



## Exampro GCSE Biology

B3.4 Environment  
Foundation tier

Name:

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Class:

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Author:

Date:

Time: 84

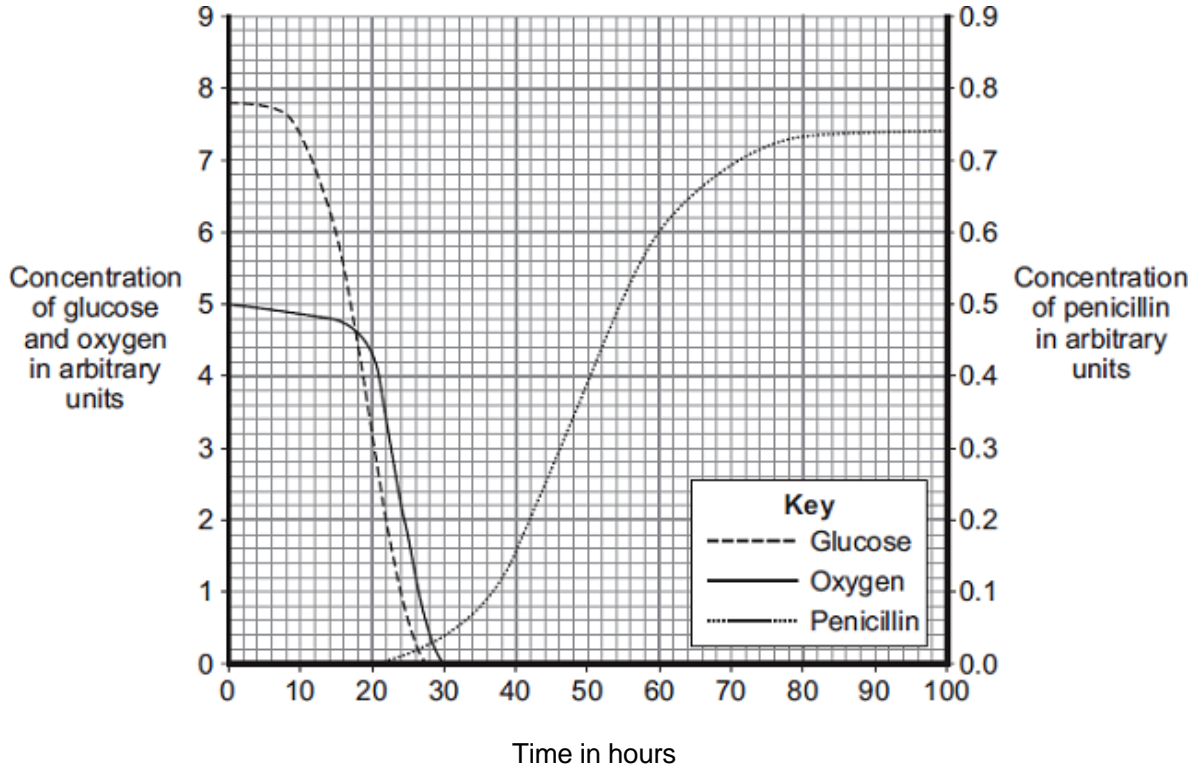
Marks: 84

Comments:

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**Q1.** The mould *Penicillium* can be grown in a fermenter. *Penicillium* produces the antibiotic penicillin.

The graph shows changes that occurred in a fermenter during the production of penicillin.



(a) During which time period was penicillin produced most quickly?

Draw a ring around **one** answer.

**0 – 20 hours**

**40 – 60 hours**

**80 – 100 hours**

(1)

(b) (i) Describe how the concentration of glucose in the fermenter changes between 0 and 30 hours.

.....

.....

.....

.....

(2)

- (ii) How does the change in the concentration of oxygen in the fermenter compare with the change in concentration of glucose between 0 and 30 hours?

Tick (✓) **two** boxes.

The oxygen concentration changes after the glucose concentration.

The oxygen concentration changes before the glucose concentration.

The oxygen concentration changes less than the glucose concentration.

The oxygen concentration changes more than the glucose concentration.

(2)

- (iii) What is the name of the process that uses glucose?

Draw a ring around **one** answer.

**distillation**

**filtration**

**respiration**

(1)

(Total 6 marks)

