Christ Church Grammar School

Science Department
Year 11 Human Biology

Semester Two Examination, 2018
Question/Answer Booklet

HUMAN BIOLOGY
UNITS 1 AND 2

Fix student label here

Student Name: _____

Time allowed for this paper

Reading time before commencing work: ten minutes
Working time: three hours

Materials required/recommended for this paper

To be provided by the supervisor

This Question/Answer booklet
Multiple-choice answer sheet

To be provided by the candidate

Standard items: pens (blue/black preferred), pencils (including coloured), sharpener, correction tape/fluid, eraser, ruler, highlighters

Special items: non-programmable calculators approved for use in this examination

Important note to candidates

No other items may be taken into the examination room. It is your responsibility to ensure that you do not have any unauthorised notes or other items of a non-personal nature in the examination room. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

Structure of this paper

Section	Number of questions available	Number of questions to be answered	Suggested working time (minutes)	Marks available	Percentage of examination	Percentage achieved
Section One: Multiple-choice	30	30	30	30	30	
Section Two: Short answer	7	7	90	104	50	
Section Three: Extended answer	3	2	40	40	20	
					100	

Instructions to candidates

1. Write your answers in this Question / Answer booklet preferably using a blue / black pen. Do not use erasable or gel pens.

2. Answer the questions according to the following instructions.

   Section One: Answer all questions on the separate Multiple-choice answer sheet provided. For each question shade the box to indicate your answer. Use only a blue or black pen to shade the boxes. Do not use erasable or gel pens. If you make a mistake, place a cross through that square then shade your new answer. Do not erase or use correction fluid / tape. Marks will not be deducted for incorrect answers. No marks will be given if more than one answer is completed for any question.

   Section Two: Write your answers in this Question/Answer booklet. Wherever possible, confine your answers to the line spaces provided.

   Section Three: Consists of three questions. You must answer two questions. Tick the box next to the question you are answering. Write your answers in this Question / Answer booklet.

3. You must be careful to confine your answers to the specific questions asked and to follow any instructions that are specific to a particular question.

4. Supplementary pages for planning / continuing your answers to questions are provided at the end of this Question / Answer booklet. If you use these pages to continue an answer, indicate at the original answer where the answer is continued, i.e. give the page number.

See next page

Section One: Multiple-choice 30% (30 Marks)

This section has **30** questions. Answer **all** questions on the separate Multiple-choice answer sheet provided. For each question, shade the box to indicate your answer. Use only a blue or black pen to shade the boxes. If you make a mistake, place a cross through that square then shade your new answer. Do not erase or use correction fluid / tape. Marks will not be deducted for incorrect answers. No marks will be given if more than one answer is completed for any question.

Suggested working time: 40 minutes

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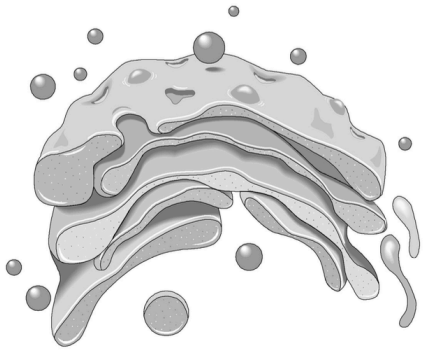
1. The majority of cell processes are controlled by the

   (a) nucleus.
   (b) lysosome.
   (c) mitochondria.
   (d) endoplasmic reticulum.

Question 2 refers to the following diagram.



2. This organelle

   (a) produces ATP.
   (b) packages molecules.
   (c) detoxifies alcohol.
   (d) synthesises nucleic acids.

3. Cells that contain large amounts of smooth endoplasmic reticulum, Golgi bodies and vesicles would be found in the

   (a) liver and testes.
   (b) liver and alveoli.
   (c) stomach and testes.
   (d) alveoli and stomach.

4. The products of mitochondria include ATP and

   (a) water.
   (b) lipids.
   (c) oxygen.
   (d) glucose.

See next page

Questions 5 and 6 refer to the table below.

AAU, AAC – Asparagine	CAU, CAC – Histidine	GAU, GAC – Asparatic acid	UAU, UAC – Tyrosine
AAA, AAG – Lysine	CAA, CAG – Glutamine	GAA, GAG – Glutamate	UAA, UAG – Stop
ACU, ACC, ACA, ACG – Threonine	CCU, CCC, CCA, CCG – Proline	GCU, GCC, GCA, GCG – Alanine	UCU, UCC, UCA, UCG – Serine
AGU, AGC – Serine AGA, AGG – Arginine	CGU, CGC, CGA, CGG – Arginine	GGU, GGC, GGA, GGG – Glycine	UGU, UGC – Cysteine UGA – Stop UGG – Tryptophan
AUU, AUC, AUA – Isoleucine AUG – Methionine	CUU, CUC, CUA, CUG – Leucine	GUU, GUC, GUA, GUG – Valine	UUU, UUC – Phenylalanine UUA, UUG – Leucine

5. A single base mutation causes the amino acid tryptophan to be replaced by leucine in a protein chain. The base in the DNA that changes to cause this mutation would be

   (a) adenine.
   (b) guanine.
   (c) cytosine.
   (d) thymine.

6. Which DNA code represents this polypeptide chain?

   (a) CTA GGT AGT
   (b) GAC ACA CCA
   (c) CAU UGA GGU
   (d) CTG TGT GGT

7. At which of the following cell structures would adenine bond with thymine but not uracil?

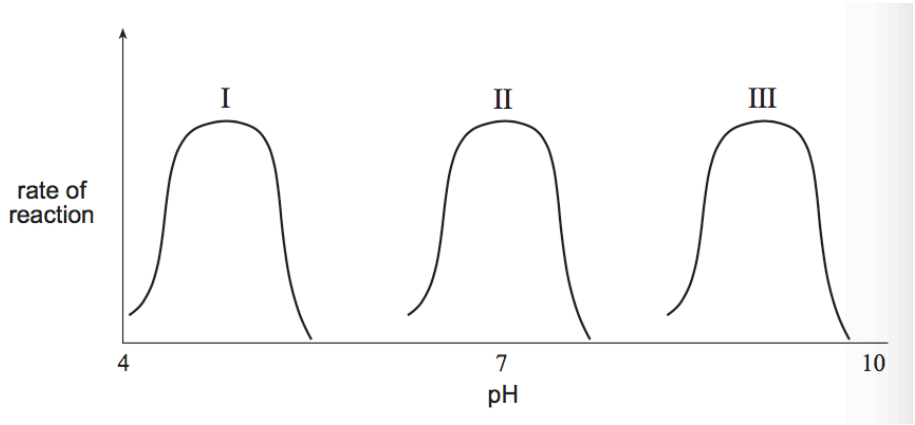
   (a) nucleus
   (b) ribosomes
   (c) Golgi bodies
   (d) endoplasmic reticulum

