OCR
RECOGNISING ACHIEVEMENT

SPECIMEN

Advanced Subsidiary GCE

HUMAN BIOLOGY

F222 QP

Unit F222: Growth, Development and Disease

Specimen Paper

Candidates answer on the question paper.

Additional Materials:

Ruler (cm/ mm)
Scientific calculator

Time: 1 hour 45 minutes

Candidate Name

Centre Number

Candidate Number

INSTRUCTIONS TO CANDIDATES

- Write your name, Centre number and Candidate number in the boxes above.
- Answer **all** the questions.
- Use blue or black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure you know what you have to do before starting your answer.
- Do **not** write in the bar code.
- Do **not** write outside the box bordering each page.
- WRITE YOUR ANSWER TO EACH QUESTION IN THE SPACE PROVIDED.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [] at the end of each question or part question.
- Where you see this icon you will be awarded marks for the quality of written communication in your answer.
- You may use a scientific calculator.
- You are advised to show all the steps in any calculations.
- The total number of marks for this paper is **100**.

FOR EXAMINER'S USE		
Qu.	**Max.**	**Mark**
1	**17**	
2	**12**	
3	**10**	
4	**12**	
5	**18**	
6	**18**	
7	**13**	
TOTAL	**100**	

This document consists of **16** printed pages and an insert.

Answer **all** the questions.

1 This question is based on the advance notice material '**MISTLETOE AND MEDICINE' (Advance Notice 1).**

(a) Plants such as the mistletoe plant are valued as a source of medicines.

Give **three** 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.

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..... **[3]**

(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]**

(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.

Answer =..... patients **[2]**

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

..... **[1]**

(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]**

(ii) Complete the table which shows differences between macrophages and lymphocytes.

The first row has been done for you.

	macrophage	lymphocyte
phagocytic	yes	no
bean shaped nucleus		
makes antibodies		

[2]

(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.

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..... **[7]**

[Total: 17]

[Turn Over

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 microorganism causes the following diseases.

disease	**microorganism**
tuberculosis (TB)	
rubella	

[2]

(b) Outline the meaning of the following terms used in the case study.

(i) *notifiable disease*

.....**[1]**

(ii) *epidemic*

.....**[1]**

(iii) *endemic*

.....**[1]**

(iv) *live vaccine*

.....**[1]**

(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.

example	type of immunity achieved
receiving antibodies across the placenta	
receiving an anti-tetanus anti-toxin injection	
picking up the polio virus from contaminated water	

[3]

(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.

Answer =..... **[2]**

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

..... **[1]**

[Total: 13]

[Turn Over

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.

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..... **[5]**

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*.

..... **[1]**

(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.

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	
Reason	
Data	
Reason	

[4]

[Total: 10]

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.

