

Human Biology

Unit: F222: Growth, Development and Disease: High banded candidate style answer.

Introduction

OCR has produced these candidate style answers to support teachers in interpreting the assessment criteria for the new GCE specifications and to bridge the gap between new specification release and availability of exemplar candidate work.

This content has been produced by senior OCR examiners, with the input of Chairs of Examiners, to illustrate how the sample assessment questions might be answered and provide some commentary on what factors contribute to an overall grading. The candidate style answers are not written in a way that is intended to replicate student work but to demonstrate what a “good” or “excellent” response might include, supported by examiner commentary and conclusions.

As these responses have not been through full moderation and do not replicate student work, they have not been graded and are instead, banded “good” or “excellent” to give an indication of the level of each response.

Please note that this resource is provided for advice and guidance only and does not in any way constitute an indication of grade boundaries or endorsed answers.

1(a) This question is based on the advance notice material ‘<u>MISTLETOE AND MEDICINE</u>’ (Advance Notice 1)	
(a) Plants such as the mistletoe plant are valued as a source of medicines. Give <u>three</u> ways in which the structure and chemical composition of a plant cell, such as a cell from a mistletoe leaf, differs from an animal cell such as a phagocyte.	
[3]	
<i>Candidate style answer</i>	<i>Examiner’s commentary</i>
<i>Plant cells have the following structures which animal cells do not:</i> <ul style="list-style-type: none">• cellulose cell wall.• large central vacuole• chloroplasts	This candidate has made good use of bullet points and succinctly given three correct statements earning high marks.

(b) Plant extracts, such as Iscador from mistletoe plants, have been widely used as part of complementary or alternative medicine in the treatment of cancers.	
Give one example of complementary or alternative therapy other than plant extracts which can be used in cancer treatment.	
[1]	
<i>Candidate style answer</i>	<i>Examiner’s commentary</i>
<i>Chemotherapy / acupuncture</i>	This gains no marks. This is because the question asks for one treatment and the first answer provided by the candidate is chemotherapy which is incorrect in this context. In questions such as these it is important for candidates to only state one answer as the first answer will be assessed in

	each case.
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(c) You were told in the Advance Notice material that, in a report of the use of complementary or alternative medicine (CAM) by 453 cancer patients, 69% used at least one form of CAM treatment.

(i) Calculate the number of patients in this study who used at least one form of CAM treatment. Show your working.

[2]

<i>Candidate style answer</i>	<i>Examiner's commentary</i>
$\frac{69}{100} \times 453 = 312.57$ <p>Answer = 313 people patients</p>	Correct answer.

(ii) Suggest one reason why the results of trials on the success of CAM therapies may be unreliable.

[1]

<i>Candidate style answer</i>	<i>Examiner's commentary</i>
<i>It is not really a big enough sample to make it reliable data.</i>	This shows good evidence of HSW awareness.

(d) The advance notice material suggests that one possible role of lectins in fighting cancer is to stimulate the immune system by activating cells such as macrophages and lymphocytes.

(i) State precisely where and in what form macrophages originate.

[1]

<i>Candidate style answer</i>	<i>Examiner's commentary</i>
<i>Macrophages are made as monocytes which specialise into macrophages and are formed in the bone marrow</i>	Correct answer.

(ii) Complete the table which shows differences between macrophages and lymphocytes. The first row has been done for you.

[2]

<i>Candidate style answer</i>			<i>Examiner's commentary</i>
	macrophage	lymphocyte	Correct answer.
phagocytic	yes	no	
bean shaped nucleus	yes	no	
makes antibodies	no	yes	

(e) Explain how cancer develops and explain the role of lymphocytes in preventing cancer.

