Name: _____( ) Class: _____

WOODLANDS SECONDARY SCHOOL
MID YEAR EXAMINATION 2019

Level:	Sec 2	Marks:	100
Stream:	Express	Day:	Wednesday
Subject:	Science	Date:	15 May 2019
Duration:	2 hours	Time:	07 50 – 09 50

READ THESE INSTRUCTIONS FIRST

There are thirty questions in Section A. Answer **all** questions. For each question, there are four possible answers **A**, **B**, **C** and **D**.
Choose the one you consider correct and shade your choice in the separate OTAS provided.

Answer **all** questions in Section B and Section C.
The number of marks is given in brackets [ ] at the end of each question or part question.

Do not use staples, paper clips, highlighters, glue or correction fluid.

The use of calculators is allowed in this examination.

For Examiner's Use	
Section A	30
Section B	40
Section C	30
TOTAL:	100

DO NOT TURN THE PAGE UNTIL YOU ARE TOLD TO DO SO.
This document consists of **30** printed pages.

Section A: Multiple Choice Question (30 marks)

1 Which of the following is **true** about osmosis?

A Energy is required in order for it to take place.

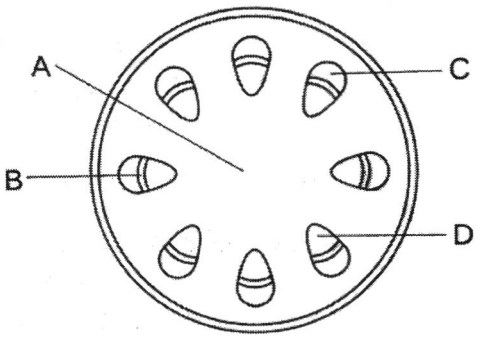
B It occurs across a partially permeable membrane.

C It occurs when there is no difference in water potential.

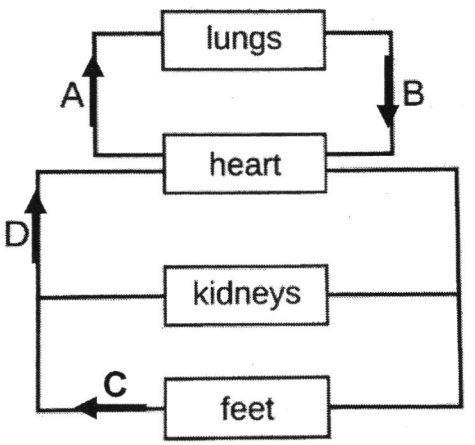
D It refers to a region of high water potential.

2 The diagram below shows the cross section of a plant stem. Water and mineral salts are transported up a plant to the leaves.

Which structure in involved in this transport?



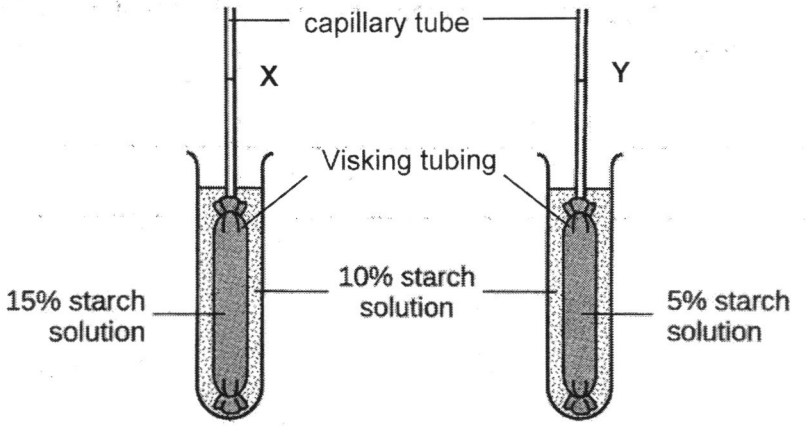
3 The diagram below represents the human circulatory system. The arrows indicate the direction of blood flow. Which blood vessel (**A**, **B**, **C** or **D**) will contain the highest concentration of oxygen?



Use the diagram below to answer Questions **4** and **5**.

The two set-ups below (**X** and **Y**) are used to compare the movement of substances across the Visking tubing when placed in different solutions. The diagram shows the liquid level at the beginning of the experiment.

Starch is a large molecule that is unable to move across the Visking tubing.



4 Liquid level at X will ..... because the water potential is ..... in the 10% starch solution.

A decrease, higher

B decrease, lower

C increase, higher

D increase, lower

5 Which of the following is necessary in order for the experiment to be **fair**?

I different volume of 10% starch solution
II same type of Visking tubing
III same diameter of capillary tube

A I only

B I and III only

C II and III only

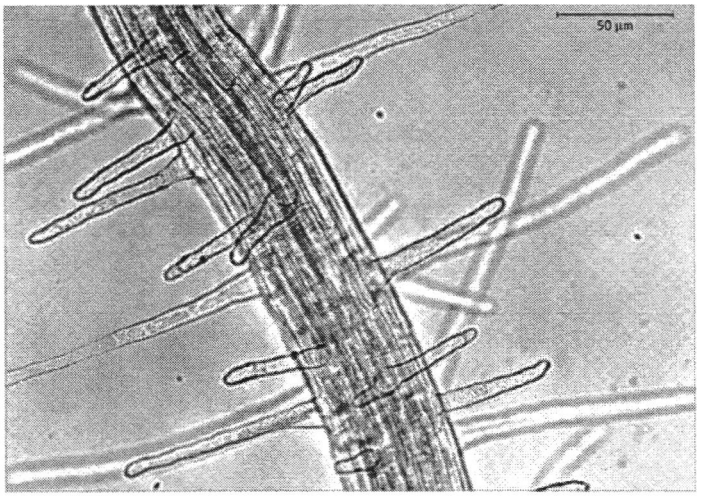
D I, II and III

6 The change in length of potato strips placed in four different solutions (**A**, **B**, **C** and **D**) is shown.

Which solution has the lowest water potential at the beginning?

	initial length /mm	final length /mm
A	48	54
B	48	50
C	50	48
D	50	46

7 The following image below shows the root hair cells of the maize plant viewed under a microscope.



Which of the following is true?