See next page

8. A solution of DNA contains 33% adenine. How much would be guanine?

(a) 67%
(b) 34%
(c) 33%
(d) 17%

9. The graph shows the effect of pH on three different enzyme catalysed reactions.



Which one of the following would best describe the effect of pH on enzyme catalysed reactions?

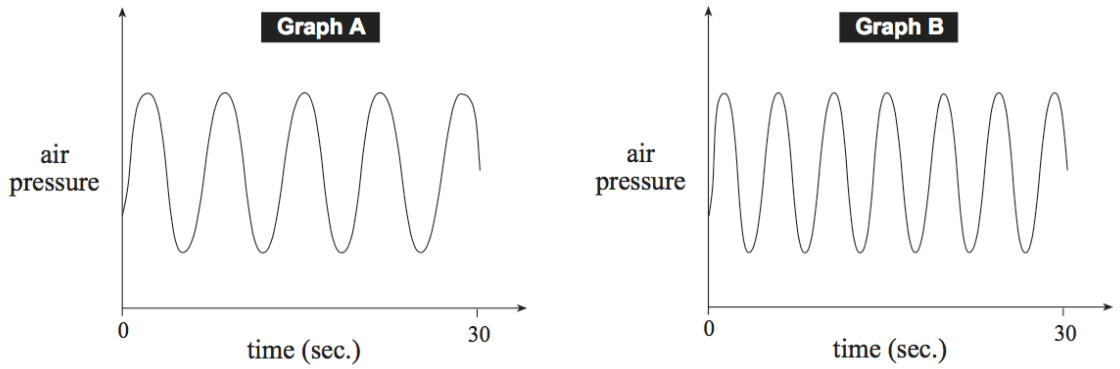
(a) Enzyme action increases as pH increases.
(b) Enzyme action decreases as pH increases.
(c) Enzymes work best in an acidic environment.
(d) Each enzyme works best within a specific pH range.

10. During inhalation

(a) the diaphragm contracts and intercostals relax.
(b) the diaphragm relaxes and the volume of the thorax increases.
(c) air pressure in the lungs decreases and the volume of the thorax increases.
(d) the intercostals and diaphragm contract and the air pressure in the lungs increases.

See next page

11. Graph A below shows the change in air pressure in the lungs over a 30 second period.



Which of the following would cause, over the same time period, the change shown in Graph B?

(a) low concentration of hydrogen ions in the blood
(b) high concentration of bicarbonate ions in the blood
(c) decreased nerve impulses sent to the diaphragm from the brain
(d) decreased nerve impulses from the stretch receptors in the lungs to the brain

12. The pH of blood is decreased because

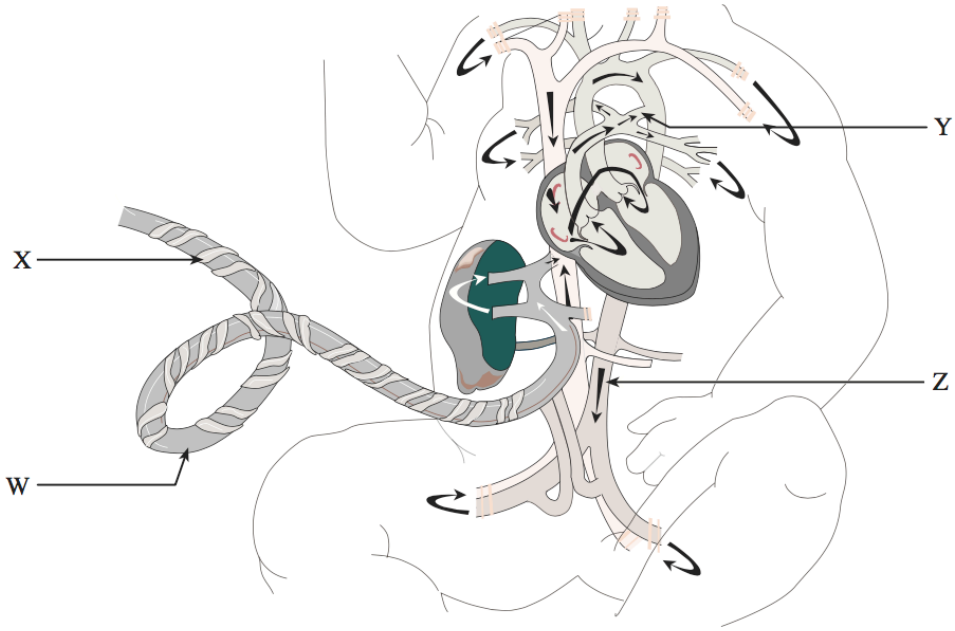
(a) water dissociates to form hydrogen ions.
(b) hydrochloric acid is formed in the stomach.
(c) of bicarbonate ions breaking down.
(d) carbon dioxide dissolves in water.

13. Which of the following would result if the foramen ovale remained functional after birth?

(a) higher than normal levels of oxyhaemoglobin in the aorta
(b) higher than normal levels of bicarbonate ions in the aorta
(c) higher than normal levels of pH in the aorta
(d) lower than normal levels of carbaminohaemoglobin in the aorta

See next page

Questions 14 and 15 refer to the image below.



