

Trial Examination 2021

HSC Year 12 Biology

General Instructions

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

Total marks:
100

Section I – 20 marks (pages 2–8)

- Attempt Questions 1–20
- Allow about 35 minutes for this section

Section II – 80 marks (pages 9–25)

- Attempt Questions 21–36
- Allow about 2 hours and 25 minutes for this section

Students are advised that this is a trial examination only and cannot in any way guarantee the content or the format of the 2021 HSC Year 12 Biology examination.

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SECTION I**20 marks****Attempt Questions 1–20****Allow about 35 minutes for this section**

Use the multiple-choice answer sheet for Questions 1–20.

1 Which of the following statements about proteins is true?

- A. Proteins are the building blocks of amino acids.
- B. Proteins are small, simple molecules.
- C. Proteins provide structure and support for cells.
- D. Proteins are types of polysaccharides.

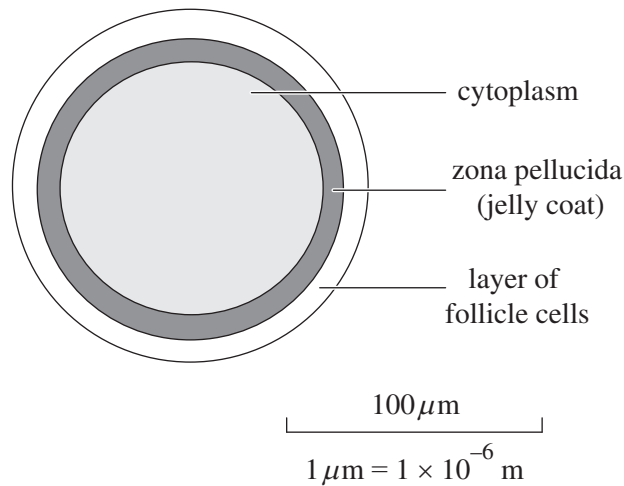
2 Which of the following correctly identifies the reproduction types of the different organisms?

	<i>Animals</i>	<i>Bacteria</i>	<i>Fungi</i>	<i>Plants</i>	<i>Protists</i>
A.	sexual only	budding and spores	binary fission and budding	sexual only	binary fission only
B.	internal and external fertilisation	binary fission only	budding and spores	asexual and sexual	binary fission and budding
C.	internal fertilisation only	binary fission and budding	binary fission only	asexual only	external fertilisation only
D.	internal and external fertilisation	asexual and sexual	budding and spores	asexual and sexual	binary fission only

3 Which of the following statements about mitosis is correct?

- A. Mitosis occurs in sex (germ) cells.
- B. Mitosis retains half of the original chromosome number.
- C. Mitosis has four phases, including prophase, metaphase, anaphase and telophase.
- D. Mitosis leads to genetic variation.

- 4 The diagram shows a simplified version of a human ovum.



Which of the following values is closest to the diameter of this cell?

- A. 7.2×10^{-6} m
 - B. 1.4×10^{-6} m
 - C. 7.2×10^{-4} m
 - D. 1.4×10^{-4} m
- 5 The DNA that exists in prokaryotic cells
- A. is linear and double-stranded.
 - B. is circular and double-stranded.
 - C. is found in a nucleus.
 - D. is in much greater quantity than in eukaryotic cells.
- 6 Colour blindness is an inherited disease. The Punnett square shows the F1 generation of offspring of a woman who is colour blind and a man with unaffected vision.

	X ^B	Y
X ^b	X ^B X ^b	X ^b Y
X ^b	X ^B X ^b	X ^b Y

KEY
X ^B = unaffected vision
X ^b = colour blind

Which of the following conclusions can be drawn from the Punnett square?