 **You should make clear in your answer the sequence of events leading to the development of cancer.**

[7]
[Total: 17]

<i>Candidate style answer</i>	<i>Examiner's commentary</i>
<p><i>Most cancers occur as a result of a mutation. If it is caused by a chemical it is called a carcinogen as well as a mutagen. The change in the DNA makes the proto-oncogenes become oncogenes and this makes the cells keep dividing by mitosis. Instead of stopping the cells keep making new cells which are also affected by the mutation and this makes a ball of cells which forms a tumour. This tumour can then break away from its original place and spread through the body to start cancers in other places. This is called metastasis and the person says they have secondary cancers. The job of the lymphocytes is to make antibodies These can then attack the antigens on the cancer cells and make the other cells in the immune system called phagocytes engulf them and break them down. The other lymphocytes which called T lymphocytes are important in making helper cells which help the B lymphocytes</i></p>	<p>This candidate has made an excellent attempt at answering each aspect of the question.</p> <p>There is good evidence of the cause of the development of a tumour.</p> <p>The candidate has also attempted the second half of the question and gives clear roles of the lymphocytes – gaining credit for high mark points.</p> <p>The candidate has provided an excellent answer. Gaining high marks.</p> <p>Candidates can be encouraged to write in bullet points and aim to provide at least the same number of bullet points as there are marks available.</p>

2 This question is based on the article 'IMMUNISATION IN SCHOOL' (Advance Notice 2).

(a) You were told in the article that polio is caused by a virus, and diphtheria and tetanus by bacteria.

State which micro organism causes the following diseases.

[2]

<i>Candidate style answer</i>	<i>Examiner's commentary</i>						
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">disease</th> <th style="text-align: center;">microorganism</th> </tr> </thead> <tbody> <tr> <td>tuberculosis (TB)</td> <td><i>M. tuberculosis</i></td> </tr> <tr> <td>rubella</td> <td><i>Rubella virus</i></td> </tr> </tbody> </table>	disease	microorganism	tuberculosis (TB)	<i>M. tuberculosis</i>	rubella	<i>Rubella virus</i>	<p>Correct answer.</p>
disease	microorganism						
tuberculosis (TB)	<i>M. tuberculosis</i>						
rubella	<i>Rubella virus</i>						

(b) Outline the meaning of the following terms used in the case study.	
(i) notifiable disease	[1]
<i>Candidate style answer</i>	<i>Examiner's commentary</i>
<i>It is law that any cases of this disease must be reported to the government</i>	Correct answer.

(ii) epidemic	
	[1]
<i>Candidate style answer</i>	<i>Examiner's commentary</i>
<i>This disease has suddenly become a lot more common</i>	Correct answer.

(iii) endemic	
	[1]
<i>Candidate style answer</i>	<i>Examiner's commentary</i>
<i>These diseases are always present such as HIV in Sub-Sahara Africa</i>	Correct answer.

(iv) live vaccine	
	[1]
<i>Candidate style answer</i>	<i>Examiner's commentary</i>
<i>The virus or bacteria is weakened and then put into the vaccine to make it safe</i>	Correct answer.

(c) Immunity can be active or passive and artificial or natural. In the following examples taken from the case study, identify the type of immunity achieved.		
		[3]
<i>Candidate style answer</i>		<i>Examiner's commentary</i>
example	type of immunity achieved	No marks can be awarded as the answers are incomplete.
receiving antibodies across the placenta	<i>passive</i>	
receiving an anti-tetanus anti-toxin injection	<i>passive</i>	
picking up the polio virus from contaminated water	<i>active</i>	

(d) In the article, Sarah explains what she means by herd immunity. In order to prevent transmission of measles occurring, it has been calculated that a herd immunity of 93 – 95% is required. Table 2.1 shows the percentage of the UK population aged 14 years and under who had received the measles vaccine by 1998 and 2003.

Table 2.1

year	population 14 years and under / million	number vaccinated / million	% vaccinated / million
1998	11.2	10.2	91
2003	10.9	8.7	80

(i) Calculate how many children aged 14 and under would need to have been vaccinated by 2003 to achieve a herd immunity of 93%.
Show your working.