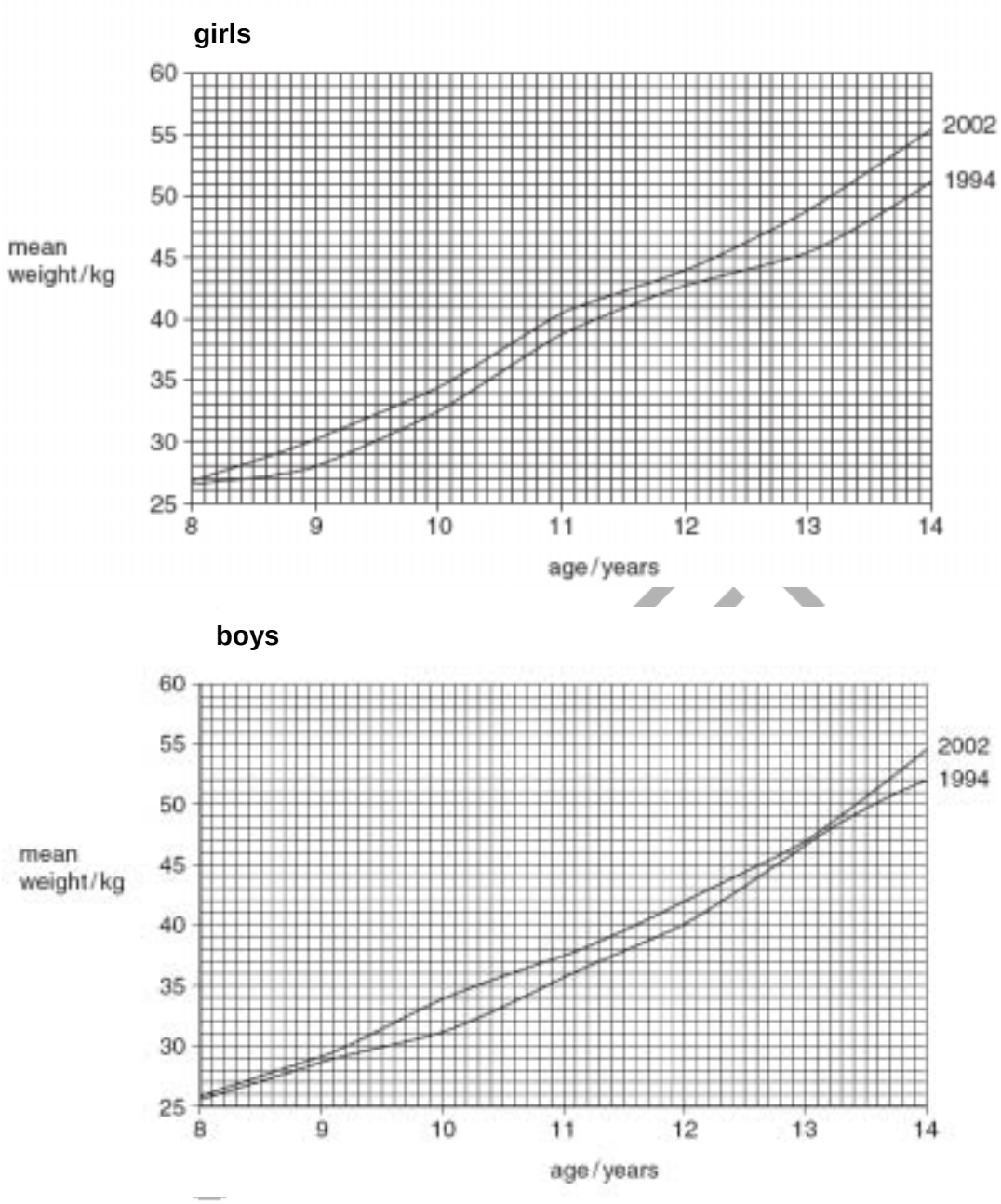

Fig 4.1

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

1.....

2..... **[2]**

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

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..... **[3]**

(iii) Suggest possible explanations for the changes seen in the mean weights of both boys **and** girls between 1994 and 2002.

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..... **[3]**

(b) Weight is also used to monitor **infant** growth rate.

State **one other** way in which infant growth rate can be monitored.

..... **[1]**

(c) Describe how you would use weight measurements to calculate the relative growth rates of a child.

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..... **[3]**

[Total: 12]

5 **(a)** Fig. 5.1 shows a diploid cell with 2 pairs of chromosomes.

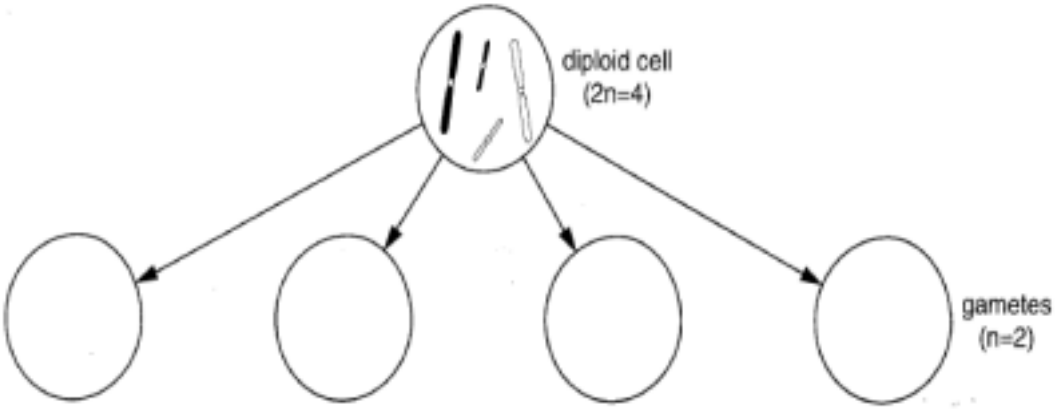

Fig. 5.1

Compete the diagram to show the possible combinations of these chromosomes in the four gametes produced by meiosis. **[4]**

