + \text{P}_i \rightarrow \text{ATP}$;
 - 9 cyclic / non-cyclic, photophosphorylation ;
 - 10 chemiosmosis / ATP synthase / description ;

6 max

- (b)
- 11 reduced NAD / FAD ;
 - 12 passed to ETC ;
 - 13 hydrogens removed ;
 - 14 split into H^+ and e^- ;
 - 15 e^- passed to carriers ;
 - 16 H^+ stays in mitochondrial matrix ;
 - 17 oxygen final e^- carrier ;
 - 18 joins with H^+ / reduced ;
 - 19 forms water ;
 - 20 ref. energy levels of carriers ;
 - 21 energy available to convert ADP and P_i to ATP ;
 - 22 occurs three times (for each reduced NAD) / ref. total yield ;
 - 23 chemiosmosis / ATP synthase / description ;

R H_2

R H_2 / hydrogen

9 max

[Total: 15]

CHEMISTRY ONLINE
— TUITION —

3 (a) Describe the main features of the Krebs Cycle. [9]

(b) Explain the role of NAD in aerobic respiration. [6]

(a) matrix;

2 of mitochondrion;

3 acetyl CoA combines with oxaloacetate;

4 to form citrate;

5 4C to 6C;

6 decarboxylation/produce CO_2 ;

7 dehydrogenation/oxidation;

8 2CO_2 released;

9 reduced NAD produced; *accept reduced coenzyme for one mark - annotate 9/10*

10 reduced FAD produced;

11 ATP produced;

12 series of steps/intermediates;

13 enzyme catalysed reactions;

14 oxaloacetate regenerated;

15 AVP;

9 max

(b) coenzyme;

17 for dehydrogenase;

18 reduced;

19 carries electrons;

20 and protons/ H^+ /H/hydrogen;

R H_2 /hydrogen molecules

21 from Krebs cycle;

22 and from glycolysis;

23 to cytochromes/electron transfer chain;

24 reoxidised/regenerated;

25 ATP produced;

26 3/2.5 (molecules of ATP) per reduced NAD;

6 max

Total 15

Question 4

- (a) cytoplasm ;
matrix in mitochondria ; 2
- (b) coenzyme ;
carries electrons / protons / hydrogen ions / hydrogen / H / 2H / H^+ ; R H_2
to electron transfer chain / AW ;
from glycolysis / link reaction / Krebs cycle ;
role of NAD in conversion / oxidation of triose phosphate to pyruvate in glycolysis ;
role of NAD in anaerobic respiration ; 3 max
- (c) in absence of oxygen electron transfer chain does not work ;
oxygen final acceptor at end of electron transfer chain ;
reduced NAD cannot be oxidised ; 3
- (d) aerobic respiration produces more ATP / (ora);
to produce the same amount of ATP more glucose broken down in glycolysis ;
glycolysis is the only part of respiration used / no ETC or oxidative phosphorylation ; 2 max

Total : 10

CHEMISTRY ONLINE
— TUITION —