



Pymble Ladies' College

**2020 HIGHER SCHOOL CERTIFICATE
TRIAL EXAMINATION**

BIOLOGY

General Instructions

- Reading time – 5 minutes
- Working time – 3 hours
- Write using black pen
- Draw diagrams using pencil
- Board-approved calculators may be used

Total marks – 100

This paper has two parts, Part A and Part B

Part A – 20 marks

- Attempt Questions 1–20
- Allow about 40 minutes for this part

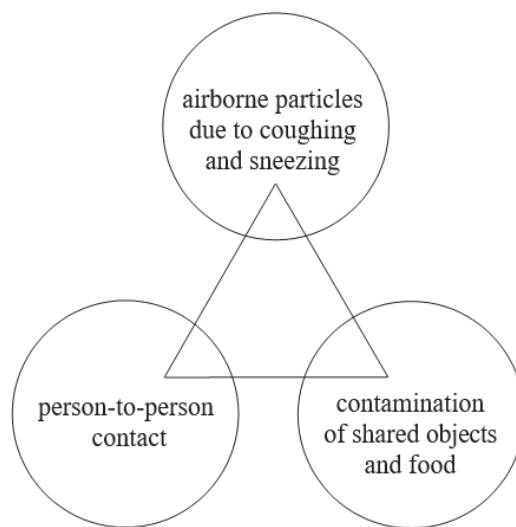
Part B – 80 marks

- Attempt Questions 21–32
- Allow about 2 hours and 20 minutes for this part

Part A – 20 marks**Attempt Questions 1–20****Allow about 40 minutes for this part**

Use the multiple-choice answer sheet for Questions 1–20 found on the back page (please remove)

1. The diagram shows how influenza (the flu) is transmitted.



Based on this diagram, which of the following situations would LEAST likely result in the transmission of the flu virus from one person to another?

- (A) A fly landing on an infected person, then landing on an uninfected person.
- (B) Drinking from an unwashed cup previously used by an infected person.
- (C) Being in the same room with someone showing flu symptoms.
- (D) Eating food prepared by an infected person.

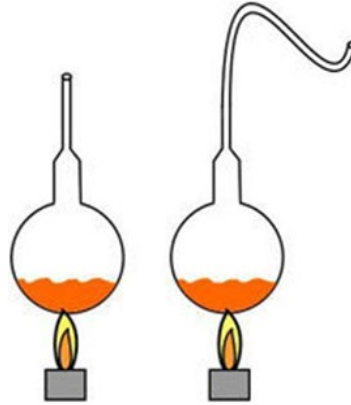
2. Which row of the table is correct for non-cellular pathogens?

	<i>Living</i>	<i>Can replicate outside host cell</i>	<i>Can infect many types of organisms</i>	<i>Example</i>
(A)	Yes	No	Yes	Prion
(B)	No	Yes	No	Bacterium
(C)	No	No	Yes	Virus
(D)	Yes	Yes	No	Protozoa

3. Which of the following is evidence that a plant has an infectious disease?

- (A) Nodules containing nitrogen fixing bacteria found on the roots of a plant.
- (B) Plant is dark green and stunted due to phosphorus deficiency.
- (C) The presence of fungal hyphae growing out of stomata.
- (D) Wilting of stem and drying out of root hairs.

4. Louis Pasteur designed a procedure to test whether sterile nutrient broth could spontaneously generate microbial life. To do this, he set up two experiments. In both, Pasteur added nutrient broth to flasks, bent the necks of the flasks into S shapes, and then boiled the broth. He broke one of the swan necks off and observed the flasks after several days.



Why did Pasteur use a swan-necked flask in his investigation?

- (A) A swan-necked flask allowed him to easily observe his results.
- (B) The curved neck caught the microbes in air that entered the flask and prevented them from contaminating the broth.
- (C) The glass was easy to sterilise using heat ensuring better microbial growth.
- (D) The curved neck ensured that the broth would condense there on boiling maximising exposure.

5. Outbreak of Newcastle disease in commercial poultry flocks, NSW.

Communicable Diseases Intelligence Volume 22, No 10

An outbreak of Newcastle disease (ND) occurred, involving two commercial poultry flocks in western Sydney and was linked to a third flock 160 km north-west of Sydney.

ND is a highly contagious viral disease affecting poultry, cage and aviary birds, and wild birds. There are a number of strains of the disease, which differ in the severity of their clinical signs, ranging from inapparent to a rapidly fatal condition. In its highly virulent form, ND can rapidly cause up to 100 per cent mortality in bird flocks and poses a devastating threat to the poultry industry. Strains are found in most countries, but the virulent form had not previously occurred in Australia.

The virus belongs to the family Paramyxoviridae and causes digestive, respiratory and/or nervous signs in birds.

ND does not present any public health risk to consumers of poultry products, including poultry meat, eggs and other chicken products. People exposed to high levels of the virus, for example laboratory workers, may experience conjunctivitis and/or mild influenza-like symptoms.

Which option provides the most effective control measures that could be applied to prevent the spread to other farms and native birds?

- (A) Destruction of all poultry and restocking with unaffected birds.
- (B) Vaccination of the poultry farmers and laboratory workers and surveillance of the affected birds.
- (C) Quarantine of the poultry farmers and laboratory workers and disinfection of the affected properties.
- (D) Quarantine, destruction of poultry and disinfection of the affected properties.

6. There are changes which take place during temperature regulation in mammals. Which of the following columns correctly identifies the mechanisms used in response to a decrease in body temperature?

Mechanism for temperature regulation	(A)	(B)	(C)	(D)
Vasodilation	✓			✓
Vasoconstriction		✓	✓	
Contraction of hair erector muscles	✓	✓	✓	
Relaxation of hair erector muscles				✓
Sweating	✓	✓		
Shivering			✓	✓

7. One of the main aims of diabetes treatment is to keep blood glucose levels within a specified target range. What is the correct response to the stimulus?

	Stimulus	Response	Hormone involved
(A)	Blood sugar level rises	Liver releases glucose	Insulin
(B)	Blood sugar level rises	Liver releases glucose	Glucagon
(C)	Blood sugar level falls	Body cells take up more glucose	Glucagon
(D)	Blood sugar level falls	Liver releases glucose	Glucagon

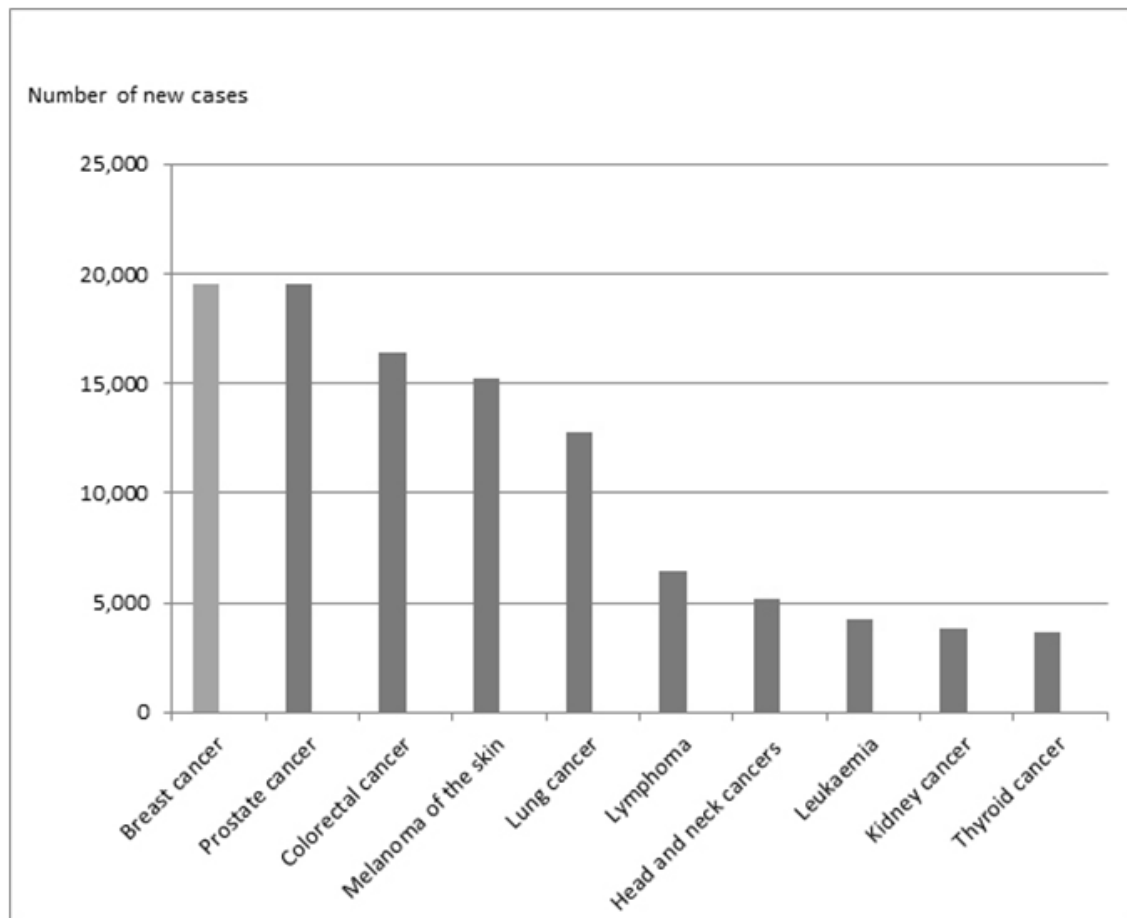
8. When seeking to establish the cause of a particular non-infectious disease, which of the following must epidemiologists first consider?
- (A) Mortality rates, if the disease is not diagnosed and addressed with appropriate treatment
 - (B) The preventative and control measures to be implemented as part of the intervention
 - (C) Evidence that exposure to a pathogen, virus or prion has not occurred before the disease appeared
 - (D) The correlation between exposure to the suspected cause and the prevalence of the disease

9. Neurofibromatosis is a disorder that causes tumours to grow on nerves throughout the body. It affects one in 3000 people. The tumours are usually non-cancerous. A person who is affected has a 50% chance of passing the disease onto their offspring.

