Hornsby Girls High School

TRIAL HSC EXAMINATION 2019

HSC Biology

BOOKLET 1

Student Number …….……

Total Assessment Weighting 30%

General Instructions

- Reading time – **5 minutes**
- Working time – **3 hours**
- Write using black or blue pen
- Draw diagrams using pencil
- Board-approved calculators may be used
- Write your Student Number on the front of this booklet and on the multiple choice answer sheet.
- **Do NOT write in the margins – there is additional writing space at the back of each booklet. If you need more space than this, ask for a blank writing booklet.**

Total marks: 100
This exam has TWO sections has two parts: Section I and Section II

Section I – 20 marks (Multiple Choice)
• Attempt Questions 1–20.
• Allow about 35 minutes for this part.
• Section I is in Booklet 1

Section II – 80 marks (Short Answers)
• Attempt Questions
• Allow about 1 hour 55 minutes for this part.
• Section II is spread across Booklet 1 and Booklet 2

---------- **Teacher Use Only** ----------

Multiple Choice Marks

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q 10	Q 11	Q 12	Q 13	Q 14	Q 15	Q 16	Q 17	Q 18	Q 19	Q 20	Total MC

Booklet 1

Question	Out of	Your Mark
Q21	5	
Q22	3	
Q23	7	
Q24	8	
Q25	4	
Q26	7	
Q27	5	
Q28	4	

Booklet 2

Question	Out of	Your Mark
Q29	5	
Q30	4	
Q31	5	
Q32	8	
Q33	5	
Q34	3	
Q35	7	
Total	**100**	

Section 1

Part A – Multiple Choice 20 Marks (1 mark each)

Answer on the separate Multiple Choice Answer Sheet.

1 Which of the following is an advantage of sexual reproduction over asexual reproduction?

(A) Sexual reproduction requires two different parents.
(B) Sexual reproduction gives genetic variation among offspring.
(C) Sexual reproduction is less complex than asexual reproduction.
(D) Sexual reproduction usually produces fewer offspring than asexual reproduction.

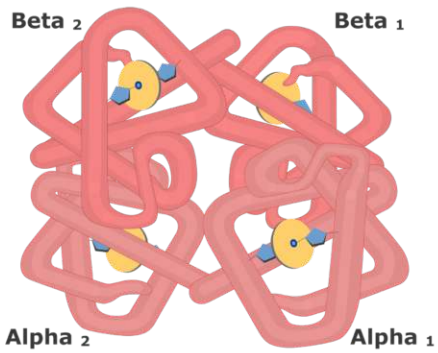
2 'Herd immunity' describes a population where the vast majority of people are immunised. Herd immunity is an effective way to control the spread of infection as

(A) there are less potential carriers in the population.
(B) even those who are not immunised will be protected from the pathogen.
(C) diseases that originated in cows cannot spread.
(D) everyone has already had the disease.

3 Ultraviolet radiation can be best described as which type of mutagen?

(A) Physical
(B) Chemical
(C) Biological
(D) Naturally occurring

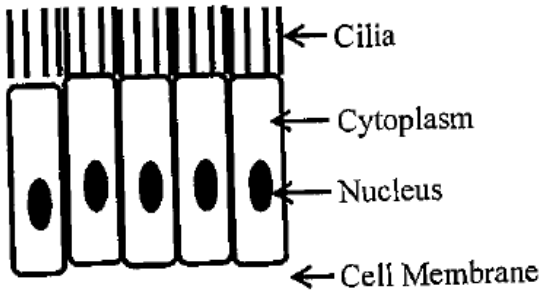
4 The diagram below represents a molecule of the protein haemoglobin.



Which level of protein structure is represented by this model?

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

The diagram below illustrates some cells found in the lining of the human respiratory system. Refer to the diagram for questions 5 and 6.