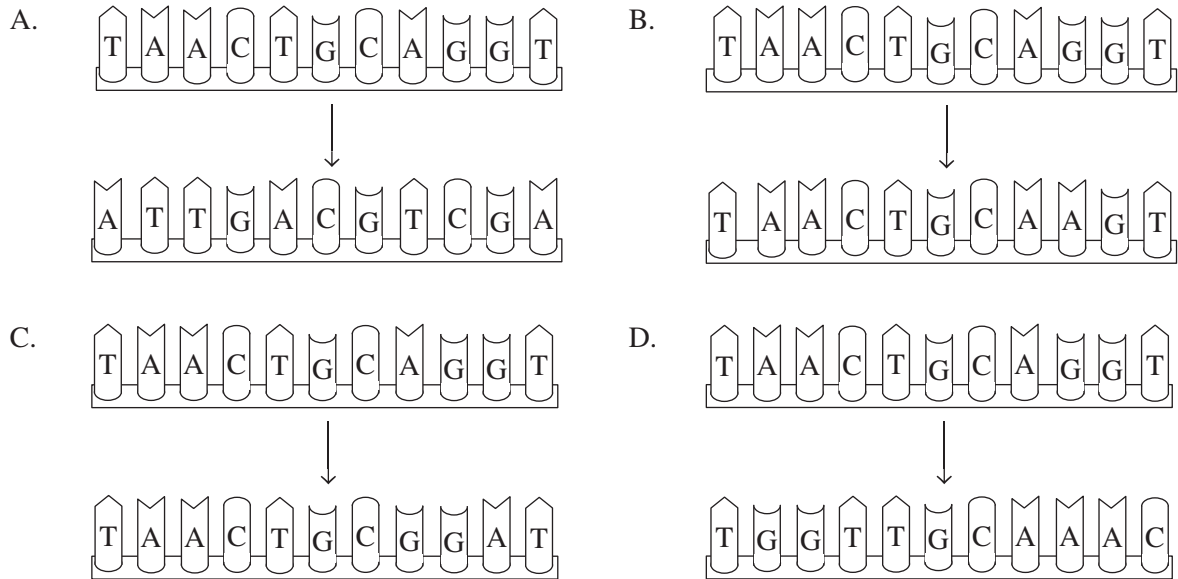
- A. Any male offspring have a 100% chance of being colour blind.
- B. Any male offspring have a 50% chance of being colour blind.
- C. The allele for colour blindness is dominant.
- D. Any female offspring will be homozygous carriers for colour blindness.

7 In the early 1800s in Ireland, the Irish Lumper was the most widely grown variety of potato. It grew in poor soils and gave a high energy yield per hectare cultivated. Because this variety of potato tended to propagate vegetatively, many of the plants were clones. In the 1840s, a rot caused by *Phytophthora infestans* wiped out most of this variety of potato.

The cultivation of the Irish Lumper is an example of

- A. genetic drift.
- B. artificial pollination.
- C. a lack of biodiversity.
- D. gene cloning.

8 Which of the following diagrams showing a change in a length of DNA is an example of a point mutation?



9 Non-coding DNA segments

- A. only make up a very small percentage of the genome of an individual.
- B. are not subject to mutations.
- C. can play a role in the regulation of gene expression.
- D. are sequences of a gene's DNA that transcribe into protein structures.

- 10** Oestrus (estrus) signifies when a cow ‘comes into heat’ and is sexually responsive. The diagram compares artificial insemination with natural mating and shows the link between the likelihood of conception and the onset of oestrus.

time after cow comes into heat (hours)	0	6	12	18	24	30
artificial insemination	too early	good	optimal	good	too late	
natural mating	too early	optimal		too late		

Which of the following conclusions can be derived from the information in the diagram?

- A. Artificial insemination produces better quality calves than natural mating.
- B. Artificial insemination has a shorter time frame for conception to occur than natural mating.
- C. There is a higher chance of conception with natural mating than with artificial insemination.
- D. Breeders need to know when their cows come into heat to maximise the chance of conception.
- 11** Kuru is a rare disease that spread in New Guinea during the 1950s and 1960s. Symptoms of the disease included headaches, difficulty swallowing and walking, and arm and leg pains. Sufferers could have the pathogen for up to 10 years before they experienced any symptoms, but usually died within one year of experiencing symptoms. The pathogen, an altered protein, changed the folded structure of proteins in the sufferer’s brain and other nervous system tissue. The pathogen that causes Kuru is classified as
- A. a prion that is non-cellular.
- B. a virus that is non-cellular.
- C. a prion that is cellular.
- D. a virus that is cellular.