14. Which structure carries oxygenated blood from the mother to the foetus?

(a) W
(b) X
(c) Y
(d) Z

15. Which structure allows blood to bypass the lungs?

(a) W
(b) X
(c) Y
(d) Z

16. The table below shows the concentration of substance X in various body fluids.

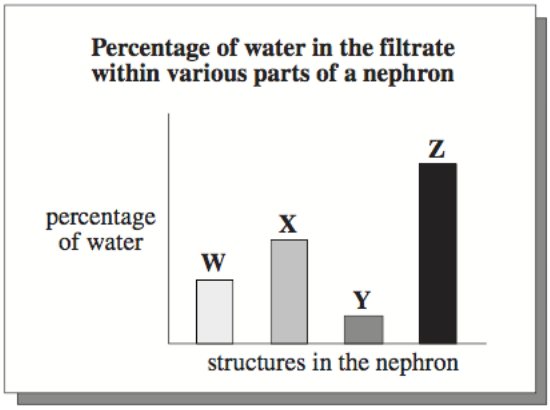
CONCENTRATIONS OF SUBSTANCE **X** IN mg PER 100 mL		
PLASMA	GLOMERULAR FILTRATE	URINE
26	26	1 820

Substance X is

(a) glucose.
(b) urea.
(c) protein.
(d) water.

See next page

17. The graph below shows the percentage of water in the filtrate in various parts of the nephron.



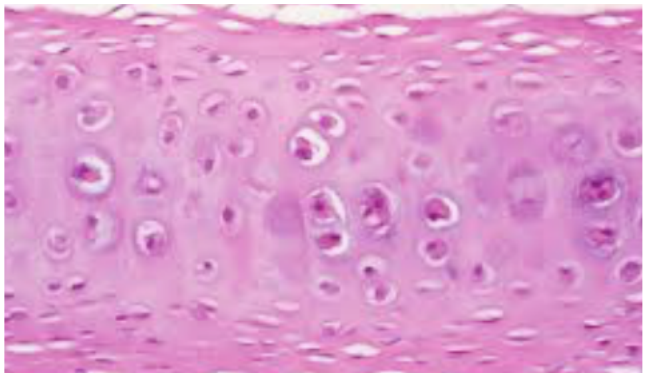
Which structure is most likely the collecting duct?

(a) W
(b) X
(c) Y
(d) Z

18. When proteins are broken down, urea is produced which enters the blood plasma. Which of the following processes would account for the presence of urea in the nephron?

(a) tubular excretion in the distal convoluted tubule
(b) active transport in the collecting duct
(c) facilitated transport in the proximal convoluted tubule
(d) glomerular filtration at the renal corpuscle

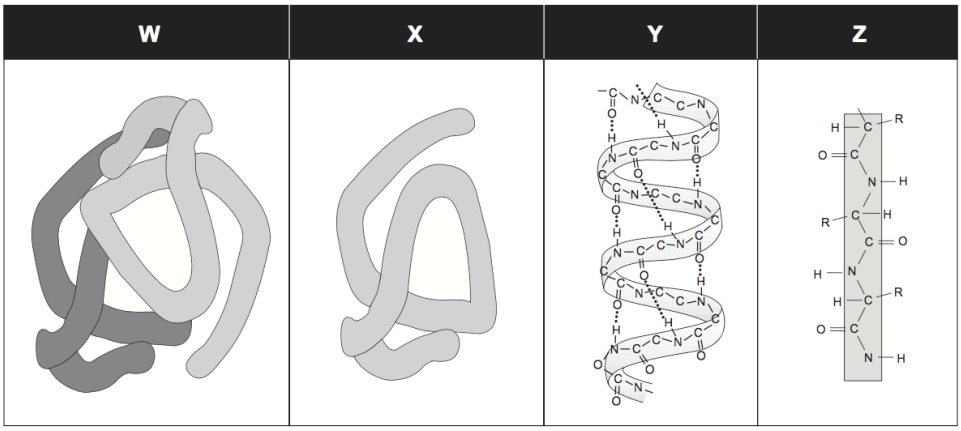
19. Which of the following is correct for this tissue?



(a) This compact bone would be found in the diaphysis.
(b) This hyaline cartilage would be found in a synovial joint.
(c) This elastic tissue would be found in the pinna of the ear.
(d) This fibroelastic cartilage would be found in between the ribs and sternum.

See next page

Question 20 refers to the following diagram that shows a number of proteins.



20. Which statement is correct?

(a) A primary structure would be shown in image Y.
(b) Haemoglobin, a tertiary structure, is shown in image W.
(c) The protein shown in image Z would be formed at a ribosome.
(d) Image X is made up of two different protein molecules.

21. Elevated levels of which hormone indicates that implantation has occurred?

(a) oestrogen
(b) progesterone
(c) testosterone
(d) HCG

22. A steroid hormone that causes breast development is

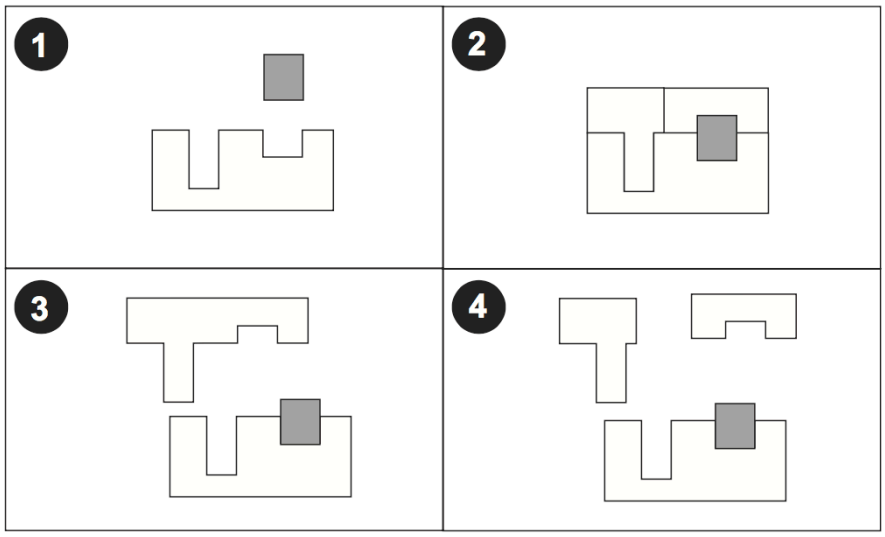
(a) oestrogen.
(b) progesterone.
(c) LH.
(d) FSH.

23. HCG

(a) stimulates the corpus luteum.
(b) causes progesterone levels to decrease.
(c) causes degeneration of the endometrium.
(d) stimulates the secretion of FSH.

