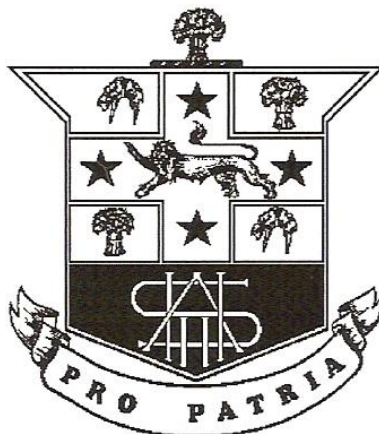


HURLSTONE AGRICULTURAL HIGH SCHOOL



HSC Half-yearly Examination 2017

BIOLOGY

General Instructions -

- * Working time – 90 minutes
- * Write using black or blue pen
- * Draw diagrams in pencil
- * Board-approved calculators may be used
- * Write your Student Number at the top of each answer page

Total marks - 55

Part A - Multiple Choice - 15 marks

- * Attempt questions 1 - 15
- * Your choices should be placed on the multiple choice answer sheet

Part B – Knowledge and Understanding extended response – 20 marks

- * Attempt questions 16 - 21

Part C – Practical and Process extended response – 20 marks

- * Attempt questions 22 - 26

Examiners: Mr B. Robson, Mr N. Mahfouz

Part A – Multiple choice. Answer all questions on the answer sheet provided.

1. What is the main role of the kidney in marine fish?

- (A) To excrete salt.
- (B) To excrete water.
- (C) To excrete dilute urine
- (D) To excrete nitrogenous waste.

2. The results of a breeding experiment investigating pod colour in pea plants is shown in the table.

<i>Generation</i>	<i>Pod colour</i>	
	<i>Green (G)</i>	<i>Yellow (g)</i>
F_1	632	0
F_2	1560	482

Which option correctly lists the genotypes and their expected proportions in the F_2 generation?

- A) 50% Gg and 50% gg
- B) 75% GG and 25% gg
- C) 50% GG, 25% Gg and 25% gg
- D) 50% Gg, 25% gg and 25% GG

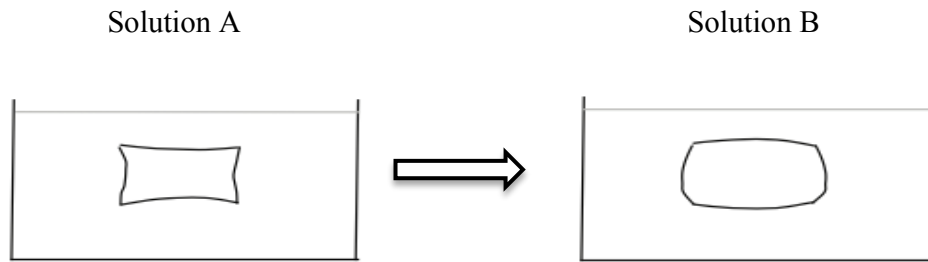
3. The work of three scientists is summarised in the table.

Scientist	Description of their work
X	Experimented with fruit flies, concluding that eye colour was a sex-linked characteristic.
Y	Experimented with pea plants, concluding that certain traits show up in offspring without any blending of parent characteristics.
Z	Experimented with grasshoppers, concluding that chromosomes are the basis of inheritance.

Which option correctly identifies these scientists?

	X	Y	Z
A)	Gregor Mendel	Thomas Morgan	Theodor Boveri
B)	Thomas Morgan	Gregor Mendel	Walter Sutton
C)	Thomas Morgan	Gregor Mendel	Theodor Boveri
D)	Walter Sutton	Gregor Mendel	Thomas Morgan

4. The diagram shows a model cell that is transferred from solution A to solution B.



Which option best explains the change in appearance of the model cell?

- (A) Solution A is less concentrated than solution B. The model cell has lost salt by diffusion.
(B) Solution A is more concentrated than solution B. The model cell has lost salt by diffusion.
(C) Solution A is less concentrated than solution B. The model cell has gained water by osmosis.
(D) Solution A is more concentrated than solution B. The model cell has gained water by osmosis.
5. The ichneumon fly is a harmless insect that mimics (looks like) a stinging wasp. Predators avoid the fly because of this similarity in appearance. The ichneumon fly and the wasp are not close relatives.

What is mimicry an example of?

