

**GENERAL CERTIFICATE OF SECONDARY EDUCATION**

**ENVIRONMENTAL AND LAND-BASED SCIENCE**

**B683/02**

Unit B683: Commercial Horticulture, Agriculture and Livestock Husbandry (Higher Tier)

Candidates answer on the question paper  
A calculator may be used for this paper

**OCR Supplied Materials**

None

**Duration:** 1 hour

**Other Materials Required:**

- Calculator
- Ruler (cm/mm)

Candidate Forename		Candidate Surname	
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Centre Number						Candidate Number				
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**INSTRUCTIONS TO CANDIDATES**

- Write your name in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Do not write outside the box bordering each page.
- Write your answer to each question in the space provided, however additional paper may be used if necessary.

**INFORMATION FOR CANDIDATES**

- Your quality of written communication is assessed in questions marked with a pencil (✎).
- The number of marks for each question is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is **50**.
- This document consists of **20** pages. Any blank pages are indicated.

<b>For Examiner's Use</b>		
	<b>Max</b>	<b>Mark</b>
<b>1</b>	<b>4</b>	
<b>2</b>	<b>2</b>	
<b>3</b>	<b>2</b>	
<b>4</b>	<b>2</b>	
<b>5</b>	<b>3</b>	
<b>6</b>	<b>4</b>	
<b>7</b>	<b>5</b>	
<b>8</b>	<b>3</b>	
<b>9</b>	<b>2</b>	
<b>10</b>	<b>3</b>	
<b>11</b>	<b>2</b>	
<b>12</b>	<b>6</b>	
<b>13</b>	<b>6</b>	
<b>14</b>	<b>6</b>	
TOTAL	50	

Answer **all** the questions.

1 Choose the correct word from the list below to complete the following sentences.

**chromosomes**

**gene**

**genotype**

**mutations**

**phenotype**

The genetic information of an animal or plant is carried by pairs of .....  
located in the nucleus of the cell.

Each characteristic is coded for by a particular ..... for that characteristic.

All the genetic information of an animal is called its ..... and the characteristics  
that this produces is the ..... .

**[4]**

2 Hydroponics is a system of agriculture which does not use soil as the growing medium.

Explain the advantages of using ICT to control hydroponic systems.

.....

.....

.....

.....

.....

..... [2]

3 Coir (coconut husk) is an alternative to peat for use in potting composts.

Some people think that coir is more environmentally friendly.

Others disagree.

Give **two** reasons why using coir may be a poor choice for the environment.

1 .....

.....

2 .....

..... [2]

4 Many plants may be raised from seed.

One of the stages in this process is thinning-out.

Give **two** reasons why thinning-out of seedlings is so important.

1 .....

2 ..... [2]

5 The photograph shows a new animal house.



M Wedgwood / © OCR

Housing for livestock must meet their needs.

Complete the table to show the way in which the housing shown above is able to provide for the needs of the calves.

The first one has been done for you.

needs of calves	provided by the calf house
food and water	water and food troughs

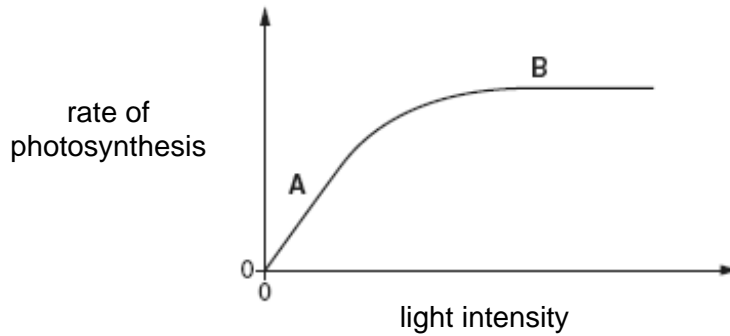
[3]

6 This question is about photosynthesis.

Look at the graph.

It shows the effect of increasing light intensity on the rate of photosynthesis.

The concentration of  $\text{CO}_2$  is kept at 0.04% throughout the experiment.



(a) Explain the shape of the graph.

.....

.....

..... [2]

(b) Julie says that if the  $\text{CO}_2$  concentration is increased, the graph will be steeper at **A** and level off at the same value at **B**.