See next page

Questions 24 and 25 refer to the image below.



24. To represent the lock and key model of enzyme action, in which order would the diagrams have to be placed?

(a) 1, 2, 3, 4
(b) 1, 4, 2, 3
(c) 2, 3, 4, 1
(d) 2, 4, 3, 1

25. The dark shaded square would represent

(a) an inhibitor.
(b) a co-factor.
(c) an active site.
(d) a substrate.

26. Testosterone secretion is controlled through negative feedback due to increased amounts of which hormone?

(a) oxytocin
(b) testosterone
(c) progesterone
(d) FSH

27. Which of the following statements about sexually transmitted infections is correct?

(a) Herpes is caused by a bacterium and can be cured.
(b) Syphilis is caused by a virus and can cause death if left untreated.
(c) Genital warts are caused by a virus and can be burnt off.
(d) Gonorrhoea is caused by a bacterium and causes blisters and a yellow discharge.

See next page

28. Muscle tissue that is multi-nucleated and contains striations would be classified as

(a) involuntary.
(b) smooth muscle.
(c) cardiac muscle.
(d) skeletal muscle.

29. A pregnant couple are concerned about the health of their unborn baby as the woman is 38 years of age. What test would NOT be able to detect Down Syndrome in their unborn baby?

(a) amniocentesis
(b) chorioni villi sampling
(c) ultrasound
(d) maternal blood test

30. All of the following events are correct, except one. Which one is INCORRECT?

(a) Morning sickness is worst in the first trimester.
(b) Mothers would feel their baby kicking in the 3th month of pregnancy.
(c) Testes descend in the 7th month of pregnancy.
(d) Babies have a good chance of survival if born after 28 weeks of pregnancy.

End of Section One

See next page

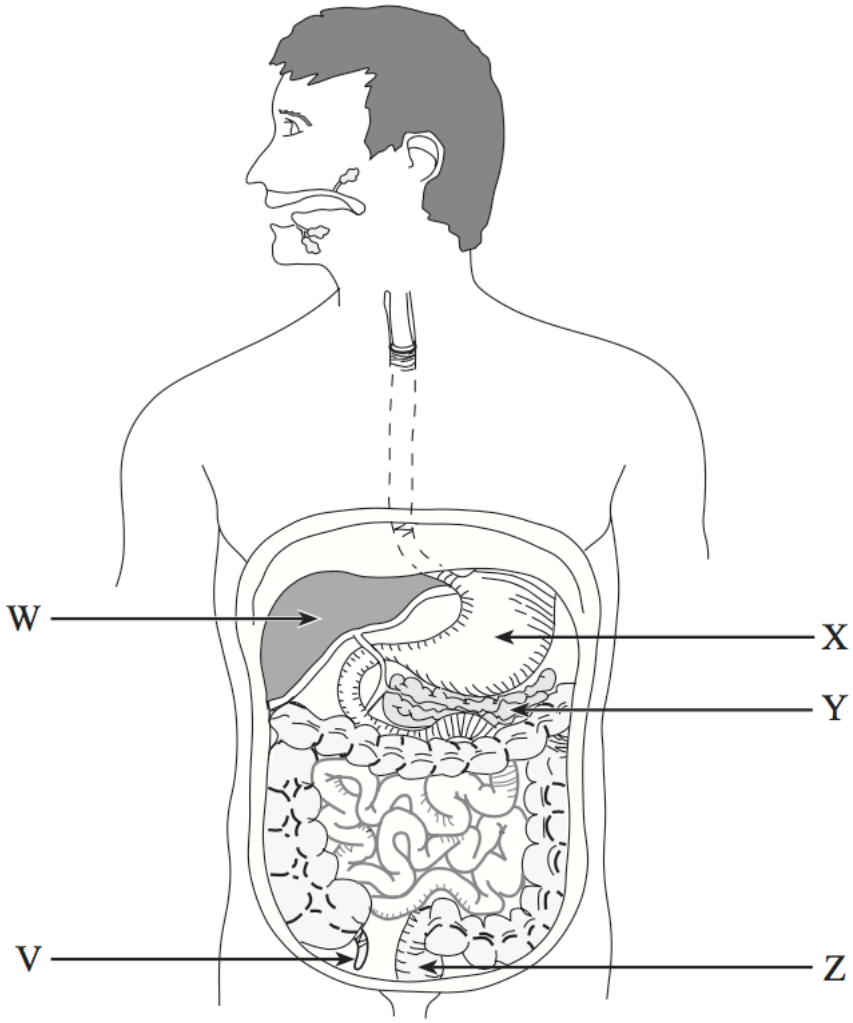
Section Two: Short answer 50% (104 Marks)

This section has **seven (7)** questions. Answer **all** questions. Write your answers in the spaces provided.

Supplementary pages for the use of planning / continuing your answer to a question have been provided at the end of this Question / Answer booklet. If you use these pages to continue an answer, indicate at the original answer where the answer is continued, i.e. give the page number.

Suggested working time: 90 minutes.

Question 31 **(24 marks)**



(a) State three functions of organ W. (3 marks)

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See next page

(b) Describe how structure X is suited to the functions it performs. (4 marks)

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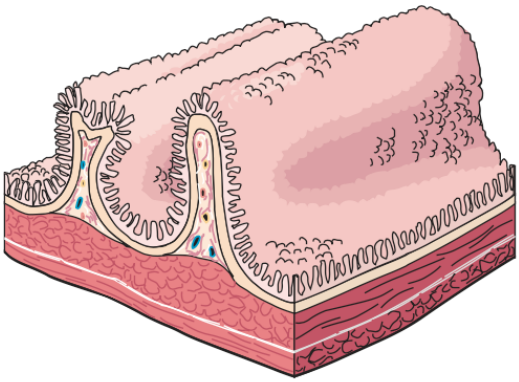
(c) A sample of tissue A (shown below) was taken from part of the digestive systém. Use an arrow to label the part of the digestive systém in the body diagram on the previous page that tissue A was taken from. (1 mark)



(d) Polysaccharides are digested both chemically and physically in the digestive system.

(i) Name two other functions of the digestive system, besides digestion.

(2 marks)

_____

_____

(ii) State where polysaccharides are first broken down chemically.