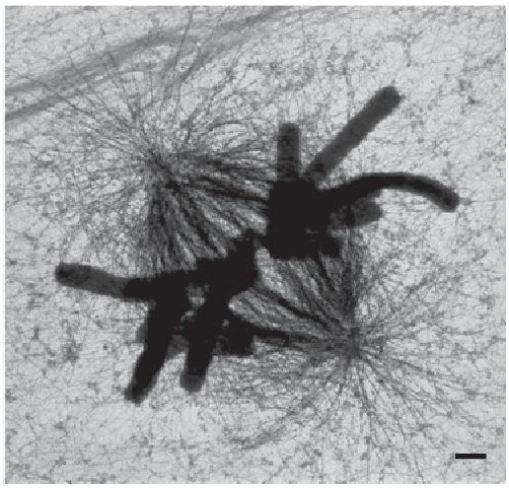
5 What is the role of cells in the immune system?

(A) To move back and forward to increase gas exchange
(B) To exchange oxygen and carbon dioxide
(C) To trap foreign material before entering the body
(D) To phagocytose foreign material once it has entered the body

6 The cilia on the surface are part of which immune system?

(A) The innate immune system
(B) The acquired immune system
(C) The adaptive immune system
(D) The active immune system

7 The electron micrograph below shows chromosomes in one cell during mitosis.



Which stage is this most likely to be?

(A) Prophase
(B) Metaphase
(C) Anaphase
(D) Cytokinesis

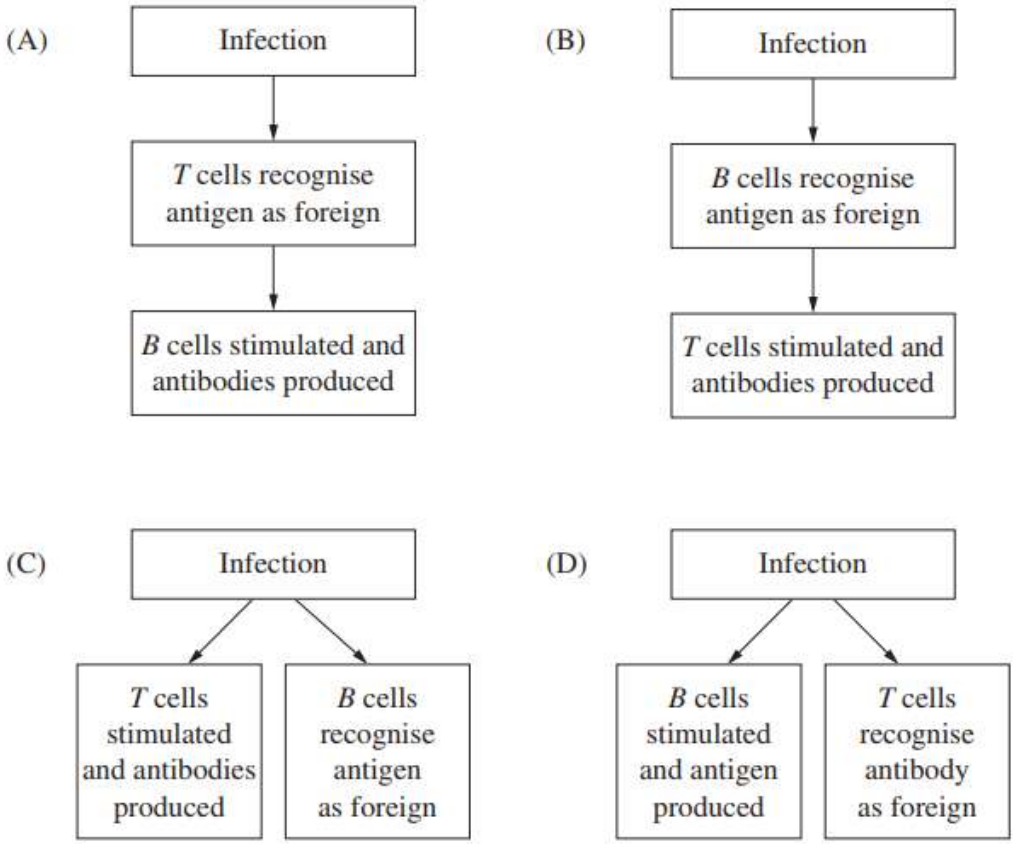
8 Patients receiving organ transplants take medication to suppress their immune system. While this presents a greater risk of infection for the patients, it is essential.