- 12 The information shown is a summary of the mode of transmission of a range of infectious diseases.

Transmission of infectious disease	
•	HIV is a virus that is spread through sexual activity.
•	Conjunctivitis is an eye disease that is spread by a person touching their infected eye and then touching the eye or face of another person.
•	SARS is an infectious disease that can be transmitted by sharing utensils.
•	Measles can be transmitted by one person entering a room after an infectious person has left the room.

Which of the following gives the correct classifications of transmission of the diseases listed above?

	<i>Direct</i>	<i>Indirect</i>
A.	SARS, measles	HIV, conjunctivitis
B.	SARS, HIV	conjunctivitis, measles
C.	SARS	HIV, conjunctivitis, measles
D.	HIV, conjunctivitis	SARS, measles

- 13 A student disinfected their workbench with alcohol wipes before conducting an experiment to test for microbes in water.

Why did the student disinfect their workbench?

- A. The student did not want to become infected with microbes from the workbench.
- B. The alcohol wipes prevent the experiment from becoming contaminated by microbes on the workbench.
- C. The student's teacher told them to have a clean work area.
- D. The microbes in the water may contaminate the workbench.

- 14 Adaptive immunity can last a lifetime.

Which of the following statements correctly explains this statement?

- A. The brain recognises infections and sends a message through the central nervous system to destroy the pathogen.
- B. Special lymphocytes remain in the body after initial exposure to a pathogen, which can recognise and fight any further infections.
- C. B cells produce antibodies that destroy any pathogens that enter the body over an individual's lifetime.
- D. B cells and T cells are involved in the immune response.

- 15** An infectious disease appears in a town with a population of 10 000 people. All the members of the town's population have an equal chance of contracting the disease. At the beginning of May, the prevalence of the disease is 200. Over the month, the incidence of the disease is 0.2%. At the end of May, 10 people who contracted the disease at the beginning of the month have fully recovered. There were no deaths.
- How many people in the town had the disease at the end of May?
- A. 210
 - B. 220
 - C. 230
 - D. 390
- 16** Which of the following describes an organism's ability to maintain a constant internal environment?
- A. homogenous
 - B. homozygous
 - C. homeostasis
 - D. *Homo sapiens*
- 17** Peripheral nerves
- A. link receptors and effectors to the central nervous system.
 - B. link receptors to hormones to control the body's internal environment.
 - C. exist in the peripheral parts of the body, such as the fingers and toes.
 - D. have axons.
- 18** Kangaroos lick their paws to regulate their internal body temperature. Blood vessels are close to the surface of the skin on their paws. When the kangaroo licks its paws, heat from the blood vessels is transferred to their saliva, which then evaporates, removing heat energy from the kangaroo.
- Which type of adaptation is the kangaroo demonstrating by licking its paws?
- A. physiological
 - B. behavioural
 - C. structural
 - D. chemical

- 19** Which of the following is a benefit of participating in an epidemiological study?
- A. Participants will make a positive contribution to society by providing information that helps scientists understand the cause of a disease.
 - B. Participants will be given the correct diagnosis of their disease.
 - C. Participants will find out from which parent they inherited their disease.
 - D. Participants will always be paid for their time.
- 20** The mortality rate of different diseases is dependent on many different factors. Mortality rate refers to the number of
- A. people diagnosed with a disease in a given population over a specific time.
 - B. deaths from a disease in a given population over a specific time.
 - C. healthy people who have become sick from an infectious disease.
 - D. people who have the pathogen but do not exhibit any symptoms.

HSC Year 12 Biology

Section II Answer Booklet

80 marks

Attempt Questions 21–36

Allow about 2 hours and 25 minutes for this section

Instructions

- Answer the questions in the spaces provided. These spaces provide guidance for the expected length of response.
 - Show all relevant working in questions involving calculations.
 - Extra writing space is provided at the back of this booklet. If you use this space, clearly indicate which question you are answering.
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Please turn over

Question 22 (4 marks)

A Year 12 Biology class carried out the following investigation.