Which of the following terms best classifies this disease?

- (A) Infectious
- (B) Non-infectious
- (C) Environmental
- (D) Deficiency-related

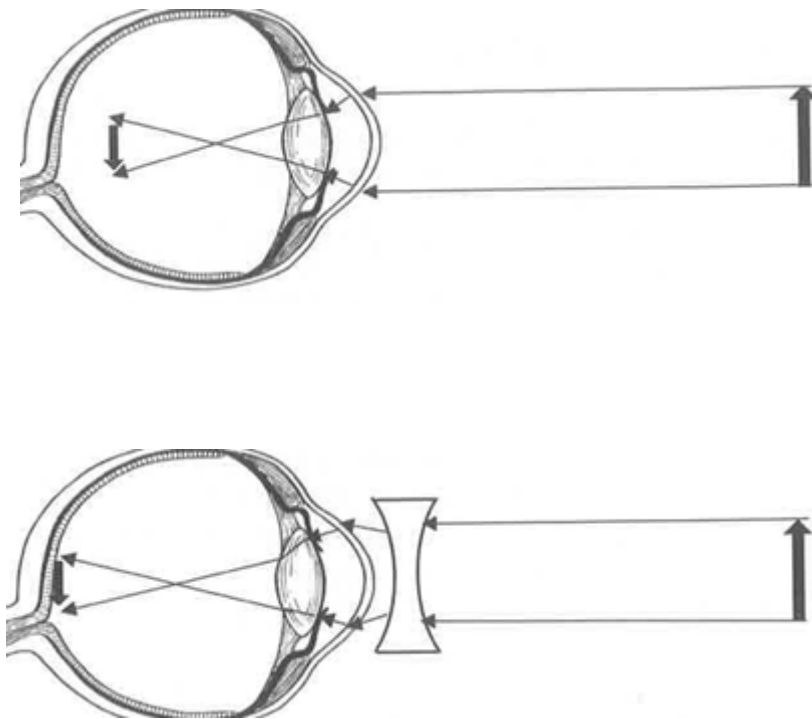
10. The graph below is of the most common cancers diagnosed in Australia in 2019.



What does this data represent?

- (A) The incidence of the diseases
- (B) The morbidity rates
- (C) The mortality rates
- (D) The prevalence of the diseases

11. The diagrams below represent a visual disorder and a technology used to treat it.



Which of the phrases below accurately completes the following sentence?

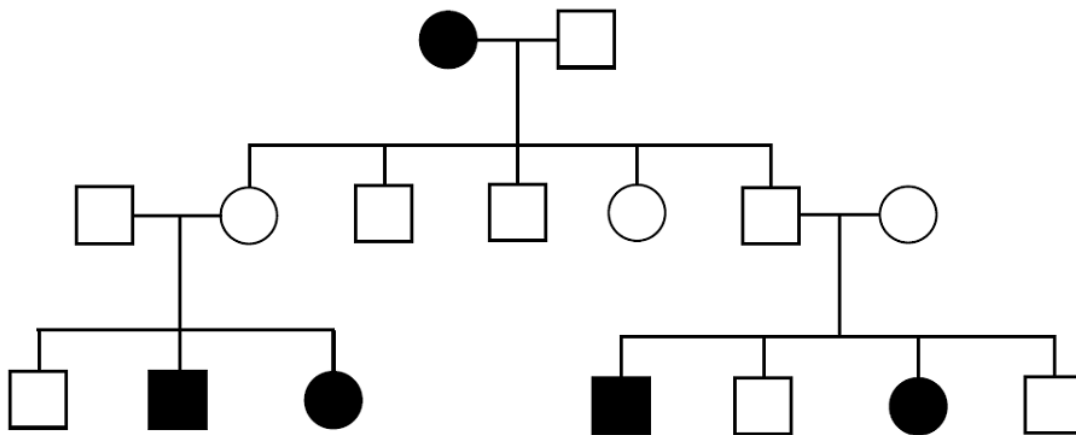
A person with the disorder that is shown in the diagram above:

- (A) has blurred vision because the lens is clouded.
- (B) has vision loss due to degeneration of cells beneath the retina.
- (C) can see near objects clearly, but distant objects appear blurred.
- (D) can see distant objects clearly, but near objects appear blurred.

12. A section of DNA has been sequenced and analysed and found to have 40 cytosine bases and 50 thymine bases. What is the total number of deoxyribose sugar molecules in this sample of DNA?

- (A) 50
- (B) 40
- (C) 90
- (D) 180

13. The pedigree below shows the inheritance of disease in a family.



What is the mode of inheritance shown in this pedigree?

- (A) Autosomal dominant
- (B) Autosomal recessive
- (C) X-linked dominant
- (D) X-linked recessive

14. Which of the following best describes a mutagen?

- (A) A mutagen is a strand of DNA that contains a mutation.
- (B) A mutagen is a peptide chain with an incorrect amino acid.
- (C) A mutagen is a tRNA molecule that has misread an mRNA strand.
- (D) A mutagen is anything that causes a mutation.

15. Chromosomal mutations occur during meiosis, a process that produces gametes (eggs and sperm) within human bodies. These mutations occur when there is an uneven split of chromosomes (non-disjunction) into each gamete. The following table shows six of the most common syndromes associated with chromosomal mutations.

Syndrome Name	Chromosome Affected	Type of mutation
Polyploidy	Extra complete set of chromosomes	Addition
Patau Syndrome	13	Addition
Edwards Syndrome	18	Addition
Down Syndrome	21	Addition
Klinefelter Syndrome	23	Addition
Turner Syndrome	23	Deletion

Which of the following is correct?

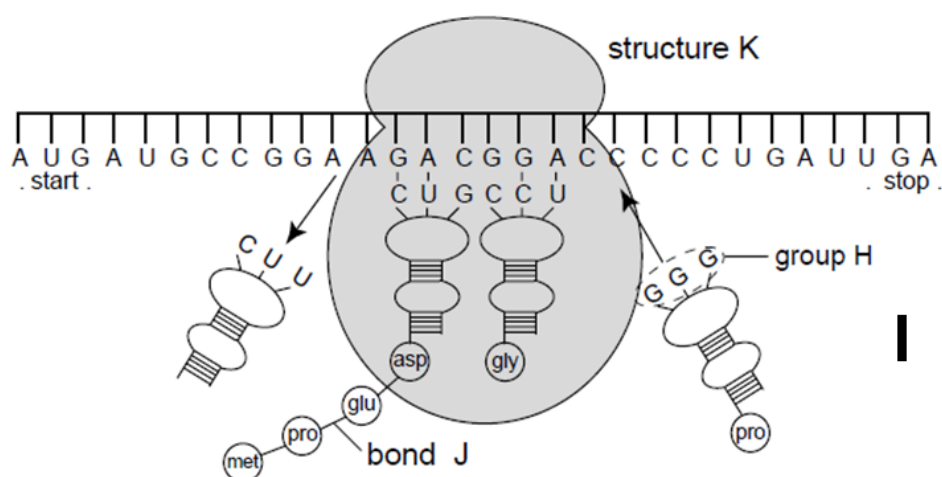
	Syndrome	Number of Chromosomes in genome	Autosomal or sex chromosome affected
(A)	Down	47	Autosomal Chromosome
(B)	Edwards	36	Autosomal Chromosome
(C)	Klinefelter	23	Sex Chromosome
(D)	Patau	47	Sex Chromosome

16. Ovulation is controlled by hormones. Infertility can be treated by increasing the chance that ovulation will occur.

Which hormone stimulates the maturation of follicles in the ovary?

- (A) Follicle Stimulating Hormone (FSH)
- (B) Luteinizing Hormone (LH)
- (C) Oestrogen
- (D) Progesterone

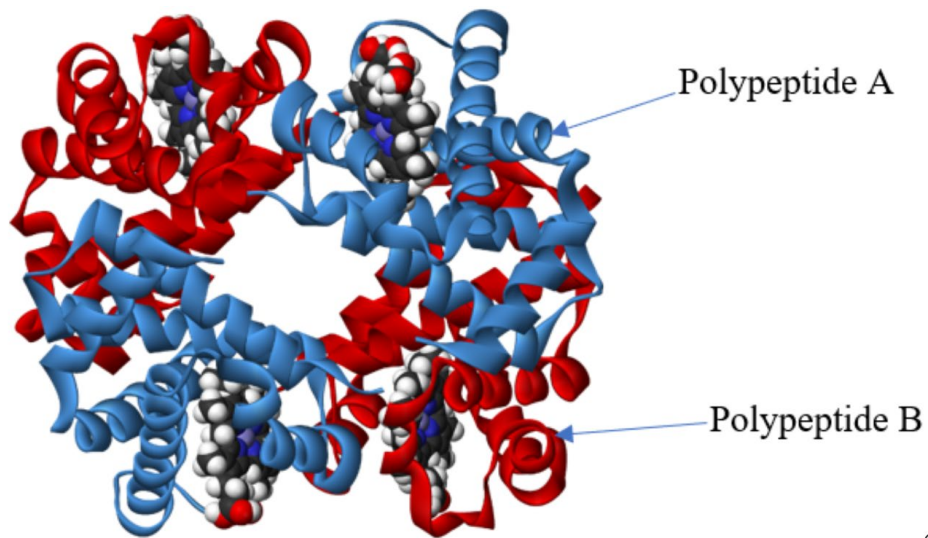
17. The diagram below shows a biological process involved in protein synthesis.



