METHODIST LADIES' COLLEGE

Methodist Ladies' College
ATAR course examination, Semester 2, SAMPLE EXAM

Question/Answer booklet

HUMAN BIOLOGY
ATAR Year 11

Student Name: _____

Teacher Name: _____

Time allowed for this paper
Reading time before commencing work: ten minutes
Working time for paper: three hours

Materials required/recommended for this paper
To be provided by the supervisor
This Question/Answer Booklet
Multiple-choice answer sheet

Number of additional answer booklets used (if applicable): ☐

To be provided by the candidate
Standard items: pens (blue/black preferred), pencils (including coloured), sharpener, correction fluid/tape, 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 material. 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	Marks awarded
Section One Multiple-choice	30	30	40	30	30	
Section Two Short response	9	9	90	98	50	
Section Three Extended answer Unit 1	2	1	50	20	20	
Unit 2	2	1		20		
				Total	100	

Instructions to candidates

1. The rules for the conduct of ATAR course examinations are detailed in the *Year 12 Information Handbook*. Sitting this examination implies that you agree to abide by these rules.

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

3. 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. If you make a mistake, place a cross through the 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 two parts each with two questions. You must answer one question from each part. Tick the box next to the question you are answering. Write your answers in this Question/Answer booklet.

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

5. 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.

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, do not erase or use correction fluid, and shade your new answer. 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 for this section is 40 minutes.

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1. What is the role of the kidney in the excretory system of humans?

   a) To remove salt from the body and to keep water in the body.
   b) To remove unwanted nutrients from the body and to keep salt in the body.
   c) To remove nitrogenous wastes from the body and to maintain water levels in the body.
   d) To remove water from the body and to maintain levels of nitrogenous substances in the body.

2. Which alternative best describes what happens to oxygen and carbon dioxide as blood travels through the lungs and muscles?

	Through Lung	**Through Muscle**
a)	Oxygen dissolves in blood.	Carbon dioxide dissolves in blood.
b)	Oxygen bonds strongly to haemoglobin.	Carbon dioxide bonds strongly to haemoglobin.
c)	Oxygen bonds strongly to haemoglobin.	Carbon dioxide dissolves in blood.
d)	Carbon dioxide binds weakly to haemoglobin	Oxygen binds weakly to haemoglobin

3. Spermatogenesis and oogenesis both involve;

   a) Cell fusion.
   b) Cell fission.
   c) Mitosis.
   d) Meiosis and mitosis.

4. The thin membrane that covers the outer surface of a bone is called the
   (a) osteoperium.
   (b) periosteum.
   (c) fibroperium.
   (d) perichondrium.

5. Which of the following statements is true for mitochondria. They

   a) contain DNA.
   b) are the site of glycolysis.
   c) prepare proteins for the Golgi complex.
   d) produce 2 ATP molecules per molecule of glucose.

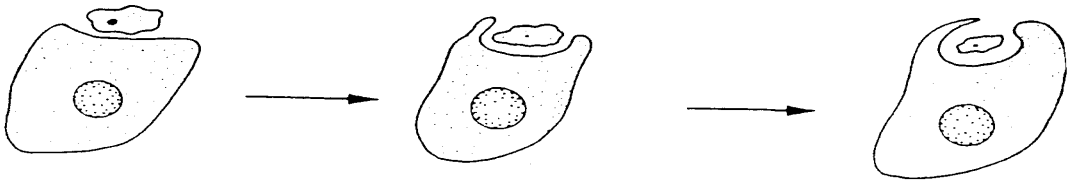
6. The following is a list of birth defects or negative side effects associated with different teratogens.

   I. increased respiratory problems
   II. increased gastrointestinal problems
   III. malformations of the heart and limbs
   IV. blindness and deafness
   V. increased risk of sudden infant death syndrome

   Which of these has been linked to smoking during pregnancy and smoking around newborn babies?

   a) i, iii, iv
   b) ii, iii, iv
   c) i,ii,v
   d) i,iv,v

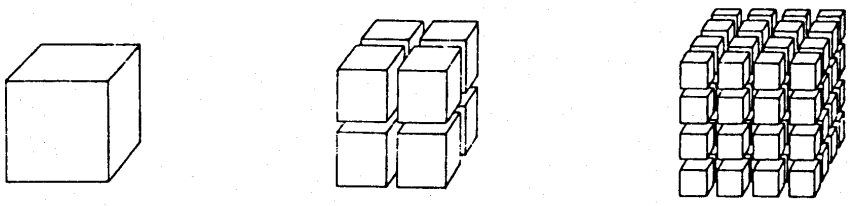
Question 7 refers to the diagrams below illustrating a **cellular** process.