[2]

Candidate style answer

Examiner's commentary

$$0.93 \times 10.9 = 10.137$$

Answer = 10.1

Correct answer.

(ii) Suggest a reason for the decline in the number of children vaccinated against measles

[1]

[Total: 13]

Candidate style answer

Examiner's commentary

Measles is no longer a real threat to children so some people chose not to give their children any medicines that are not essential.

This is a suitable answer for the AVP (alternative valid point) to be awarded. Questions of the 'suggest' type require plausible answers to be given but not necessarily facts that have been taught or learnt in rote fashion.

3 Coronary heart disease (CHD) is one of the most common causes of premature death in the United Kingdom. Evidence has shown that a high level of saturated fat in the diet increases the risk of CHD.

(a) Describe the events which occur in coronary arteries which can lead to the development of CHD.

[5]

Candidate style answer

Examiner's commentary

The high intake of saturated fat can lead to the formation of an atheromas on the wall of the coronary artery. This is caused by macrophages absorbing the fat and forming foam cells. As they do this it causes the lumen to reduce in size and so less blood can pass down the blood vessel. This means the cells past

This is an excellent answer with good use of terminology in most cases. However, some marks are not awarded as the candidate states the atheroma builds up 'on the wall' of the artery instead of 'in' the wall or endothelium of the artery. More marks could be awarded for this answer.

the atheromas get less oxygen. This can cause a heart attack.

Table 3.1 shows the number of deaths from CHD in four countries.

Table 3.1

country	deaths per 100 000
Ukraine	393.8
Romania	198.6
United Kingdom	150.4
Japan	35.7

b(i) Suggest why the figures in table 3.1 are quoted as *deaths per 100 000*.
question

[1]

Candidate style answer

Examiner's commentary

It means that different sized countries can be compared fairly

Correct answer.

(ii) Suggest with reasons two other types of data that could be collected in an epidemiological study on the possible causes of CHD in these countries.

One example has been done for you.

[4]

[Total: 10]

Candidate style answer

Examiner's commentary

Data	Quantity of dairy produce eaten in diet
Reason	Dairy products contain high levels of saturated fat and this increases the risk of CHD
Data	<i>Gender</i>
Reason	<i>Men are more at risk than women.</i>
Data	<i>Blood pressure</i>
Reason	<i>High blood pressure increases the risk of CHD.</i>

Excellent answer.