Identify the process, structure K and group H.

	Process	Structure K	Group H
(A)	Transcription	Chromosome	Anticodon
(B)	Translation	Ribosome	Anticodon
(C)	Transcription	Chromosome	Codon
(D)	Translation	Ribosome	Codon

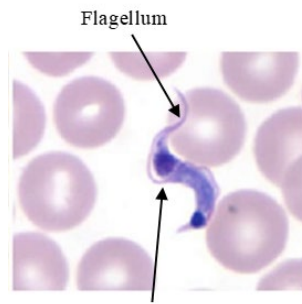
18. The diagram below represents a molecule of the protein haemoglobin which is made up of 4 polypeptides.



Which level of protein structure is represented by this model?

- (A) Primary
- (B) Secondary
- (C) Tertiary
- (D) Quaternary

19. Chagas disease is caused by *Trypanosoma cruzi*, shown in Figure 1.



Trypanosoma cruzi

Figure 1



Figure 2

Trypanosoma cruzi have flattened bodies and are transmitted by “kissing bugs” (Figure 2), from one human to another. Trypanosoma are protozoans and live in the blood stream in humans and reproduce there by splitting into two.

Which of the following would be a reasonable conclusion about an adaptation that aids transmission and survival of this protozoa

- (A) *Trypanosoma cruzi* has a thick cell wall to resist attack by macrophages.
- (B) *Trypanosoma cruzi* is likely to be attached to the walls of blood vessels.
- (C) *Trypanosoma cruzi* has a flagellum for locomotion within the blood.
- (D) *Trypanosoma cruzi*’s flat body aids in it’s transmission between kissing bugs and humans.

20. Bacteria reproduce by binary fission.

Which row of the table correctly assesses binary fission in relation to survival of the species?

	Advantage	Disadvantage
(A)	A large number of bacterial cells can be produced in a short time span.	The cells produced by binary fission are genetically identical, resulting in a lack of diversity.
(B)	Only a small amount of energy is required to produce offspring.	Cells undergo sexual reproduction to increase genetic variation.
(C)	Strains of bacteria are resistant to superbugs.	Binary fission can only occur in eukaryotic cells.
(D)	Only two cells are needed for offspring to be produced.	The two cells produced are genetically identical.

Part B – 80 marks**Attempt Questions 21–32****Allow about 2 hours and 20 minutes for this part**

Answer the questions in the spaces provided. These spaces provide guidance for the expected length of response.

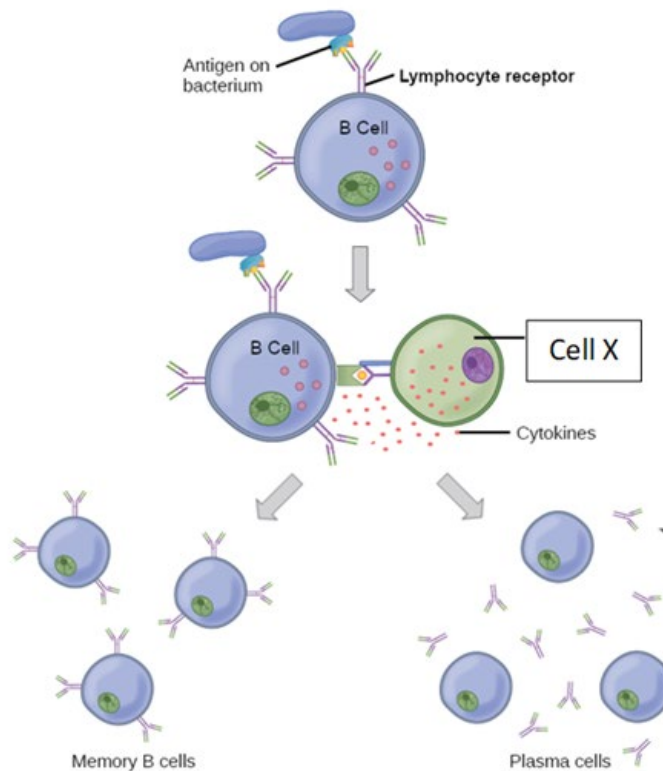
Question 21 [9 marks]

Pertussis (whooping cough) is a bacterial infection caused by *Bordetella pertussis*.

It spreads when an infected person coughs or sneezes and you breathe it in. The bacteria affect the lungs and airways, causing a person to cough violently and uncontrollably.

This can make it hard for the infected person to breathe. A vaccine is given to infants at eight-weeks of age.

The diagram below shows an immune response to a *Bordetella pertussis* infection.



a) Identify Cell X.

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b) Describe the role of plasma cells as shown in the diagram.

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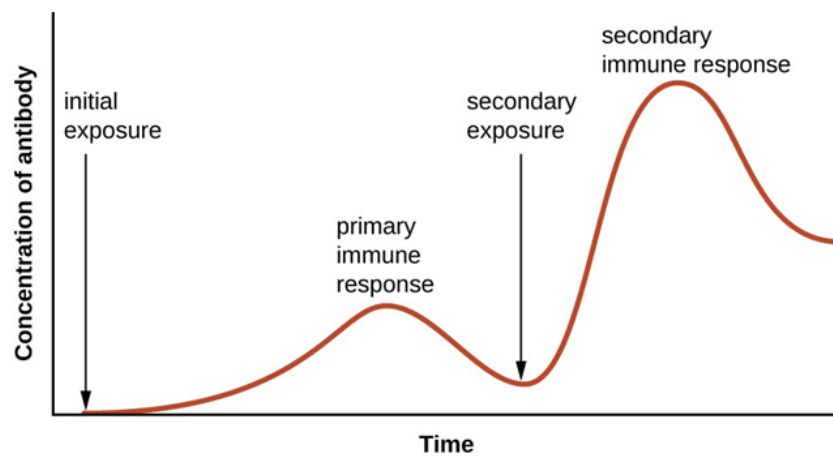
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c) Refer to the diagram on the previous page and the graph below to explain why a child who has been vaccinated against pertussis will not get the disease?

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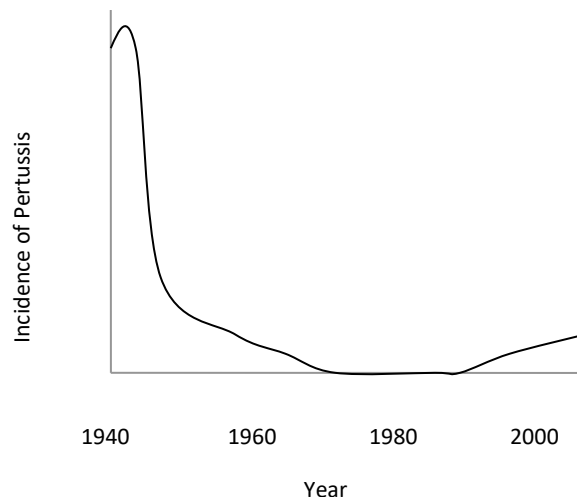
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The graph below shows the incidence of Pertussis in Australia from 1940 to 2009.



d) Suggest a reason for the trend shown in the graph.

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Question 22 [3 marks]

Gumbi Gumbi (Gumby Gumby) is an Aboriginal Australian bush medicine traditionally used to treat coughs and colds. Traditional bush medicines such as Gumbi Gumbi are sold and used by non-Indigenous individuals. The illustration shows a typical label for this product.



Outline what is meant by the term ‘bush medicine’ and explain why the recognition and protection of Aboriginal Australian cultural and intellectual property is important.

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Question 23 [5 marks]

Nigeria and other West African countries are facing an ongoing Lassa fever epidemic.

Lassa fever is caused by the Lassa virus. Study the information below about Lassa fever.

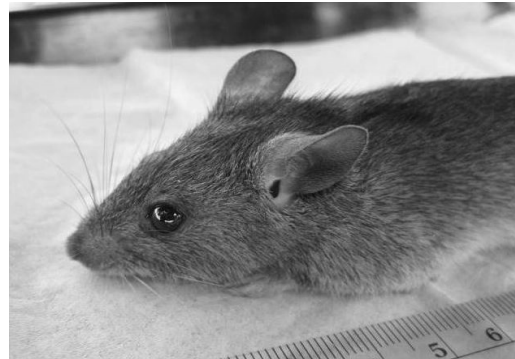
Statistics.

400,000 cases per year on average,
across West Africa.

5,000 deaths per year.

20% of cases require hospitalisation

Women comprise 55% of cases.

**Transmission.**

The main reservoir of the virus is the rat *Mastomys natalensis*. The virus is present in the urine and faeces of infected *Mastomys* and the main method of transmission to humans is thought to be through contaminated food stores. 90-95% of human cases are thought to arise through this route.