7. The process shown is called;

   a) osmosis.
   b) exocytosis.
   c) pinocytosis.
   d) phagocytosis.

Questions 8 refers to the diagram below; a model in which the cubes represent living cells. Cell A, tissue B and tissue C all have the same volume and a concentration of salts equivalent to a human cell.



Cell A Tissue B Tissue C

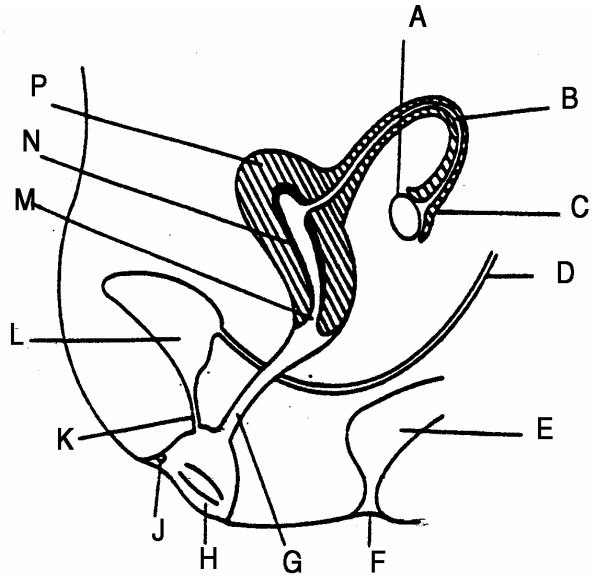
8. Which one of the following statements is correct?

   a) In distilled water tissue B would gain water at a faster rate than cell A.
   b) In distilled water the cells in tissue C would shrink at a faster rate than cell A.
   c) In a concentrated salt solution tissue C would gain water at a faster rate than cell A.
   d) In a concentrated salt solution tissue C would lose water more slowly than tissue B.

9. Which of the following does not result in increased variation?

a) crossing-over during meiosis
b) replication of chromosomes in the nucleus
c) random union of two gametes
d) random assortment of chromosomes during meiosis

10. Consider the diagram below



Which of the following correctly matches the letter and the name in the diagram below?

a)	P = bladder,	L = uterus,	K = vagina
b)	G = vagina,	M = uterus,	N = cervix
c)	N = endometrium,	B = oviduct,	M = cervix
d)	A = ovary,	P = oviduct,	M = cervix

11. Crushing, mashing and grinding of food are best accomplished by the action of the;

a) Premolars
b) Incisors.
c) Canines.
d) Molars.

12. The pulmonary circulation directs blood to and from the:

a) lungs.
b) kidneys.
c) heart.
d) placenta.

13.

In rabbits, black (B) coat colour is dominant over white (b) coat colour.

Which Punnet square correctly represents a cross between a rabbit heterozygous for coat colour and a white rabbit?

(A)

	B	b
B	BB	Bb
b	Bb	bb

(B)

	B	B
b	Bb	Bb
b	Bb	Bb

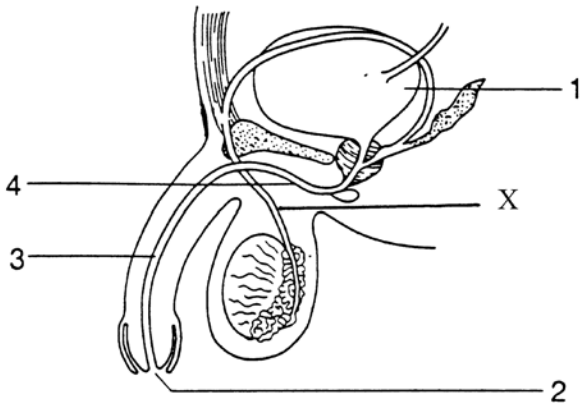
(C)

	B	b
b	Bb	bb
b	Bb	bb

(D)