A Both water and mineral salts are absorbed by these structures.

B Long protrusions are present to help absorb oxygen.

C Only food molecules are absorbed by these structures.

D The total surface area is small.

8 Valves are structures that prevent the back flow of blood. They are present in

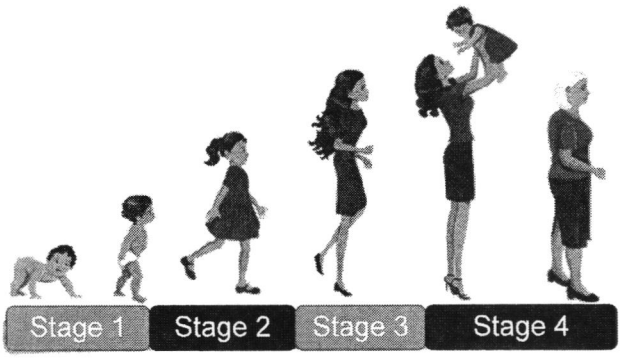
A arteries.

B capillaries.

C red blood cells.

D veins.

9 The diagram below shows the different stages of development in females.



At which stage is menstruation most likely to first take place?

A Stage 1

B Stage 2

C Stage 3

D Stage 4

10 Which part of the male reproductive system helps to maintain a low temperature in the testes?

A prostate gland

B scrotum

C sperm duct

D urethra

11 Which of the following is responsible for the puberty changes experienced in both sexes?

A hormones

B in-vitro fertilisation

C sex cells

D sexual contact

12 Susan crossed out the first day of her menstrual cycle in the month of July.

July						
MON	TUE	WED	THU	FRI	SAT	SUN
	1	2	3	4	5	6
7	8	9	X	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

On which date is she considered the most fertile?

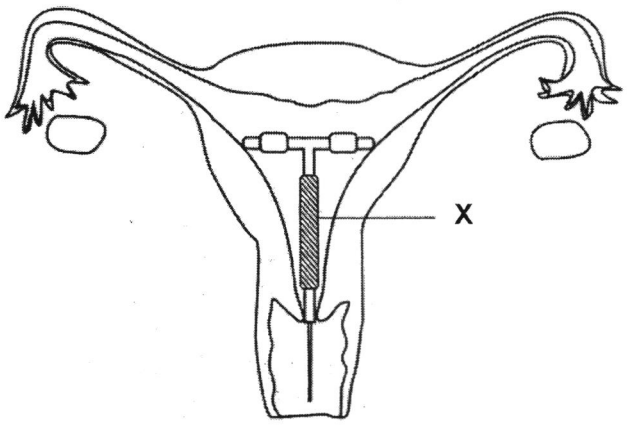
A 9 July

B 14 July

C 23 July

D 31 July

13 The following image below shows a contraceptive method which involves structure **X** being inserted into the female reproductive system.



How does structure **X** is prevent pregnancy?

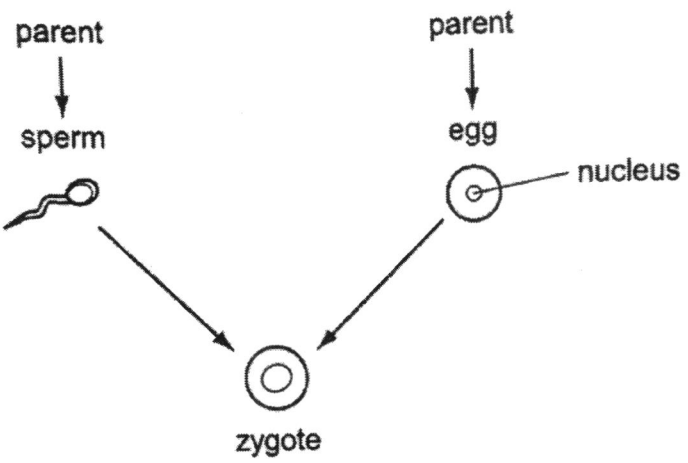
A Egg is not released.

B Egg is unable to travel along the oviduct.

C Fertilised egg is unable to implant.

D Sperms are unable to meet the egg.

14 What is the process that is shown in this diagram?



A contraception

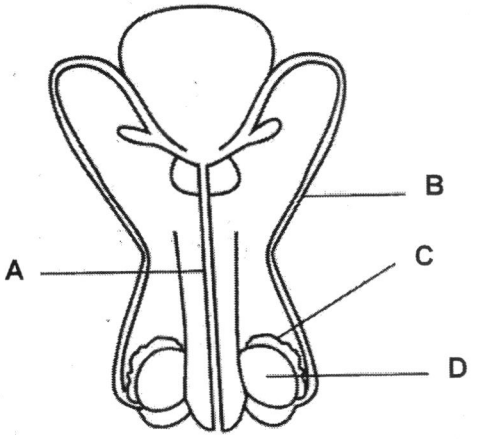
B fertilisation

C implantation

D sexual intercourse

15 A vasectomy is a permanent birth control method for men. The diagram below shows the male reproductive system.

Which structure is altered during a vasectomy?