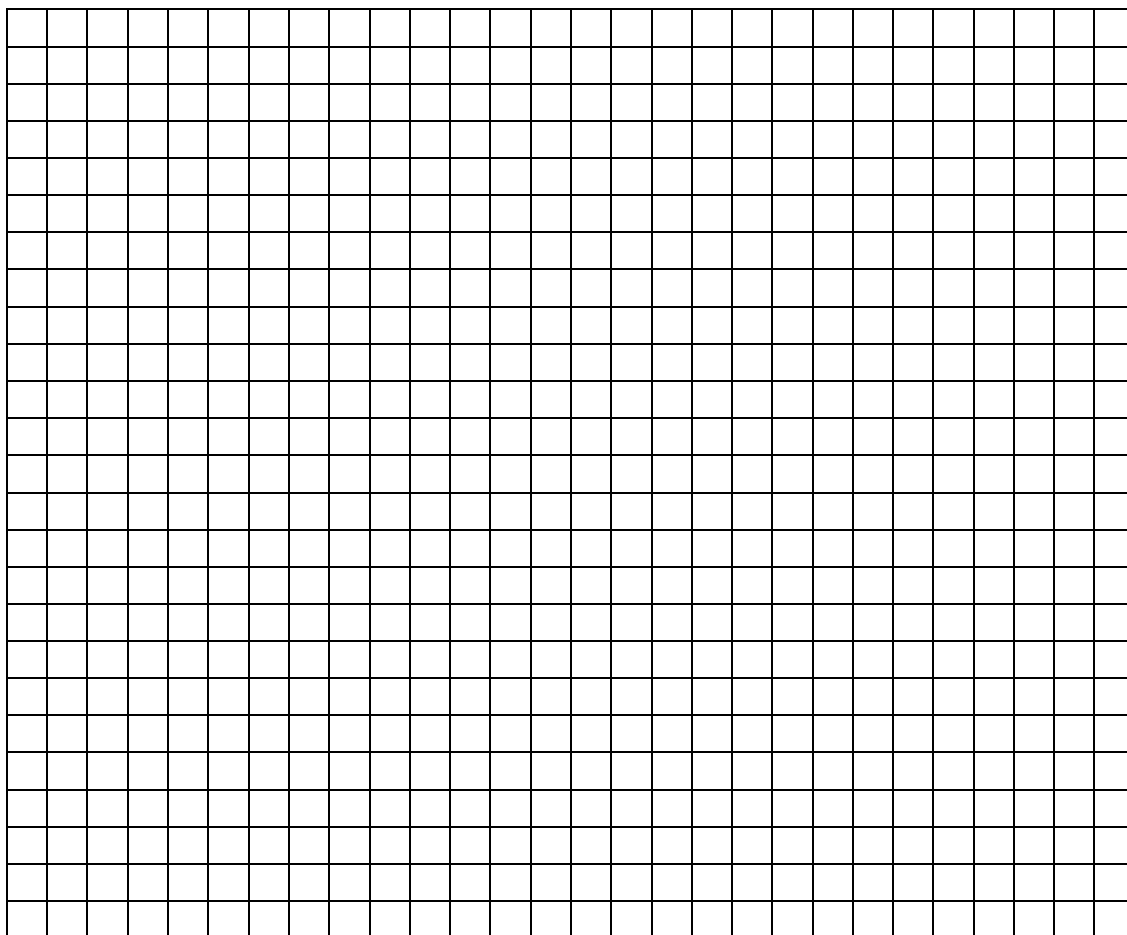
Mastomys is common around human habitation in many parts of West Africa. Its numbers increase rapidly during the Dry season (December – April).

Human to human transmission has also been shown. The virus is present in the blood, semen, urine and other body fluids of infected people.

The table below shows the weekly incidence of Lassa fever in Nigeria since the beginning of the latest outbreak, in January 2020.

Weeks since start of outbreak	Confirmed new cases by week
1	20
2	69
3	82
4	96
5	102
6	110
7	122

- a) Use the grid below to plot a bar graph of the data in the table.

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- b) Propose a measure that could be taken to control the disease and explain how it would work.

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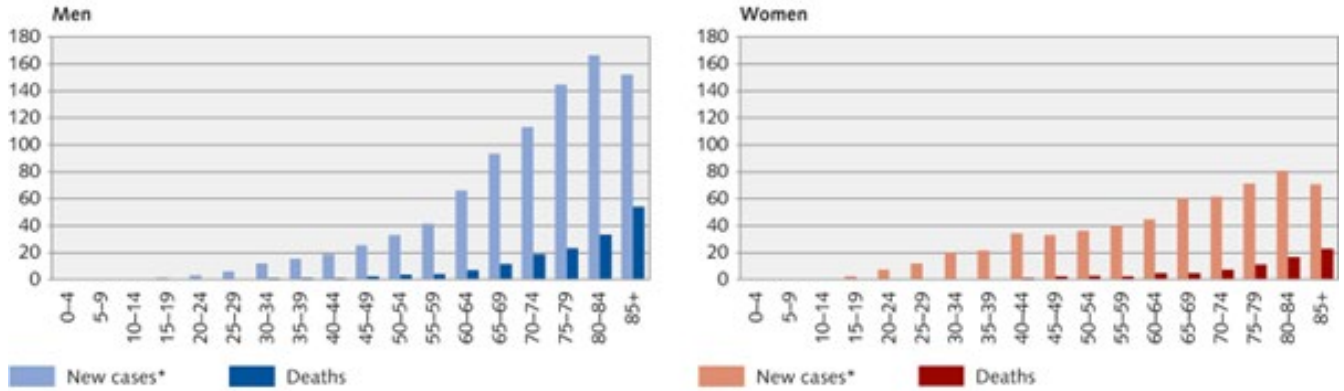
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Question 24 [9 marks]

The graph below shows the incidence of skin melanoma for men and women.

Skin melanoma by age, 2009–2013

Age-specific rate per 100,000 inhabitants



* New cases estimated on the basis of cancer registry data

Sources: NICER – New cases; FSO – Deaths

© FSO, Neuchâtel 2016

a) Analyse and account for the trends shown in the graphs above.

6

In Australia, the educational campaign SLIP SLOP SLAP was introduced in the 1980's. One image from this campaign is shown below.



- b) It was primarily aimed at parents. Why do you think this was the case? 2

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- c) What type of epidemiological study could be used to test the effectiveness of this campaign? 1

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Question 25 [7 marks]

Diabetes is a disease where a persons' blood glucose levels are not properly controlled in the body. A health authority published the following statistics for a specific population.

For this calendar year:

- population size (16 years and over): 6.1 million
- total cases of diabetes (includes new and existing cases): 192 760
- new cases of diabetes (in calendar year): 29 280

a) Use these figures to calculate the following as a percentage of the population.

i. incidence of the disease **1**

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ii. prevalence of the disease **1**

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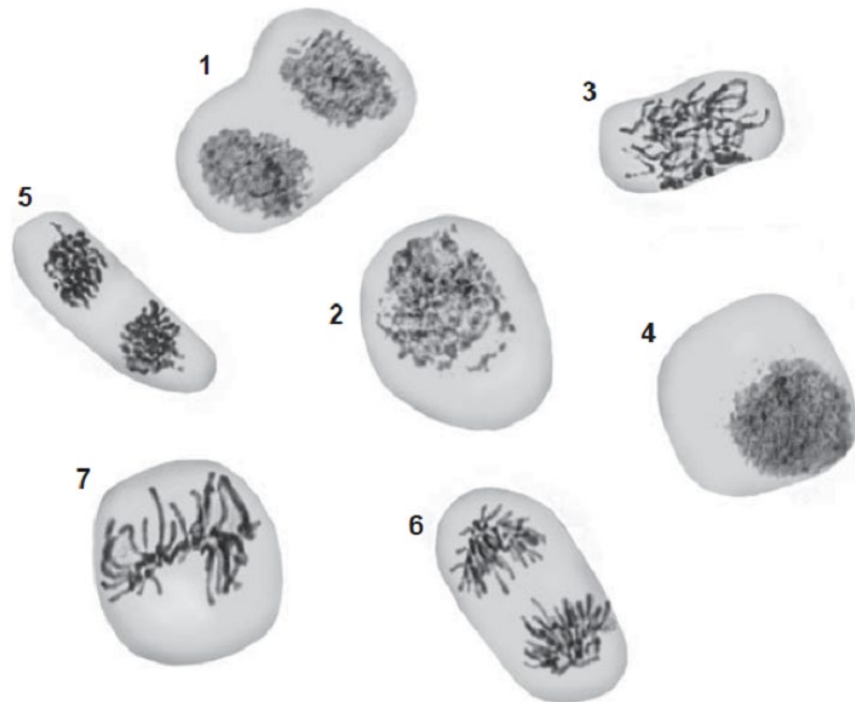
Diabetes is a non-infectious disease. Nutritional diseases and diseases caused by the environment are also non-infectious diseases.

b) Describe the cause, effect(s), treatment/management and means of prevention of a named nutritional disease OR a named disease caused by environmental exposure. Present your information in a table.

5

Question 26 [4 marks]

The following are images of cells undergoing mitosis.



The cells are numbered but are not in the correct order. The order of the first 3 stages is: 4 → 2 → 3.

- a) Complete the correct order of the remaining four stages.

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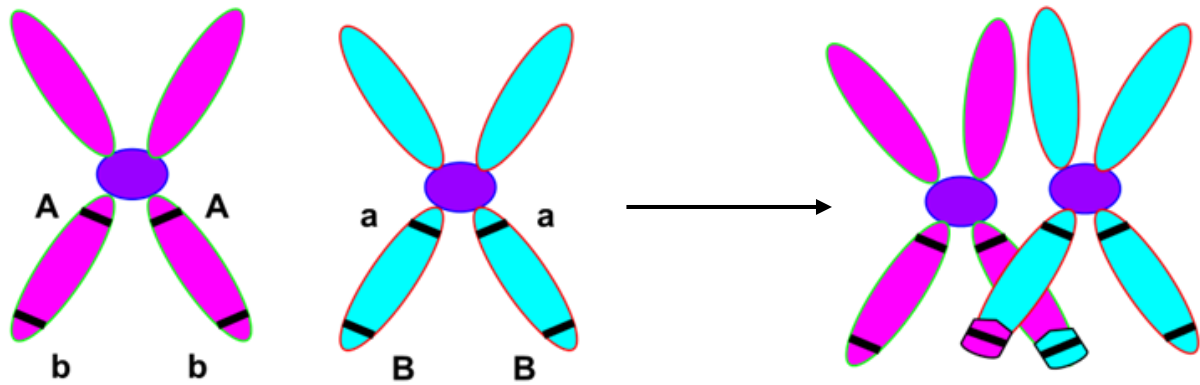
- b) Complete the table below which compares the processes of mitosis and meiosis.