	B	b
b	Bb	Bb
b	Bb	Bb

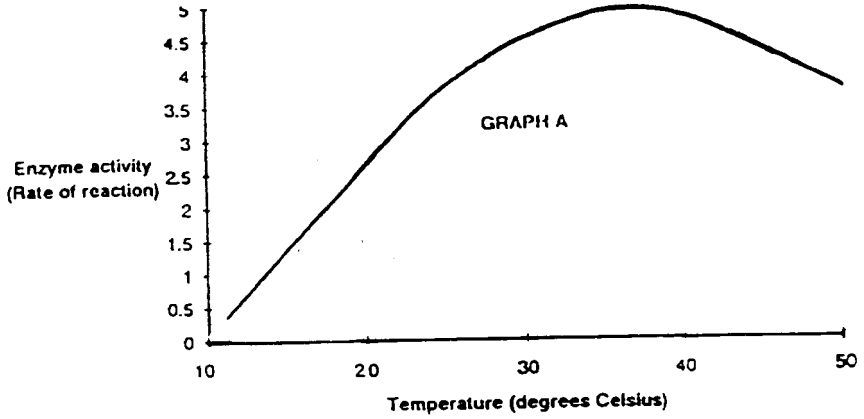
Question 14 refers to the diagram which shows the parts of the male reproductive system.

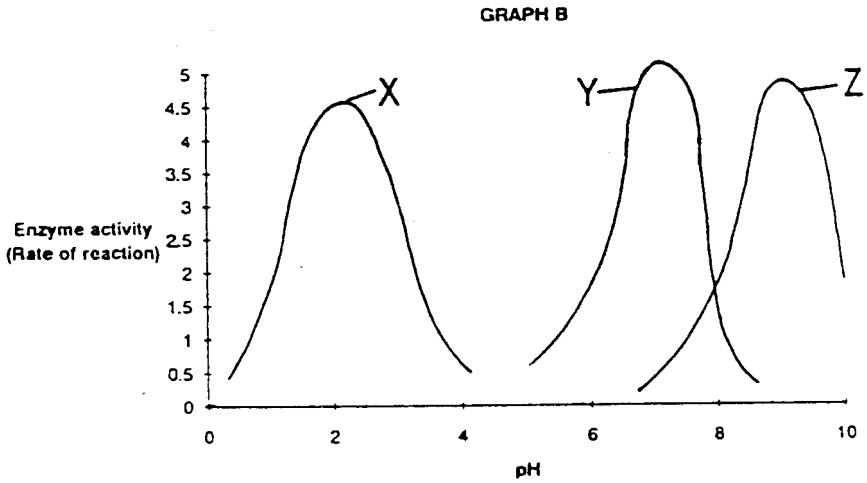


14. The tube labelled X is:

a) the seminiferous tubules and is where the sperm matures.
b) the vas deferens and carries sperm from the testis to the urethra.
c) a gland that is part of the reproductive system.
d) the vas deferens and is where sperm mature.

Question 15 refers to graphs A and B depicting the effects of temperature and pH of body fluids on human enzyme activity in body fluids.





A student made 3 suggestions, which could account for the data in the graphs.

1. The curves X, Y and Z in graph B represent different enzymes each having an optimum activity within a narrow pH range.
2. pH of body fluids varies considerably
3. Enzyme activity increases with increasing temperature.

15. Which of the student's suggestions are consistent with the data in the graphs?

a) 1,2 and 3.
b) 1 and 3.
c) 2 and 3.
d) 1 only.

16. Lacteals and capillary networks are found in close association in the

a) lungs.
b) stomach rugosae.
c) villi of the small intestine.
d) mammary glands.

17. In the kidney the correct sequence of formation of urine involves the following processes.

a) glomerular filtration, reabsorption, secretion.
b) reabsorption, filtration, secretion.
c) filtration, secretion, reabsorption.
d) reabsorption, secretion, filtration.

Question 18 relates to the following information.

The table shows the numbers of formed elements in blood samples taken from four different people. Two of the samples are from individuals with health problems.

The normal amounts are indicated thus* once in the table.

	A	B	C	D
red blood cells *(cells/mL)*	500 000	7 500 000	5 000 000*	2 000 000
white blood cells *(cells/mL)*	500	7 000*	10 000	7 000
platelets *(number/mL)*	250 000*	250 000	250 000	50 000

18. Which of the individuals has probably recently spent time at high altitude?

a) A
b) B
c) C
d) D

19. The average gestational period for a human is most correctly given as:

a) 36 weeks from the time of conception.
b) 28 days.
c) 40 weeks from the beginning of the last menstrual cycle.
d) 9 months.

20. Fatty acids move by diffusion into the cells lining the small intestine;

a) to provide energy to those cells.
b) because there are more fatty acids in the cells lining the small intestine than in the lumen of the small intestine.
c) because the concentration gradient is maintained by the constant export of fatty acids from the intestinal cells.
d) because the lymph is actively exporting fatty acids.