16 The table shows the results of food tests carried out on a drink.

test	result
Benedict's	orange colour
Iodine	blue-black colour

What does the drink contain?

A fats and reducing sugar

B reducing sugar only

C starch only

D starch and reducing sugar

17 Which of the following describes chemical digestion?

A Complex food molecules are changed to simpler forms.

B Large food pieces become smaller.

C Mechanical action is involved.

D Surface area of food increases.

18 Which of the following substances will be obtained when a sample of bread is completely digested?

A amino acids

B fatty acids

C glucose

D glycerol

19 A man consumes mainly lean meat and fish in his diet for some time. What is the benefit of these nutrients to him?

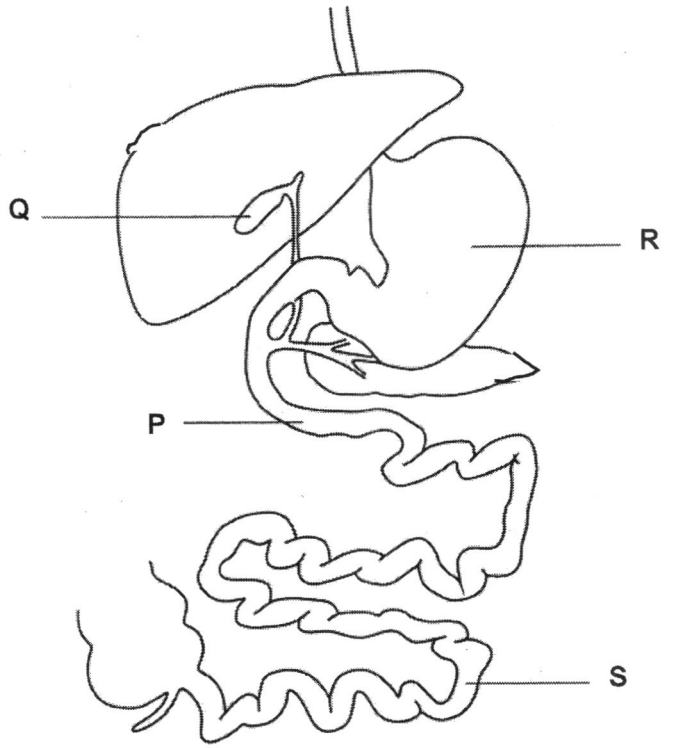
A ease bowel movements

B grow new cells and tissues

C insulation to keep warm

D supply energy to do work

Use the diagram below to answer Questions **20** and **21**.



20 In which part do simpler food substances enter the blood stream?

A Part **P**

B Part **Q**

C Part **R**

D Part **S**

21 What is **not** a function of Part **R**?

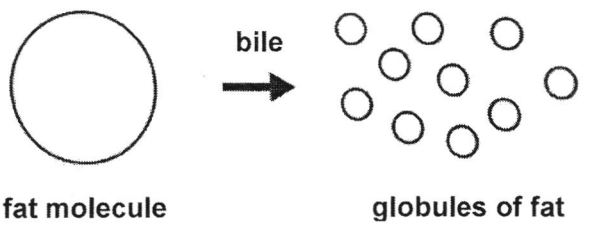
A It can digest different types of nutrients.

B It carries out physical digestion with its muscular walls.

C It contains a chemical that is acidic.

D It stores food temporarily.

22 The diagram shows physical digestion taking place in the digestive system.



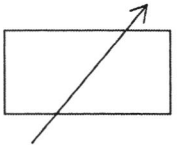
Which of the following is true about this event?

A It allows subsequent chemical digestion of fat to take place quickly.
B It decreases the surface area of the fat molecule.
C Fat globules are small enough to enter the blood stream.
D This event requires an enzyme.

23 What is the function of the rectum?

A absorption of water and minerals
B digestion of carbohydrates
C releases waste out of body
D storage of undigested matter

24 What is the name of the following electrical component?

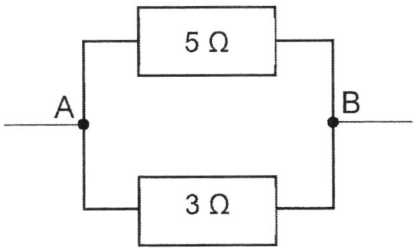


A a.c. supply
B fuse
C motor
D variable resistor

25 Which of the following electrical components has zero resistance in an ideal circuit?

A ammeter
B electric bell
C light bulb
D voltmeter

26 The diagram below shows part of an electrical circuit.



What is the effective resistance between points A and B?

A 0.53 Ω

B 1.88 Ω

C 2.00 Ω

D 8.00 Ω

27 Electrolysis makes use of the ..... effect of electricity.

A chemical

B heating

C lighting

D magnetic

28 An electric cooker is rated 240 V, 3000 W.

A student connects the electric cooker to a 300 V supply and finds that the cooker is able to operate.

The student makes the following statements about the electric cooker connected to the 300 V supply:

(i) The electric cooker may overheat.
(ii) The electric cooker will take a shorter time to cook.
(iii) The electric cooker will consume a power of 3000 W.

Which of the student's statement(s) is/are true?