Which part of the immune response would be dangerous to the patient?
(A) T cells reproducing when exposed to an antigen
(B) cytotoxic T cells recognising and killing foreign cells
(C) memory T cells being stored for future exposure to the antigen
(D) helper B cells stimulating production of T cells

9 Which of the following statements is correct of DNA in eukaryotes and prokaryotes?

(A) DNA in eukaryotes and prokaryotes is located on chromosomes
(B) There is less DNA in eukaryote cells arranged in a simple structure whereas prokaryotes have a more complex helix structure
(C) DNA in prokaryotes is free to move around the cytoplasm of the cell whereas DNA in eukaryotes is contained within a membrane
(D) DNA in eukaryotes is composed of adenine, guanine, cytosine and thymine, whereas DNA in prokaryotes uses uracil instead of thymine

10 Which flow chart correctly shows an interaction between B and T lymphocytes during an immune response?



Refer to the following information to answer question 11 and 12

For many years, health professionals have been concerned about the increase in new cases of childhood obesity. Recent policies to educate pre-school children about nutrition and exercise have had some impact and the rate of new cases diagnosed each year has stabilised.

11 The data above relates to the

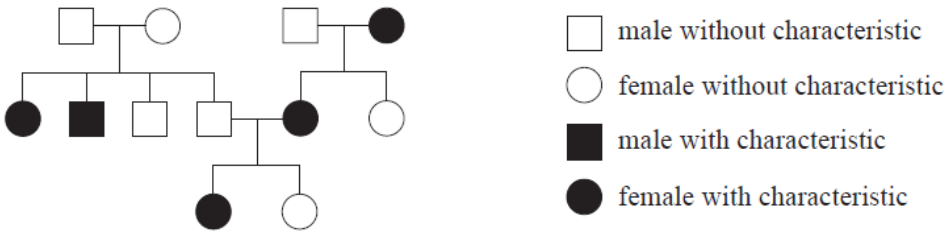
(A) incidence of childhood obesity
(B) prevalence of childhood obesity

(C) mortality of childhood obesity
(D) frequency of childhood obesity

12 The strategy to address childhood obesity was

(A) public policies in hospitals
(B) genetic engineering
(C) drug trials
(D) education campaigns

13 The pedigree shows the presence or absence of a particular characteristic.



Which of the following is the most likely type of inheritance for this characteristic?

	Dominant or recessive	*Sex-linked or not sex-linked*
(A)	dominant	sex-linked
(B)	recessive	sex-linked
(C)	dominant	not sex-linked
(D)	recessive	not sex-linked

14 The diagram below shows a section of mRNA.

U-C-U-G-A

Which one of the following shows the base sequence on the template (or sense) strand of DNA from which this piece of mRNA was transcribed?

(A) TGTCT

(B) AGACU

(C) AGACT

(D) TGTCU

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In humans colour blindness is a sex-linked recessive condition carried on the X chromosome.

If a colour blind male has a son to a woman who has normal vision with no history of colour blindness in her family, what are the chances of their son being colour blind?

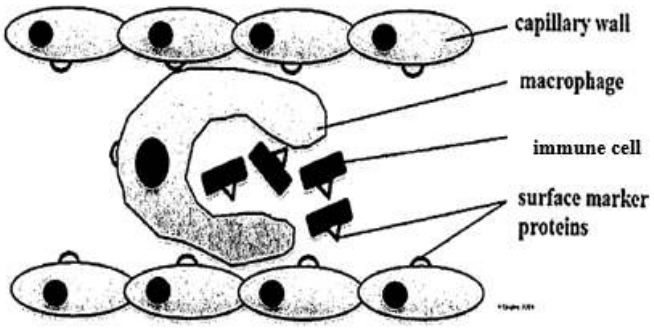
(A) 0%

(B) 50%

(C) 25%

(D) 100%

For question 16 and 17, observe the diagram below.



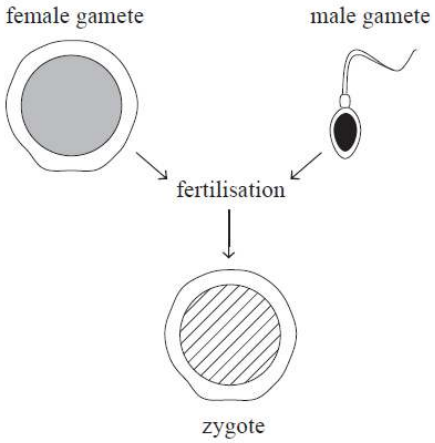
16 What immune process is being modelled by the diagram?