21. Valves in the heart

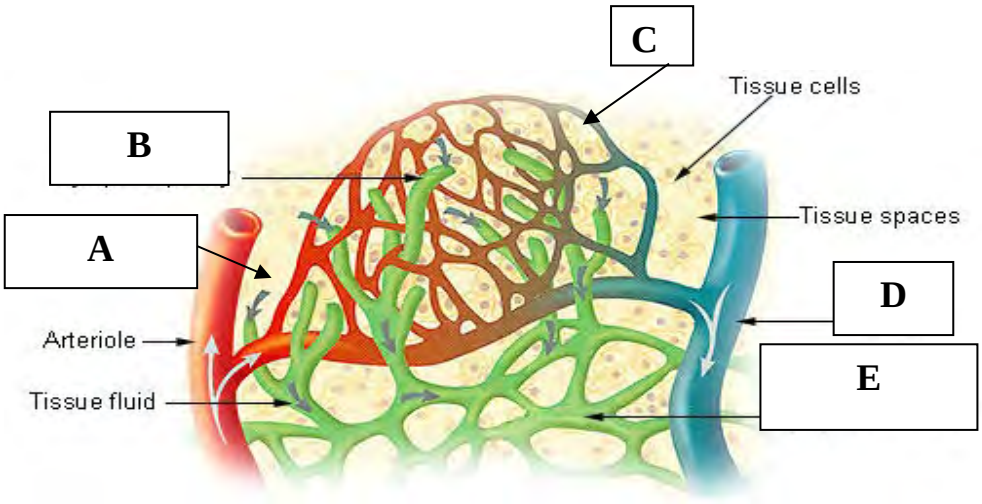
a) prevent the blood from flowing too fast.
b) maintain the flow of blood.
c) maintain the pressure of blood.
d) prevent back flow of blood.

22. Peristalsis occurs all along the intestine as this assists in

a) excretion of the wastes.
b) mixing of the food particles to increase absorption in the stomach.
c) moving the food in and out of the alimentary canal.
d) moving the food along the alimentary canal.

Questions 23 and 24 refer to the diagram below.

23. In the capillary network shown, the blood pressure would be highest at:



a) A
b) B
c) C
d) D

24. The type of vessel labelled E is a/n

a) Artery.
b) Vein.
c) Capillary.
d) Lymph vessel.

25. Progesterone is secreted

a) by the corpus luteum to activate the production of oestrogen.
b) from the pituitary gland to stimulate the secretion of prolactin.
c) from the corpus luteum to maintain the endometrium.
d) by the pituitary gland to assist in the production of sperm.

26. Which of the following alternatives lists **all** of the chemical components of a chromosome?

a) sugar, phosphate and bases
b) lipids and DNA
c) DNA and protein
d) genes and DNA

27. The tissue type lining the vagina is

a) muscular tissue.
b) connective tissue.
c) epithelial tissue.
d) nervous tissue.

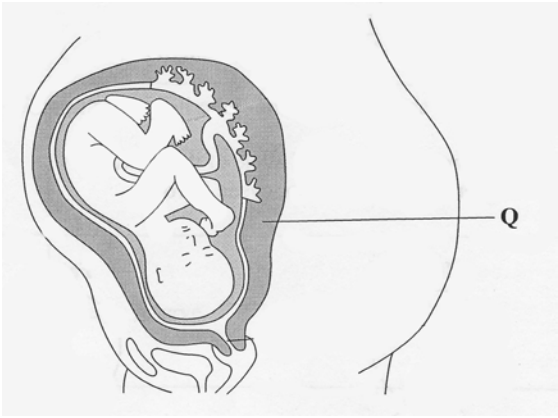
28. Besides shock absorption, one of the roles of the amniotic fluid during pregnancy is to

a) provide nutrients and oxygen to the foetus.
b) contribute to the development of the umbilical cord.
c) form part of the placenta.
d) help to maintain a constant temperature.

29. The end of the uterine tube (closest to the ovary) has feathery processes called

a) cilia.
b) flagella.
c) follicles.
d) fimbriae.

The following question refers to the diagram below showing a human baby just before birth.



30. The correct term for label Q is

a) amniotic fluid.
b) oviduct.
c) yolk sac.
d) uterus.