4

<p>Procedure</p> <p>Two hydrangea plants of similar size were propagated using cuttings from the same pink plant. They were placed in different pots containing the same amount of potting mix at the back of a laboratory in the same lighting conditions. The hydrangeas were watered regularly with the same amount of water. After two weeks, when the plants seemed to have stabilised, special fertilisers were added to the soils. A certain amount of ‘hydrangea bluing agent’ (which is acidic and lowers pH) was added to one plant and the same amount of ‘hydrangea pinking agent’ (which is alkaline and raises pH) was added to the other plant.</p> <p>Results</p> <p>The hydrangea that had the ‘hydrangea bluing agent’ added to its soil turned from pink to blue in colour. The hydrangea that had the ‘hydrangea pinking agent’ added to its soil became a slighter deeper shade of pink.</p> <p>Conclusion</p> <p>The environment (acidic or alkaline soil) affected a phenotype, in this case the colour of the hydrangeas.</p>
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Discuss the appropriateness of the investigation in terms of assessing how phenotypic expression is affected by genes and environment.

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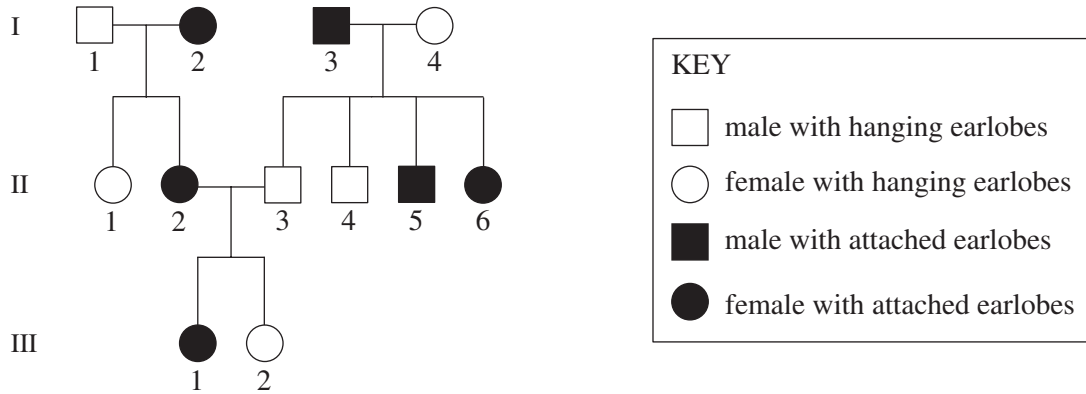
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Question 23 (4 marks)

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The possession of one of two types of earlobe (hanging or attached) is sometimes used to study the inheritance of characteristics in humans. The pedigree shows the different types of earlobes present in three generations. In the first generation, individuals 1 and 4 are heterozygous for the alleles responsible for earlobe type and individuals 2 and 3 are homozygous for these alleles.



Discuss the type of inheritance shown in the pedigree. In your answer, include reference to the alleles involved using standard notation.

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Question 25 (9 marks)

- (a) Mutations have many different causes and effects.

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Outline how mutations can affect the gene pool of a population.

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Question 25 continues on page 15

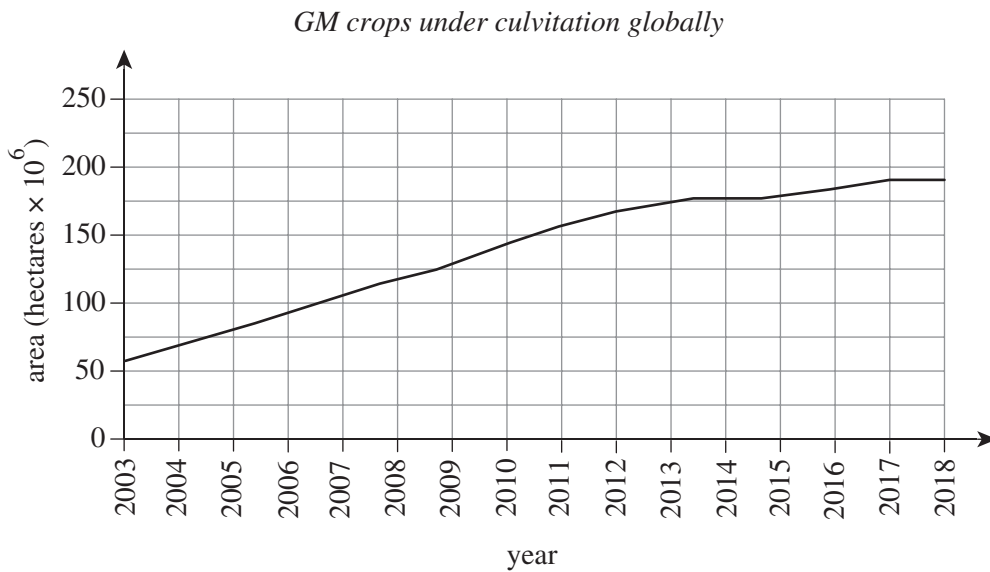
Question 25 (continued)