3

Feature	Mitosis	Meiosis
<i>Genetically</i>	Produces identical daughter cells	Produces genetically different daughter cells
<i>Type of cells produced</i>		
<i>Number of cell divisions</i>		
<i>Number of daughter cells produced</i>		

Question 27 [9 marks]

The diagram below shows a process which occurs during meiosis.



a) Identify this process.

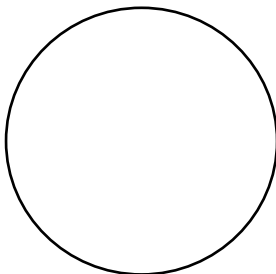
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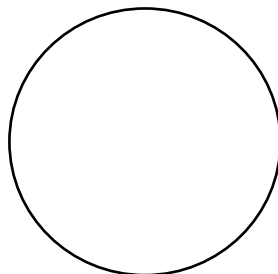
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b) Draw the 4 gametes that will be produced from the chromosomes shown in the diagram above.

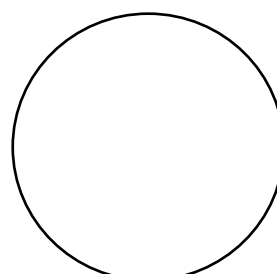
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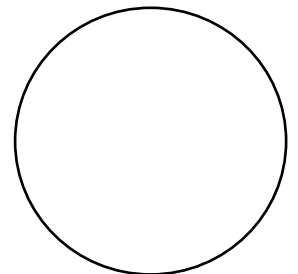
Gamete



Gamete



Gamete



Gamete

c) Explain the benefit of this process to the continuity of the species.

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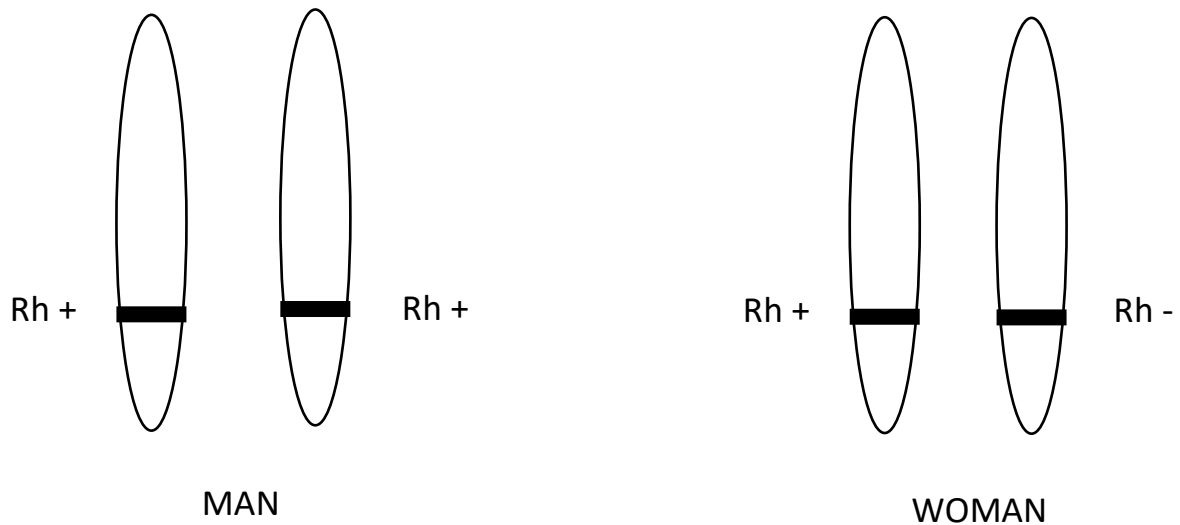
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Rh factor is a blood protein. People without Rh factor are known as Rh negative, while people with the factor are known as Rh positive. The Rh genes are on chromosome 1 and the Rh positive allele is dominant. A man and woman's homologous pair of chromosome 1 are shown below.



- d) What is the probability of this couple having a child who is Rh negative? Show all working. **3**

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Question 28 [3 marks]

Scientists often study the effects of the environment on phenotype by studying identical twins.



Account for the use of this methodology, using examples of the effect of environment on phenotype.

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Question 29 [8 marks]

The “blueprint” of all life on earth is contained within deoxyribose nucleic acid (DNA). In the 1950’s, scientists such as Rosalind Franklin, James Watson and Francis Crick uncovered the molecular structure of DNA and in 1953, Watson and Crick described the double helix model of DNA.

- a) Draw a labelled diagram to show the structure of DNA including base pairing, bonding and the composition of the nucleotide.

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- b) Outline the major steps involved in DNA replication.

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Question 31 [5 marks]

Thermal pollution comes from hot or cold water being dumped into a body of water such as a river. The sudden temperature change causes problems for a range of organisms living in the ecosystem. Design an experiment to investigate the effect of water temperature on the growth of aquatic plants. **5**

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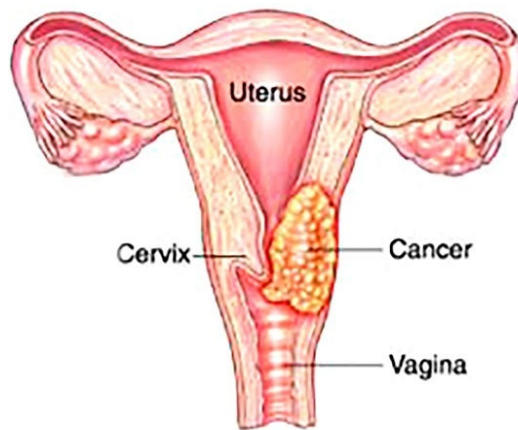
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Question 32 (11 marks)

Cervical cancer is the fourth most common cancer in women. In 2018, an estimated 570 000 women were diagnosed with cervical cancer worldwide and about 311 000 women died from the disease. Cervical cancer develops in a woman's cervix (the entrance to the uterus from the vagina).

Most cervical cancer cases are linked to infection with human papillomaviruses (HPV), an extremely common virus transmitted through sexual contact. Being vaccinated against HPV types 16 and 18 significantly reduces the risk of developing cervical cancer.

Australia launched a vaccination campaign to decrease the incidence of cervical cancer in 2007 for females and 2013 for males.



- a) Explain how vaccination against HPV prevents cervical cancer.

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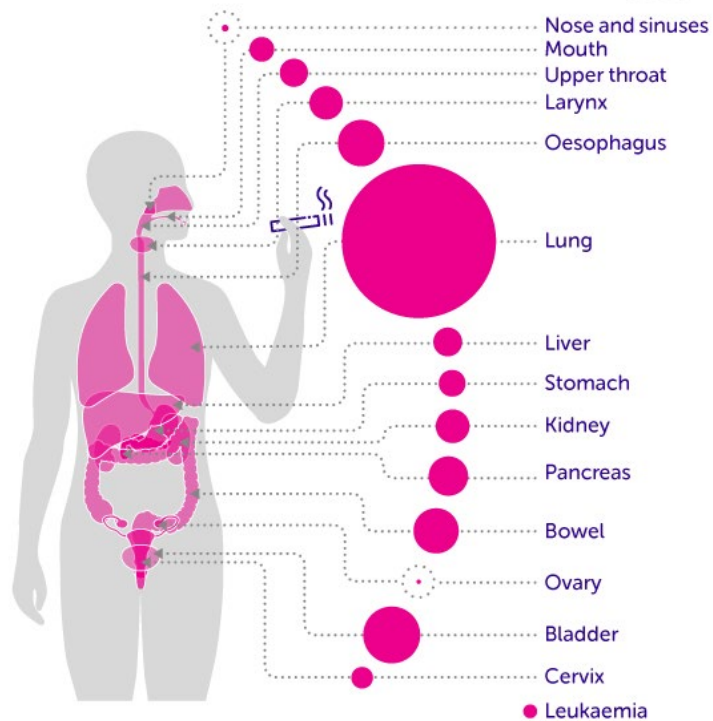
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Smoking has also been shown to play a role in causing cervical cancer.

Being smoke free can prevent 15 types of cancer



●●● Larger circles indicate more UK cancer cases

Circle size here is not relative to other infographics based on Brown et al 2018.
Source: Brown et al, British Journal of Cancer, 2018

cruk.org/prevention
Together we will beat cancer



Diseases are classified as infectious or non-infectious.

- b) Evaluate whether cervical cancer should be classified as an infectious disease or a non-infectious disease using the information above and your knowledge of disease. **8**

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PART B EXTRA WRITING SPACE

If you use this space, clearly indicate which question you are answering.

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PART B EXTRA WRITING SPACE

If you use this space, clearly indicate which question you are answering.

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Pymble Ladies' College

2020 HIGHER SCHOOL CERTIFICATE TRIAL EXAMINATION

BIOLOGY

ANSWER SHEET

General Instructions

- Write your Student Number at the top of this page.
- Answer ALL multiple choice questions on this Answer Sheet.
- Use a pencil to fill in the circle indicating your answer.