A (iii) only

B (i) and (ii) only

C (ii) and (iii) only

D (i), (ii) and (iii)

29 Which of the following correctly describes an ideal fuse?

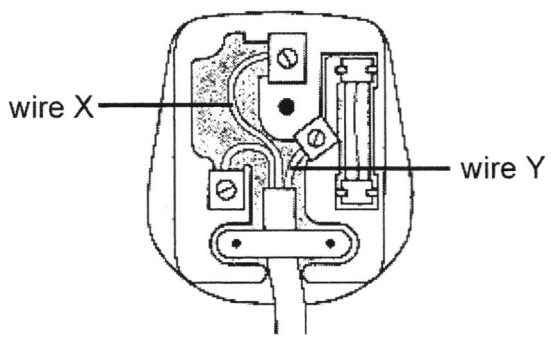
A It can be reset.

B It has zero resistance.

C It melts when the current flowing through it is below its rating.

D Its main purpose is to prevent electric shocks.

30 Which of the following correctly states the name and colour of wire in an electric plug?



	Wire X		Wire Y	
	name	colour	name	colour
A	earth wire	brown	neutral	blue
B	earth wire	green-yellow	live wire	brown
C	neutral	blue	earth wire	green-yellow
D	live wire	green-yellow	earth wire	brown

Section B: Structured Questions (40 marks)

Answer **all** the questions from this section in the spaces provided.

1 Fig. 1.1 below shows the components in blood.

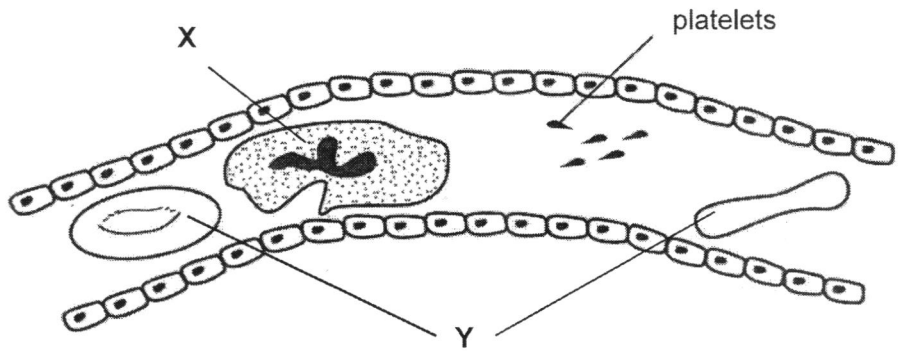


Fig. 1.1

(a) Identify the components **X** and **Y**.

X: .....

Y: ..... [2]

(b) Draw a 'Z' on the diagram to indicate where the highest concentration of carbon dioxide can be found. [1]

(c) Before a patient can undergo blood transfusion, the donor's blood has to be tested to ensure that his blood is compatible with the patient's blood If his blood is not compatible, the patient's immune system would be triggered to reject the donated blood.

Suggest what will happen to the donor's red blood cells if the recipient gets an incorrect match. Explain your answer.

.....

.....

..... [2]

(d) How does a transport system in multicellular organisms like humans differ from the way unicellular organisms like bacteria obtain their nutrients?

.....

.....

..... [2]

[Total: 7]

2 Fig. 2.1 below shows an apparatus used by a student to investigate digestion in part **X** of the human digestive system.

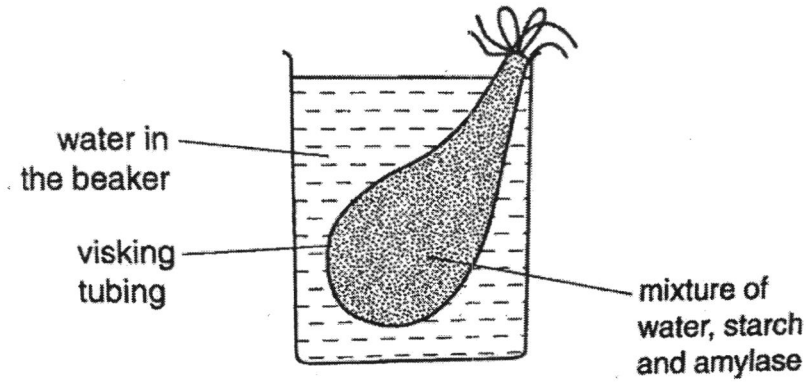


Fig. 2.1

(a) The contents in the Visking tubing are similar to the contents found in part **X** of the digestive system. Identify part **X**.

..... [1]

(b) After an hour, the student tested the contents of the Visking tubing for presence of starch. He found that starch was absent.

The steps below were taken in order to obtain the results. Fill in the blanks with appropriate words.

Step 1: 2cm^3 of the solution inside the Visking tubing is placed in a test tube.

Step 2: ..... solution is added to the mixture.

Step 3: A ..... colour is obtained. [2]

(c) The student then tested the contents of the water in the beaker for the presence of reducing sugars. His results showed that a brick-red colour is obtained.

Explain his results.

.....

.....

..... [2]

[Total: 5]

3 Fig. 3.1 below shows a diagram of two blood vessels (**X** and **Y**) found in the human body.

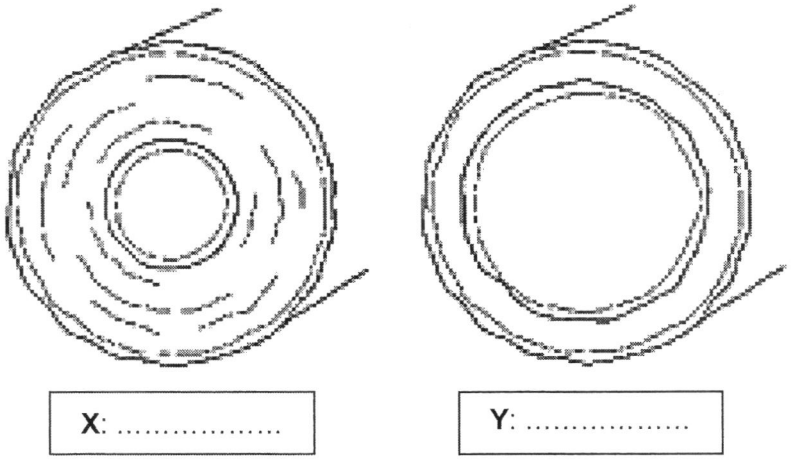


Fig. 3.1

(a) Identify the type of blood vessels by filling in the blanks on Fig. 3.1. [2]

(b) Describe how the walls of blood vessel **X** allows it to withstand the high pressure of blood pumped out from the heart.