(1 mark)

_____

(iii) Identify where and in what form polysaccharides enter Tissue A shown above.

(2 marks)

_____

_____

See next page

(e) A piece of living small intestine was placed in a solution containing maltose (a disaccharide), egg white and fats. In order to ensure the piece of intestine functioned normally, oxygen was bubbled through the solution and the pH was maintained at 8.2. After one hour, the solution was analysed.

(i) Explain why glucose was found in the solution. (2 marks)

_____

_____

_____

(ii) Products from the breakdown of fat were not found. Explain why this would be the case. (2 marks)

_____

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_____

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(iii) Why was the solution buffered to a pH of 8.2? (2 marks)

_____

_____

_____

(iv) In a variation of this experiment, pancreatic protease was also added to the original solution.

(a) Name two variables that should be controlled in this experiment.

(2 marks)

_____

_____

(b) Describe the results of this new experiment after one hour.

(3 marks)

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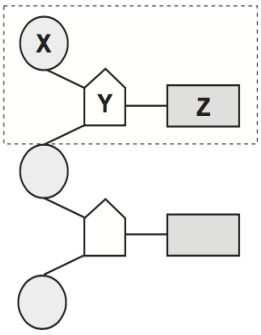
See next page

Question 32 **(9 marks)**



(a) Identify the structures from the diagram above: (2 marks)

X _____

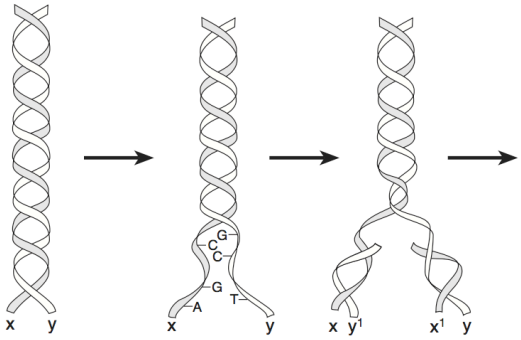
Z _____

(b) Name the structure identified by the dotted box in the diagram above and indicate how many different types of these can be found in DNA. (2 marks)

_____

_____

(c) Stage 1 Stage 2 Stage 3 Stage 4



(i) What process does the diagram above depict? (1 mark)

_____

(ii) Where does this proces take place? (1 mark)

_____

(iii) Complete the diagram by drawing in what would be present at stage 4. (1 mark)

(d) Tissue sample A was taken from a mole on the skin that showed abnormal growth while tissue sample B was composed of normal skin cells. Describe how the cells in tissue sample A are different from those in tissue sample B. (2 marks)

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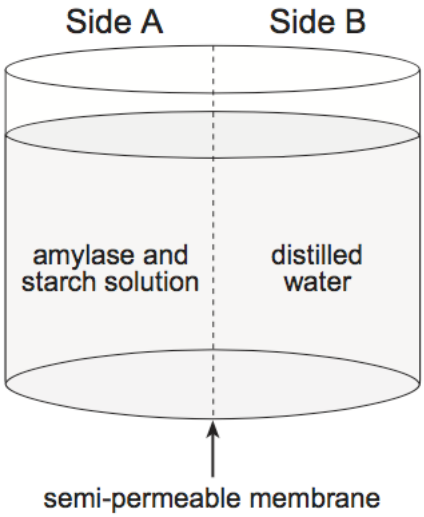
Question 33 **(12 marks)**



A scientist set up the container shown above in his laboratory. Side A contained a solution of amylase and starch, while side B contained only distilled water. The two sides were separated by dialysis tubing, a semi-permeable membrane. The container was kept at a temperature of 37°C for one hour.

(a) Explain how the dialysis tubing mimics a cell membrane. (2 marks)

_____

_____

_____

_____

(b) Identify how the dialysis tubing is different to a cell membrane. (2 marks)

_____

_____

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See next page

(c) After one hour, the scientist conducted a series of tests on the liquids found in both sides of the container. In side A he found starch and a disaccharide. In side B he found a disaccharide but no starch.

(i) What test would he have done to determine no starch was found on side B? (1 mark)

_____

(ii) Account for the presence of the disaccharide on side A. (1 mark)

_____

_____

(iii) Account for the presence of the disaccharide on side B. (2 marks)

_____

_____

_____

_____

(iv) If the scientist left the container for another hour, explain what results you would expect him to find after that time on each side of the dialysis tubing. (4 marks)

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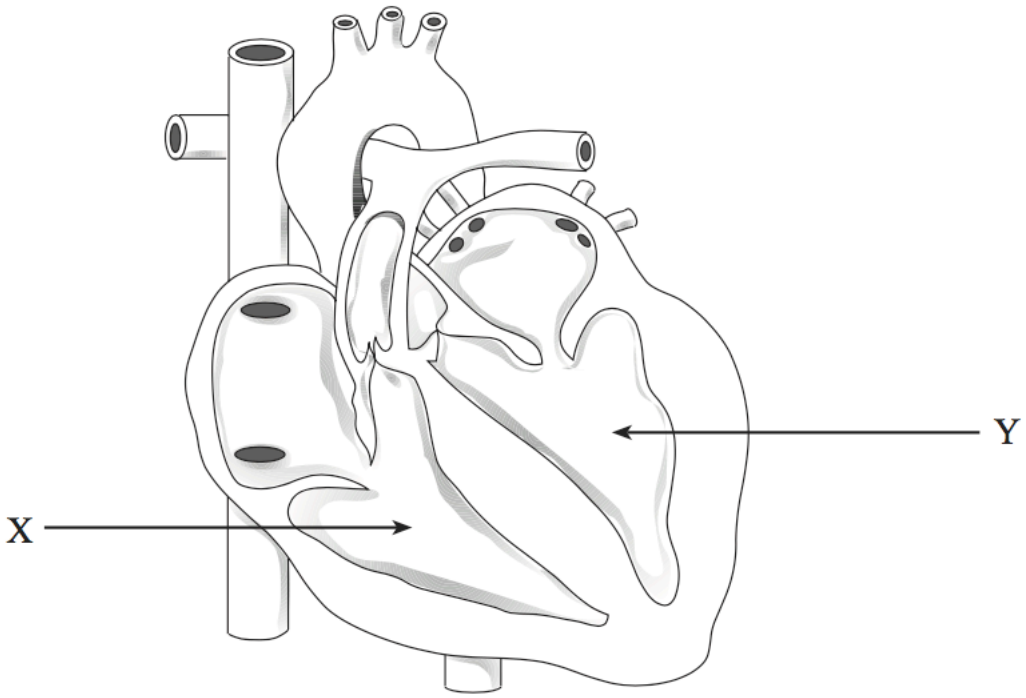
See next page

