Past-paper walk-through

Energy ▪ 12.1

eXercise

Questions in this set

- 9700/13 N25 Q24 ▪ 1 mark
- 9700/41 N25 Q7 ▪ 9 marks
- 9700/41 J25 Q1 ▪ 11 marks

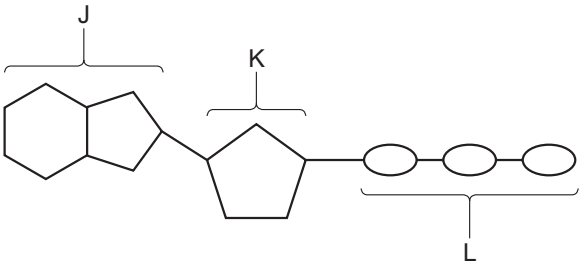
Reading the mark scheme

- **B1** a mark that stands on its own – the point is either made or not.
- **M1** a *method* mark: the right approach, even if the number is wrong.
- **A1** an *answer* mark, and it usually needs its M mark first.
- **C1** a working mark on the way to the answer.
- // separates answers the examiner accepts equally.
- **ecf** = error carried forward: a later part is marked on your own earlier answer.
- **owtte** = "or words to that effect" – the wording need not match.

Question 24

9700/13 N25 ▪ Q24 ▪ 1 mark

24 The diagram represents a molecule of ATP.



What are the components of ATP labelled J, K and L?

Question 24

	J	K	L
A	adenine	deoxyribose	phosphates
B	adenosine	pentose	a phosphate group
C	adenosine	ribose	phosphorus
D	purine	pentose	phosphates

Solution 24

Answer: **D**

Why

- ATP is adenine joined to ribose joined to three phosphates.
- Adenine is a purine base, and the sugar is a pentose (ribose, not deoxyribose).
- There are three phosphate groups, not one.

Question 7

9700/41 N25 ▪ Q7 ▪ 9 marks

7 In aerobic respiration, most ATP is produced by oxidative phosphorylation.

(a) Outline the features of ATP that make it suitable as the universal energy currency.

Question 7

(b) Rotenone is a compound that affects oxidative phosphorylation.

Rotenone disrupts the first carrier in the electron transport chain by stopping the transfer of electrons from this carrier.

Suggest **and** explain how rotenone reduces the production of ATP **and** water in aerobic respiration.

Question 7

[Total: 9]

Solution 7

(a) Mark scheme

- any three from:
- 1
- breaks down / hydrolyses to / converted to, ADP / AMP, and Pi ;
- 2
- releases energy / energy donor ;
- 3
- reversible reaction / high turnover / can be regenerated ;
- 4

Solution 7

- small / soluble, so can, diffuse / move (freely), in cell ;
- 5
- AVP ;
- 3

Solution 7

(b) Mark scheme

- any six from:
- 1
- ETC / electron flow, less / stops ;
- 2
- no / less, energy, available / released / supplied (from electron flow) ;
- 3
- no / fewer, H+ ions / protons, pumped to intermembrane space ;
- 4

Solution 7

- no / smaller, H+ / proton, gradient ;
- 5
- no / fewer, protons diffuse through ATP synthase ;
- 6
- no / fewer, electrons reach, last carrier / end of chain ;
- 7
- no / fewer, electrons can react with oxygen to form water ;
- 8
- (oxidised) NAD not regenerated / lack of NAD ;
- 9

Solution 7

- no / less, glycolysis / link reaction / Krebs cycle ;
- 10
- AVP ;
- 6
- 9700/41
- October/November 2025

Question 1

9700/41 J25 ▪ Q1 ▪ 11 marks

1 Organisms need a source of energy for many cellular processes. Respiration involves the release of energy from energy-rich molecules for the synthesis of ATP molecules. ATP is described as the energy currency of cells.

(a) Name **two** energy-rich molecules that enter the respiration pathway to synthesise ATP.

Question 1

(b) Fig. 1.1 shows a molecule of ATP.

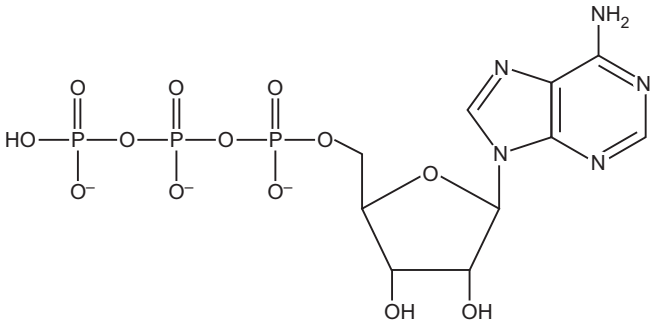


Fig. 1.1

Question 1

Explain the features of ATP that make it suitable to be the universal energy currency of cells.

Question 1

(c) Identify the type of phosphorylation reaction to synthesise ATP that occurs during glycolysis and the Krebs cycle.

Question 1

(d) (i) Pyruvate moves into the matrix of the mitochondrion only when a particular inorganic molecule is present.

Name the inorganic molecule that must be present in the cell for pyruvate to enter the matrix of the mitochondrion.

Question 1

(ii) Explain how the presence of the inorganic molecule named in **(d)(i)** affects the ATP yield from respiration.

Question 1

[Total: 11]

Solution 1

(a) Mark scheme

- any two from:
- glucose (phosphate) ;
- fructose (phosphate / bisphosphate) ;
- triose phosphate ;
- (named) fatty acid / keto-acid ;
- glycerol ;
- amino acid ;
- 2

Solution 1

(b) Mark scheme

- any four from:
- 1
- breaks down / hydrolyses to, ADP / AMP, and Pi ;
- 2
- releases, energy / 30.5 kJ mol-1 ;
- 3
- reversible reaction / high turnover / can be regenerated ;
- 4

Solution 1

- small / soluble, so can, diffuse / move (freely), in cell ;
- 5
- AVP ;
- 4

Solution 1

(c)

Mark scheme

- substrate-linked / substrate-level (phosphorylation) ;
- 1

Solution 1

(d)(i)

Mark scheme

- oxygen ;
- 1

Solution 1

(d)(ii) Mark scheme

- presence of oxygen:
- 1
- (ATP yield) increases / is higher ;
- plus any two from:
- 2
- oxygen acts as final, electron / proton, acceptor ;
- 3
- oxidative phosphorylation / chemiosmosis (occurs) ;

Solution 1

- 4
- energy from, reduced NAD / reduced FAD / electron transport chain ;
- 5
- proton gradient / $H+ \rightarrow$ into intermembrane space ;
- 6
- ATP made in Krebs cycle ;
- 3
- 9700/41
- May/June 2025