4 Fig 4.1 shows the mean weight (mass) in kilograms for boys and girls of different ages in 1994 and 2002 in the UK.

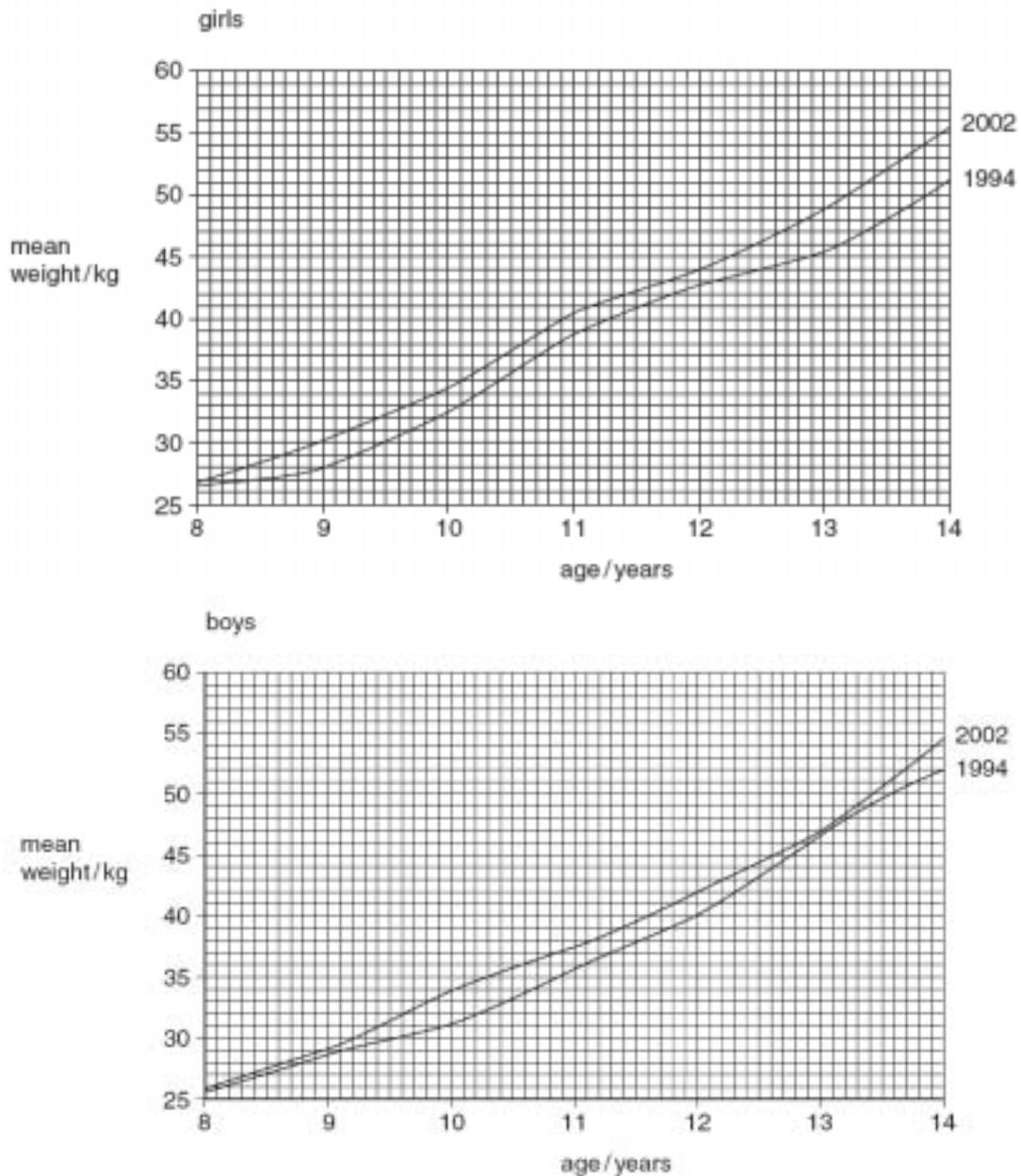


Fig 4.1

a(i) Identify two trends shown by the data for boys in Fig. 4.1.

[2]

Candidate style answer	Examiner's commentary
<p>1.. Boys in 1992 are lighter than those in 2002</p> <p>2.. Boys put on most weight when they are 13 or 14</p>	Correct trends noted.

(ii) Suggest why girls tend to weigh more than boys at the age of 12 years.

[3]

Candidate style answer	Examiner's commentary
Puberty is reached at different times by different individuals but generally girls get to puberty before boys do which	Excellent answer.

<p>means they put on more weight earlier. Their body has to get ready for becoming pregnant so it stores more fat especially around the hips and waist. Girls tend to do less active sports than boys and so do use as much energy as boys and the extra energy gets stored as fat.</p>	
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(iii) Suggest possible explanations for the changes seen in the mean weights of both boys and girls between 1994 and 2002. **[3]**

<i>Candidate style answer</i>	<i>Examiner's commentary</i>
<p>Children now eat a lot more fast food than they did in the past as people live busier lives More parents are working and children have quick ready meals which have more fat and salt in them. This means they put on more weight. Also they are driven everywhere rather than walking to school and in some towns 1 in every 3 children are obese.</p>	<p>Correct answer, score high marks.</p>

(b) Weight is also used to monitor infant growth rate
State one other way in which infant growth rate can be monitored. **[1]**

<i>Candidate style answer</i>	<i>Examiner's commentary</i>
<p>Height</p>	<p>A concise and accurate answer.</p>