Question 34 **(17 marks)**



(a) Compare and contrast the blood found in structure X and structure Y. (4 marks)

_____

_____

_____

_____

_____

_____

(b) Relate the difference in the structure of X and Y to their functions. (2 marks)

_____

_____

_____

_____

(c) Explain why it is important that blood flows very slowly in the capillaries. (1 mark)

_____

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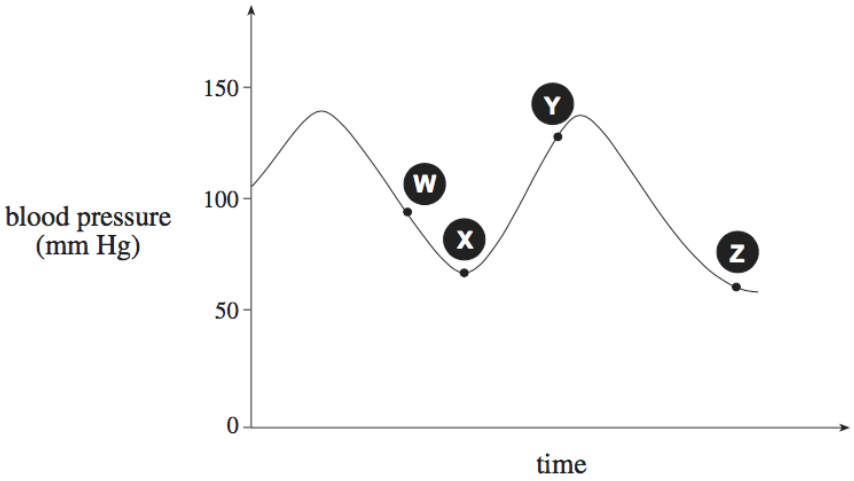
See next page

The graph below shows changes in blood pressure in the aorta over time.



(d) Which letter on the graph above (W, X, Y or Z) would show when ventricular systole is occurring? Justify your decision. (2 marks)

_____

_____

_____

_____

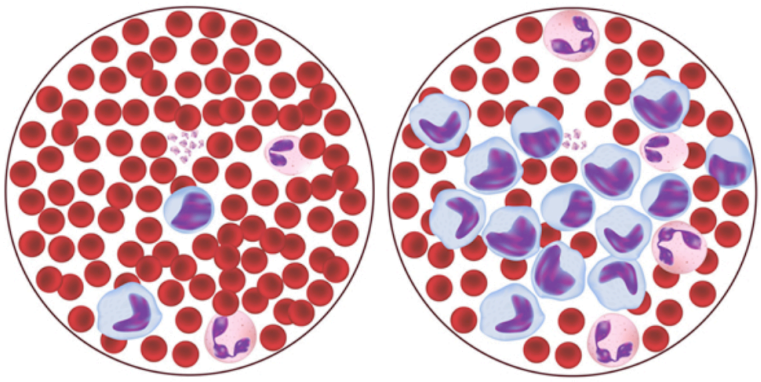
(e) Complete the following table. (4 marks)

Structure	Location in the heart	Function
Sinoatrial node		
Atrioventricular bundle		

See next page

(f) Two people were admitted to hospital and the doctor took blood from them and looked at it under the microscope. This is what she saw:

Person A Person B



(i) If the field of view of the blood of Person A is 1.1mm, what is the average diameter of the red blood cells? (1 mark)

_____

(ii) The doctor changed the magnification of the microscope to a higher powered objective. How would this change the image? (1 mark)

_____

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(iii) According to their blood test, which person appears to be unwell? Explain your answer. (2 marks)

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_____

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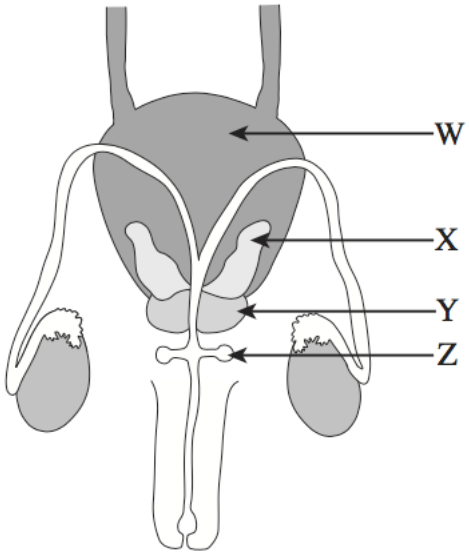
See next page

Question 35 **(10 marks)**



(a) Name the following structures and identify one function of each. (4 marks)

W _____

_____

_____

Y _____

_____

_____

(b) Give three characteristics of semen and describe how each of these characteristics facilitates the function of semen. (6 marks)

_____

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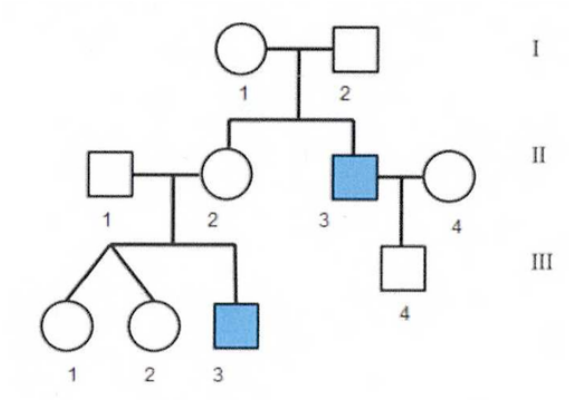
See next page

Question 36 **(12 marks)**



(a) What is the most likely mechanism of inheritance – dominant or recessive? Explain your answer. (2 marks)

_____

_____

_____

(b) If this condition was autosomal, what would be the genotypes of the following individuals? Use the letters A and a. (2 marks)