**Q2.** The photographs show four ways of farming.

**Growing wheat**



**Keeping sheep outside**



**Keeping pigs outside**

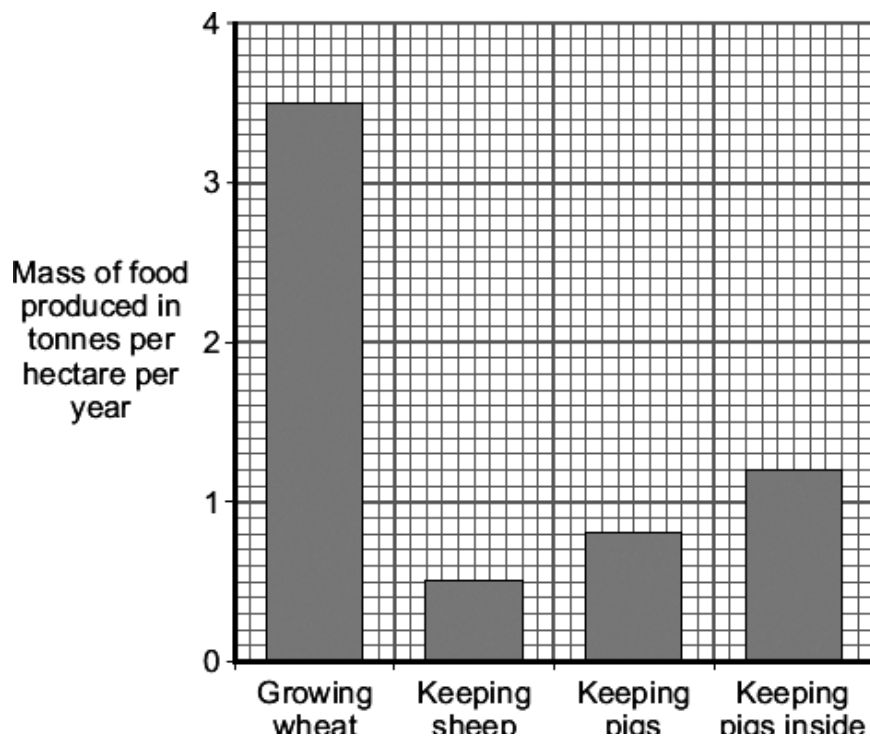


**Keeping pigs inside**



Growing wheat by Eileen Henderson [CC-BY-SA-2.0], via Wikimedia Commons. Keeping Sheep outside by Andrew Smith [CC-BY-SA-2.0], via Wikimedia Commons. Keeping Pigs outside by David Williams [CC-BY-SA-2.0], via Wikimedia Commons. Keeping Pigs inside supplied by iStockphoto/ Thinkstock.

The bar chart shows the amount of food produced from these four ways of farming.



.....      sheep      pigs      pig.....  
outside      outside  
**Way of farming**

- (a) How much extra food can be produced when farmers grow wheat, compared with keeping sheep outside?

Show clearly how you work out your answer.

.....  
.....

Answer ..... tonnes per hectare per year

(2)

- (b) Sheep eat grass.  
For every 1000 g of grass eaten, a sheep increases in mass by only 50 g.  
The other 950 g is lost.

How is the other 950 g lost?

Tick (✓) **two** boxes.

- |                                    |                          |
|------------------------------------|--------------------------|
| As oxygen from photosynthesis      | <input type="checkbox"/> |
| As faeces                          | <input type="checkbox"/> |
| As meat                            | <input type="checkbox"/> |
| As carbon dioxide from respiration | <input type="checkbox"/> |

(2)

- (c) (i) Pigs kept inside lose less energy than pigs kept outside.

Why?

Tick (✓) **two** boxes.

- |   |                          |
|---|--------------------------|
| Pigs kept inside are fed more.                | <input type="checkbox"/> |
| Pigs kept inside are kept in small pens.      | <input type="checkbox"/> |
| Pigs kept inside are kept warm in the winter. | <input type="checkbox"/> |
| Pigs kept inside are healthier.               | <input type="checkbox"/> |

(2)

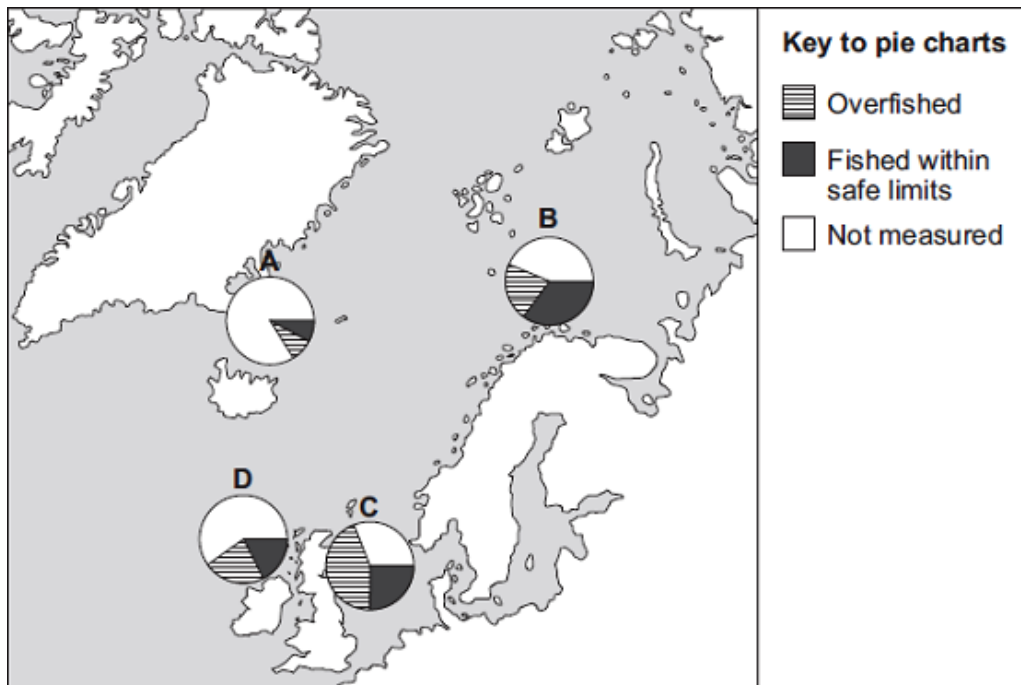
(ii) Meat from pigs kept inside is usually cheaper than meat from pigs kept outside.