(c) Describe how you would use weight measurements to calculate the relative growth rates of a child. **[3]**
[Total: 12]

<i>Candidate style answer</i>	<i>Examiner's commentary</i>
<p>The child should be weighed at the beginning of the year. They are then weighed again at the end of the year. The difference in the weight is then calculated and divided by the weight at the start of the year</p> $RGR = \frac{\text{change in weight}}{\text{weight at the start of the year}}$	<p>This is an excellent answer where the candidate explains clearly how to calculate the answer and also summarises it in a formula at the end. This is a good answering technique for any of the growth rates.</p>

5(a) Fig. 5.1 shows a diploid cell with two pairs of chromosomes.

Complete the diagram to show the possible combinations of these chromosomes in the four gametes produced by meiosis.

[4]

Candidate style answer

Examiner's commentary

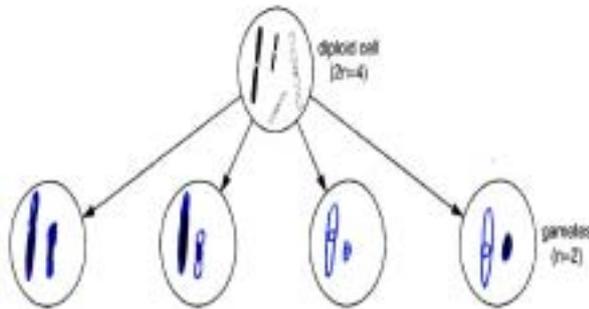


Fig. 5.1

This would score high marks.

(b) Explain how the process of meiosis can result in genetic variation.

[4]

Candidate style answer

Examiner's commentary

Meiosis is very important in increasing variation in individuals. Its main function is to produce haploid gametes. This then means that when 2 haploid gametes fuse during fertilisation the diploid number is returned to normal. If not then the diploid number would keep getting bigger. and bigger all the time. Also sometimes in meiosis the chromosomes overlap each other and crossing over happens which swaps DNA between chromosomes. This can also increase variation in gametes.

This is a standard AS question and as such, candidates should be able to list succinctly the areas in which variation is increased. This is a clear answer so further marks can be gained from discussing the importance of the alignment of the bivalents and independent assortment and independent segregation i.e. the use of more key terms.

(c) Four light micrographs of onion cells undergoing mitosis are shown in Fig. 5.2.