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

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..... **[4]**

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

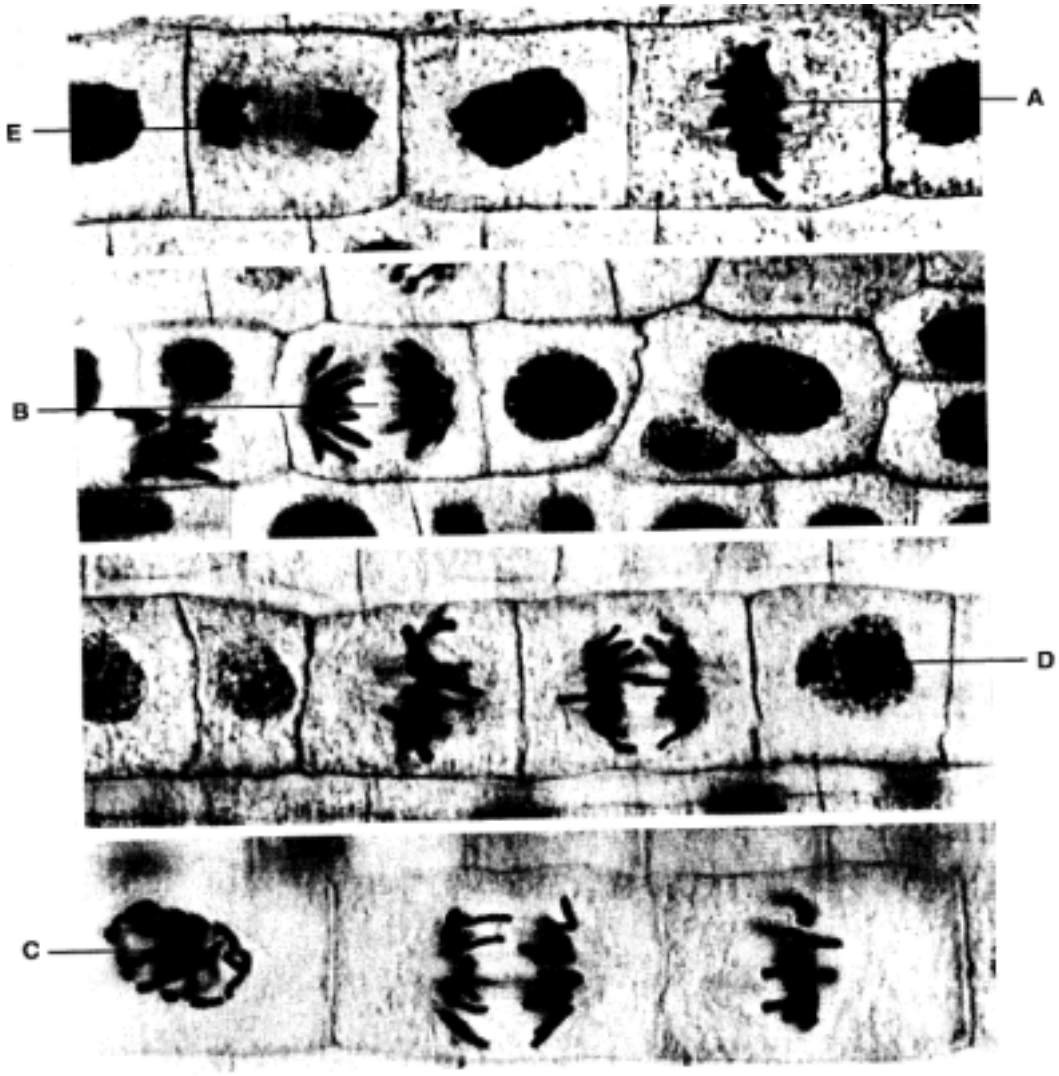

Fig. 5.2 © 2007 Manfred Kage/ Science Photo Library

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.

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..... **[10]**

[Total: 17]

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]**

(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.

	prokaryotic cells	eukaryotic **animal** cells
DNA present	✓	✓
nuclear envelope (membrane) present		
cell wall present		
plasmids present in cytoplasm		
naked DNA present		

[4]

(b) Outline **three** reasons which may explain the fall in the number of MRSA cases.

1 .....

2 .....

3 .....**[3]**

(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.

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.....**[4]**

(d) The Millennium Seed Bank Project at Kew, near London, seeks to develop a global seed conservation network, capable of safeguarding wild plant species.

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.

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.