.....

..... [1]

[Total: 3]

4 Nutrient **Y** is found in egg whites. Fig. 4.1 below shows how nutrient **Y** is digested by enzyme **X** into products **Z**.

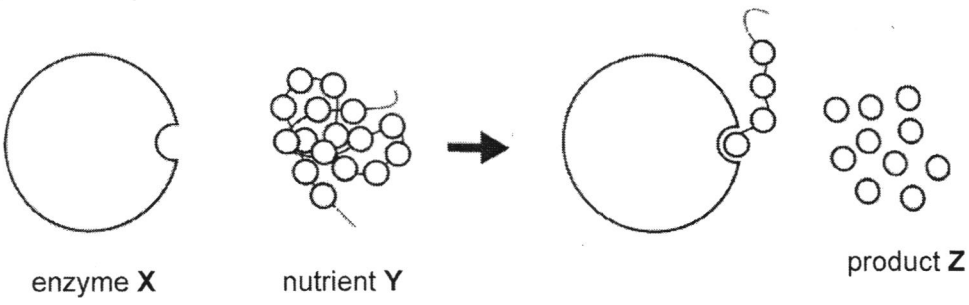


Fig. 4.1

(a) Identify the following molecules.

Enzyme **X**: .....

Nutrient **Y**: .....

Product **Z** : ..... [3]

(b) Explain why product **Z** will not reach the large intestines of a healthy person.

.....

..... [1]

[Total: 4]

5 Fig. 5.1 below shows the changes that take place in the female body during the menstrual cycle.

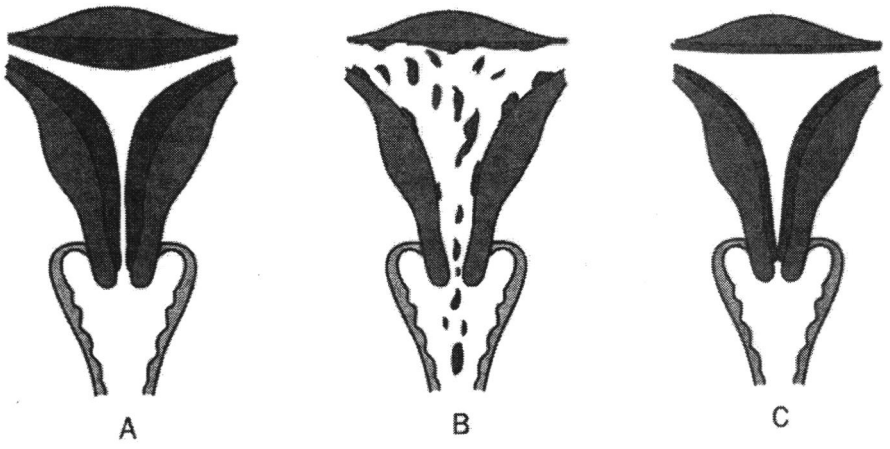


Fig. 5.1

(a) In the blanks below, write down the letters to indicate the sequence of events during the menstrual cycle.

[1]

(b) Mrs Dolly tries to get pregnant with her husband. On diagram **C**, place a "**X**" to indicate where sperms will be deposited during sexual intercourse. [1]

(c) At which stage (**A**, **B** or **C**) is Mrs Dolly least fertile? Provide a reason to explain why this is so.

.....

.....

..... [2]

[Total: 4]

6 Fig. 6.1 below shows the side view of the male reproductive system.

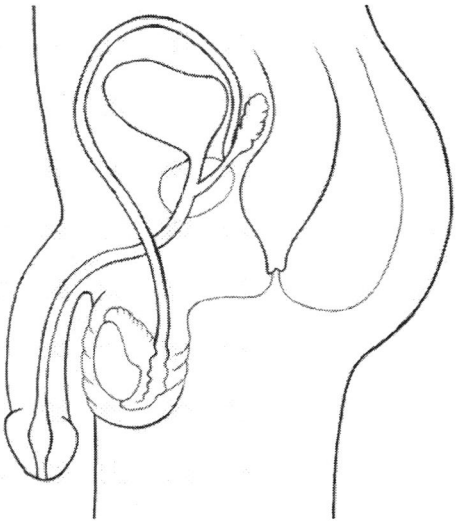


Fig. 6.1

(a) On Fig. 6.1, draw straight lines and label the testes, sex gland, sperm duct and urethra clearly. [2]

(b) State the function of the sex gland in males.

..... [1]

(c) Mr and Mrs Ting do not want any children at all. Suggest what birth control method Mrs Ting can opt for. Explain why.

.....

..... [2]

(d) Fig. 6.2 illustrates how the Amoeba organism reproduces itself.