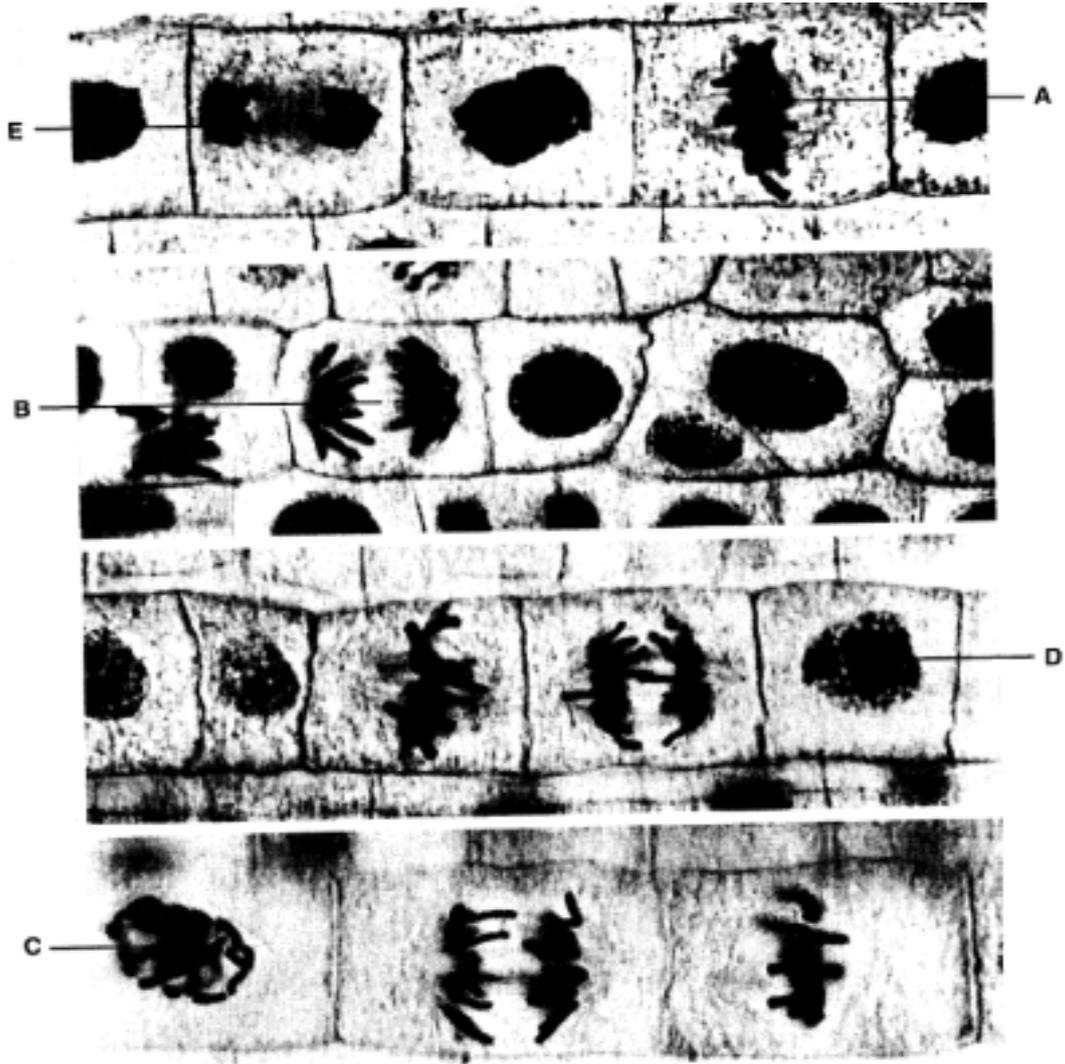


Fig. 5.2 © 2007 Manfred Kage/ Science Photo Library

Outline what happens to chromosomes during the mitotic cell cycle. You will gain credit if you refer to the labelled cells A – E in Fig 5.2.

 You should make clear in your answer how the steps are sequenced.

[10]

[Total: 17]

Candidate style answer	Examiner's commentary
<p><i>Prophase is the first stage of mitosis. This can be seen in cell C. The chromosomes are getting shorter and fatter which makes them more visible. Each chromosome consists of two sister chromatids joined by a centromere. The next stage is metaphase (as seen in cell A). In this stage the chromosomes line up in the middle of the cytoplasm. Spindle fibres start to form and attach to the centromere of each chromosome. This is important for the next stage of mitosis. The third stage is anaphase</i></p>	<p>This candidate would be awarded. Excellent answer. high marks.</p> <p>Candidates can be encouraged to use side headings to help organise their answer and then bullet point features of each stage underneath e.g.</p> <p>Prophase – as seen in cell C <i>The chromosomes get shorter and thicker. This makes them more visible under the light microscope.</i></p>

<p>(cell B). The spindle fibres are specialised protein molecules which shorten. As they get shorter they pull on the centromere and cause the chromatids to split. They get pulled to the poles in the shape of an arrow head i.e. the centromere leads the way The last stage of mitosis is telophase which is shown in cell E. At this point the nuclear membrane starts to reform and two nuclei form in cell E. Eventually the cell will split into two with one nucleus in each of the cells.</p>	<p>Each chromosome is made up of two chromatids. They are joined together by a centromere.</p>
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6 MRSA is a bacterium which can cause infections. There has been much publicity regarding the increased number of infections due to MRSA which occur in hospitals but data suggests that the number of cases may now be falling.
(a)(i) State what the initials MRSA stand for. **[1]**

<i>Candidate style answer</i>	<i>Examiner's commentary</i>
Methicillin Resistant Staphylococcus Aureus	Correct answer.