Give **one** reason why.

.....  
.....

(1)  
(Total 7 marks)

**Q3.** The map shows pie charts, **A**, **B**, **C** and **D**, that give information about fisheries in some of the seas around Europe.



© European Environment Agency

(a) Which pie chart, **A**, **B**, **C** or **D**, shows the fishery with the largest amount of

overfishing?

(1)

(b) It is important to maintain fish stocks high enough for breeding to continue.

Give the reason why.

.....  
.....

(1)

(c) Give **two** ways fish stocks can be conserved.

.....

.....

.....

.....

(2)  
(Total 4 marks)

**Q4.** Human activities affect the environment.

(a) **List A** gives four human activities.

**List B** gives the effect of the activities on the environment.

Draw **one** line from each human activity in **List A** to its effect on the environment in **List B**.

**List A**  
**Human activity**

Digging a new quarry

Spraying pesticides on crops

Growing rice

Driving cars that release sulfur dioxide

**List B**  
**Effect on the environment**

Adds methane to the atmosphere

Pollutes hedges around fields

Reduces the land available for wild animals

Produces lots of litter

Produces acid rain

(4)

(b) Human activities are increasing *global warming* .

Give **two** effects of *global warming* on the environment.

1.....

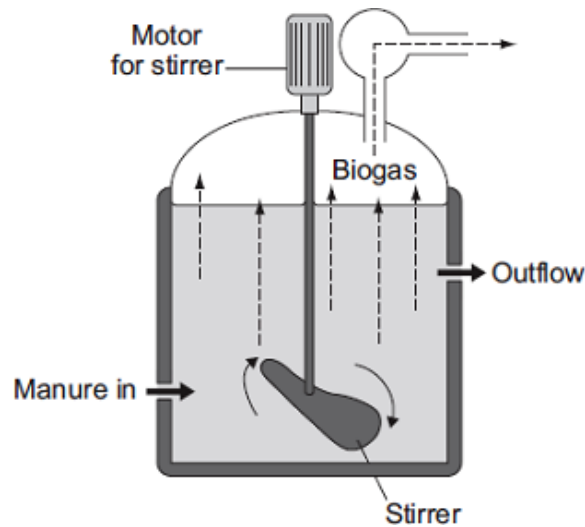
.....

2.....

.....

(2)  
(Total 6 marks)

**Q5.** The diagram shows one type of biogas generator.



(a) With this type of biogas generator, the concentration of solids that are fed into the reactor must be kept very low.

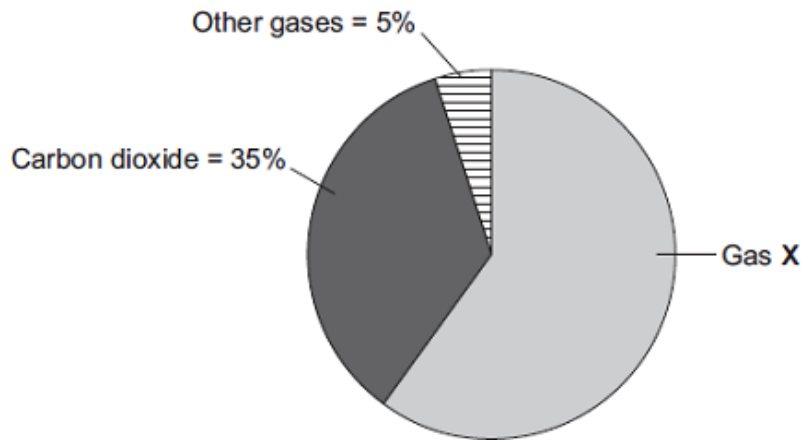
Suggest **one** reason for this.

Tick (✓) **one** box.

A higher concentration contains too little oxygen.



(b) The pie chart shows the percentages of the different gases found in the biogas.



Gas X is the main fuel gas found in the biogas.

(i) What is the name of gas X?

Draw a ring around **one** answer.

**methane**

**nitrogen**

**oxygen**

(1)

(ii) What is the percentage of gas X in the biogas?