Niall says that if the  $\text{CO}_2$  concentration is increased, the graph will be the same at **A** but will level off at a higher value at **B**.

Who is correct? Explain your answer.

.....

.....

..... [2]

7 PCV2 is a virus disease of pigs. Pigs can be vaccinated against this disease.

An investigation was carried out to see what effect vaccination has on the growth of piglets.

Four groups of piglets were used

- A** both the mother sows and piglets were vaccinated
- B** the sows were vaccinated but not the piglets
- C** the piglets were vaccinated but not the sows
- D** neither piglets nor sows were vaccinated

The average weights of the piglets in each group are shown in the table below.

	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
birth weight in kg	1.6	1.7	1.6	1.6
weight at 3 weeks old in kg	6.5	6.5	6.3	6.3
weight at 7 weeks old in kg	14.7	14.6	14.0	13.9
number of piglets in each group	462	467	425	422

<http://www.thepigsite.com/articles/1/pig-health/3123/pcv2-vaccination-strategy-experiment>

- (a) Calculate the average growth rate in kg per day of the piglets in group **D**, for the first 7 weeks of life.

.....

.....

..... [2]



**(b)** Use the information in the table to recommend whether sows and piglets should be vaccinated.

.....

.....

.....

.....

.....

.....

..... [3]

8 Plants need to grow well in a garden.

Garden designers need to choose the plants they use carefully.



Describe **three** features of plants, in addition to size, colour and cost, which garden designers need to consider.

.....

.....

.....

..... [3]

9 Breeders have produced a new dwarf narcissus asexually from bulbs.



Give **one** advantage and **one** disadvantage of this method, compared to saving seed from the flowers.

advantage .....

.....

disadvantage .....

..... [2]

10 Look at the picture.

It shows rice being planted in China.



© iStockphoto.com/Christian Wagner

(a) Scientists have taken the genes that control beta-carotene production and placed them into rice.

This rice is called Golden Rice.

Give **two** reasons why genetic engineering is used in this process and not selective breeding.

.....

.....

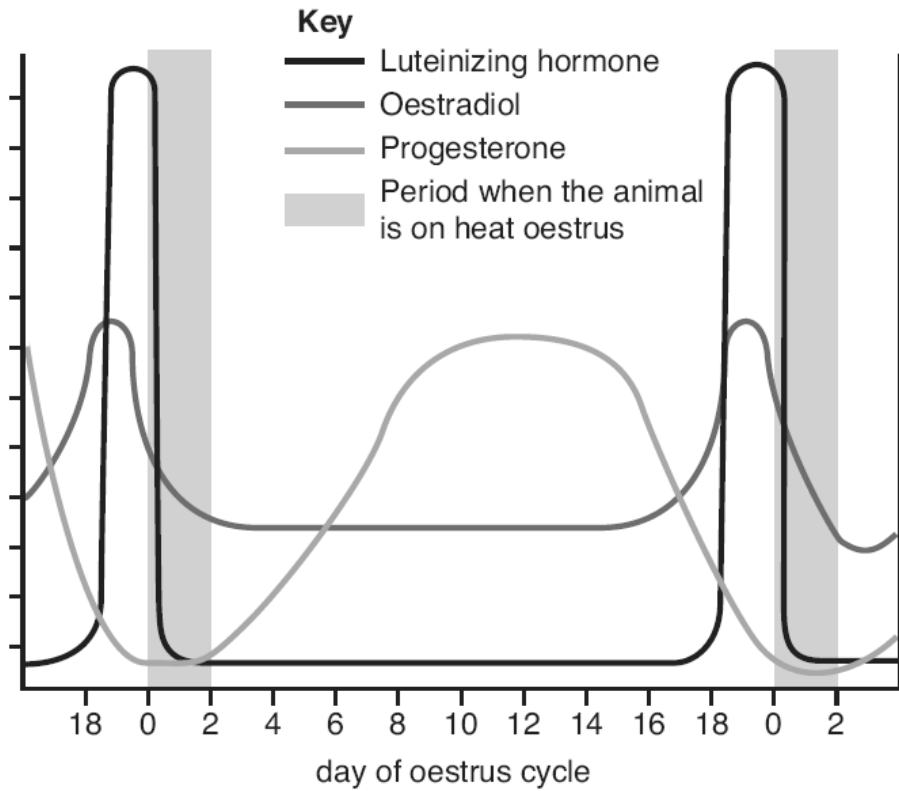
..... [2]

(b) Some people are opposed to Golden Rice because it may have unexpected harmful effects. Suggest how scientists could gather evidence to try to overcome this opposition.