- (A) Adaptive radiation
(B) Divergent evolution
(C) Convergent evolution
(D) Evolution of acquired characteristics

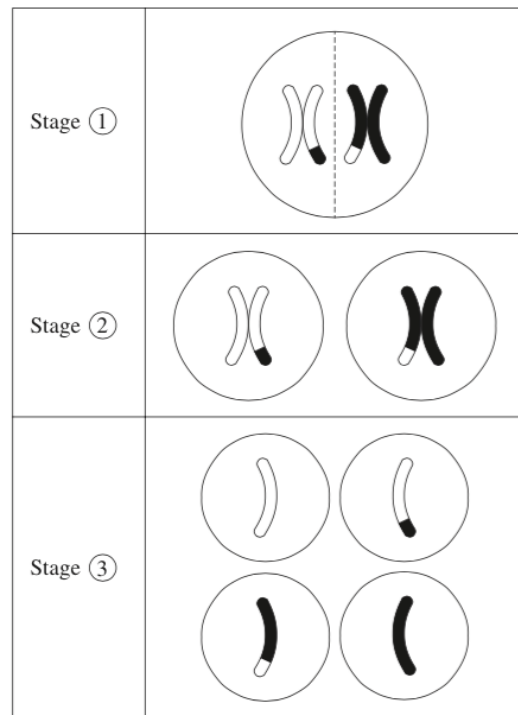
6. Which statement about the changes to the pH of blood as it circulates around the body is correct?

- A) The pH of blood decreases as it passes through the lungs.
B) The pH of blood decreases as it passes through the brain.
C) The pH of blood increases as it passes through the muscles.
D) The pH of blood increases as it passes through the capillaries.

7. A genetic disorder is controlled by a gene on the Y chromosome. What is the probability a man with the condition will have an affected daughter?

- A) 0 %
B) 25 %
C) 75 %
D) 100 %

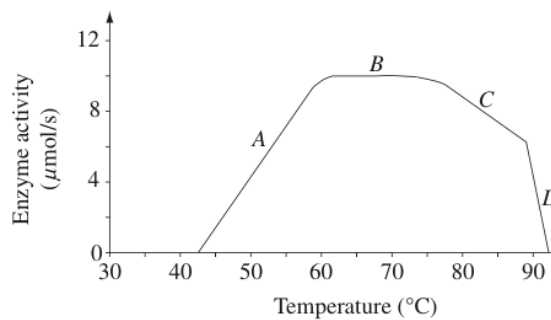
8. The diagram shows some stages in meiosis.



When does crossing over occur?

- A) Before stage 1
- B) During stage 2
- C) Between stage 1 and stage 2
- D) Between stage 2 and stage 3

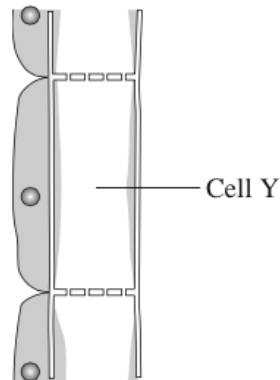
9. The graph shows the results of an experiment investigating the effect of temperature on the activity of a bacterial enzyme.



Which section of the graph indicates that the enzyme is denatured?

- (A) A
- (B) B
- (C) C
- (D) D

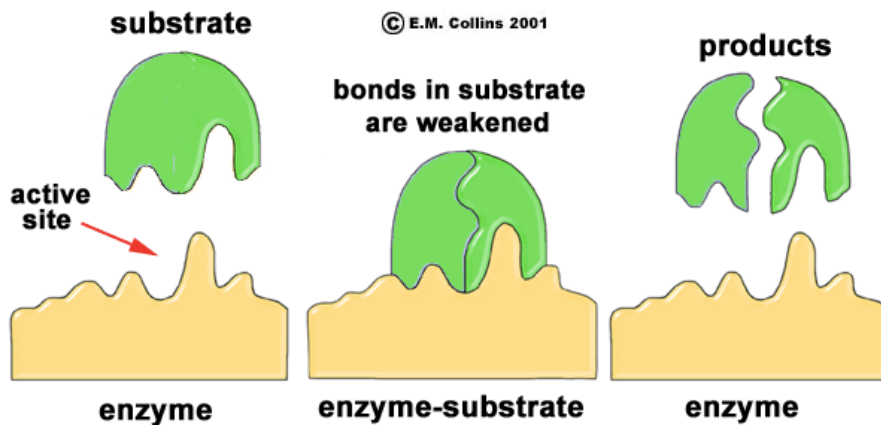
10. The diagram shows a section of plant tissue.



Which statement about cell Y is correct?

- A) Cell Y is a xylem vessel that has a lignified cell wall
- B) Cell Y is a xylem vessel that is part of a vascular bundle.
- C) Cell Y is a phloem sieve tube element that is part of the cambium.
- D) Cell Y is a phloem sieve tube element that does not have a nucleus.