End of Section One

Section Two: Short answer **50% (98 Marks)**

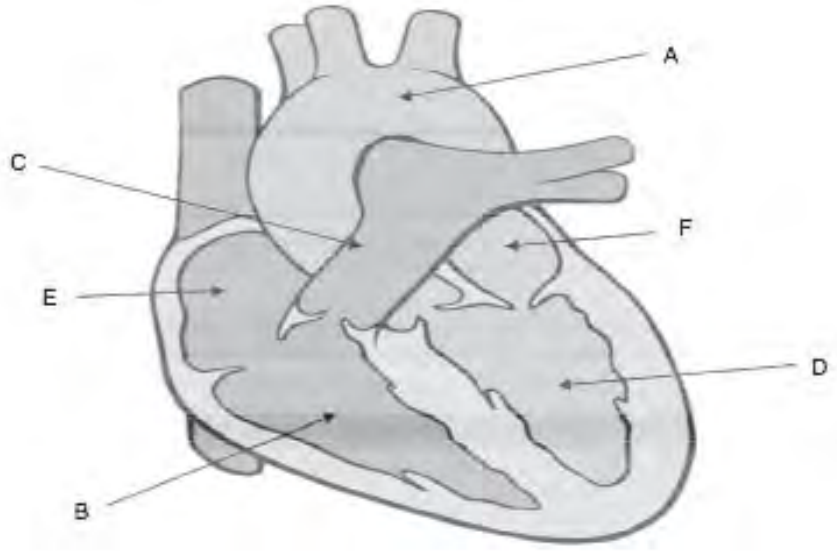
This section has **eleven (11)** questions. Answer **all** questions. Write your answers in the space provided.

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 for this section is 90 minutes.

Question 31 **14 marks**

This question refers to the diagram below, which represents a longitudinal section through the human heart.



a) Identify the structures labelled A and B. (2 marks)

A: _____

B: _____

b) State the function of the structures labelled C and D. (2 marks)

C: _____

D: _____

c) In some instances, babies can be born with a hole that connects the structure labelled E with the structure labelled F. Explain why this 'hole in the heart' is a serious problem. (3 marks)

d) Describe and explain the difference in structure between an artery and a vein. (5 marks)

f) Describe what occurs during atrial systole. (2 marks)

Question 32 **11 marks**

Refer to the information below to answer the following question.

An experiment was conducted to determine the effects on body function of increasing ambient temperature. 100 participants in Group A were asked to lie down and remain as still as possible during the entire experiment. The following observations were made:

- The starting ambient temperature was 22°C.
- The mean heart rate of all participants at the start of the experiment was 75 beats/minute.
- As the room temperature increased, sweating and heart rate also increased.
- As the room temperature returned to 22°C, sweating and heart rate returned to the levels initially measured.

100 participants in Group B were asked to lie down in a room where the ambient temperature was maintained at 22°C, no changes in sweating and heart rate were observed.

a) Identify the independent variable and dependent variable in this experiment. (2 marks)

Independent: _____

Dependent: _____

b) Identify the control group in this experiment. Justify your answer. (2 marks)

_____

_____

_____

_____

c) State one control variable, not mentioned in the information above. (1 mark)

_____

d) Describe **one** possible method used to select the 200 participants in this experiment that would be valid. (2 marks)

_____

_____

_____

e) Explain why the subjects in this experiment were asked to lie still during the time interval over which the experiment ran. (2 marks)

_____

_____

_____

d) Can 75 beats/minute be described as the average heart rate of a human? Explain your answer. (2 marks)

_____

_____

Question 33 **16 marks**

a) A section of one of the strands of a DNA molecule has the sequence of bases shown.

DNA: C T T A C A T T A C T C

In the spaces below, enter the sequence of bases in the corresponding strand of DNA. (1 mark)

corresponding DNA												

b) The percentage of base T in a molecule of DNA is 30%. What is the percentage of G bases in the same DNA molecule? Show working. (2 marks)

_____

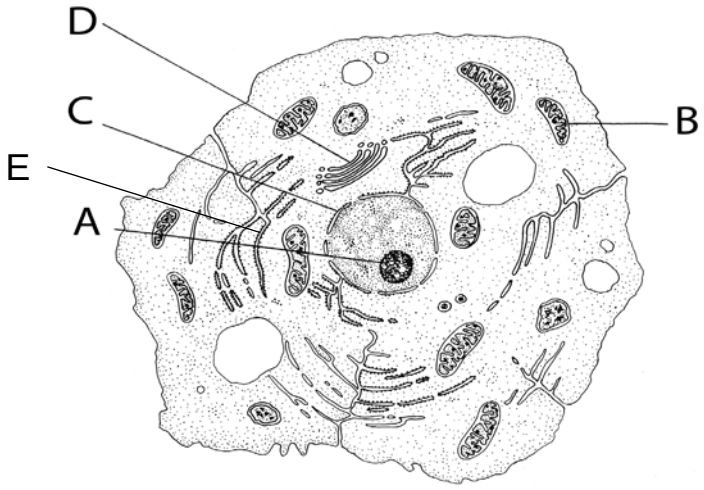
c) Explain why there are pores in the nuclear membrane. (2 marks)