(A) The interaction of B-cell and T-cells
(B) The interaction of cytotoxic cells and helper t cells
(C) Phagocytosis by a macrophage
(D) Phagocytosis by a plasma cell

17 Another term to describe the surface marker proteins on the bacteria is

(A) Antibodies
(B) Antigens
(C) Neutrophils
(D) Antibiotics

18 Consider the diagram



Which statement about these cells is correct?

(A) No genetic information is passed to the zygote from either gamete
(B) The genetic information carried in the nuclei of both of the gametes is the same
(C) The zygote contains all the genetic information from both gametes
(D) The gametes lose some of their genetic information when they combine to form the zygote

19 Transmission of a pathogen by a vector means

(A) an organism or object transports the pathogen from one infected individual to another.
(B) the pathogen is a virus that can become a vector as it moves between organisms.
(C) the pathogen must be a prion that formed from a protein.
(D) the pathogen can live outside a cell for extended periods of time.

20 Which of the following shows the appropriate classification of pathogens?

	Cellular (living)	*Non-cellular (non-living)*
(A)	Prokaryotes, protozoans, fungi, prions	Virus
(B)	Prokaryotes, fungi,	Virus, protozoans, prions
(C)	Prions, protozoans, fungi,	Virus, prokaryotes
(D)	Protozoans, fungi, prokaryotes	Virus, prions

Section II
Attempt Questions 21 – 28 in this booklet.

Answer the questions in the space provided.
Do not write in the margins - if you require more space to complete a question, clearly note on the question that the answer continues then complete the question at the back of the section on the spare lined pages.

Question 21 (5 marks)
DNA replication is a biological process by which DNA is copied. The model below represents a section of DNA that has replicated into two identical strands.

a) Using the same shapes and symbols in this model, complete the missing STAGE 2, showing the main features of DNA replication. **3**



b) Explain why the scientists use models to represent the process of DNA replication. **2**

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Question 22 (3 marks)

Complete the table below to identify an animal/human disease caused by each pathogen and the mode of transmission. **3**

Pathogen	*Disease caused by pathogen*	*Mode of transmission*
Bacteria		
Fungus		
Prion		

Question 23 (7 marks)

a) Maintaining a stable internal environment is crucial for cells to function and organisms to survive. **4**

Construct a diagram to show how the human body responds to consumption of sugar-rich foods.

b) Explain how the process given in part (a) is a feedback mechanism that helps maintain homeostasis. **3**

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Question 24 (8 marks)

Two species of endangered orchid, *Orchidus viotletus* and *Orchidus aquas* are at risk of being completely eliminated due to housing development.

Data was collected examining the gene for flower colour in *Orchidus aquas.* The blue flower allele is dominant to a white flower allele. The number of each genotype in the population of 24 individuals is shown below:

Genotype	*Number of individuals*
BB	16
Bb	5
bb	3

a) Construct a Punnet square to show the genotype and phenotype in a cross between heterozygotes. **3**

b) Using your Punnett square from (a) as an example, explain the link between Punnett squares and probability. **2**

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c) Use the information above to calculate allele frequency in the *Orchidus aquas* population. Show all your working. **3**

COLOUR	AMOUNT		GENOTYPE	AMOUNT		TOTAL FROM GENOTYPE INFO		TOTAL FROM LAST COLUMN		Total Allele's (B and b) =
Blue			BB			B's=		Total B's=		
White			Bb			B's = b's=		Total b's =		
TOTAL			bb			b's=				

$$\frac{\text{\# of B's}}{\text{Total \# of alleles}} \times 100\ \% =$$

$$\frac{\text{\# of b's}}{\text{Total \# of alleles}} \times 100\ \% =$$

Question 25 (4 marks)

A student designed the following first-hand investigation to determine how one factor in the environment can effect phenotypic expression. The plants used were grown from seed.