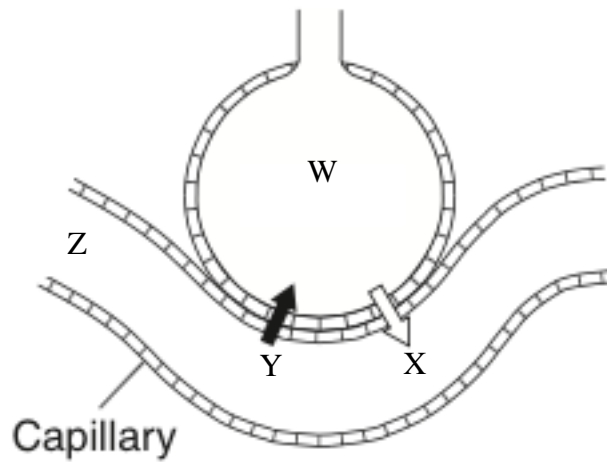
11. The next question refers to the diagram.



What can be observed from the diagram?

- (A) An enzyme is substrate specific.
- (B) An enzyme weakens bonds in the substrate molecule.
- (C) An enzyme can catalyse more than one type of reaction.
- (D) The shape of the enzyme matches the shape of the substrate.

12. The diagram is a model of a process that occurs in the lungs.



What does each letter represent?

Option	W	X	Y	Z
A)	Alveolus	Oxygen	Carbon dioxide	Blood
B)	Blood	Carbon dioxide	Oxygen	Alveolus
C)	Alveolus	Blood	Carbon dioxide	Oxygen
D)	Alveolus	Carbon dioxide	Oxygen	Blood

13. The table shows the design of an experiment to investigate the activity of an enzyme.

Tube Number	Contents	pH	Temperature (°C)
1	Substrate	4	25
2	Substrate + Enzyme	4	25
3	Substrate	7	25
4	Substrate + Enzyme	7	25
5	Substrate	11	25
6	Substrate + Enzyme	11	25

What is the independent variable in this investigation?

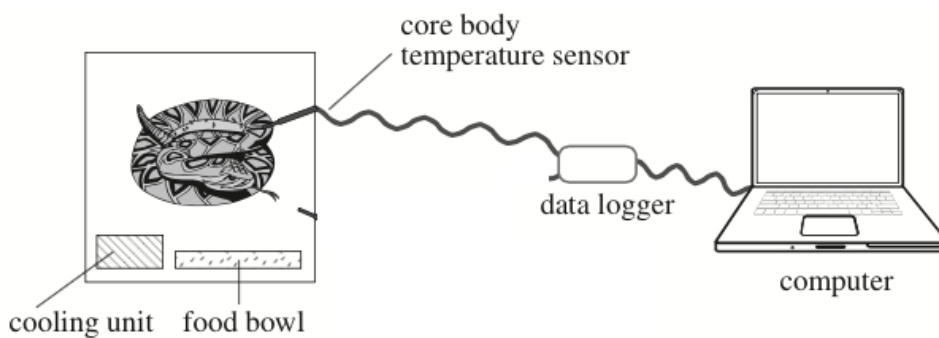
- A) pH
- B) Temperature
- C) Type of enzyme
- D) Presence of the substrate

14. Osmoconformers are organisms that adjust the concentration of the solution in their cells to match their environment.

Which term best describes this type of process?