_____

_____

_____

Refer to the diagram below of an animal cell.



d) Label the cell parts: (2 marks)

A:_____

D: _____

e) Consider a pancreatic cell producing digestive enzymes to secrete into the alimentary canal. Name **two** of the structures in the above diagram you would expect to find in high quantities in the cell, and explain why you would expect this. (4 marks)

Structure 1:

_____

_____

_____

_____

Structure 2:

_____

_____

_____

_____

f) Name the part of the digestive tract that has both the pancreatic juice and bile emptied into it. (1 mark)

_____

g) It is impossible to live normally without a liver. Describe **four** reasons why this is the case. (4 marks)

One: _____

_____

Two: _____

_____

Three: _____

_____

Four: _____

_____

Question 34 **8 marks**

A brown eyed woman whose father was blue eyed marries a man with brown eyes. They produce three brown eyed children.

a) What is the genotype of the mother? (1 mark)

_____

b) What genotype(s) could the father be? Explain your answer. (4 marks)

_____

_____

_____

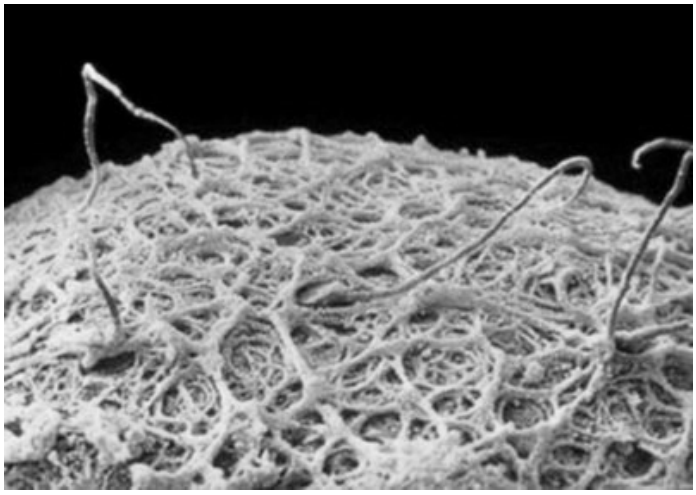
_____

_____

c) If their next child is blue-eyed, what is the father's genotype? How can you be so sure? Show your workings. (3 marks)

Queston 35 **10 marks**

The image below shows the egg and sperm uniting.



a) Draw and label a diagram in the space below showing what happens to the chromosomes of the egg and sperm as fertilisation occurs. Use a model with 2 pairs of chromosomes in the diploid form for ease of representation. (2 marks)

b) Name the method of reproduction that takes place once fertilisation has occurred. (1 mark)

_____

c) Name and explain **one** way in which meiosis leads to genetic variation in gametes. (2 marks)

_____

_____

_____

d) State **two** early symptoms that would indicate a woman was pregnant. (2 marks)

_____

_____

c) Describe **three** functions of the placenta. (3 marks)

One: _____

_____

_____

Two: _____

_____

_____

Three: _____

_____

_____

Question 36 **14 marks**

The following table shows information about kidney function.

Fluid	Component (g per 100mL)				
	Urea	**Glucose**	**Amino acids**	**Salts**	**Proteins**
Blood plasma	0.03	0.1	0.05	0.9	8.0
Glomerular filtrate	0.03	0.1	0.05	0.9	none
Urine	1.75	None	None	0.9-2.2	none

a) Name the organ where urea is produced and describe how urea is transported to the kidneys. (2 marks)

i) Organ: _____

ii) Means of transport: _____

_____

b) Use the information in the table above to answer the following questions:

i) Name **two** components in the table which can pass through the wall of the glomerulus. (2 marks)

_____

ii) Explain what happens to glucose in the glomerular filtrate. (2 marks)