.....

..... [1]

11 The graph shows the changes in an animal's hormones during its oestrous cycle.



The onset of heat (oestrus) in an animal is controlled by a number of hormones.

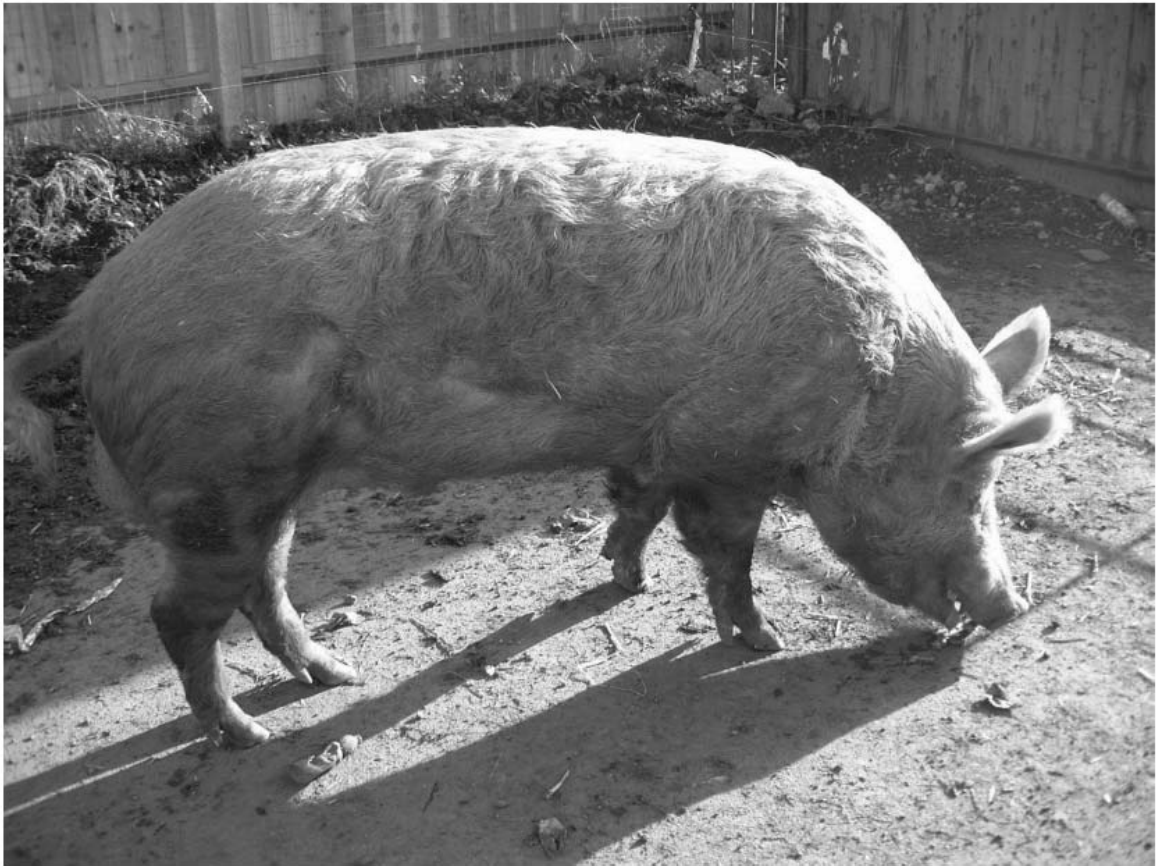
(a) Which hormones **cause** the onset of oestrus?

..... [1]

(b) Which hormone **reduces** with the onset of oestrus?

..... [1]


12



Sometimes young sows do not come into season when they should.

Putting a boar near to the sow can often have the effect of bringing her into season.

For farm animals you have studied, explain how the farmer can use knowledge of the way reproductive hormones work to help in the breeding of livestock.

 The quality of written communication will be assessed in your answer to the question.