Show clearly how you work out your answer.

.....  
.....

Percentage of gas X = .....

(2)

(c) If the biogas generator is not airtight, the biogas contains a much higher percentage of carbon dioxide.

Draw a ring around **one** answer in each part of this question.

(i) The air that leaks in will increase the rate of

aerobic respiration.

anaerobic respiration.

fermentation.

(1)

(ii) The process in part (c)(i) occurs because the air contains

- ammonia.
- nitrogen.
- oxygen.

(1)  
(Total 6 marks)

**Q6.** Scientists have produced many different types of GM (genetically modified) food crops.

(a) Use words from the box to complete the sentence about genetic engineering.

- |               |                    |                |              |
|---------------|--------------------|----------------|--------------|
| <b>clones</b> | <b>chromosomes</b> | <b>embryos</b> | <b>genes</b> |
|---------------|--------------------|----------------|--------------|

GM crops are produced by cutting ..... out of the  
..... of one plant and inserting them into the cells of a crop plant.

(2)

(b) Read the information about GM food crops.

- Herbicide-resistant GM crops produce higher yields.
- Scientists are uncertain about how eating GM food affects our health.
- Insect-resistant GM crops reduce the total use of pesticides.
- GM crops might breed naturally with wild plants.
- Seeds for a GM crop can only be bought from one manufacturer.
- The numbers of bees will fall in areas where GM crops are grown.

Use this information to answer these questions.

(i) Give **two** reasons why some farmers are in favour of growing GM crops.

- 1 .....
- .....
- 2 .....
- .....

(2)

(ii) Give **two** reasons why many people are against the growing of GM crops.

1 .....

.....

2 .....

.....

(2)  
(Total 6 marks)

**Q7.** The number of fish in the oceans is decreasing.

The table below shows information about the mass of fish caught by UK fishermen between 2002 and 2010.

<b>Year</b>	<b>Mass of fish caught by UK fishermen from ALL SOURCES in thousands of tonnes</b>	<b>Mass of fish caught by UK fishermen from SUSTAINABLE SOURCES in thousands of tonnes</b>	<b>Percentage of fish caught from sustainable sources</b>
<b>2002</b>	690.0	427.8	62.0
<b>2004</b>	655.0	396.6	60.5
<b>2006</b>	619.0	386.0	62.4
<b>2008</b>	589.0	436.1	74.0
<b>2010</b>	611.5	465.0	

(a) (i) Calculate the percentage of fish caught from sustainable sources in 2010.

.....

.....

.....

..... %

(2)

(ii) Describe the pattern in the table above for the mass of fish caught from all sources.  
Suggest reasons for this pattern.

.....  
.....  
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(4)

(iii) Suggest why the percentage of fish caught from sustainable sources is increasing.

.....  
.....

(1)

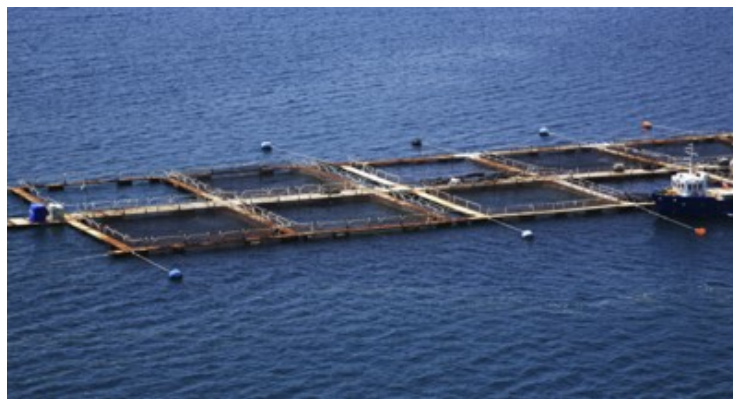
(b) Give **two** methods of maintaining fish stocks at a sustainable level.

1 .....

2 .....

(2)

(c) The image below shows a fish farm.



© debsthelio/iStock/Thinkstock

In a fish farm, large numbers of fish are grown in cages in the sea.

Why do fish in the cages grow faster than fish of the same species that are free in the sea?

You should refer to energy in your answer.