_____

_____

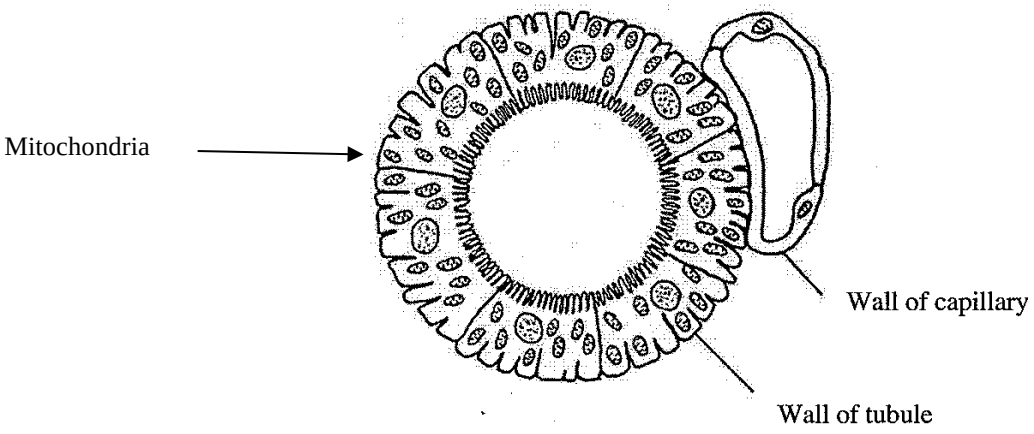
iii) Explain why the urea in the urine is more concentrated than in the glomerular filtrate. (2 marks)

_____

_____

_____

c) The diagram below shows a cross section of the coiled tubule of a nephron with a capillary attached.



Explain how **three** features shown in this diagram are important to the functioning of the tubule. (6 marks)

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Question 37 **9 marks**

Refer to the following diagram, which represents an alveolus and an associated capillary

a) Describe **two** features of the alveolus and/or capillary that help maintain the concentration gradient of oxygen, and explain how this facilitates efficient gas exchange. (4 marks)

b) Describe **two** features of the red blood cells that allow them to carry oxygen efficiently. (2 marks)

c) Name the tissue surrounding the alveoli and describe the feature of this tissue that makes it suited to its protective role in the body. (3 marks)

Question 38 **16 marks**

The table below which shows the relative hormone levels for four major hormones concerned with the menstrual cycle in women for any given day in the cycle.

Day	Luteinizing Hormone (LH)	Follicle Stimulating Hormone (FSH)	Oestrogen	Progesterone
1	6	10	10	2
4	8	13	10	2
7	8	12	16	2
10	10	13	28	2
12	22	16	28	3
14	20	15	19	5
15	6	10	16	8
19	6	8	15	18
22	6	6	15	28
23	6	6	15	28
25	4	6	10	18
26	3	8	10	12
27	3	10	10	7
28	3	10	10	2

a) On what days are oestrogen levels highest? _____ (1 mark)

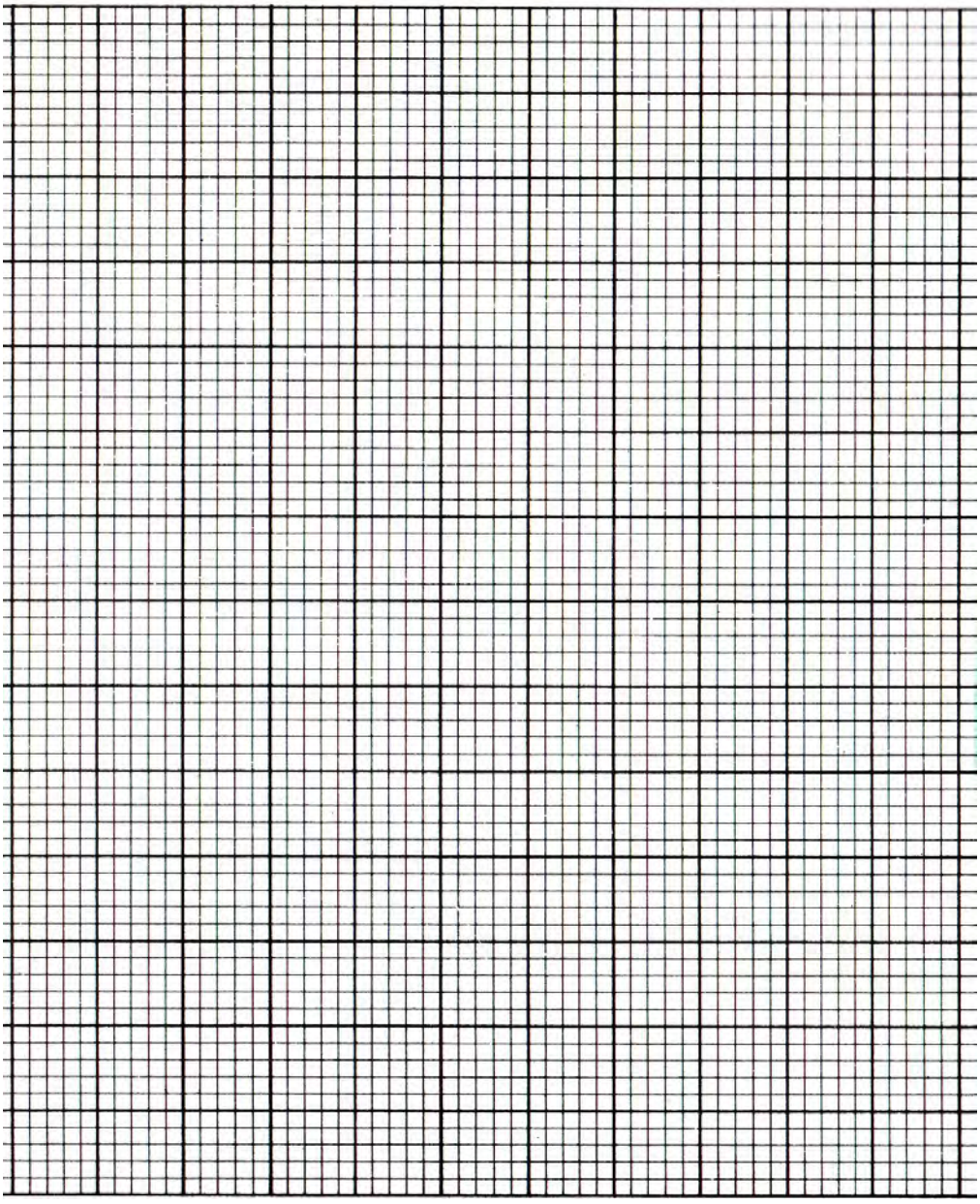
b) LH levels have quite a sharp peak as seen on the table. Name the feature of the ovarian cycle is this peak linked with? (1 mark)

