


**WJEC (Wales) Biology A-level  
Topic 3.1: Importance of ATP  
Questions by Topic - Mark  
Scheme**

1.

Question	Marking details	Marks available					
		AO1	AO2	AO3	Total	Maths	Prac
1 (a)	 <p>Only one phosphate need be labelled.            Pentagon shape with adenine and 3 phosphates coming off at correct points (1)            Ignore shape of adenine            Correct labels = ribose + adenine + phosphate (1)            Accept adenosine if structures bracketed            Reject pentose            Reject base</p>	2			2		
(b) (i)	<p>40.4 = 2 marks</p> $\frac{38 \times 7.3}{888} \times 100 \%$ <p>=            40 = 1 mark incorrect dp            Correct substitution into equation = 1 mark</p>		2		2	2	
(i)	Approx (twice/ four times) as efficient / (20/30)% more ECF from (i)			1	1		
(c)	<p>Any four (x1) from:</p> <ol style="list-style-type: none"> <li>Both involve proton pumps/ protons are pumped(1)</li> <li>(Driven/ powered) by (electron (energy)/ redox reactions of ETC)(1)</li> <li>Creation of (electro chemical/ proton/ chemiosmotic) gradient (1)</li> <li>(Diffusion/ flow) of (hydrogen ions/ protons)/ protons (travel down/ pass through) (stalked particle/ carrier protein)/ chemiosmosis(1)</li> <li>(through/ use) ATP synthase (synthesising ATP) (1) Accept synthetase</li> </ol>		4		4		
Question 1 total		2	6	1	9	2	0

2.

Question	Marking details	Marks Available
(a) (i)	phosphate / Pi / inorganic phosphate/ iP/ $PO_4^{3-}$ ;	1
(ii)	W is outer (mitochondrial) membrane; Z is the (mitochondrial) matrix;	2
(iii)	most concentrated in part X;	1
Question 5 Total		[4]

3.

Question	Marking details	Marks Available
(a)	inner membrane/crista;	1
(b)	ref to NADH/FADH; membrane impermeable to protons; pumped across membrane; to intermembrane space;	3 max
(c)	accepts electrons and protons; final acceptor of ETC; forms water; to maintain flow of electrons;	2 max
Question 7 Total		[6]

4.	Question	Marking details	Marks Available
	(a)	<p><u>Similarities</u>            (Both contain) a 5 carbon sugar;            Both have two phosphate groups;            Both contain (two) nitrogenous bases/ adenine/ organic base;            Dinucleotide;            Accept adenosine for 1 mark if MP1 and 3 not awarded</p> <p><u>Differences</u>            FAD only contains one (ring form) sugar <u>and</u> NAD contains 2/            One 5C sugar is in its linear form in FAD <u>and</u> both 5C sugars are in ring form in NAD/            NAD contains nicotinamide and FAD contains flavin/ FAD has a three ring base and NAD has one ring base;</p>	max 2  1
	(b)	<p>(i) The bond between the {terminal/last two} phosphate groups on ATP;</p> <p>(ii) Does not involve the ETC/complex series of carriers and pumps;            Does not need stalked particles/ATP synthetase;            Does not need an electrochemical gradient/eq;            Does not require oxygen;            Accept 'Does not require mitochondria' as alternative to MPs 1, 2,3</p>	1  Max 2

**Question 6 Total**

**[6]**

5.	Question		Marking details	Marks Available
5	(a)	(i)	inner mitochondrial membrane / cristae;	1
		(ii)	Hydrogen;	1
		(iii)	Any 5 from: As electrons pass along the ETC energy released; used to pump protons; into inter membrane mitochondrial space; creates proton concentration gradient / electrochemical gradient / proton motive force; protons flow through / move down surface of stalked particles; provides energy for ATP synthetase / ATP synthase ; ADP + Pi to ATP; chemiosmosis;	5
			<b>Question 5 Total</b>	<b>[7]</b>

6. Question		Marking details	Marks Available					
			AO1	AO2	AO3	Total	Maths *	Prac **
6	(a)	From the intermembrane space into the matrix (1) Via (a stalked particle containing) ATP synthase (1)	2			2		
	(b)	Cannot produce enough/lower yield of ATP/ no ATP produced (1) For {flight/muscle contraction/active transport / transmission of nerve impulses/ no protein synthesis/ cell division} (1) NOT overheating/ denaturation of proteins		2		2		
	(c)	<b>Any 4 (x1) from:</b> A. Use of fat stores as an energy source causes weight loss (1) reference to muscle/ protein is neutral B. Increased metabolic rate to compensate for ATP underproduction (1) C. Lack of ATP causes tiredness/fatigue (1) D. Heat produced as a by-product so increases body temperature (1) E. More sweat production to lower body temperature (1)		1  1		4		
	(d)	Overheating/hyperthermia/organ failure			1	1		
<b>Question 6 total</b>			<b>2</b>	<b>4</b>	<b>3</b>	<b>9</b>	<b>0</b>	<b>0</b>

**Question**  
7 (a)

**Marking details**

**Marks Available**

<b>Chloroplasts</b>	<b>Mitochondria</b>
D;	H;
A;	F;
B;	J;
E;	G;

8

- (b) (i) Reference to a suitable function of ATP e.g. protein synthesis/  
active transport/ muscle contraction etc NOT movement  
Different types of energy can be transferred into a common  
form;  
Only 1 molecule needed to transfer energy to chemical  
reactions;  
Energy can be supplied in {small amounts/ packages/ approx  
30.6kJ} /less {energy/ heat} wasted;  
Easily transported (across membranes);  
{Single enzyme/ only ATPase} needed to release energy from  
ATP;  
{Single bond needed to be broken/ one step reaction} to  
release energy;
- (ii) used by all organisms/ species; NOT cells  
To provide {energy/ fuel} for (nearly all biochemical) reactions;  
NOT provide energy unqualified

max 3

2

**Question 4 Total**

**[13]**