PART A

Start Here

- | | | | | | | | | |
|-----|---|-----------------------|---|-----------------------|---|-----------------------|---|-----------------------|
| 1. | A | ☐ | B | ☐ | C | ☐ | D | ☐ |
| 2. | A | ☐ | B | ☐ | C | ☐ | D | ☐ |
| 3. | A | ☐ | B | ☐ | C | ☐ | D | ☐ |
| 4. | A | ☐ | B | ☐ | C | ☐ | D | ☐ |
| 5. | A | ☐ | B | ☐ | C | ☐ | D | ☐ |
| 6. | A | ☐ | B | ☐ | C | ☐ | D | ☐ |
| 7. | A | ☐ | B | ☐ | C | ☐ | D | ☐ |
| 8. | A | ☐ | B | ☐ | C | ☐ | D | ☐ |
| 9. | A | ☐ | B | ☐ | C | ☐ | D | ☐ |
| 10. | A | ☐ | B | ☐ | C | ☐ | D | ☐ |
| 11. | A | ☐ | B | ☐ | C | ☐ | D | ☐ |
| 12. | A | ☐ | B | ☐ | C | ☐ | D | ☐ |
| 13. | A | ☐ | B | ☐ | C | ☐ | D | ☐ |
| 14. | A | ☐ | B | ☐ | C | ☐ | D | ☐ |
| 15. | A | ☐ | B | ☐ | C | ☐ | D | ☐ |
| 16. | A | ☐ | B | ☐ | C | ☐ | D | ☐ |
| 17. | A | ☐ | B | ☐ | C | ☐ | D | ☐ |
| 18. | A | ☐ | B | ☐ | C | ☐ | D | ☐ |
| 19. | A | ☐ | B | ☐ | C | ☐ | D | ☐ |
| 20. | A | ☐ | B | ☐ | C | ☐ | D | ☐ |

Student number: _____

Student number: _____

Yr 12 Biology 2020 Task 4 – Trial Marking Guidelines with Markers Comments

Part A – Multiple Choice

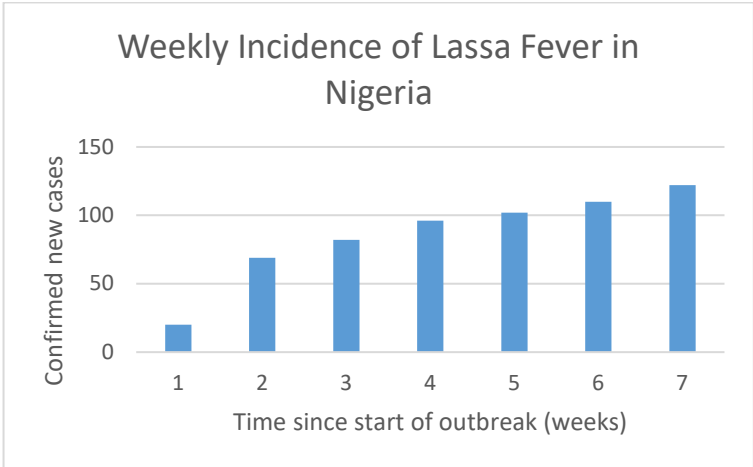
Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20
A	C	C	B	D	C	D	D	B	A	C	D	B	D	A	A	B	D	D	A

Part B

	Marking Guidelines		Sample Answer	Markers Comments
21a	Correctly identifies the type of cell	1	Cell X is a Helper T-cell	Straight knowledge question. Many students misinterpreted the diagram. Close to half the cohort did not answer this question correctly.
21b	Provides characteristics and features of the role of plasma cells	2	B plasma cells produce antibodies which bind to the antigen to form antigen-antibody complex and destroy the pathogen.	Generally well done. For <i>describe</i> , features must be included – stating that antibodies destroy the pathogen is not sufficient. You need to say how this occurs.
	States a feature of plasma cells	1		

21c	Makes evident the relationship between peaks, immune response and antibody production at different times	4	The first exposure to pertussis is through a vaccine. This triggers a primary response and antibodies are secreted first from B plasma cells and Memory B cells are made. There is a delay as this process occurs as seen in primary exposure peak on the graph. Upon re-exposure to pertussis, a secondary response that is faster and stronger occurs. Memory B cells differentiate into antibody-secreting plasma cells that quickly output a greater amount of antibody for a longer period of time as shown in the second larger peak. Therefore, a child would not get the pertussis disease once vaccinated for pertussis.	You must refer to the information in the graph to support your answer eg, relative size of the peak antibody levels. This diagram showed plasma cells and antibodies and memory B cells. The graph referred to antibody levels so discussion of plasma cells and memory B cells is necessary. Many students spent time and writing space including information that was not needed to answer the question – plan your response and be concise.
	Sketches in general terms the relationship between peaks, immune response and antibody production at different times	3		
	Sketches in general terms the relationship between peaks and immune response or antibody production at different times	2		
	Identifies a feature of the primary or secondary immune responses	1		
21d	Gives a reason for and outlines the trends in the graphical data presented	2	There is a rapid decrease in cases from mid-1940 to 1970 and then a gradual decrease till 1990 then a gradual increase till 2000. This is due to a vaccine introduced and in widespread use from mid-1940 but then a decline in people vaccinating their children from 1990 (or adaptations of the bacteria making the vaccine less effective or immune response reduced in some people).	Well answered. Note: Antibiotics could not be responsible for the decline as they are used to treat existing disease which would therefore be recorded as cases and appear on the graph.
	Outlines the trends in the graphical data presented OR outlines one trend with reason	1		
22	Gives an outline of bush medicine AND two reasons for the importance of recognition and protection of Aboriginal cultural and intellectual property OR gives one reason and describes the importance of Gumbi Gumbi or another bush medicine as an exemplar (eg, smokebush)	3	Bush medicine is traditional Aboriginal Australian medicine, typically prepared from herbs and other plants. Because bush medicine such as Gumbi Gumbi has been discovered and developed by Aboriginal Australians, it is part of their heritage and belongs to them. If it is used by non-Indigenous Australians, then the source of this medicine and knowledge should be acknowledged, and appropriate remuneration provided to support indigenous communities.	Most students achieved 2 or 3 marks for this question. Do not repeat the words in the question or the stimulus – you need to build on the data provided.
	Gives an outline of bush medicine OR explains the importance of recognition and protection of Aboriginal cultural and intellectual property	2		
	Gives some relevant information	1		

Student number:

23a	<table><tr><td>Correct axes (X – weeks, Y – no. of new cases, labels, units), accurate plot, bar graph</td><td>3</td></tr><tr><td>Any 2 of the above</td><td>2</td></tr><tr><td>Any 1 of the above</td><td>1</td></tr></table>		Correct axes (X – weeks, Y – no. of new cases, labels, units), accurate plot, bar graph	3	Any 2 of the above	2	Any 1 of the above	1	Weekly Incidence of Lassa Fever in Nigeria <table><thead><tr><th>Time since start of outbreak (weeks)</th><th>Confirmed new cases</th></tr></thead><tbody><tr><td>1</td><td>20</td></tr><tr><td>2</td><td>70</td></tr><tr><td>3</td><td>85</td></tr><tr><td>4</td><td>95</td></tr><tr><td>5</td><td>100</td></tr><tr><td>6</td><td>110</td></tr><tr><td>7</td><td>125</td></tr></tbody></table>	Time since start of outbreak (weeks)	Confirmed new cases	1	20	2	70	3	85	4	95	5	100	6	110	7	125	Bar graph = discontinuous data so the columns should not touch. (-1 if graph was drawn with columns touching) USE SHARP PENCILS
	Correct axes (X – weeks, Y – no. of new cases, labels, units), accurate plot, bar graph	3																								
	Any 2 of the above	2																								
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	Proposes control measure with no explanation	1																								

Student number:

24a	Describes and gives reasons for two or more trends for melanoma with specific data for each	6	Melanoma is shown to have the highest rate of new cases and deaths in older age brackets and increases consistently as people age. This is represented in the data with zero new cases and zero deaths for both men and women in the 0-4, 5-9 and 10-14 age groups. The figures for new cases increase to a high of 165/100,000 in men and 80/100,000 in women for the 80-84 age bracket. The new case numbers are slightly lower in the 85+ age bracket for both sexes but this may be due to other factors. The death rate peaks in the 85+ age bracket for both sexes with a rate of 55/100,000 in men and 22/100,000 in women. We know that a person's cumulative exposure to UV radiation would increase as they age due to all the time they have spent outside. A young person would have had less total UV exposure than an older person and since melanoma is caused by exposure of the skin to UV radiation it makes sense that new case numbers and death rates for melanoma increase as a person ages. Melanoma is shown to have a higher rate of new cases in men over the age of 60 compared to women over the age of 60, peaking at age 80-84 with 165/100,000 in men compared to 80/100,000 in women. However, for men under the age of 60 they have a lower rate of new cases than women under the age of 60 with men exhibiting new cases of 4/100,000 in the 20-24 age bracket and women exhibiting new cases of 7/100,000 in the 20-24 age bracket. This may be due to more men undertaking careers that are outside as they get older, such as building. It may also be due to women being more likely to wear sun cream as part of their makeup as they get older compared to men which would protect the women from the UV rays.	Reasons must be for each trend (not two reasons for the same trend). Data must include age groups AND numbers of incidence/deaths. Need to be specific with reasons ie. Did not accept men spend more time outdoors. Needed to say why (jobs such as labourers).
	Describes and gives reasons for two trends for melanoma including reference to some data	5		
	Describes two trends for melanoma including reference to data for both or reasons for both trends (or some data and a reason for one trend)	4		
	Describes two trends for melanoma with data or a reason for one trend	3		
	Describes one trend with data or a reason	2		
	Some relevant information	1		