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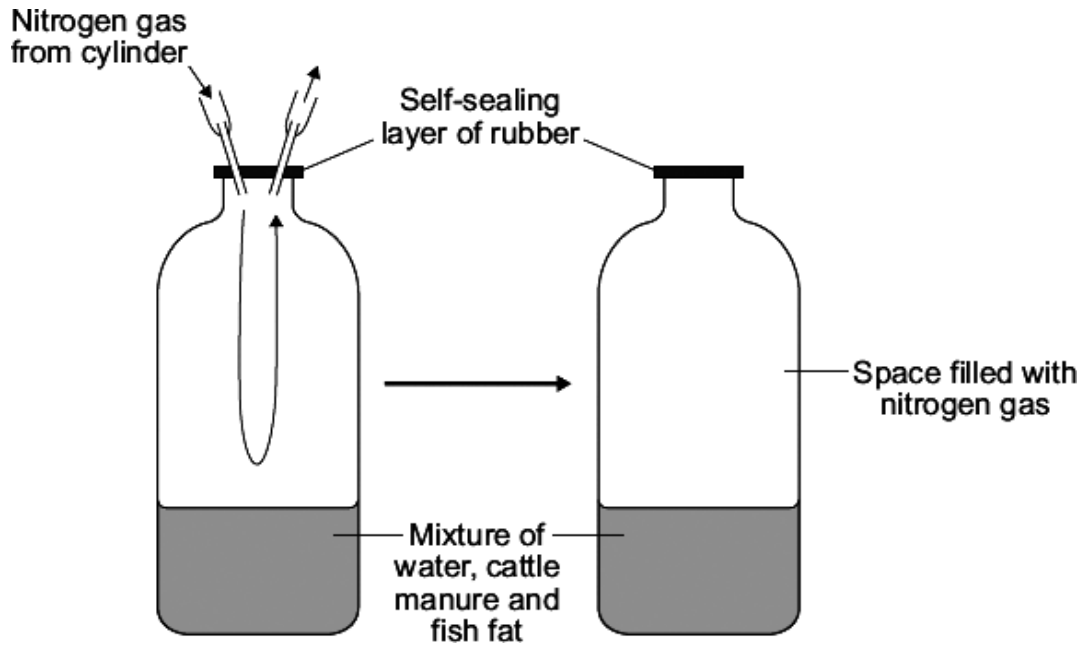
.....

(4)  
(Total 13 marks)

**Q8.** Norway has a large fishing industry. Norwegian scientists investigated the effect of adding waste fish fat to cattle manure to improve the production of biogas.

The scientists set up many jars containing different concentrations of fish fat added to the cattle manure. The air in each jar was removed and replaced with pure nitrogen gas.

The diagram shows how one of these jars was set up.



The scientists then kept all the jars in an incubator at 35 °C for 6 weeks.

(a) The scientists sealed each jar with a layer of rubber and replaced the air in the jars with nitrogen gas.

Explain why.

.....

.....

.....

.....

(2)

- (b) The scientists removed samples of gas from each jar at intervals over the 6 weeks.

The table shows some of the scientists' results.

Contents of jar	Yield of biogas in cm <sup>3</sup> per gram	Yield of methane in cm <sup>3</sup> per gram	Proportion of methane in the biogas
Cattle manure	426	256	0.60
Cattle manure + 2.5 % fish fat	686	426	
Cattle manure + 5 % fish fat	861	543	0.63
Cattle manure + 10 % fish fat	999	630	0.63

- (i) The final column of the table shows the proportion of methane in the biogas.

Apart from the methane and the added nitrogen, name the other gas that makes up most of the rest of the biogas.

.....

(1)

- (ii) Calculate the proportion of methane in the biogas when 2.5 % fish fat was added to the manure.

Show clearly how you work out your answer.

.....

.....

Proportion of methane = .....

(2)

- (iii) Describe the effects on biogas production of adding fish fat to cattle manure.

.....

.....

.....

.....

.....

(2)

- (iv) Olaf is a Norwegian farmer. Olaf's farm is 110 kilometres from the sea. He has a biogas generator on his farm. Olaf adds manure from his 50 cattle to his biogas generator.

Olaf decided **not** to add fish fat to his biogas generator.

Suggest **one** reason why.

.....  
.....

(1)  
(Total 8 marks)

**Q9.** There are many ways to increase the efficiency of food production.

- (a) The table shows the energy available to humans from two different food chains.

Food chain	Energy transferred to humans in kJ per hectare of crop
Wheat → humans	900 000
Wheat → pigs → humans	90 000

- (i) Compare the amount of energy the two food chains transfer to humans.

.....  
.....

(1)

- (ii) Give **one** reason for the difference in the amount of energy the two food chains transfer to humans.

.....  
.....

(1)



(b) *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

Give methods used in the factory farming of animals.  
Explain the advantages and disadvantages of these methods.

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.....

(6)  
(Total 8 marks)

**Q10.** In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

Deforestation affects the environment.

Deforestation is causing a change in the amounts of different gases in the atmosphere. This change causes global warming and climate change.

The image below shows an area of deforestation.



© Nivellen77/iStock/Thinkstock

Give the reasons why deforestation is taking place.

Describe how deforestation is causing the change in the amounts of different gases in the atmosphere.

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Extra space .....