Feature	*Group A*	*Group B*
Type of seedling	Bean	Bean
Number of seedlings	100	100
Temperature (°C)	10	30
Light (hours/day)	12	12
Water (mL/day)	20	20
Soil	Potting medium	Potting medium

a) Identify the independent variable in this investigation. **1**

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b) Evaluate the validity of this investigation. **3**

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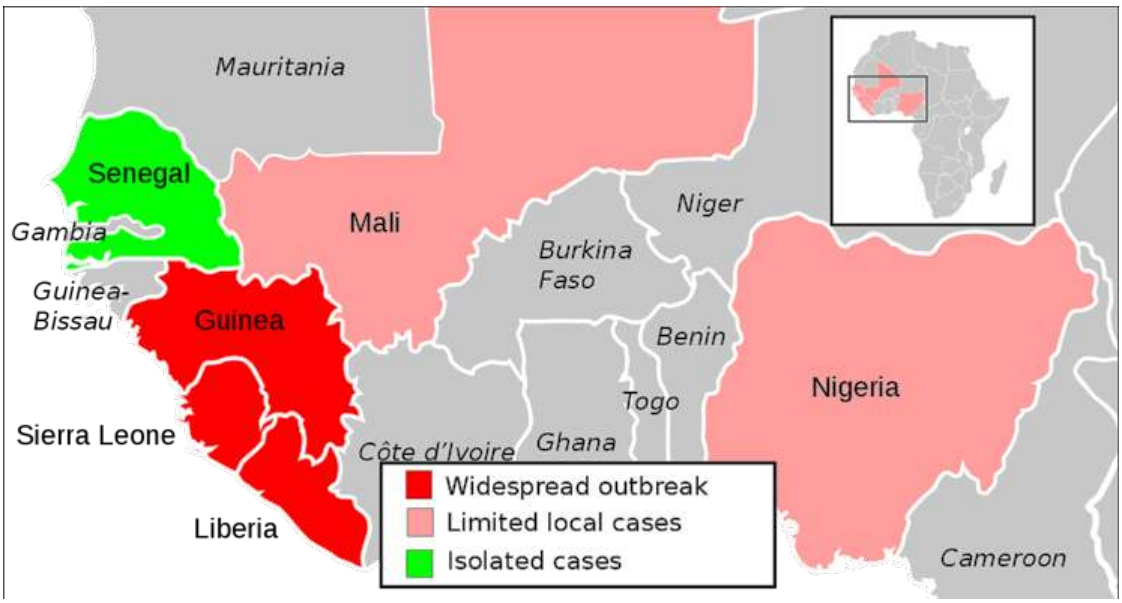
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Question 26 (7 marks)

Ebola is a highly contagious virus which can cause rapid death. It is transmitted through human to human contact/exchange of bodily fluids.

The diagram shows the spread of the Ebola epidemic in West Africa in 2014.



a) Identify a possible procedure that could be employed by countries surrounding Guinea to prevent the spread of Ebola. **1**

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b) Compare the effectiveness of quarantine programs in 'Senegal' and 'Guinea' during this epidemic using the information in the map to support your answer. **3**

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c) Using another infectious disease you have studied as an example, explain how the development and use of an Ebola vaccine could be used to help control the spread of Ebola in the future. **3**

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Question 28 (4 marks)
You have a friend who is ten years old and has just been diagnosed with myopia. Her parents are considering glasses, contact lenses or laser surgery and have asked for your opinion.

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State TWO questions you would ask about the ten-year-old friend, and explain why each of these questions are relevant to the decision about which technology to select.

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Additional Writing Space – Booklet 1
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Hornsby Girls High School

TRIAL HSC EXAMINATION 2019

HSC Biology

BOOKLET 2

Student Number …….…….

Answer Questions 29 – 35 in this booklet

---------- **Teacher Use Only** ----------

Booklet 2

Question	Out of	Your Mark
Q29	5	
Q30	4	
Q31	5	
Q32	8	
Q33	5	
Q34	3	
Q35	7	

Section II continued
Attempt Questions 29 –35 in this booklet.
Answer the questions in the space provided.
Do not write in the margins - if you require more space to complete a question, clearly note on the question that the answer continues then complete the question at the back of the section on the spare lined pages.