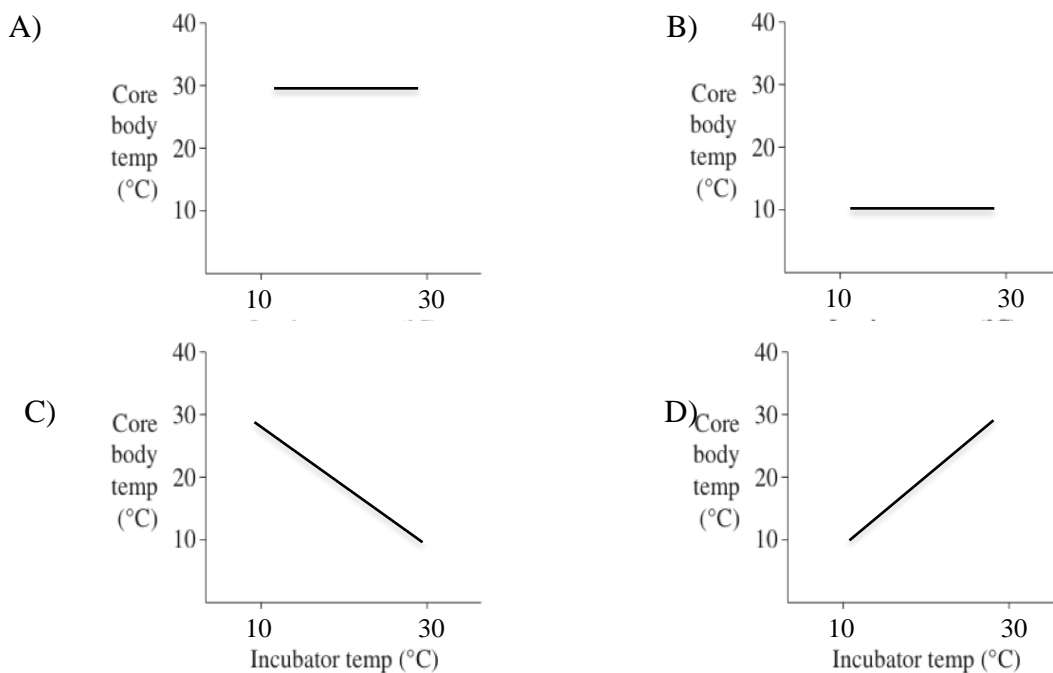
- A) Osmosis
- B) Homeostasis
- C) Enantiostasis
- D) Negative feedback

15. An experiment was set up to measure the changes in the core body temperature of a snake in response to changes in the temperature of the surroundings.



The cooling unit in the incubator housing the snake was used to reduce the temperature of the surroundings from 30°C to 10°C.

Which graph best predicts the change in core body temperature of the snake?



Part B – Knowledge and Understanding extended response (20 marks)

Answer the following questions in the space provided.

16. Why is the removal of nitrogenous waste essential for continued metabolic activity? 1M

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17. Identify an Australian endotherm and describe how it responds to an increase in ambient temperature. 2M

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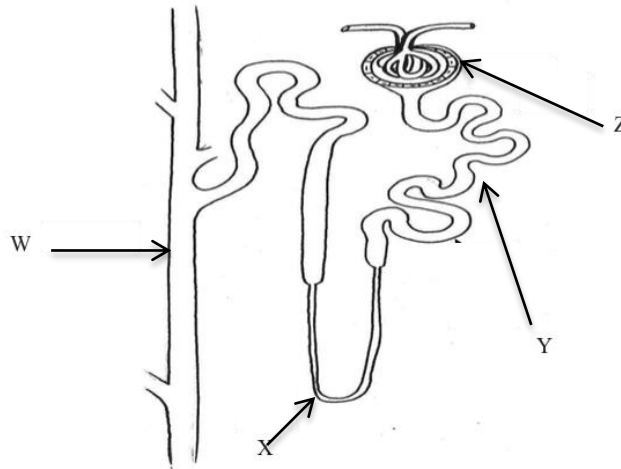
18. Use an example to distinguish between the terms gene and allele. 2M

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19. Compare the transport of sugars in plants with the transport of sugars in mammals 3M

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20. The next question refers to the diagram of a nephron.



a) Identify the letter representing the part of the nephron that is targeted by ADH. 1M

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b) Assess the importance of active transport in part Z. 3M

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c) Describe the role of aldosterone in the functioning of the nephron. 2M

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21. Present day humans display a huge variety of characteristics or phenotypes.

Evidence from a variety of sources including genetics and fossils indicates that all humans alive today descended from small populations of individuals totalling no more than 10,000 who lived about 75,000 years ago.

Analyse the role of meiosis, sexual reproduction and natural selection in producing this huge phenotypic diversity.

6M

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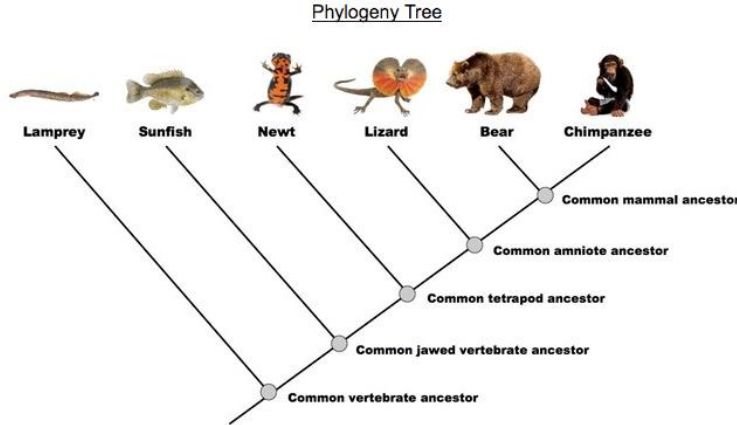
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Part C: Practical and Processes extended response (20 marks)

Answer the following questions in the space provided.