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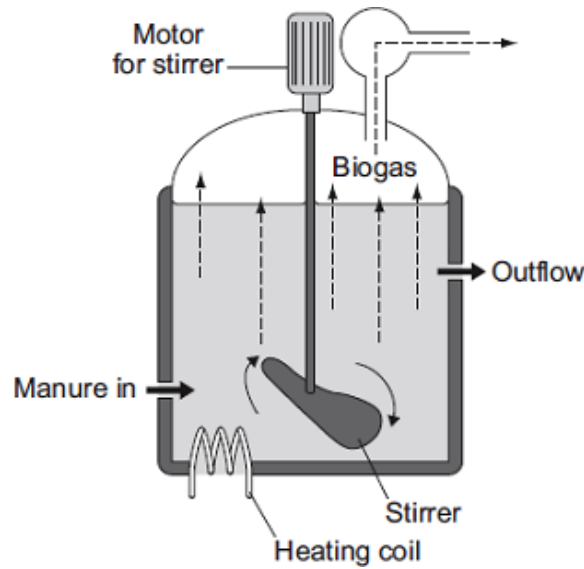
.....

.....

.....

(Total 6 marks)

Q11. The diagram shows one type of *anaerobic* digester. The digester is used to produce biogas.



(a) (i) What does *anaerobic* mean?

.....

.....

(1)

(ii) The concentration of solids that are fed into this digester must be kept very low. Suggest **one** reason why.

.....

.....

(1)

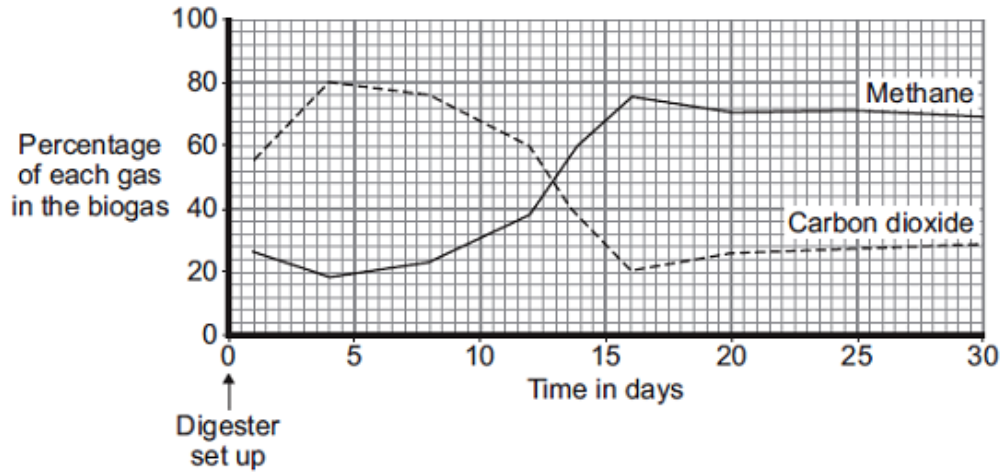
(iii) This digester is more expensive to run than some other simpler designs of biogas generator.

Suggest **one** reason why.

.....  
.....

(1)

(b) The graph shows how the composition of the biogas produced by the digester changed over the first 30 days after the digester was set up.



Use information from the graph to answer the following questions.

(i) Describe how the percentage of carbon dioxide changed over the 30 days.

.....  
.....  
.....  
.....  
.....  
.....  
.....

(3)

(ii) On which day was the best quality biogas produced? .....

(1)

- (c) Four days after the digester was first set up, the biogas contained a high percentage of carbon dioxide.

Suggest an explanation for this.

.....  
.....  
.....  
.....

(2)  
(Total 9 marks)

**Q12.** Deforestation affects the environment in many ways.

- (a) Deforestation increases the amount of carbon dioxide in the atmosphere.

Give **two** reasons why.

1 .....  
.....  
2 .....  
.....

(2)

- (b) Deforestation also results in a loss of *biodiversity*.

- (i) What is meant by *biodiversity*?

.....  
.....

(1)

- (ii) Give **two** reasons why it is important to prevent organisms becoming extinct.

1 .....  
.....  
2 .....  
.....

(2)  
(Total 5 marks)

<b>M1.</b>	(a)	40 – 60 hours	1
	(b)	(i) decrease	1
		1 <sup>st</sup> slowly then faster / appropriate detail from the graph – e.g. from 7.8 to 0 / faster after 4 – 10h	1
		(ii) oxygen after glucose <i>extra box ticked cancels 1 mark</i>	1
		oxygen less than glucose	1
		(iii) respiration	1
			<b>[6]</b>

<b>M2.</b>	(a)	3 (.0) <i>correct answer, irrespective of working gains 2 marks. if the answer is incorrect or there is no answer, award 1 mark for use of correct figures (0.5 and 3.5) [and no other figures]</i>	2
	(b)	as faeces <i>if more than two boxes ticked deduct 1 mark for each additional tick</i>	1
		as carbon dioxide from respiration	1
	(c)	(i) pigs kept inside are kept in small pens <i>if more than two boxes ticked deduct 1 mark for each additional tick</i>	1
		pigs kept inside are kept warm in the winter	1

(ii) any **one** from:

- faster growth  
*ignore bigger / less flavour / fatty*
- need less food  
*ignore references to movement / energy*
- ready for market sooner  
*ignore ethical arguments*