Question 29 (5 marks)
As part of your Biology course, you had to design and conduct a practical investigation relating to the microbial testing of water and food samples.

a) State a hypothesis that you tested. **1**

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b) Describe the safe work practices employed during your investigation. **2**

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c) Justify your choice of data collection when collecting the results of this investigation. **2**

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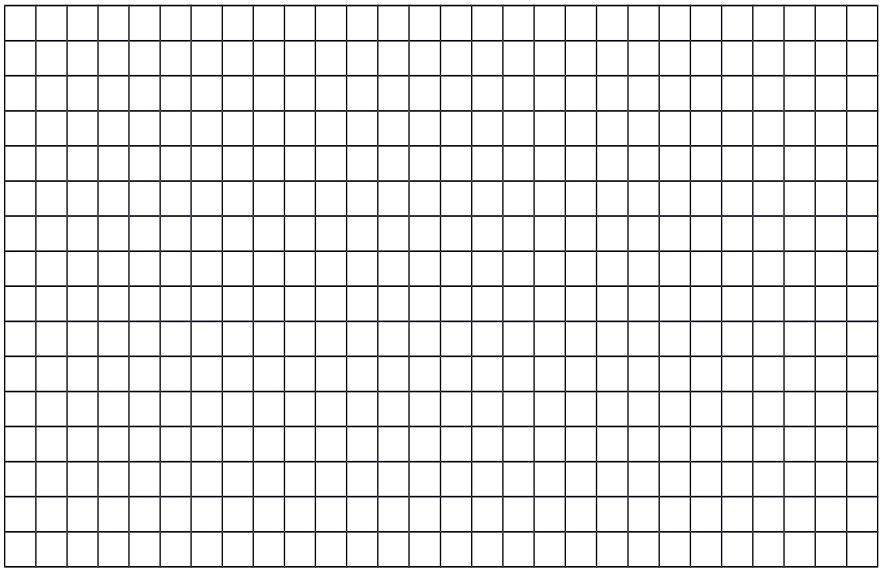
Question 30 (4 marks)

Achondroplasia (dwarfism) is a genetic disorder that occurs in approximately 1 in 20 000–30 000 live births. It is caused by a spontaneous genetic mutation in approximately 80 percent of patients. In the remaining cases, it is inherited from a parent. Typically, the torso and head of the affected individuals are of normal size, but the arms and legs are short.

a) The table shows the fold increase (how many times more likely) of the occurrence of achondroplasia related to the age range of the parents. **3**

Age range (years)	24 and under	25–29	30–34	35–39	40–44	45–49	50–54
Fold increase	1.0	1.4	3.0	5.2	7.9	8.3	11.5

Using these figures, construct a graph on the grid provided.



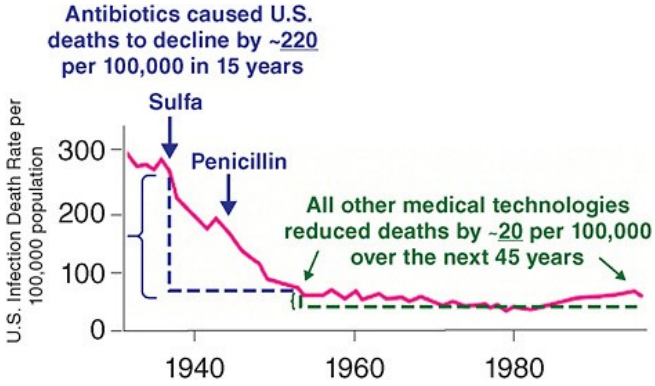
b) State a hypothesis that would be supported by the statistics. **1**

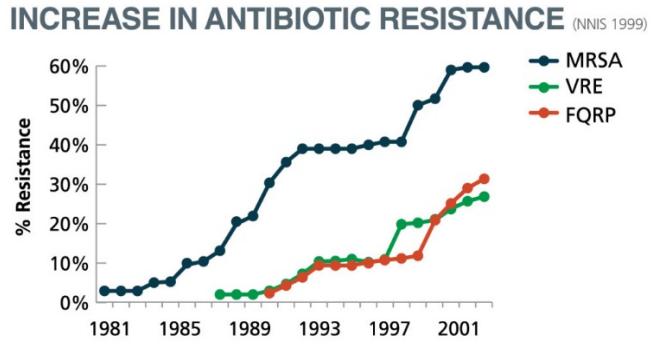
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Question 31 (5 marks)

The graphs below show different information about the effectiveness of antibiotics as a treatment strategy of infectious diseases.