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..... **[6]**

[Total: 18]

7 **(a)** State what is meant by the term *non-infectious disease.*

.....**[1]**

(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 **incidence** of the disease or the **prevalence** of the disease.

Explain what is meant by the terms *incidence* and *prevalence*.

(i) *incidence*

.....

.....**[2]**

(ii) *prevalence*

.....

.....**[2]**

(c) Suggest, **with reasons**, 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.

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.....**[3]**

(d) State **two** differences between Type 1 and Type 2 diabetes,

1. .....

2. .....

3. .....**[2]**

(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]

Copyright Acknowledgements:

Sources

Figure 5.2: © 2007 Manfred Kage/ Science Photo Library

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

Advanced Subsidiary GCE

HUMAN BIOLOGY F222 MS

Unit F222: Growth, Development and Disease

Specimen Mark Scheme

The maximum mark for this paper is 100.

This document consists of **11** printed pages and **2** blank page.

<table>
<tr><th>Question Number</th><th>Answer</th><th>Max Mark</th></tr>
<tr><td>1(a)</td><td>(mistletoe has)cellulose, cell wall;
large / permanent vacuole;
chloroplasts / chlorophyll;
(contain) starch;
AVP; e.g. no centrioles / plasmodesmata
AVP; at least one reference to a biochemical component must be made.</td><td>[3]</td></tr>
<tr><td>(b)</td><td>acupuncture;
hypnotherapy;
AVP;

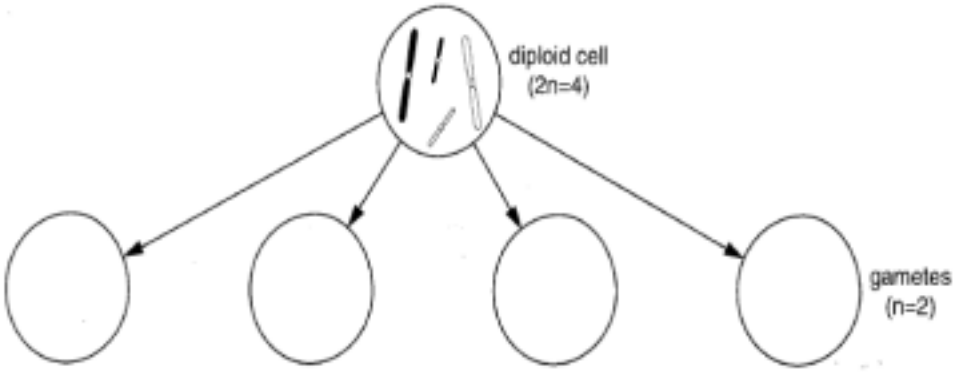
R diet unless qualified
R homeopathy</td><td>[1]</td></tr>
<tr><td>(c)(i)</td><td>313;;

correct answer = 2 marks
correct working, but wrong answer = 1 max</td><td>[2]</td></tr>
<tr><td>(ii)</td><td>sample size too small / AW;
controls not done / AW;
methods not standard / AW;
AVP; e.g. anecdotal evidence</td><td>[1]</td></tr>
<tr><td>(d)(i)</td><td>(from) bone marrow (as) monocytes;</td><td>[1]</td></tr>
<tr><td>(ii)</td><td><table><tr><td>macrophage</td><td>lymphocyte</td></tr><tr><td>yes</td><td>no;</td></tr><tr><td>no</td><td>yes;</td></tr></table></td><td>[2]</td></tr>
</table>

Question Number	Answer	Max Mark
1(e)	proto-oncogenes, become oncogenes**;** (due to) mutation**;** ref to repressor gene**;** (leading to) uncontrolled cell division**;** (resulting in formation of) tumour / mass of cells**;** (cells show) lack of differentiation**;** metastases / metastasis**;** A *description* AVP**;** e.g. ref mitosis / (named) carcinogen *Look for clear sequencing/link terms .* ref to cytotoxic / killer T cells / lymphocytes**;** recognition / described, of (mutated) cell receptors / antigens**;** ref clonal selection / expansion**;** detail of mechanism for cell destruction**;** ref T helper cells**;** role / cytokine release**;** *Look for a role assigned to a lymphocyte.* ref role of B cells / antibody production**;** role of antibody / opsonin / described**;** AVP**;** e.g. ref to role of phagocytes	**[7]**
	Total	**[17]**
2(a)	*Mycobacterium tuberculosis / M. tuberculosis / M. bovis**;*** **R** (TB) bacteria (rubella) virus**;**	**[3]**
(b)(i)	diseases which must (by law) be reported, to (governmental) authorities / AW**;**	**[1]**
(ii)	sudden increase in the incidence of a disease / AW**;** **R** outbreak unless qualified	**[1]**
(iii)	(infectious disease) is always present in the prevalence pool / population / sporadic occurrence / AW**;**	**[1]**
(iv)	attenuated / AW strain of the organism / AW**;** organism capable of reproducing (in host)**;** **R** 'a small dose'	**[1]**