1

[7]

M3. (a) C

1

(b) otherwise species may disappear altogether  
*allow to avoid extinction*

1

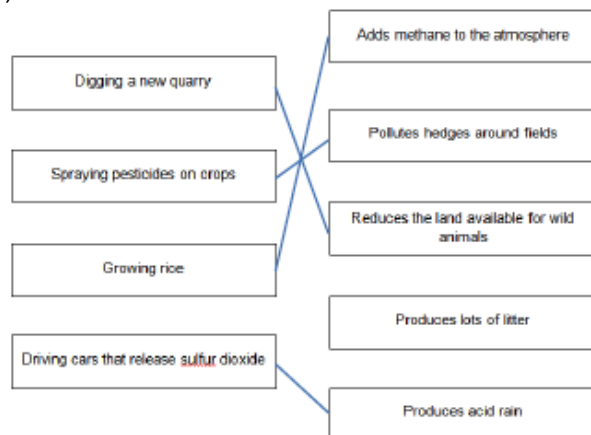
(c) any **two** from:

- regulate net size  
*if mesh size specified, must be larger*
- impose fishing quotas
- limit fishing during breeding seasons
- bans on discarding of fish
- bans on fishing in certain areas

2

[4]

M4. (a)



1 mark for each correct line

extra line from box in left hand column cancels mark

4

(b) any **two** from:

- climate change  
*ignore 'Earth warmer'*
- more extreme weather / changes to weather (patterns) / described
- rise in sea level
- melting of ice caps
- reduced biodiversity
- changes to migration patterns
- changes in distribution of species  
*accept faster plant growth / tropical species can be grown in UK  
accept tropical diseases / example spread to temperate regions*

2

[6]

**M5.** (a) a higher concentration would be difficult to stir

1

(b) (i) methane

1

(ii) 60

*100 - (5 + 35) but incorrect answer allow 1 mark*

2

(c) (i) aerobic respiration

1

(ii) oxygen

1

[6]

**M6.** (a) genes

1

chromosomes

1

(b) (i) higher yield

1

less use of pesticides

1



- (ii) any **two** from:
- uncertain about effects on health
  - fewer bees
  - might breed with wild plant
  - seeds only from one manufacturer

2

[6]

**M7.** (a) (i) 76.0 / 76

*correct answer with or without working gains 2 marks*

*allow 76.04 for 2 marks*

*allow 76.04 with extra decimal places eg 76.042 for 1 mark*

$$\frac{465}{611.5} \text{ for 1 mark}$$

2

(ii) mass of fish declines (until 2008)

*ignore use of numbers*

*allow number of fish decline (until 2008)*

1

(due to an) increase in fishing / overfishing

1

and then rises (until 2010)

1

(which could be due to) quotas / net restrictions working

*allow any reasonable suggestion, such as countries swapping*

*quotas or restrictions on fishing during breeding seasons*

*ignore less fishing*

*if no other marks awarded allow 1 mark for a decrease in mass*

**and** *an increase in mass if answer relates to sustainable fishing*

1

(iii) (this is due to) public awareness / demand

*allow legislation / rules*

1

(b) fishing quotas / bans

1

(small) net / mesh size

*if size of net is stated then it must be smaller*

*if size of mesh is stated then it must be larger*

1

- (c) (fish) cannot move freely / as much 1
- (therefore) less energy loss from the fish  
*do **not** allow 'no energy is lost'*  
*ignore references to less heat loss through controlling body temperature*  
*ignore references to respiration* 1
- (there is) more food available / better quality food / fed more often  
*accept 'high-protein food (for making cells)'* 1
- (so) there is more energy for growth **or** (more food) is converted to biomass 1
- [13]**

- M8.** (a) (biogas / methane is made) by fermentation / anaerobic respiration  
*accept reverse argument*  
*accept for **1** mark so no oxygen in jar **or** so oxygen can't enter **or** makes conditions anaerobic*  
*ignore references to keeping other microbes out*  
*ignore air* 2
- (b) (i) carbon dioxide  
*accept CO<sub>2</sub> / CO2*  
*do **not** accept CO<sup>2</sup>* 1
- (ii) 0.62 look for answer in table  
*correct answer with or without working gains **2** marks*  
*allow 62% for **2** marks but 62 for **1** mark if incorrect / no answer*  

$$\frac{426}{686} \text{ gains } 1 \text{ mark}$$
 2
- (iii) (more fat → much) more biogas / methane  
*allow more implied by giving two numbers or a subtraction / division* 1
- (more fat →) only small increase in proportion / concentration / percentage of methane  
*allow increases only from 0.60 to 0.63 **or** only changes by 0.03*  
**or** approximately constant  
**or** no change above 5% 1

- (iv) fat (too) expensive **or** fat (too) expensive to transport (from coast to farm)  
*accept any suitable reference to extra cost / effect on environment  
eg more pollution from transport*

1

[8]

- M9.** (a) (i) wheat → humans chain transfers 10 times more energy than wheat → pigs → humans chain  
*allow 10% if given as a comparison e.g. one is 10% of the other*

or

wheat → pigs → humans chain transfers 810 000 (kJ per hectare) less  
*ignore less unqualified*

1

- (ii) any **one** reason for energy loss from pigs e.g :

*ignore respiration, growth*

*ignore heat unqualified*

- movement
- (maintaining) body temperature
- waste materials  
*allow named examples*
- not all parts of pig eaten by human
- because there is an extra stage (pigs) in the food chain and energy is lost at each stage  
*allow longer food chain so more energy lost*

1

- (b) Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information in the [Marking guidance](#), and apply a 'best-fit' approach to the marking.