(ii) The following table compares some of the features of prokaryotic cells such as MRSA and eukaryotic cells such as a leucocyte.

Complete the table by placing a tick (✓) or a cross (x) in each box. The first one has been done for you. **[4]**

<i>Candidate style answer</i>	<i>Examiner's commentary</i>																		
<p>Complete the table by placing a tick (✓) or a cross (x) in each box. The first one has been done for you.</p> <table border="1" data-bbox="165 1442 766 1836"> <thead> <tr> <th></th> <th>prokaryotic cells</th> <th>eukaryotic animal cells</th> </tr> </thead> <tbody> <tr> <td>DNA present</td> <td>✓</td> <td>✓</td> </tr> <tr> <td>nuclear envelope (membrane) present</td> <td>X</td> <td>✓</td> </tr> <tr> <td>cell wall present</td> <td>✓</td> <td>X</td> </tr> <tr> <td>plasmids present in cytoplasm</td> <td>✓</td> <td>X</td> </tr> <tr> <td>naked DNA present</td> <td>✓</td> <td>X</td> </tr> </tbody> </table> <p style="text-align: right;">[4]</p>		prokaryotic cells	eukaryotic animal cells	DNA present	✓	✓	nuclear envelope (membrane) present	X	✓	cell wall present	✓	X	plasmids present in cytoplasm	✓	X	naked DNA present	✓	X	<p>The candidate has correctly completed the rows gaining high marks.</p>
	prokaryotic cells	eukaryotic animal cells																	
DNA present	✓	✓																	
nuclear envelope (membrane) present	X	✓																	
cell wall present	✓	X																	
plasmids present in cytoplasm	✓	X																	
naked DNA present	✓	X																	

(b) Outline <u>three</u> reasons which may explain the fall in the number of MRSA cases.	
[3]	
<i>Candidate style answer</i>	<i>Examiner's commentary</i>
<p>1 Hospitals are now much cleaner and more hygienic</p> <p>2 Those who have MRSA are isolated and their visitors are restricted</p> <p>3 More people in general are tested for MRSA to enable quicker treatment to be given</p>	<p>Some marks would be awarded for the first and last statements. The second answer does not indicate an <u>increase</u> in the number of people being isolated.</p>

(c) The presence of MRSA has been linked to the use of antibiotics. Explain how the use of antibiotics has led to the development of MRSA.	
[4]	
<i>Candidate style answer</i>	<i>Examiner's commentary</i>
<p>MRSA is a form of bacterium which has developed due to the over prescription of antibiotics. When a patient has a bacterial infection they are normally given antibiotics. If they have the <i>Staphylococcus aureus</i> bacteria then some of these may mutate and become resistant to that antibiotic. These bacteria can then survive and carry on breeding and reproducing in the patient. The new bacteria also have the resistance gene and so they also survive and the process continues.</p>	<p>This is a sound attempt at answering the question. The candidate would gain some marks. It should be noted that all points have been met, the candidate has used the term 'gene' where the term 'allele' is correct, hence full marks cannot be awarded.</p>

(d) The Millennium Seed Bank Project at Kew, near London, seeks to develop a global seed conservation network, capable of safeguarding wild plant species.	
<p>The project has focused its collecting priorities on the arid and semi-arid areas of the world. This is because nearly a fifth of the world's human population lives in such dry lands and is directly dependent upon the plants that grow there.</p> <p>Explain why the project has concentrated on the arid and semi-arid areas of the world and discuss the possible advantages for people living in these areas of maintaining such a seed bank.</p>	
[6]	
[Total: 18]	
<i>Candidate style answer</i>	<i>Examiner's commentary</i>
<p>The reason why they have concentrated on arid regions is because less plants grow there and as the environment changes with global warming then it is less likely that they will all survive as there are less plants in total which may be able to adapt and evolve to cope with the new conditions. The main purpose of</p>	<p>This candidate demonstrates good exam technique in answering both aspects of the question in different paragraphs. This allows them to focus on each aspect individually. If the candidate uses half the number of marks available as a guide, then tries to include at least one more point for each section they will ensure they have tackled both aspects fairly.</p>