22. A phylogenetic tree can be used to show the evolutionary relationships between organisms. An example is shown in the diagram.



Describe a technology that could be used to provide evidence that bears are more closely related to chimpanzees than lizards.

2M

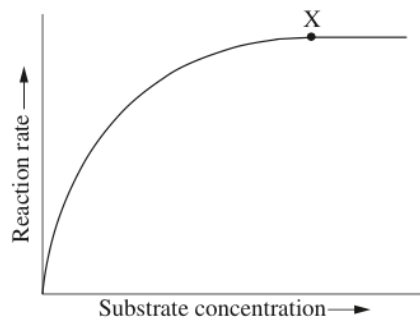
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23. The graph shows the effect of substrate concentration on the rate of a reaction catalysed by an enzyme.



Explain the trend shown by the graph.

2M

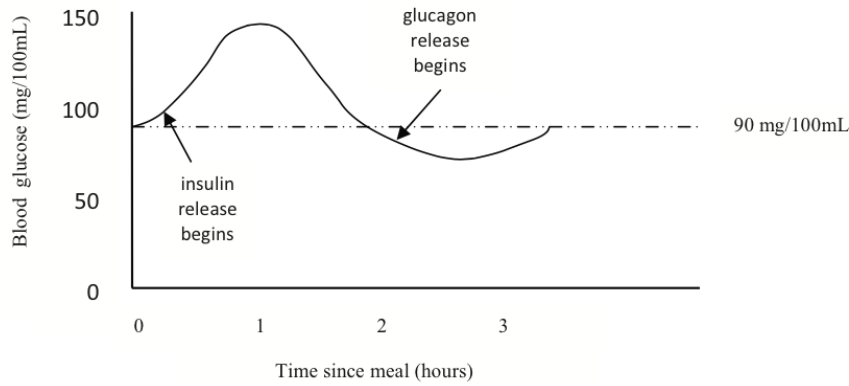
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24. Insulin and glucagon are two hormones released by the pancreas that help maintain blood sugar levels. The graph shows how the glucose concentration in the blood can change from its normal value of 90 mg/100mL after a meal.



a) Describe the effect of glucagon on blood sugar levels. 1M

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b) Explain why control of blood sugar levels is an example of negative feedback. Include a diagram in your answer. 4M

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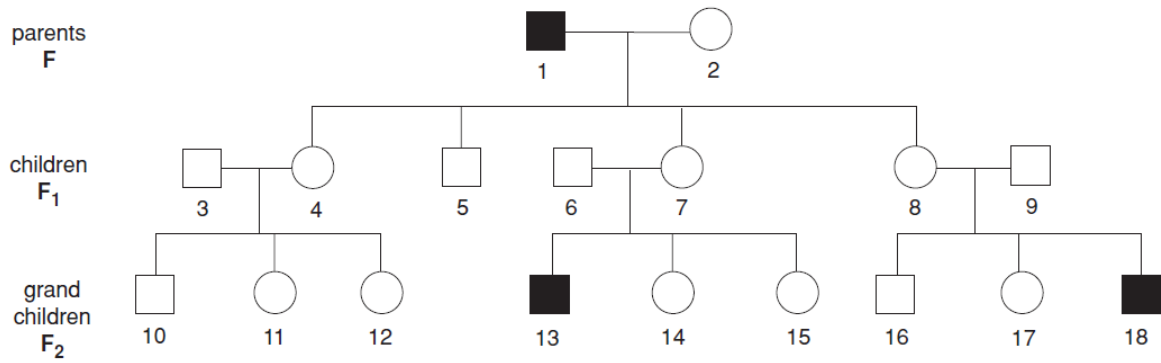
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25. The pedigree shows the inheritance of a genetic disorder.



a) A student stated that the genetic condition is controlled by a recessive allele on the X chromosome. 3M
 Assess this statement.

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b) Use an **appropriate** punnett square to predict the probability that a fourth child of individuals 6 and 7 has the condition. 3M

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26. a) Identify a biological concept you modelled in a first-hand investigation during this course. 1M

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b) Discuss the use of the model when illustrating this biological concept. 4M

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End of Exam!

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Multiple-choice Answer Sheet

Remove from exam booklet – then place inside exam booklet when exam is finished

Select the alternative A, B, C or D that best answers the question. Fill in the response oval completely.

Sample $2 + 4 =$ (A) 2 (B) 6 (C) 8 (D) 9

(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

correct



drawing an arrow as follows: (A) (B) (C) (D)

Part A

- 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)