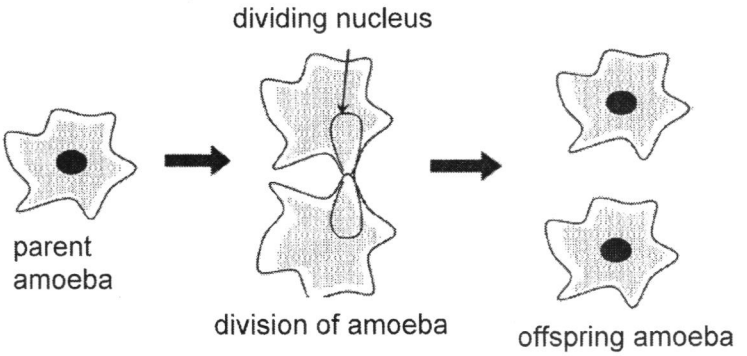


Fig. 6.2

How is reproduction by the human male different from the parent amoeba? Describe two ways in which they are different.

1) .....

.....

2) .....

..... [2]

[Total: 7]

7 Fig. 7.1 shows two electrical circuits, A and B.

Each electric cell supplies a voltage of 9 V.
I_1, I_2, and I_3 denote the current flowing through the circuit at their respective points.
V_1 and V_2 denote the potential difference across the respective electrical components.

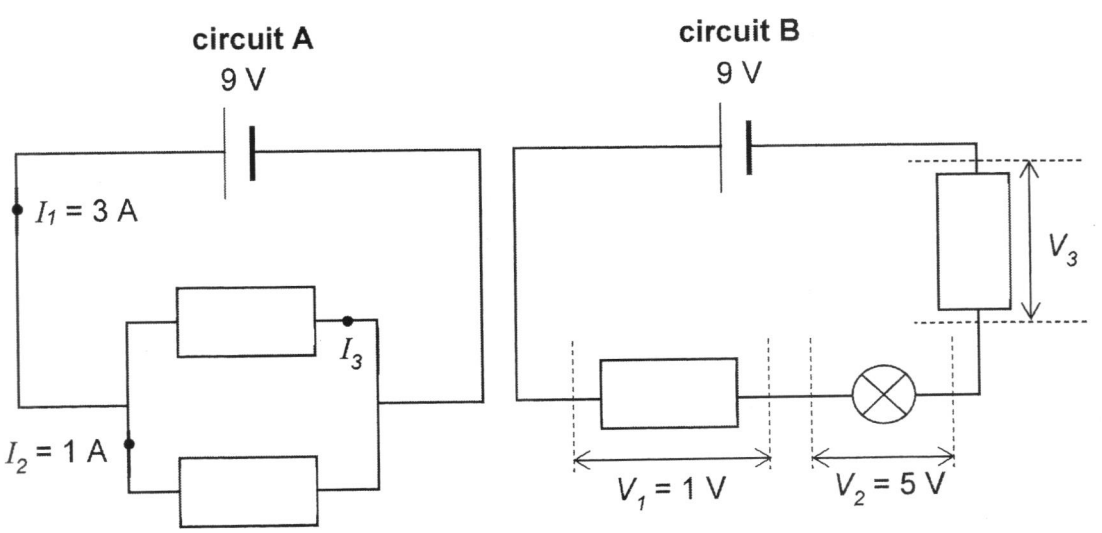


Fig. 7.1

(a) Draw an arrow, in Fig. 7.1, to show the direction of current flow in circuit A. [1]

(b) Based on Fig. 7.1, calculate the values of

(i) I_3,

I_3 = ...A [1]

(ii) V_3.

V_3 = ...V [1]

[Total: 3]

8 Fig. 8.1 shows an electrical circuit comprising of three electric cells and a bulb. Each electric cell is rated 1.5 V, and the bulb has a resistance of 5 Ω.

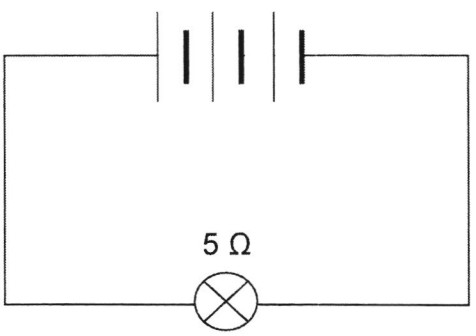


Fig. 8.1

(a) Calculate the total voltage supplied by the electric cells in the circuit.

voltage = ...V [1]

(b) Calculate the current flowing through the bulb.

current = ...A [2]

(c) Draw, in Fig. 8.1, the circuit components and how they would be connected to measure the

(i) current flowing through the bulb, [1]

(ii) potential difference across the bulb. [1]

Use the correct circuit symbols to represent your answers in **(i)** and **(ii)**.

[Total: 5]

9 Fig. 9.1 shows an electrical hazard found in households.

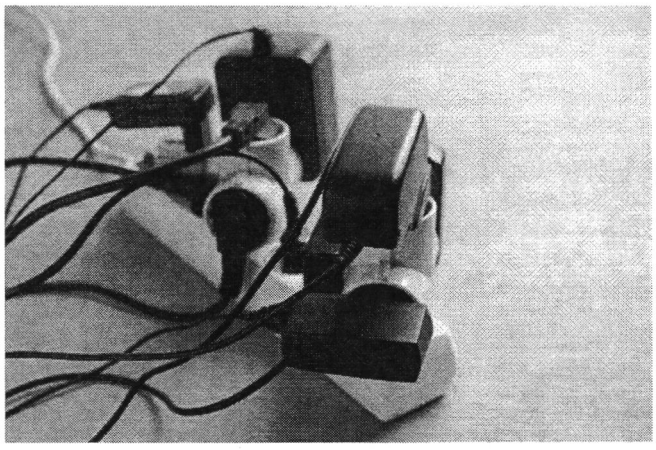


Fig. 9.1

(a) Name the hazard shown in Fig. 9.1.