III.3 _____

I.1 _____

(c) If this condition was sex linked, what would be the chance of II.1 and II.2 having an affected girl as their fourth child? Show your working. Use the letters A and a. (3 marks)

See next page

(d) ABO blood groups demonstrate two different mechanisms of inheritance. Identify these two different mechanisms and explain how a mother with A type blood and a father with B type blood can produce two children, one with AB type blood and the other with O type blood. (5 marks)

See next page

Question 37 **(20 marks)**

A large pharmaceutical company conducted a trial on 40 mice to determine the effectiveness of their new drug, OA218, in reducing the symptoms associated with osteoporosis. Each group was made up 10 female mice aged 3 years. The average lifespan of laboratory mice is 3 – 4 years. Group 1 were given 10mg of OA218 mixed in with their daily diet of grain pellets. Group 2 were given 10mg of OA218 as a daily injection after they had been given their daily diet of grain pellets, while Group 3 were given 20mg of OA218 mixed in with their daily diet of grain pellets. Once the experiment began, density of the neck of the femur was calculated using scanning technology at one month, 7 months and 12 months after the trial began.

(a) (i) State one hypothesis the company could have been testing in this trial. (2 marks)

_____

_____

_____

(ii) Identify the independent variable for this hypothesis. (1 mark)

_____

(b) Name two variables the company controlled in their trial. (2 marks)

_____

_____

(c) Name one other variable the company should have controlled in this trial. (1 mark)

_____

(d) Group 4 were the control group.

(i) What is the term given for what all control groups should be given? (1 mark)

_____

(ii) As the control group for this experiment, what should these mice be given? (1 mark)

_____

_____

(e) This trial was done as a double blind trial. Explain what this term means and indicate the advantage of conducting this experiment in this way. (2 marks)

_____

_____

_____

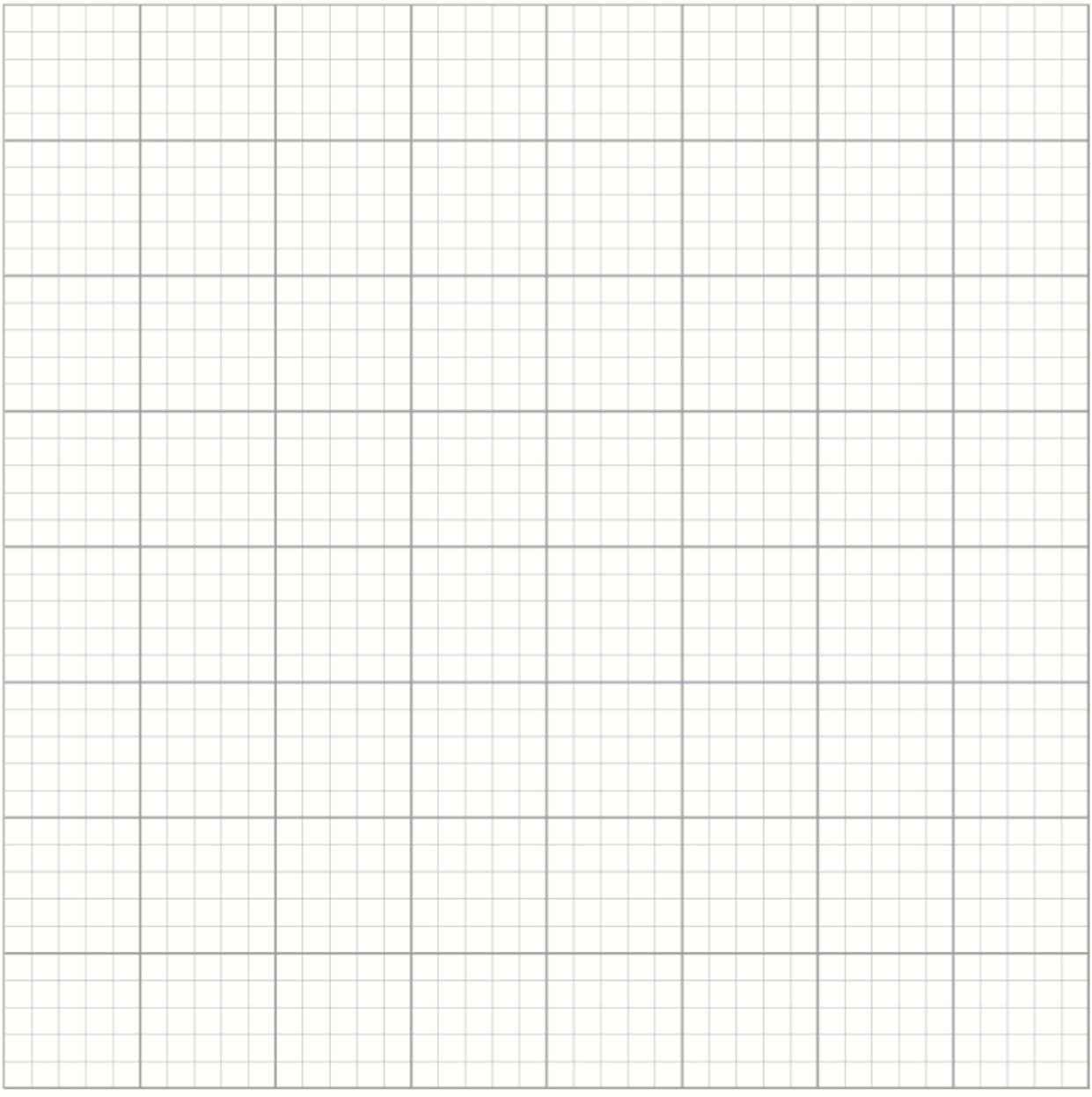
See next page

The company collected the following results:

Title: Effect of OA218 on average bone density of three year old mice over 12 months

Time after experiment began (months)	Average density of neck of femur (g/cm^3)			
	Group 1	Group 2	Group 3	Group 4
1	10	9	11	10
7	8	7	12	6
12	7	5	13	4

(f) Graph the data to show the effect of OA218 on average density of the neck of the femur. A spare graph can be found on Page 39 if required. (5 marks)



See next page

(g) According to the data, what conclusion can be made about the effect of OA218 on bone density? (1 mark)

_____

_____

_____

(h) The company wanted to know the average bone density for Group 2 at 15 months after the trial began, and 13 months after the trial began for Group 4. Which of these two results would provide the most reliable data? Explain your answer. (2 marks)

_____

_____

_____

(i) Based on their results from this trial, the company prepared to apply for human trials.