.....

.....

.....

.....

.....

.....

[6]




14 The photograph shows an extensive pig unit.



Pigs can be produced extensively or intensively.

Compare the animal welfare issues of both systems for rearing pigs.

 The quality of written communication will be assessed in your answer to the question.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [6]

[Paper Total: 50]

**END OF QUESTION PAPER**



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**MARK SCHEME**

**Duration:** 60 minutes

**MAXIMUM MARK 50**

## Guidance for Examiners

Additional guidance within any mark scheme takes precedence over the following guidance.

1. Mark strictly to the mark scheme.
2. Make no deductions for wrong work after an acceptable answer unless the mark scheme says otherwise.
3. Accept any clear, unambiguous response which is correct, eg mis-spellings if phonetically correct (but check additional guidance).
4. Abbreviations, annotations and conventions used in the detailed mark scheme:
  - / = alternative and acceptable answers for the same marking point
  - (1) = separates marking points
  - not/reject** = answers which are not worthy of credit
  - ignore** = statements which are irrelevant - applies to neutral answers
  - allow/accept** = answers that can be accepted
  - (words) = words which are not essential to gain credit
  - words = underlined words must be present in answer to score a mark
  - ecf = error carried forward
  - AW/owtte = alternative wording
  - ORA = or reverse argument

Eg mark scheme shows 'work done in lifting/(change in) gravitational potential energy' (1)

work done = 0 marks

work done lifting = 1 mark

change in potential energy = 0 marks

gravitational potential energy = 1 mark

5. If a candidate alters his/her response, examiners should accept the alteration.
6. Crossed out answers should be considered only if no other response has been made. When marking crossed out responses, accept correct answers which are clear and unambiguous.

Eg

For a one mark question, where ticks in boxes 3 and 4 are required for the mark:

Put ticks (✓) in  
the two correct  
boxes.

✓
<del>✓</del>

This would be  
worth 0 marks.

Put ticks (✓) in  
the two correct  
boxes.

<del>✓</del>
<del>✓</del>

This would be  
worth one mark.

Put ticks (✓) in  
the two correct  
boxes.

<del>✓</del>
<del>✓</del>
✓
✓

This would be  
worth one mark.

## 7. The list principle:

If a list of responses greater than the number requested is given, work through the list from the beginning. Award one mark for each correct response, ignore any neutral response, and deduct one mark for any incorrect response, eg one which has an error of science. If the number of incorrect responses is equal to or greater than the number of correct responses, no marks are awarded. A neutral response is correct but irrelevant to the question.

## 8. Marking method for tick boxes:

Always check the additional guidance.

If there is a set of boxes, some of which should be ticked and others left empty, then judge the entire set of boxes.

If there is at least one tick, ignore crosses. If there are no ticks, accept clear, unambiguous indications, eg shading or crosses.

Credit should be given for each box correctly ticked. If more boxes are ticked than there are correct answers, then deduct one mark for each additional tick. Candidates cannot score less than zero marks.

eg If a question requires candidates to identify a city in England, then in the boxes

Edinburgh	
Manchester	
Paris	
Southampton	

**the second and fourth boxes should have ticks (or other clear indication of choice) and the first and third should be blank (or have indication of choice crossed out).**

Edinburgh			✓			✓	✓	✓	✓	
Manchester	✓	x	✓	✓	✓				✓	
Paris				✓	✓		✓	✓	✓	
Southampton	✓	x		✓		✓	✓		✓	
Score:	2	2	1	1	1	1	0	0	0	NR


Question		Expected answer	Marks	Additional guidance
1		chromosomes gene genotype phenotype	[4]	
2		constant monitoring of conditions so idea of maintaining constant environment for plant growth	[2]	<b>allow</b> examples of conditions monitored such as concentration of nutrients in water, flow rates, temperature etc. (1 mark) <b>allow</b> saving of labour costs (1 mark) answers must be linked in order to gain full credit; they must link idea of constant monitoring and adjusting conditions to idea of lack of variation in conditions and the advantages of this, and should be in the order specified
3		two from: transportation costs are high/uses a lot of fossil fuels coir is better used in home countries to improve the soil theoretical risk of pathogens such as salmonella	[2]	
4		two from: reduces competition for light water nutrients space reduces chance of diseases such as damping off	[2]	