..... [1]

(b) Describe why the hazard in **(a)** is dangerous.

..... [1]

[Total: 2]

Section C: Data-based Questions (30 marks)

Answer **all** the questions from this section in the spaces provided.

1 Fig. 1.1 below shows the statistics for new infection by the Human Immuno-deficiency virus (HIV) in a population for the year of 2018.

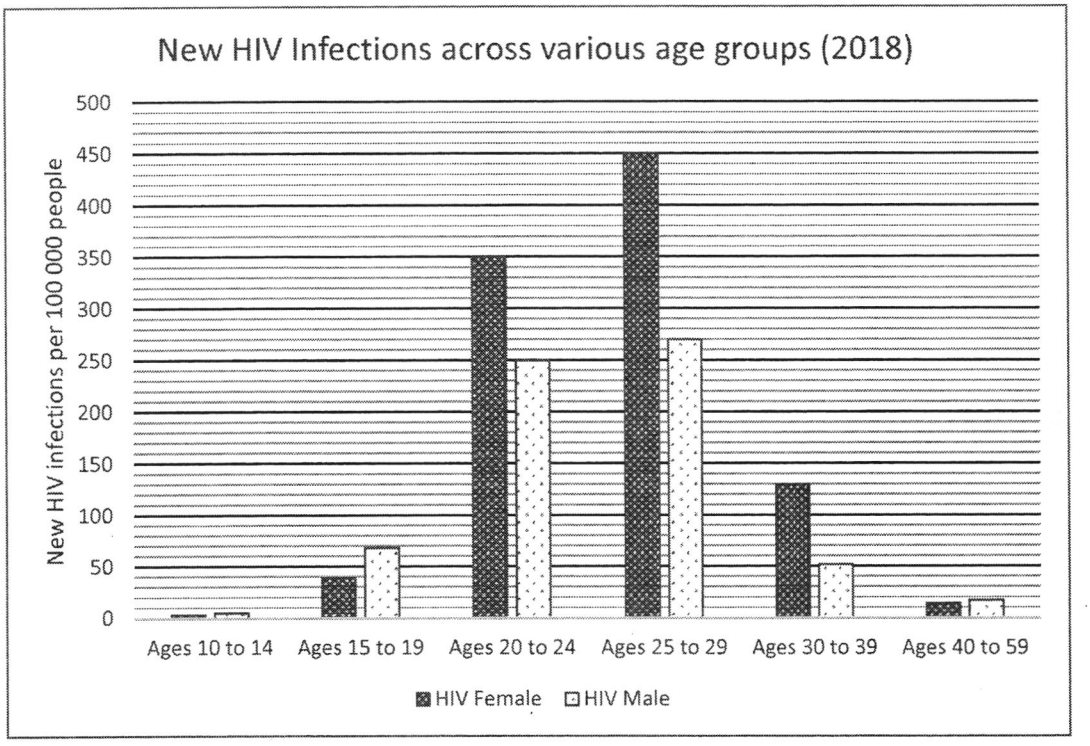


Fig. 1.1

(a) In which gender and age group is the rate of new HIV infections the highest?

..... [1]

.....

(b) Calculate the percentage of new HIV infections in this population for females in the age range of 30-39. Show your working.

percentage: ..... % [2]

(c) State two ways to prevent HIV transmission in young adults.

1) .....

2) ..... [2]

[Total: 5]

2 Table 2.1 shows calories consumed from different foods. Table 2.2 shows calories burnt when engaging in various activities.

A calorie is a unit of measurement for the energy level in food.

Table 2.1

Type of food	Amount of calories
One large packet of French fries	500
One slice of chocolate cake	371
One medium cup of bubble tea with milk	230

Table 2.2

Type of exercise	Amount of calories burnt
Rock climbing for 1 hour	454
Swimming for 30 minutes	150
Cycling for 30 minutes	260

(a) French fries are made from deep frying potato strips in vegetable oil. What are the **two** main nutrients that contribute to the calorie value of a large packet of French fries?

..... [1]

(b) Jacky consumes one slice of chocolate cake and one medium cup of bubble tea with milk for his tea break. Use Table 2.1 to calculate the amount of calories consumed.

..... calories [1]

(c) Jacky engages in rock climbing for 30 minute.

(i) Use Table 2.2 to calculate the amount of calories burnt off.

..... [1]

(ii) Has he burnt off **all** the calories consumed in **(b)**? Explain why by showing your calculations in the space below.

.....

..... [1]

(d) Exercise can be categorised into low, moderate or high intensity activities. The guidelines below help users to engage in suitable activities based on their individual profiles.

Low intensity : less than 100 calories burnt
Moderate intensity: 101 – 200 calories burnt
High intensity: more than 200 calories burnt

In which category does swimming and cycling for 30 minutes belong to? Place a tick (√) for each exercise to show which category it belongs to.

exercise	low intensity	moderate intensity	high intensity
swimming			
cycling			

[1]

[Total: 5]

3 A leaf has tiny openings known as stomata which allow the entry and escape of gases.

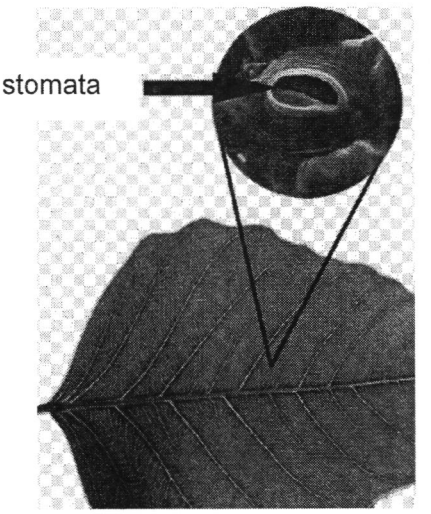


Table 3.1 shows the different concentrations of carbon dioxide gas between a leaf and its surroundings during the day or at night.