Question Number	Answer	Max Mark
(c)	<table><tr><td></td><td>natural passive;</td></tr><tr><td></td><td>artificial passive;</td></tr><tr><td></td><td>natural active;</td></tr></table>	**[3]**
(d)(i)	10.1;; **A** *10.137* *correct answer = 2 marks* *correct working, but wrong answer = 1 max*	**[2]**
(ii)	introduction of MMR / triple vaccine; adverse publicity; concern about side affects / AW; AVP; e.g. thinking that measles is no longer a risk	**[1]**
	Total	**[13]**
3(a)	build up of atheroma / described; in wall (of coronary artery); **R** coronary alone (due to) activity of, macrophages; re(which form) foam cells; (in response to) damage to endothelium; blood flow restricted; to cardiac muscle; ref reduced oxygen supply (to cardiac muscle); ref angina / described; ref MI / described; AVP; *Do not credit phase alone – look for use of the phrase (suggestions in brackets).*	**[5]**
(b)(i)	for comparison / countries are different sizes / AW;	**[1]**
(ii)	gender; CHD more common in males / AW; number of cigarettes smoked; smoking increases risk of CHD; blood pressure; high blood increases risk of CHD; AVP; one factor and one explanation	**[4]**
	Total	**[10]**

4(a)(i)	boys weight increases with age / comparative figs in support**;** mean weight has increase with age / comparative figs in support**;** boys greatest weight increase occurs between ages of 12-14 years / comparative figs in support**;** AVP**;** e.g. other correct interpretation / comparative figures in support	**[2]**
(ii)	girls have an earlier growth spurt**;** ora for boys girls enter puberty earlier**;** correct ref to action of hormones on growth**;** girls increased fat reserves / named body part gets bigger in girls**;** girls may do less exercise than boys**;**	**[3]**
(iii)	children eating more**;** (so)more, fat / carbohydrate / protein, in diet**;** (such as in)take away meals / fast food**;** so more overweight / obese**;** less exercise / more sedentary lifestyles / taken to school by car / decreased PAL**;** (so) less energy used / more energy stored**;** AVP**;** e.g. supermarkets / advertisements, encouraging children to buy sweets / crisps / parental anxiety about playing outside etc Look for linkage of ideas	**[3]**
(b)	height / from back of heels to top of head / length / head circumference**;**	**[1]**
(c)	measure at start and end of a time interval**;** calculate, difference / increase in weight**;** divide by weight at start**;** stating correct units**;** AVP**;**	**[3]**
	Total	**[12]**

Question Number	Answer	Max Mark
5(a)	 2 chromosomes per nucleus**;** 1 large and 1 small chromosome**;** large black with small black / large white with small white**;** large black with small white / large large white with small white**;**	**[4]**
(b)	crossing over**;** **(between) paternal and maternal chromatids / AW;** at prophase 1**;** independent segregation**;** at anaphase 1**;** (and) anaphase 2**;** (meiosis produces) haploid / AW, gametes**;** (fertilisation requires) two (haploid) gametes**;**	**[4]**
5(c)	*award marking points 1, 6, 9, 14 and 16 only if descriptions of the stages are correct – do not award simply for identifying the stages – ignore ref to centrioles* prophase 1 C**;** 2 chromosomes / chromatids, condense / coil / shorten <u>and</u> thicken**;** 3 become visible**;** 4 consist of two <u>chromatids</u>**;** 5 joined by a centromere**; A** *kinetochore* **NOT** *centrosome* metaphase 6 A**;** 7 chromosomes align at, equator / metaphase plate**;** 8 attached to spindle by centromeres**;**	