_____

c) State the function of follicle stimulating hormone in men. (1 mark)

_____

d) Graph the oestrogen and progesterone levels. (6 marks)



e) Draw a labelled diagram showing what is happening in the ovarian cycle at the equivalent time. (5 marks)

f) If pregnancy occurs explain what happens to the production of oestrogen and progesterone hormones and why it is important. (2 marks)

_____

_____

_____

_____

End of Section Two

Section Three: Extended answer **20% (40 Marks)**

This section has **four** questions. You must answer **two** questions.

Questions 39 and 40 are from Unit 1. Questions 41 and 42 are from Unit 2. Answer **one** question from Unit 1 and **one** question from Unit 2.

Responses may include clearly labelled diagrams with explanatory notes; lists of points with linking sentences; clearly labelled tables and graphs; and annotated flow diagrams with introductory notes.

Supplementary pages for planning/continuing your answers to questions are provided at the end of the 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.

Unit 1

Choose **either** Question 39 or Question 40.

Indicate the question you will answer by ticking the box next to the question. Write your answer on pages 26-30. When you have answered your first question, turn to page 31 and indicate on that page the second question you will answer.

☐ **Question 39** **20 marks**

Describe the structure and function of an enzyme and explain how temperature, pH and concentration of the enzyme, affect an enzyme's activity. Include examples in your answer.

☐ **Question 40** **20 marks**

a) Describe the complete process of aerobic respiration. (10 marks)

b) Cells transport substances across their membranes. For two types of cellular transport, diffusion and endocytosis, describe the energy requirements, the process, and give one example of where the process is used. (10 marks)

Question Number ___

Question Number ___

Question Number ___

Question Number ___

Question Number ___

Unit 2

Choose **either** Question 41 or Question 42.

Indicate the question you will answer by ticking the box next to the question. Write your answer on the pages provided.

☐ **Question 41** **20 marks**

a) Some methods of birth control rely on a female's ability to determine the time of ovulation. Name and explain **three** such methods a female could use and discuss why determining the time of ovulation is helpful to the female. (12 marks)

b) Describe the events that occur in the three stages of birth. (8 marks)

☐ **Question 42** **20 marks**

a) Describe how the information in a diploid cell is reorganised to produce gametes in the female reproductive system. (11 marks)

b) During an investigation, a student acquired three photographs of cross sections of the female reproductive tract. The student lost the labels and mixed up the photographs. Describe the structural features of the vagina, fallopian tube and uterus that could help the student identify each photograph correctly. Include in your description the function of each of the structures. (9 marks)

Question Number ___

Question Number ___

Question Number ___

Question Number ___

Question Number ___

Question Number ___

Additional working space