- (b) Draw a table that identifies **THREE** types of mutagen, describes how each mutagen operates and identifies the effects of each mutagen. **6**

End of Question 25

Question 26 (7 marks)

A student was asked to research genetically modified crops. The graph shows the information that they collected.



- (a) Using the graph above, calculate the percentage yearly increase of genetically modified crops from 2009 to 2018. Show your working. **2**

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Question 26 continues on page 17

Question 26 (continued)

- (b) There are benefits and drawbacks of using genetically modified crops. **5**
Outline TWO possible benefits and TWO possible drawbacks of using genetically modified crops.

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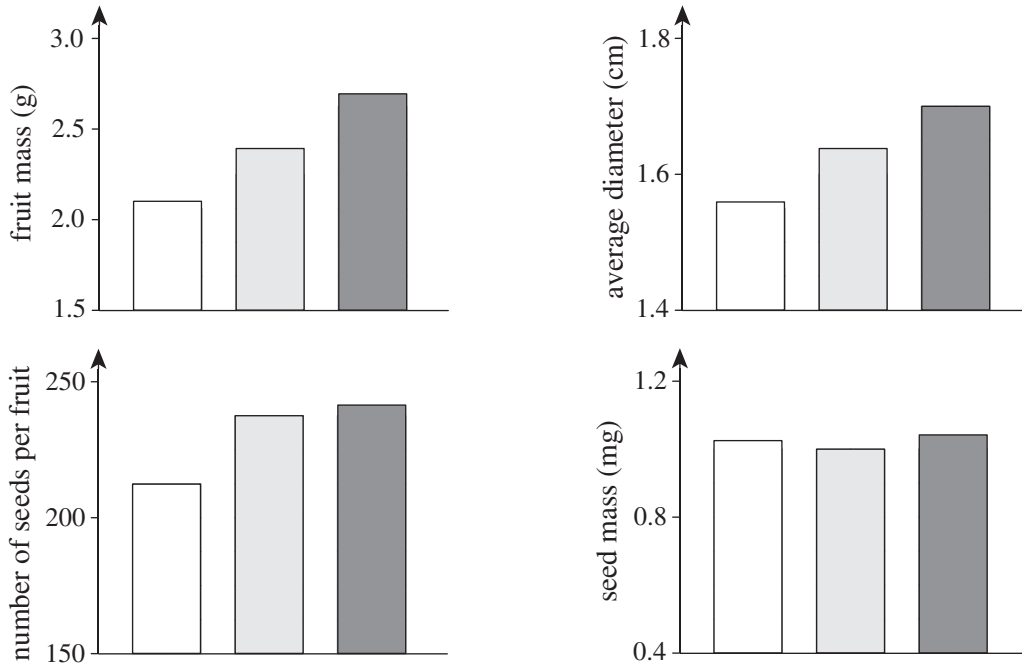
End of Question 26

Question 27 (5 marks)

A fruit farm collected information on the fruit formed by three types of pollination on their farm over one year. The resulting data is shown in the graphs.

5

Fruit pollination data



KEY

- artificial pollination
- open pollination (bees, other insects and wind)
- pollination by bees only

After considering the data in the graphs and other factors, the decision was made to use 100% artificial pollination on the farm.