Question		Expected answer	Marks	Additional guidance
5		three from: security    strong construction / bolt or lock on door exercise    space to move around in house dry conditions    roof and walls waterproof / good drainage ventilation    open front of house / avoid drafts bedding    straw for bedding	[3]	one mark for each correct line
6	(a)	A - photosynthesis increases with increasing light because light is the limiting factor / limits rate (1)  B - light is not the limiting factor / does not limit the rate as increasing light has no effect OR CO <sub>2</sub> / temperature is limiting rate as increasing light has no effect (1)	[2]	ignore water
	(b)	(Niall is correct) (no mark): at <b>A</b> CO <sub>2</sub> is not the limiting factor so an increase will not cause any change (1) at <b>B</b> CO <sub>2</sub> is the limiting factor so an increase in CO <sub>2</sub> will cause the rate to continue to increase until something else becomes the limiting factor (1)	[2]	
7	(a)	$13.9 - 1.6 = 12.3$ $12.3/49 = 0.25$ to 2 decimal places	[2]	units given in question so not needed in answer 2 marks for correct answer, 1 mark if evidence of calculation of growth and division by number of days

Question		Expected answer	Marks	Additional guidance
7	(b)	idea that piglets grew more in A and B than in C and D and no significant difference between C and D or A and B so it is the vaccination of sows which is significant and vaccination of piglets makes no significant difference / recommendation to vaccinate sows and not piglets	[3]	answers must be linked in order to gain full credit; they must link statements about the data to a recommendation or a statement about the effects of vaccination of sows and piglets
8		three from: fragrance toxic sap or berries thorns hardiness not attractive to pests flowering/fruiting season attractive foliage/flowers/fruits whether annual, biennial, perennial shape/form	[3]	reject size/colour/cost

Question		Expected answer	Marks	Additional guidance
9		<i>advantage:</i> trueness to type/ genetically identical/speed to adult plants <i>disadvantage:</i> slow to produce large numbers/ diseases propagated	[2]	1 advantage and 1 disadvantage needed <b>allow</b> technical difficulty in propagating from seed <b>reject</b> cost
10	(a)	two from: beta-carotene genes not found in rice / AW genetic engineering is quicker more control over making sure the desired characteristic is present in the offspring selective breeding can lead to reduction in genetic variation	[2]	assume answer refers to genetic engineering unless stated
	(b)	carry out controlled tests	[1]	<b>allow</b> examples of controlled testing eg testing humans to see if it makes them ill compared to a control group / doing field trials to make sure that it does not impact plants growing around <b>ignore</b> reference to arguing / writing articles
11	(a)	oestradiol and luteinizing	[1]	(both needed for mark)
	(b)	progesterone	[1]	




Question	Expected answer	Marks	Additional guidance
12 	<p><b>[level 3]</b> Using more than one relevant named example (in addition to sow), provides a comprehensive explanation of how a farmer can use an understanding of the way hormones and other stimuli affect the onset of oestrus in the breeding of livestock. All information in answer is relevant, clear, organised and presented in a structured and coherent format. Specialist terms are used appropriately. Few, if any, errors in grammar, punctuation and spelling. (5 – 6 marks)</p> <p><b>[level 2]</b> Using at least 1 relevant named example (in addition to sow), provides some relevant information about how a farmer can use an understanding of the way hormones and other stimuli affect the onset of oestrus in the breeding of livestock. For the most part the information is relevant and presented in a structured and coherent format. Specialist terms are used for the most part appropriately. There are occasional errors in grammar, punctuation and spelling. (3 – 4 marks)</p> <p><b>[level 1]</b> Answer based on the information given in the question, with little explanation. Answer may be simplistic. There may be limited use of specialist terms. Errors of grammar, punctuation and spelling prevent communication of the information. (1 – 2 marks)</p> <p><b>[level 0]</b> Insufficient or irrelevant information. Answer not worthy of credit. (0 marks)</p>	<b>[6]</b>	<p><b>relevant points include:</b></p> <p>sensory stimulation: sight / smell / sounds of the male trigger hormonal response in the female the hormones trigger the onset of heat/season reference to ‘teaser’ animals how environmental conditions can increase production of reproductive hormones in sheep and /or poultry, eg light / temperature use of hormones by the farmer to regulate the reproductive cycle, eg testosterone sponges in sheep to synchronise oestrous</p>