(i) Name one ethical consideration that would be the same in the two trials. (1 mark)

_____

(ii) Descibe one ethical consideration that would only be required in a human trial. (1 mark)

_____

_____

End of Section Two

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See next page

Section Three: Extended answer 20% (40 Marks)

This section has **three** questions. You must answer **two** questions. Write your answers on the pages following Question 40.

Supplementary pages for planning / continuing your answers to questions are provided at the end of this Question / Answer booklet. If you use these pages to continue an answer, indicate at the original answer where the answer is continued, i.e. give the page number.

Suggested working time: 50 minutes.

Answer any **two** questions from Questions 38 to 40.

Indicate the questions you will answer by ticking the box next to the question. Write your answers on the pages that follow.

☐ **Question 38** **(20 marks)**

(a) Discuss how lifestyle choices, such as diet, alcohol, nicotine and chemicals may affect foetal development. (8 marks)

(b) Use an example of each to compare and contrast the structure and function of synovial joints and slightly moveable joints. (6 marks)

(c) Discuss how variation in the genotypes of offspring, including gender, arise as a result of the processes of meiosis and fertilisation. (6 marks)

☐ **Question 39** **(20 marks)**

(a) Using diagrams, outline how the sliding filament model can be used to explain muscle contraction. (12 marks)

(b) Describe the changes involved in the development of the zygote from conception to its implantation in the endometrium wall. (8 marks)

See next page

Question 40 **(20 marks)**

(a) Infertility occurs in approximately 10% of couples. Describe two different treatments that couples may try in order to overcome male infertility. (6 marks)

(b) Compare and contrast spermatogenesis and oogenesis. (6 marks)

(c) Discuss how one named chemical and one named physical contraceptive prevent pregnancy from occurring. Include in your discussion what type of person would utilise these techniques, as well as any limitations of the named techniques. (8 marks)

End of questions

See next page

Question Number _____

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Supplementary Page

Question Number _____

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Supplementary Page

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Supplementary Page

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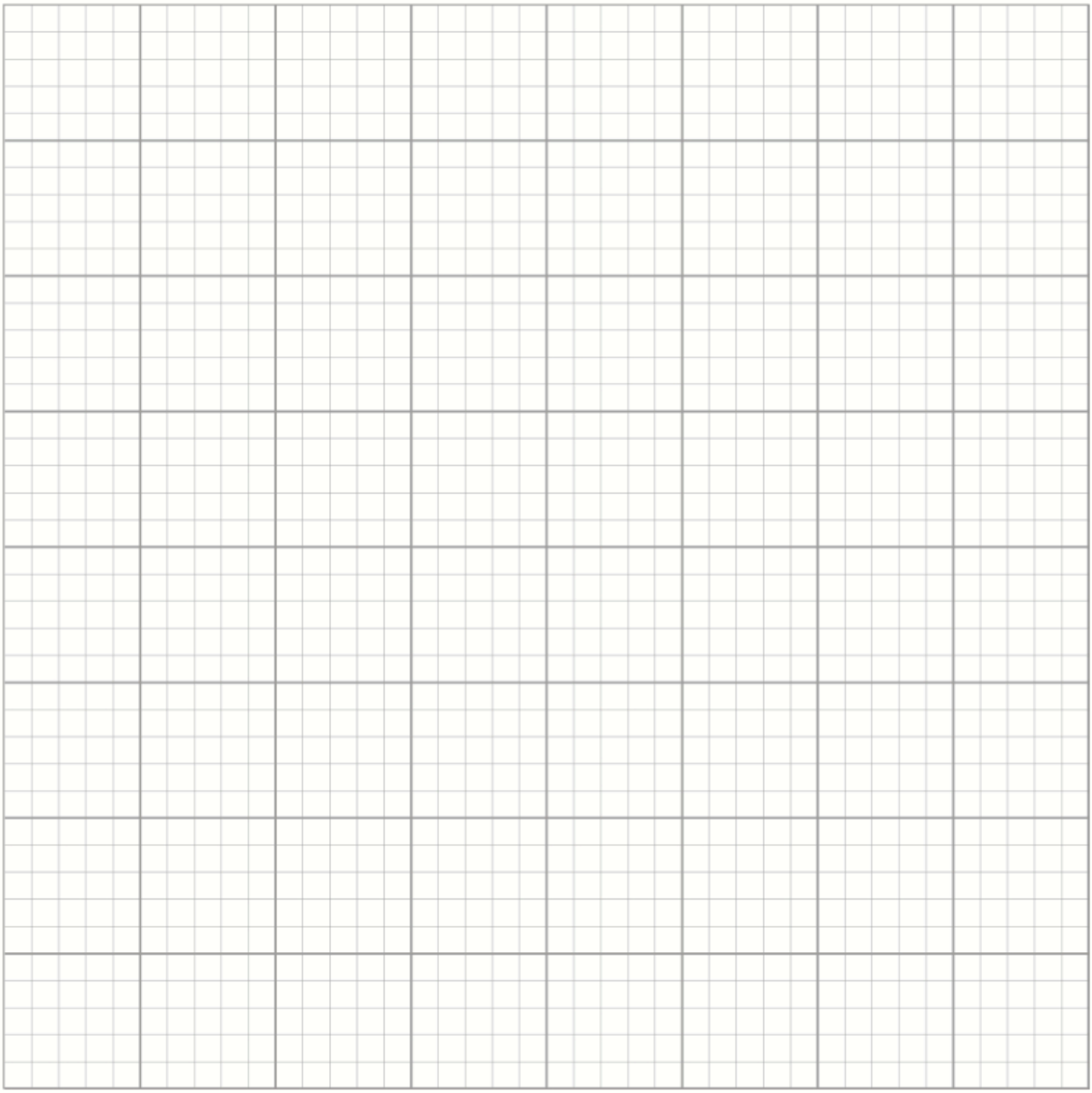
Question 37 (f)



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