Describe FIVE possible reasons for this decision.

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Question 28 (4 marks)

Consider an infectious disease you have studied.

(a) Give the name of the disease. **1**

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(b) Identify ONE strategy that has been used to limit the spread of the disease identified in part (a) at a global level. **1**

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(c) Analyse how the strategy identified in part (b) has influenced the spread of the disease at regional and local levels. **2**

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Question 30 (3 marks)

Australian plants are vulnerable to a range of viral and fungal pathogens.

- (a) Name ONE Australian plant and ONE viral or fungal pathogen that invades this plant. **1**

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- (b) Describe how the plant named in part (a) responds to the pathogen. **2**

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Question 31 (3 marks)

Identify an infectious disease and evaluate ONE strategy that is used to predict and control the spread of this disease. **3**

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Question 32 (3 marks)

A parent took their child to a doctor because their child had a fever and mild cold symptoms, including a runny nose. The doctor examined the child and told the parent to give the child medication to reduce the fever, have them drink a lot of fluids and ensure they get plenty of rest. The parent also asked for antibiotics, but the doctor decided not to prescribe them.

- (a) Suggest ONE reason why the doctor would not prescribe the child antibiotics. **1**

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- (b) Assess the use of antibiotics in Australia. **2**

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Question 33 (4 marks)

An epidemiological study has found high levels of obesity in a school.

- (a) Propose TWO questions that could be asked to investigate why obesity is high in this population. **2**

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- (b) Select ONE question from your response in part (a) and design an educational program to address the cause of obesity. **2**

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Question 34 (6 marks)

A disorder occurs when normal tissue is changed, resulting in its structure or function being altered. Technology can assist people who live with disorders.

- (a) Name ONE disorder and describe the technology used to assist people living with this disorder. **3**

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- (b) Evaluate the effectiveness of the technology described in part (a). Support your answer with TWO reasons. **3**

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Question 35 (4 marks)

Complete the table below for a nutritional disease OR a disease caused by environmental factors. Describe the cause of the disease, the treatment for the disease AND outline an area of possible research into the disease.

4

<i>Disease name</i>	
<i>Cause</i>	
<i>Treatment</i>	
<i>Area of possible research</i>	

Question 36 (6 marks)

Two students choose different activities to complete for 15 minutes.

6

<i>Student</i>	<i>Activity</i>
<i>A</i>	eat an ice cream
<i>B</i>	go for a run

Draw a labelled diagram that demonstrates the changes that take place in both student *A* and student *B* in response to their activities, including changes in hormone levels and the role of specific internal organs.

End of paper

Neap Trial Examination 2021

HSC Year 12 Biology

DIRECTIONS:

Write your name in the space provided.

Write your student number in the boxes provided below. Then, in the columns of digits below each box, fill in the oval which has the same number as you have written in the box. Fill in **one** oval only in each column.

Read each question and its suggested answers. Select the alternative A, B, C, or D that best answers the question. Fill in the response oval completely, using blue or black pen. Mark **only one** oval per question.

A B C D

If you think you have made a mistake, put a cross through the incorrect answer and fill in the new answer.

A B C D

If you change your mind and have crossed out what you consider to be the correct answer, then indicate this by writing the word *correct* and draw an arrow as follows.

A B C D
correct
 ↓

STUDENT NAME: _____

STUDENT NUMBER:

①	①	①	①	①	①	①	①	①
②	②	②	②	②	②	②	②	②
③	③	③	③	③	③	③	③	③
④	④	④	④	④	④	④	④	④
⑤	⑤	⑤	⑤	⑤	⑤	⑤	⑤	⑤
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⑧	⑧	⑧	⑧	⑧	⑧	⑧	⑧	⑧
⑨	⑨	⑨	⑨	⑨	⑨	⑨	⑨	⑨
⑩	⑩	⑩	⑩	⑩	⑩	⑩	⑩	⑩

SECTION I MULTIPLE-CHOICE ANSWER SHEET

1. A B C D
2. A B C D
3. A B C D
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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

**STUDENTS SHOULD NOW CONTINUE
WITH SECTION II**