**0 marks**

No relevant content.

**Level 1 (1-2 marks)**

There is a basic description of at least one factory farming method

**or**

identification of an advantage or disadvantage of factory farming.

**Level 2 (3-4 marks)**

There is a description of at least one factory farming method  
**and**  
an advantage or disadvantage is explained.

**Level 3 (5-6 marks)**

There is a description of factory farming methods  
**and**  
advantage(s) and disadvantage(s) are explained.

**Examples of Biology points made in the response:**

factory farming methods e.g.:

- Kept in cramped conditions / battery hens / calf crates / pig barns / fish tanks
- Controlled temperature / heating
- Controlled feeding / modified food given / growth hormones
- Controlled lighting
- Treated with prophylactic antibiotics

Advantages e.g.:

- Increased efficiency / profit / greater food production / cheaper food / faster growth
- Farmer can have more livestock
- Less energy is lost through movement
- Less energy is used keeping warm
- (Food is high in calories / protein) so animals will grow faster / lay more eggs
- Easier to vaccinate all the animals
- Easier to protect animals from predators
- Antibiotic treatment stops infections in animals

Disadvantages e.g.:

- Stress / cruelty / inhumane / unethical
- Restricted movement / overcrowding
- Faster spread of diseases
- Antibiotics in the food chain / residual chemicals in the food chain
- Wasting fossil fuels / increasing global warming
- Increased pollution from animal waste and from additional transport

**M10.** Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also apply a 'best-fit' approach to the marking.

**0 marks**

No relevant content

**Level 1 (1 – 2 marks)**

There is at least one reason for deforestation

**or**

an attempt at a description of at least one way deforestation is affecting the atmosphere.

**Level 2 (3 – 4 marks)**

There is at least one reason for deforestation

**and**

a description of the way deforestation is affecting one gas in the atmosphere

**or**

the process that causes an effect.

**Level 3 (5 – 6 marks)**

There are reasons for deforestation

**and**

a clear description of the way deforestation is affecting one gas in the atmosphere

**and**

the process that causes this.

**examples of the points made in the response**

Reasons for deforestation

- timber for construction / furniture / boat building / paper production
- growing plants for biofuels for motor fuel / aviation / lawnmowers
- use of wood as a fuel
- land for building or agriculture to provide food, such as rice fields and cattle ranching

Effects of deforestation

- increase in carbon dioxide in atmosphere  
due to burning  
due to activities of microbes  
less carbon dioxide taken in / locked up (by trees)  
less photosynthesis
- increase in methane in atmosphere  
due to rice production / cattle

***extra information***

*ignore references to oxygen*

*accept explanations of the effect of water (vapour)*

[6]

**M11.** (a) (i) without oxygen  
*ignore reference to 'air'*

1

- (ii) otherwise difficult to stir / to pump / to transfer  
*allow prevent 'clogging' owtte* 1
- (iii) need to stir / pump / heat 1
- (b) (i) rises then falls 1
- then levels / slight rise 1
- quantitative descriptor  
- e.g. to 80% / max. on day  
4 / min. on day 16  
*accept other valid quantitative descriptor*  
*allow accuracy  $\pm \frac{1}{2}$  small square* 1
- (ii) 16 (15.5 to 16.4) 1
- (c) any **two** from:
- oxygen present
  - (CO<sub>2</sub> produced) by aerobic respiration
  - **or** not much anaerobic respiration
  - **not** much methane / CH<sub>4</sub> produced

2

[9]

**M12.**

- (a) any **two** from:  
*ignore CO<sub>2</sub> release unqualified*
- burning
  - activity of microbes / microbial respiration
  - less photosynthesis
- or**
- trees take in CO<sub>2</sub>  
*do **not** accept CO<sub>2</sub> taken in for respiration*
- or**
- less CO<sub>2</sub> locked up in wood
- CO<sub>2</sub> given off by clearing machinery

2

(b) (i) range of different species  
*accept idea of variety of organisms or plants or animals*

1

(ii) any **two** from:

- organisms may produce substances useful to humans  
*do **not** accept if food is only example*
- duty to preserve for future generations
- effect on other organisms, eg food chain effects  
*ignore effect on human food supply*
- loss of environmental indicators

2

[5]