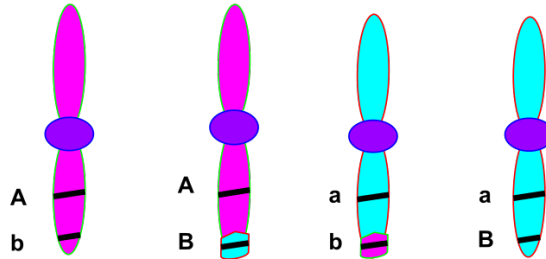
Student number:

24b	Identifies the link between increasing age and accumulating UV exposure increasing cancer incidence	2	The campaign was primarily aimed at parents because UV exposure when a child is likely to increase the risk of developing skin cancer later in life. As people get older their incidence of skin cancer increases due to an accumulation of UV exposure.	Most students didn't link children being protected at a young age means less accumulation of UV exposure as they get older so less chance of skin cancer which is due to an accumulation of UV exposure.								
	Identifies that older people are more likely to develop skin cancer	1										
24c	Identifies the type of epidemiological study	1	Intervention									
25ai	Calculates the incidence of the disease	1	29 280/6 100 000 = 0.48% or 4.8 cases per 100 000 people	6.1 million = 6 100 000 (not 61 000 000)								
25aii	Calculates the prevalence of the disease	1	192 760/6 100 000 = 3.16% or 31.6 cases per 100 000 people									
25b	Identifies an appropriate disease and Presents answer in a table and Describes features of all four of: cause, effect(s), treatment/management, means of prevention	5	For example: Disease caused by environmental exposure: asbestosis <table><tr><td>Cause</td><td>Exposure to fibrous material, mineral silicates (asbestos)</td></tr><tr><td>Effect(s)</td><td>Shortness of breath, appetite loss, decreased ability to exercise and premature death</td></tr><tr><td>Treatment/management</td><td>Taking oxygen and other measures to ease breathing</td></tr><tr><td>Means of prevention</td><td>Reduced use of asbestos, reduced exposure to asbestos</td></tr></table> Students can also use: rickets, scurvy, melanoma, heavy metal poisoning, passive smoking etc.	Cause	Exposure to fibrous material, mineral silicates (asbestos)	Effect(s)	Shortness of breath, appetite loss, decreased ability to exercise and premature death	Treatment/management	Taking oxygen and other measures to ease breathing	Means of prevention	Reduced use of asbestos, reduced exposure to asbestos	Choose an obvious disease we have studied (melanoma, asbestosis, lung cancer caused by cigarette smoke, etc). Name the disease eg: MELANOMA not skin cancer. Specify what the cause of the disease is (eg: melanoma is caused by UV radiation causing a mutation in the DNA of genes controlling the cell cycle)
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	Identifies an appropriate disease and Presents answer in a table and Describes features of any three of: cause, effect(s), treatment/management, means of prevention	4										
Identifies an appropriate disease and Presents answer in a table and Describes features of any two of: cause, effect(s), treatment/management, means of prevention	3											
Identifies an appropriate disease and Presents answer in a table	2											
Gives some appropriate information	1											

Student number: _____

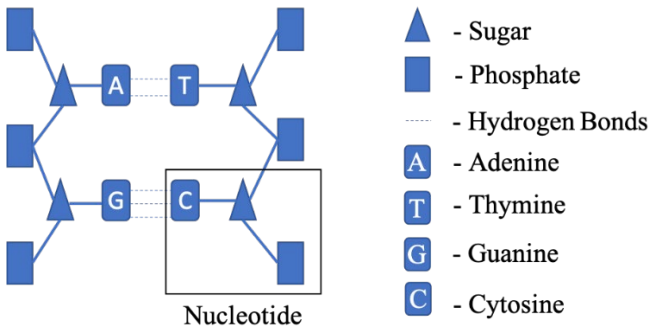
		<table><tr><td>Disease name</td><td>Melanoma</td></tr><tr><td>Cause</td><td>Exposure to UV radiation that causes mutations in the DNA of skin cells leading to malignant tumours</td></tr><tr><td>Effects</td><td>Development of tumours on the skin. Cancer cells can spread to other parts of the body such as lung, brain and bone</td></tr><tr><td>Treatment</td><td>Surgical removal of tumours, chemotherapy and radiotherapy to destroy cancer cells. Targeted immunotherapy to destroy cancer cells</td></tr><tr><td>Prevention</td><td>Avoid exposure to UV radiation</td></tr></table>	Disease name	Melanoma	Cause	Exposure to UV radiation that causes mutations in the DNA of skin cells leading to malignant tumours	Effects	Development of tumours on the skin. Cancer cells can spread to other parts of the body such as lung, brain and bone	Treatment	Surgical removal of tumours, chemotherapy and radiotherapy to destroy cancer cells. Targeted immunotherapy to destroy cancer cells	Prevention	Avoid exposure to UV radiation	3 marks were awarded if a vague or brief OUTLINE of >2 or a DESCRIPTION of 3 (cause, effects, treatment/management, prevention)											
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26a	<table><tr><td>Correctly orders the stages of mitosis</td><td>1</td></tr></table>	Correctly orders the stages of mitosis	1	4 2 3 7 6 5 1	Everything needed to be correct to get the mark.																			
Correctly orders the stages of mitosis	1																							
26b	<table><tr><td>A correct table of comparison is made</td><td>3</td></tr><tr><td>Most comparisons between mitosis and meiosis are made</td><td>2</td></tr><tr><td>Some comparisons between mitosis and meiosis are made</td><td>1</td></tr></table>	A correct table of comparison is made	3	Most comparisons between mitosis and meiosis are made	2	Some comparisons between mitosis and meiosis are made	1	<table><tr><th>Feature</th><th>Mitosis</th><th>Meiosis</th></tr><tr><td>Genetically</td><td>Produces identical daughter cells</td><td>Produces genetically different daughter cells</td></tr><tr><td>Types of cells produced</td><td>Somatic or body cells</td><td>Gametes or sex cells</td></tr><tr><td>Number of cell divisions</td><td>1</td><td>2</td></tr><tr><td>Number of daughter cells produced</td><td>2</td><td>4</td></tr></table>	Feature	Mitosis	Meiosis	Genetically	Produces identical daughter cells	Produces genetically different daughter cells	Types of cells produced	Somatic or body cells	Gametes or sex cells	Number of cell divisions	1	2	Number of daughter cells produced	2	4	No mark given for diploid or haploid cell as these are not cell types they are a description of the number of chromosomes within a cell
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Student number:

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27b	<table><tr><td>Correctly draws the resulting gametes produced from the process</td><td>2</td></tr><tr><td>Identifies an aspect of the process</td><td>1</td></tr></table>	Correctly draws the resulting gametes produced from the process	2	Identifies an aspect of the process	1		Need to show whole chromosome not just bottom half where alleles are shown. Also need to show correct allele combinations. Only one chromosome should be shown in each gamete.		
Correctly draws the resulting gametes produced from the process	2								
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27c	<table><tr><td>Explains the benefit of crossing over to the continuity of the species</td><td>3</td></tr><tr><td>Explains the benefit of crossing over but does not link it to continuity of the species</td><td>2</td></tr><tr><td>Includes some relevant information</td><td>1</td></tr></table>	Explains the benefit of crossing over to the continuity of the species	3	Explains the benefit of crossing over but does not link it to continuity of the species	2	Includes some relevant information	1	Crossing over means that alleles on the maternal and paternal chromosomes within homologous chromosomes can swap places. This provides more genetic variation as each of the four chromatids will separate and end up in a different gamete. Greater variation in the gametes means greater genetic variation in offspring. If there was a change in the environment, some may be adapted to this change, survive, reproduce and continue the species.	1 mark - how crossing over causes variation in chromosomes 1 mark – this causes variation in gametes which leads to variation in offspring 1 mark – variation will allow some individuals in a species to survive in a changing environment.
Explains the benefit of crossing over to the continuity of the species	3								
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Uses a punnet square correctly Uses parent genotypes correctly to calculate probability Calculates correct probability	3																	
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28	<table><tr><td>Provides a reason why this methodology is useful Relates the influence of the environment to the changes that could occur to twins' phenotype</td><td>3</td></tr><tr><td>Provides a reason why this methodology is useful Describes an example of the influence of environment on phenotype of twins OR identifies several possible changes</td><td>2</td></tr><tr><td>Identifies an example of the influence of environment on phenotype of twins</td><td>1</td></tr></table>	Provides a reason why this methodology is useful Relates the influence of the environment to the changes that could occur to twins' phenotype	3	Provides a reason why this methodology is useful Describes an example of the influence of environment on phenotype of twins OR identifies several possible changes	2	Identifies an example of the influence of environment on phenotype of twins	1	This methodology is valid as twins have identical genotypes, so any differences in their phenotype must be due to the environment. Phenotype is influenced by a number of genes in combination with environmental influences. Genes code for structural and functional proteins which influence phenotype, however, environmental conditions, such as temperature and availability of nutrients can affect phenotypes. For example, height in humans is influenced by many genes, but it is also influenced by nutrition. A person who eats a diet poor in nutrients will not grow as tall as they would have had they eaten a more nutritious diet. They will not reach their genetic potential. If the twins in the picture were to be separated and brought up in different environments with different carers, nutrition, education and different levels of exposure to different UV light intensities then they may have different heights, muscle tone, skin colour, behaviour and careers even though they have the same genome.	Also accepted one example of effect of environment of human twins and an example of environmental effect on another cloned organisms such as hydrangeas (for methodology to be relevant organisms must be genetically identical). Generally well done. Key support for the methodology was to state that identical twins will have identical genotype (and phenotype at birth) and therefore any changes in phenotype may be linked to changes in environment.									
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Student number:

29a	Shows clear and labelled diagram Shows base pairing and bonding correctly Identifies nucleotide	4		The bases are not chemically joined together, the complementary bases are attracted through hydrogen bonding. If the bases were shown connected together without it being clear these were hydrogen bonds then a mark was deducted. Nucleotide mark was given for showing that this consisted of one base, one sugar and one phosphate joined together – if they were incorrectly bonded a mark was penalised for this in terms of <i>bonding</i> rather than the representation of the nucleotide. Many students mixed up the position of the sugar and phosphate molecules, please remember that the base is bonded to the sugar molecule.
	Shows labelled diagram Shows generally correct base pairing, bonding and nucleotide	3		
	Shows some understanding of DNA structure referring to base pairing and backbone composition	2		
	Provides some relevant information	1		

29b	<table><tr><td>Correctly identifies all major steps in DNA replication including both enzymes Gives steps in correct/logical order</td><td>4</td></tr><tr><td>Identifies most steps in DNA replication OR all steps with no enzymes Gives steps mostly in correct/logical order</td><td>3</td></tr><tr><td>Identifies some steps in DNA replication Gives some steps in correct/logical order</td><td>2</td></tr><tr><td>Identifies a step in DNA replication</td><td>1</td></tr></table>	Correctly identifies all major steps in DNA replication including both enzymes Gives steps in correct/logical order	4	Identifies most steps in DNA replication OR all steps with no enzymes Gives steps mostly in correct/logical order	3	Identifies some steps in DNA replication Gives some steps in correct/logical order	2	Identifies a step in DNA replication	1	Enzyme helicase unwinds and unzips the double strand of DNA. Free DNA Nucleotides arrange against their complementary base pairs in each single strand and form new bonds with the help of DNA polymerase. Replication errors are identified by DNA polymerase and corrected. Newly replicated DNA re-winds to form 2 x double helix. (must have names of enzymes)	Some students gave a description of protein synthesis rather than DNA replication. Many students missed the step of identification and correction of replication errors.
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Student number: _____

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31	<table><tr><td>Provides a suitable procedure which includes all of the following: – How the independent variable is changed – How the dependent variable is measured – Variables kept constant – Repetition – Logical</td><td>5</td></tr></table>	Provides a suitable procedure which includes all of the following: – How the independent variable is changed – How the dependent variable is measured – Variables kept constant – Repetition – Logical	5	1. Set up two ponds/water baths of the same size containing the same amount of water 2. Adjust the temperature of one pond to 40°C and leave the other at normal/room temperature 3. Place 10 identical aquatic plants in each pond and leave them in the same amount of sunlight	I – Independent variable (specific and appropriate temperatures were needed).				
Provides a suitable procedure which includes all of the following: – How the independent variable is changed – How the dependent variable is measured – Variables kept constant – Repetition – Logical	5								

Student number: _____

	<table><tr><td>Provides a suitable procedure which includes 4 of the following: – How the independent variable is changed – How the dependent variable is measured – Variables kept constant – Repetition – Logical</td><td>4</td></tr><tr><td>Provides a suitable procedure which includes 3 of the following: – How the independent variable is changed – How the dependent variable is measured – Variables kept constant – Repetition – Logical</td><td>3</td></tr><tr><td>Provides a procedure which includes 2 of the following: – How the independent variable is changed – How the dependent variable is measured – Variables kept constant – Repetition – Logical</td><td>2</td></tr><tr><td>Provides some relevant information</td><td>1</td></tr></table>	Provides a suitable procedure which includes 4 of the following: – How the independent variable is changed – How the dependent variable is measured – Variables kept constant – Repetition – Logical	4	Provides a suitable procedure which includes 3 of the following: – How the independent variable is changed – How the dependent variable is measured – Variables kept constant – Repetition – Logical	3	Provides a procedure which includes 2 of the following: – How the independent variable is changed – How the dependent variable is measured – Variables kept constant – Repetition – Logical	2	Provides some relevant information	1	4. Keep the temperatures and pH of each pond constant for 1 month 5. Observe the plants each day over the month and record the height of each plant in a table 6. Repeat the whole experiment twice or until consistency in results is achieved.	D – Dependent variable (specific measurement needed). Growth not enough. V – Variables. Identify how these were being made constant. Also needed a control. R – Repeats. There should be at least 2 repeats of the whole experiment until consistency is achieved. Just repeats of the same experiment was accepted. Also accepted for this mark was a large > 20 sample size). L – gical. Would your experiment test the aim? Is it in an appropriate sequence? Is it carried out for an appropriate amount of time to investigate growth?
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32a	<table><tr><td>Explains how HPV vaccine prevents infection with HPV and therefore prevents cancer cells developing</td><td>3</td></tr><tr><td>Identifies HPV vaccine prevents infection with HPV and therefore prevents cervical cancer</td><td>2</td></tr><tr><td>Identifies that the vaccine prevents infection with HPV OR links HPV with cervical cancer</td><td>1</td></tr></table>	Explains how HPV vaccine prevents infection with HPV and therefore prevents cancer cells developing	3	Identifies HPV vaccine prevents infection with HPV and therefore prevents cervical cancer	2	Identifies that the vaccine prevents infection with HPV OR links HPV with cervical cancer	1	The HPV vaccine initiates an immune response against the human papilloma virus and results in the production of memory B and T cells. When a person is exposed to the human papilloma virus the immune system responds quickly preventing infection and stopping the virus from causing the cells of the cervix to become cancerous.	Not well answered. Lots of students talked about reducing the incidence of cervical cancer without addressing what the vaccination does. The bold text in the sample answer were the key points.		
Explains how HPV vaccine prevents infection with HPV and therefore prevents cancer cells developing	3										
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32b	Justifies a suitable judgement Demonstrates an extensive knowledge of infectious and non-infectious disease, including criteria for classification of disease Supports the classification of cervical cancer with detailed and appropriate reference both pieces of information and data provided Communicates logically <i>and succinctly</i> with precise biological terms	8	Infectious diseases are caused by pathogens that can be passed from one person to another. A pathogen is established as a cause of disease using a rigorous set of criteria known as Koch's postulates.	J - Judgement (suitable) - this statement needs to be strong and backed up with evidence. Some students said it is infectious but contradicted themselves in the response, so not suitable (1 mark) I - define infectious disease (1 mark) NI - define non-infectious (1 mark) K - link to Koch's Postulates (1 mark) D1 - use specific data from HPV info and link to classification of infectious/non-infectious (2 marks) D2 - use specific data from smoking data and link to classification of infectious/non-infectious (2 marks) Minus 1 mark for not communicating with precise bio terms Lots of students missed defining the terms – these are easy marks. Please make sure you are referring explicitly to the stimuli – in this case, both the information on HPV and smoking. Specific data is required.
	Justifies a suitable judgement Demonstrates a thorough knowledge of infectious and non-infectious disease, including criteria for classification of disease Supports the classification of cervical cancer with appropriate reference to both pieces of information and data provided Communicates logically using biological terms	7	The data from the study provides evidence for an association between untreated Human papillomavirus (HPV) and the increased risk of development of cervical cancer. The data also shows that the use of a vaccination for HPV types 16 and 18 results in a much lower risk of developing cervical cancer. This provides some evidence that the disease may be infectious – a result of infection with the virus Human papillomavirus. However, this does not prove that HPV causes cervical cancer, as Koch's postulates would need to be fulfilled. Every person with cervical cancer must have the HPV virus which is not the case. The study indicates that the vaccination only reduces the risk but does not eliminate the disease which this might suggest that cervical cancer is not caused by HPV alone. It appears that HPV acts as a mutagen, increasing mutation rate in cervical cells resulting in cervical cancer.	
	Justifies a suitable judgement Demonstrates a thorough knowledge of infectious and non-infectious disease, including criteria for classification of disease Classifies cervical cancer as infectious or non-infectious Communicates logically using biological terms	6	Non-infectious do not spread from person to person and are not caused by pathogens. They are caused by other factors such as environmental factors or inherited genes.	
	Demonstrates a thorough knowledge of infectious and non-infectious disease, including criteria for classification of disease Classifies cervical cancer as infectious or non-infectious	5	The infographic produced from a reputable source; British Journal of Cancer provides evidence that being smoke free can prevent cervical cancer and therefore supports an environment basis for the cause of cervical cancer. This could mean that the disease is non-infectious.	

Student number:

	Communicates logically using biological terms		However, there is not enough information in the infographic. The size of the circles represents cancer cases but does not give the level of efficacy that a reduction in smoking would have on the cases of cervical cancer. Therefore, the development of cervical cancer may also be influenced by other environmental factors or pathogens. From the information provided it is not possible to classify cervical cancer as infectious or non-infectious as there appears to be evidence that the risk of developing it is influenced by both a viral pathogen and environment via smoking. OR From the information provided, cervical cancer should be classified as non-infectious as Koch's postulates have not been satisfied to link HPV with cervical cancer and it cannot be transmitted from person to person so it cannot be an infectious disease. The data suggests that HPV acts as a mutagen increasing mutations to cause cervical cancer.	Make sure your answers are logical and succinct – you should not need to write pages and pages.
	Classifies cervical cancer as infectious or non-infectious and demonstrates a sound knowledge of infectious and non-infectious disease including criteria for classification	4		
	Classifies cervical cancer as infectious or non-infectious and demonstrates a sound knowledge of infectious and non-infectious disease	3		
	Provides information about infectious or non-infectious disease AND data OR Relates data to classification of cervical cancer OR Provides information about infectious and non-infectious disease	2		
	Provides some relevant information	1		