Question	Expected answer	Marks	Additional guidance
13 	<p><b>[level 3]</b> Detailed explanation of the problem and description of what can be done about it, with many examples to support the answer. All information in answer is relevant, clear, organised and presented in a structured and coherent format. Specialist terms are used appropriately. Few, if any, errors in grammar, punctuation and spelling. (5 – 6 marks)</p> <p><b>[level 2]</b> Some reasons given for the problem and what can be done about it, with some examples used. For the most part the information is relevant and presented in a structured and coherent format. Specialist terms are used for the most part appropriately. There are occasional errors in grammar, punctuation and spelling. (3 – 4 marks)</p> <p><b>[level 1]</b> Answer may focus on either the problem or the solution, with few examples used or may concentrate on one aspect only. Answer may be simplistic. There may be limited use of specialist terms. Errors of grammar, punctuation and spelling prevent communication of the information. (1 – 2 marks)</p> <p><b>[level 0]</b> Insufficient or irrelevant information. Answer not worthy of credit. (0 marks)</p>	<b>[6]</b>	<p><b>relevant points include:</b></p> <p><i>build up of pests:</i></p> <ul style="list-style-type: none"> <li>• because environment better for pests, including: temperature, humidity; lack of predators; density of food plants for pests</li> </ul> <p><i>to reduce pest problems:</i></p> <ul style="list-style-type: none"> <li>• only introduce pest free crops</li> <li>• isolate crops</li> <li>• have a regular spraying regime</li> <li>• introduce biological pest control</li> <li>• rotate crops to break up pest-cycle</li> <li>• avoid re-use of compost (or sterilise)</li> </ul>

Question	Expected answer	Marks	Additional guidance
14 	<p><b>[level 3]</b> Balanced and detailed discussion of advantages and disadvantages of both systems, including both physical and psychological factors. All information in answer is relevant, clear, organised and presented in a structured and coherent format. Specialist terms are used appropriately. Few, if any, errors in grammar, punctuation and spelling. (5 – 6 marks)</p> <p><b>[level 2]</b> Answer is balanced including some advantages and disadvantages of the systems. For the most part the information is relevant and presented in a structured and coherent format. Specialist terms are used for the most part appropriately. There are occasional errors in grammar, punctuation and spelling. (3 – 4 marks)</p> <p><b>[level 1]</b> May be one-sided, focussing on either intensive or extensive systems or a simple comparison of extensive and intensive systems, not particularly related to animal welfare issues. Answer may be simplistic. There may be limited use of specialist terms. Errors of grammar, punctuation and spelling prevent communication of the information. (1 – 2 marks)</p> <p><b>[level 0]</b> Insufficient or irrelevant information. Answer not worthy of credit. (0 marks)</p>	<p><b>[6]</b></p>	<p><b>relevant points include:</b></p> <ul style="list-style-type: none"> <li>• physical and psychological factors</li> </ul> <p>intensive</p> <ul style="list-style-type: none"> <li>• easier to care for pigs: monitor health, breeding, feeding</li> <li>• not subject to poor weather</li> <li>• disease spreads more quickly</li> </ul> <p>extensive</p> <ul style="list-style-type: none"> <li>• pigs able to move about freely, exercise</li> <li>• able to associate – social interaction</li> <li>• more difficult to care for pigs: monitor health, breeding, feeding</li> <li>• disease spreads more slowly</li> <li>• subject to poor weather</li> </ul>
	<p><b>Total</b></p>	<p><b>[50]</b></p>	

## Assessment Objectives (AO) Grid

(includes quality of written communication )

Question	AO1	AO2	AO3	Total
1	4			4
2	2			2
3	2			2
4	2			2
5		3		3
6(a)		2		2
6(b)		2		2
7(a)		2		2
7(b)		1	2	3
8	3			3
9	1	1		2
10(a)		2		2
10(b)		1		1
11(a)		1		1
11(b)		1		1
12 	3	3		6
13 	3	3		6
14 	3	3		6
<b>Totals</b>	<b>23</b>	<b>25</b>	<b>2</b>	<b>50</b>

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