

# Biological Molecules

## Mark Scheme 3

<b>Level</b>	IGCSE
<b>Subject</b>	Biology
<b>Exam Board</b>	CIE
<b>Topic</b>	Biological Molecules
<b>Paper Type</b>	(Extended) Theory Paper
<b>Booklet</b>	Mark Scheme 3

**Time Allowed:** 44 minutes

**Score:** /36

**Percentage:** /100

<p><b>1 (a)</b></p>	<p>carbon ; hydrogen ; oxygen ; nitrogen ; sulfur ;</p> <p>[4 max]</p>	<p><b>R</b> CHONS</p>
<p><b>(b)</b></p>	<p>1 N / nitrogen, fixation ; 2 bacteria / <i>Rhizobium</i> ; <b>R</b> 'nodules are bacteria'  3 convert, nitrogen / N<sub>2</sub> / AW, into, ammonia / NH<sub>3</sub> / ammonium / NH<sub>4</sub><sup>+</sup> / amino acid(s) ;  4 plants use (fixed) nitrogen to make, amino acids / proteins / AW ; [3 max]</p>	<p><b>N</b>-fixing bacteria = 2 mar  <b>R</b> to nitrite / nitrate  <b>A</b> plants use NH<sub>3</sub> / NH<sub>4</sub><sup>+</sup></p>
<p><b>(c)</b></p>	<p>1 (dead plants) eaten by, animals / detritivores / scavengers ; 2 e.g. earthworms / termites / AW ; 3 ref. their faeces / increase in surface area ;  4 decay / decomposition ; <b>A</b> decomposers 5 by, bacteria / fungi / saprophytes / saprotrophs ;  6 break down proteins to amino acids ;  7 deamination ; 8 ammonia / NH<sub>3</sub> / NH<sub>4</sub> ; } 9 ammonia to <u>nitrite</u> ; } 10 <u>nitrite</u> to nitrate ; <b>A</b> one mark for ammonia to nitrate 11 nitrification / nitrifying bacteria ; 12 <i>Nitrosomonas</i> / <i>Nitrobacter</i> in correct context of nitrification ; [6 max]</p>	<p>MP3 must be related to MP1 or 2  <b>A</b> even if linked to incorrect organism <b>R</b> if wrong type of bacteria (e.g. N-fixing)  <b>A</b> if in context of MP1 or 2 but do not award twice  protein → ammonia / AW = 1 mark if 6, 7, 8 not given  <b>R</b> 'nitride' unless qualified by NO<sub>2</sub><sup>-</sup> <b>R</b> nitrate unqualified by nitrite or ammonia</p>

<p>1 (d)</p>	<p>1 light intensity ;  <b>A</b> limited sunlight / lack + of sunlight / sunshine                  2 light duration ; <b>A</b> day length                  3 water / moisture availability ; <b>A</b> drought / flood / humidity / soil water                  4 carbon dioxide, availability / concentration / tension / level ;                  5 temperature ;                  6 competition / overcrowding / space / weeds ;                  7 grazing / herbivores / predation / primary consumers ;                  8 pests ;                  9 parasites / disease ;                  10 use of (inappropriate) herbicides / nearby use of herbicides ;  <b>A</b> drift of herbicides / weed killers                  11 pollution / sulphur dioxide / acid rain ;                  12 soil pH / depth of soil / type of soil / poor soil / oxygen in the soil ;                  13 wind speed ;                  14 salt concentration of soil ;</p> <p style="text-align: right;">[3 max]</p>	<p><b>R</b> heat / warmth</p> <p><b>R</b> oxygen unqualified</p>
<p>(e)</p>	<p><i>accept ora with population starting to increase about day 40</i></p> <p>1 small population to start with ;                  2 takes time for eggs to hatch ;                  3 not enough food / soya bean plants not grown enough / AW ;                  4 aphids, not sexually mature / cannot breed / finding mates ;                  5 too cold / too wet / AW (another appropriate weather condition) ;                  6 ref. to, predators / ladybirds ;                  7 ref. to, parasites / disease ;                  8 ref. to, pesticides / insecticides ;                  9 no immigration ;                  10 competition (between aphids, with another pest) ;                  11 AVP ;</p> <p style="text-align: right;">[3 max]</p>	<p><i>do not expect knowledge of aphid biology</i>  <i>I names of phases (lag, log)</i>  <i>I 'adjusting to surroundings'</i>                  refs. to soya must refer to food for aphids  <b>A</b> few soya plants / competition for food / soya grows slowly</p> <p><b>R</b> unfavourable conditions unqualified</p> <p>(e.g. correct ref. biotic and abiotic factors)</p>
<p><b>[Total: 19]</b></p>		

- 2 (a) ( reserves last longer for walking / ora ;  
(approx) 4 times longer / other use of figures ; [2]
- (ii) glucose **and** muscle glycogen ; [1]
- (iii) fat **and** carbohydrate ; [1]
- (iv) *award two marks if correct answer (16.6 / 17) is given  
if no answer or incorrect answer award one mark for correct working*
- 1660 / 100 **OR** 5800 / 350 **OR** average of the two  
16.57 / 16.58 / 16.59 / 16.6 / 17 (kJ per gram) ;; **R** rounding down to 16.5 [2]
- (b) ( muscle, growth / development / repair ; **A** 'make / build up, muscle' [1]
- (ii) to build up, energy / glycogen, reserves / stores ;  
muscle / liver, glycogen ;  
converted to fat / stored as fat ; [2]
- (c) (  $C_6H_{12}O_6 \longrightarrow 2C_3H_6O_3$  (+ energy released)
- 1 mark for glucose + lactic acid formulae correct ;  
1 mark for balanced equation ; **R** if anything else given ( $CO_2 + H_2O$ ) [2]
- (ii) 1 short, time / distance, for sprint *or* long, time / distance, for marathon ;  
2 sprint needs (lots of) energy quickly / marathon needs energy over long  
period ;  
3 sprint oxygen supply not sufficient / oxygen supplied during marathon ;  
4 anaerobic does not need oxygen / aerobic needs oxygen ;  
5 lactic acid, removed after sprint / would build up in marathon ;  
6 ref to muscle, fatigue / cramp / pain ;  
7 ref to oxygen debt ;  
8 AVP ; e.g. fat has higher energy content useful for marathon [max 4]
- (iii) glycogen in liver broken down to glucose ;  
correct ref to glucagon ; **R** if 'glucagon breaks down glycogen...'  
glucose from liver enters the blood ; **R** 'excreted into blood'  
*idea that* balances use of glucose ; **A** 'replaces glucose used up' [max 2]

[Total: 17]