<i>the seed bank is to act as a gene bank where the genes can be researched into and used in genetic engineering to hopefully produce new species. The advantages to the people in these areas is that they may be able to grow different crops or there may be the possibility of producing a plant of the same species which has a higher yield or some which are resistant to drought or disease</i>	In this case the candidate would gain some.
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7(a) State what is meant by the term <i>non-infectious disease</i>.	
[1]	
<i>Candidate style answer</i>	<i>Examiner's commentary</i>
<i>These disease are not caused by bacteria, viruses or protozoa</i>	Correct answer.

(b) Type 2 diabetes is also known as non-insulin dependent diabetes. The rise in the number of cases of Type 2 diabetes could be measured using the <u>incidence</u> of the disease or the <u>prevalence</u> of the disease. Explain what is meant by the terms <i>incidence</i> and <i>prevalence</i>.	
(i) incidence	
[2]	
<i>Candidate style answer</i>	<i>Examiner's commentary</i>
<i>The number of cases in a given population</i>	So full marks would not be awarded. The candidate has not stated that it is the number of <u>new</u> cases.

(ii) prevalence	
[2]	
<i>Candidate style answer</i>	<i>Examiner's commentary</i>
<i>The total number of cases in a given population</i>	Correct answer.

(c) Suggest, <u>with reasons</u>, which of the two methods of measuring the number of cases (incidence or prevalence) would be of most use in planning future health care provision for people with Type 2 diabetes.	
[3]	
<i>Candidate style answer</i>	<i>Examiner's commentary</i>
<i>Incidence This is because it allows you to see how many new cases have occurred. This then tells you how fast it is spreading and if the education programmes are working effectively. Then it also allows the medical services to prepare for the number of cases in the future depending on how contagious it is. It allows them</i>	So full marks would not be awarded. The candidate has failed to appreciate the angle of the question.

<i>to plan for the cost of treating the patients in the future.</i>	
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(d) State <u>two</u> differences between Type 1 and Type 2 diabetes,	
[2]	
<i>Candidate style answer</i>	<i>Examiner's commentary</i>
<p>1 <i>Type 2 diabetes occurs in later life whereas Type 1 is when you are born with it or develop it in early childhood</i></p> <p>2 <i>Type 2 can be kept under control by exercising and an adapted diet but Type 1 needs insulin injections</i></p>	<p>This answer would be supported for high marks. Further detail comparing the types of diet and lifestyle could have been included. Websites such as http://diabetes.niddk.nih.gov/dm/pubs/type1and2/index.htm can be used by students for independent research and revision activities such as web hunts.</p>

(e) The health of people with Type 2 diabetes is managed by a team of health professionals.	
Suggest the role of the dietician in the management of Type 2 diabetes.	
[3]	
[Total: 13]	
[Paper Total 100]	
<i>Candidate style answer</i>	<i>Examiner's commentary</i>
<p><i>A dietician will be able to give the diabetic advise on how to maintain a balanced diet. They should restrict the amount of saturated fat they eat, ensure they exercise regularly. It is also important that they eat slow release carbohydrates such as starches and not quick release sugary foods</i></p>	<p>High marks can be awarded for this answer.</p>

Overall Rating: High standard.

Overall Comments: This candidate has gained a mark typical of a high ability candidate. There are several examples of good exam technique in this paper such as Q1a, 1ci, 1e, 2di and 5c. This candidate should refer to the glossary of command words at the back of the specification to clarify certain command words such as 'describe' and 'explain'. The use of specific key terms will also help gain the last few extra marks.