Question Number	Answer	Max Mark
5(c) cont'd	anaphase 9 B**;** 10 centromere splits**;** 11 chromatids separate**;** 12 move to opposite poles**;** 13 by, contraction / shortening, of spindle**;** telophase 14 E**;** 15 chromosomes uncoil l**;** interphase 16 D**; A** for a description of early prophase 17 <u>DNA</u> replication**;** 18 transcription / formation of mRNA**;** 19 AVP**;** *these must relate to behaviour of chromosomes* 20 AVP**;** e.g. spindle made of microtubules chromatin becomes chromosomes (in prophase) ora in interphase centromere leads chromatid to pole gene switching during interphase	**[10]**
	Total	**[17]**
6(a)(i)	Methicillin *(***A** multi / multiple*)* resistant *Staphylococcus aureus;*	**[1]**
(ii)	✗ ✓ ; ✓ ✗ ; ✓ ✗ ; ✓ ✗ ;	**[4]**
(b)	(improved) sterilisation of surgical instruments**;** **R** 'use clean needles' Introduction (sterile) air conditioning**;** improved (post-operative) hygiene / cleanliness of rooms**;** improved personal hygiene / AW**;** increased use of sterile bedding**;** ref. to over-use of antibiotics**;** increased screening / testing, for MRSA carriers**;** more isolation / dedicated rooms/wards**;** more effective barrier nursing / AW**;**	

Question Number	Answer	Max Mark
(b) cont'd	AVP**;** *(e.g. further detail of above points)* look for idea of change in the above before awarding mark.	**[3]**
(c)	(some *S.aureus*) more resistant (to antibiotic)**;** (due to a) gene / allele**;** (which may) mutate**;** to mutation**;** (use of antibiotics acts as a) selection pressure**;** resistant bacteria, survive**;** (and have less)competition / out compete / **;** (resistance allele) passed on / AW**;** (on) plasmids**;** AVP**;** e.g. horizontal transfer via plasmids	**[4]**
(d)	people in these areas have a subsistence economy**;** heavy reliance on a small number of plant species able to survive in arid conditions**;** risk of these plants being unable to adapt (to changing conditions)**;** disease / global warming / changing environment**;** seed bank is a gene bank / store of genes of wild plants**;** these plants could be used to breed with crop plants**;** to produce new varieties able to adapt (to changing conditions) / produce better yields (in arid conditions)**;** (max 6)	**[6]**
	Total	**[18]**

Question Number	Answer	Max Mark
7(a)	(disease) not caused by a pathogen / AW**;**	**[1]**
(b)(i)	number of <u>new</u> cases**;** in a population / AW**;**	**[2]**
(ii)	number of existing cases**;** in a population**;**	**[2]**
(c)	*No mark for suggestion* *(prevalence)* long tem condition**;** <u>chronic**;**</u> *(incidence)* ref to cost of health care**;** ref to rising numbers due to obesity**;** AVP**;**	**[3]**
(d)	*look for comparative statements* (Type 1) juvenile onset / Type 2 mature onset**;** Type 1 insulin dependent / Type 2 non–insulin dependent**;** AVP**;**	**[2]**
(e)	(advice on) <u>balanced</u> diet**;** reduced energy intake **;** reduce intake of fat**;** ref to NACNE advice**;** AVP**;** **AVP;** e.g. promote positive attitude	**[3]**
	Total	**[13]**
	Paper Total	**[100]**

Assessment Objectives Grid (includes QWC)

Question	AO1	AO2	AO3	Total
1(a)	2	1		**3**
1(b)	1			**1**
1(c)(i)			2	**2**
1(c)(ii)			1	**1**
1(d)(i)	1			**1**
1(d)(ii)	2			**2**
1(e)	3	4		**7**
2(a)	2			**2**
2(b)	3	1		**4**
2(c)	1	2		**3**
2(d)(i)			2	**2**
2(d)(ii)		1		**1**
3(a)	3	2		**5**
3(b)(i)			1	**1**
3(b)(ii)		4		**4**
4(a)(i)			2	**2**
4(a)(ii)	1	2		**3**
4(a)(iii)		3		**3**
4(b)	1			**1**
4(c)		1	2	**3**
5(a)	2	2		**4**
5(b)	4			**4**
5(c)	4	6		**10**
6(a)(i)	1			**1**
6(a)(ii)	2	2		**4**
6(b)		3		**3**
6(c)	4			**4**
6(d)		6		**6**
7(a)	1			**1**
7(b)	4			**4**
7(c)		3		**3**
7(d)	2			**2**
7(e)		3		**3**
Totals	**44**	**46**	**10**	**100**

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