Using the information provided in the graphs and your own knowledge, discuss the effectiveness of antibiotics as a treatment strategy for infectious disease. **5**

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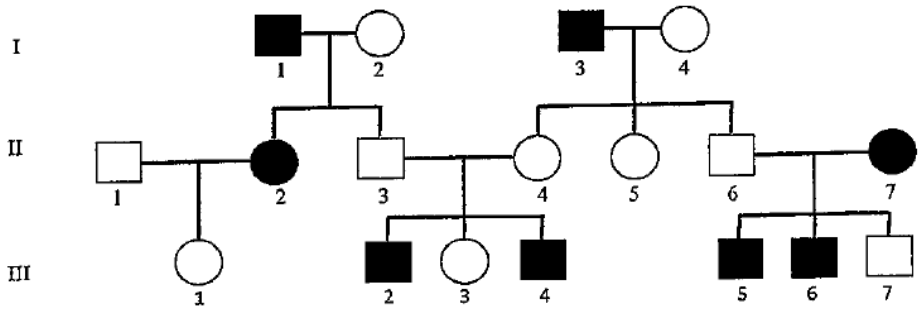
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Question 32 (8 marks)
The pedigree below shows the inheritance of a genetic disease in a family through three generations.



a) What is the relationship of I2 to II3? **1**

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b) Assess if it is possible to determine if this disease is sex-linked from the information given in the pedigree. **3**

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c) Compare and contrast the use of pedigrees and one other technology of your choice in accurately predicting inheritance patterns. **4**

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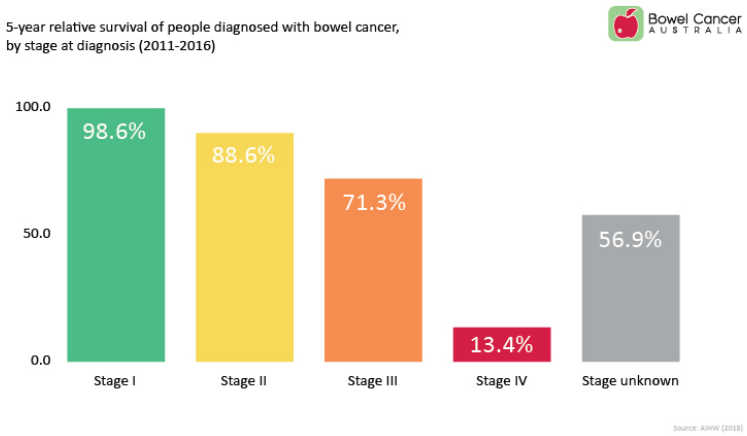
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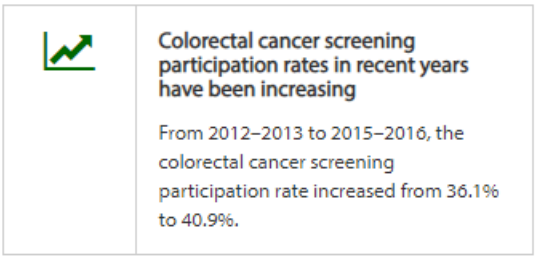
Question 33 (5 marks)

In 2017, bowel cancer had the second highest mortality rate amongst cancers in Australia. Australia commenced an organised program of bowel cancer population screening in 2006 through the National Bowel Cancer Screening Program (NBCSP). Below are three sources are used to promote participation in this Program.

Source 1



Source 2



Source 3



With reference to the three sources, assess the effectiveness of the National Bowel Cancer Screening Program in relation to the incidence and mortality rate of bowel cancer in Australia. **5**

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Question 34 (3 marks)
Below is an excerpt article about curing SCID.

SCID stands for 'Severe Combined Immunodeficiency'. It is a group of disorders that is

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Question 35
The term 'disorder' can be used to describe something that alters or disrupts the normal functioning of the body.

Explain the cause of a specific disorder that affects the human body and evaluate the use of a technology implemented to manage the effects of this disorder. *You may NOT use an example that you have used in a previous questions.* **7**

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