Table 3.1

	relative concentrations of carbon dioxide /	
	inside leaf	outside air
at night	400	4
in the day	0.5	4

(a) Name the process that is responsible for the movement of carbon dioxide as it enters or exits the leaf.

.....

[1]

(b) Using the information from Table 3.1, describe the direction of carbon dioxide movement at night, between the outside air and inside the leaf.

.....

.....

[1]

(c) Explain your answer in **(b)**.

.....

.....

[1]

(d) A layer of grease is applied to cover all the stomata of the leaf. How will this affect the movement of carbon dioxide gas?

.....

..... [1]

[Total: 4]

4 **(a)** Describe, in as much detail as possible, the physical and chemical digestion of proteins in the stomach.

.....

.....

.....

.....

.....

.....

..... [4]

(b) Explain why the process of digestion of food is important.

.....

.....

.....

..... [2]

[Total: 6]

5 A student connects the same light bulb in two different circuits, X and Y, as shown in Fig. 5.1.

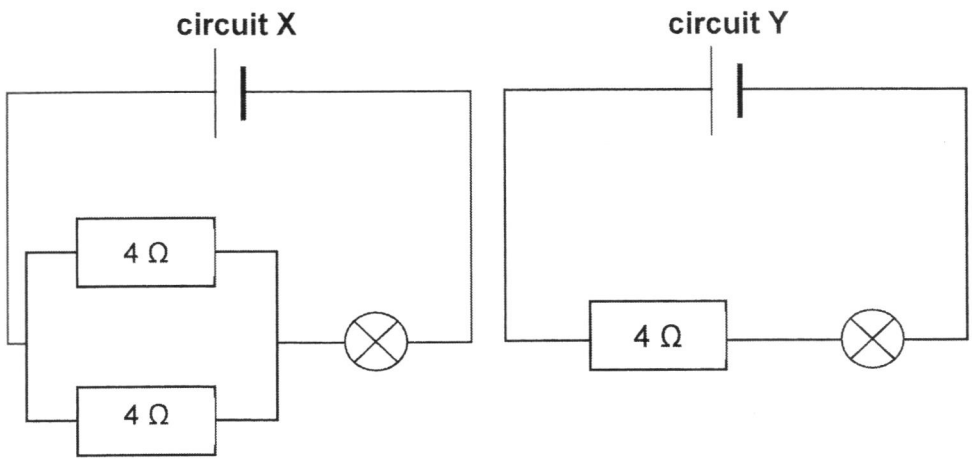


Fig. 5.1

Compare the brightness of the bulb in circuits X and Y.
Explain your answer.

.....

.....

..... [2]

[Total: 2]

6 A gameshow technician must design an electric circuit for three contestants to compete in a question-and-answer gameshow.

Requirements of gameshow's electric circuit:
- Each of three contestant will be assigned a switch to activate their respective bell.
- The first person to close their switch will cause their bell to ring first, and that person will get a chance to answer the question.

The gameshow technician designs the circuit as shown in Fig. 6.1.

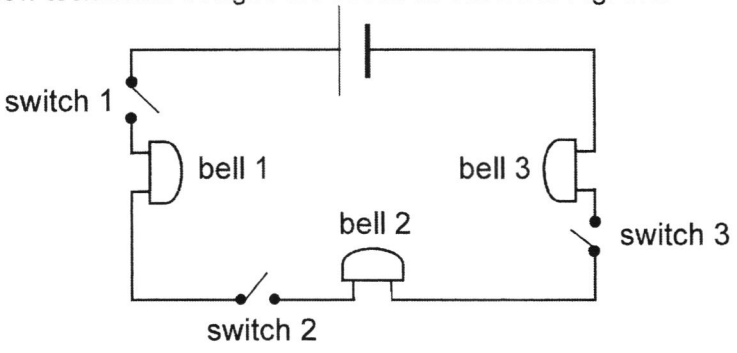


Fig. 6.1

(a) Suggest why the electric circuit in Fig. 6.1 does not meet the requirement(s) of the gameshow.

.....

..... [1]

(b) Draw, in Fig. 6.2, the same circuit components of Fig. 6.1 in a different arrangement to allow the electric circuit to function based on the requirements of the gameshow.

Label the names of the following circuit components:
- switch 1, switch 2, and switch 3,
- bell 1, bell 2, and bell 3. [3]

Fig. 6.2

[Total: 4]

7 A washing machine has a power rating of 325 W. It is used for 3 hours each day.

(a) Express the power rating of the washing machine in kW.

power = ...kW [1]

(b) Calculate the energy used by the washing machine in kWh each day.

energy = ...kWh [2]

(c) Given that the electricity costs 20 cents per kWh used, calculate the cost of using the washing machine each day in cents.

cost = ...cents [1]

[Total: 4]

2EXP MYE Answer Key

Section A

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
B	D	B	C	C	D	A	D	C	B

Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20
A	C	C	B	B	D	A	C	B	D

Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29	Q30
A	A	D	D	A	B	A	B	B	B

Section B

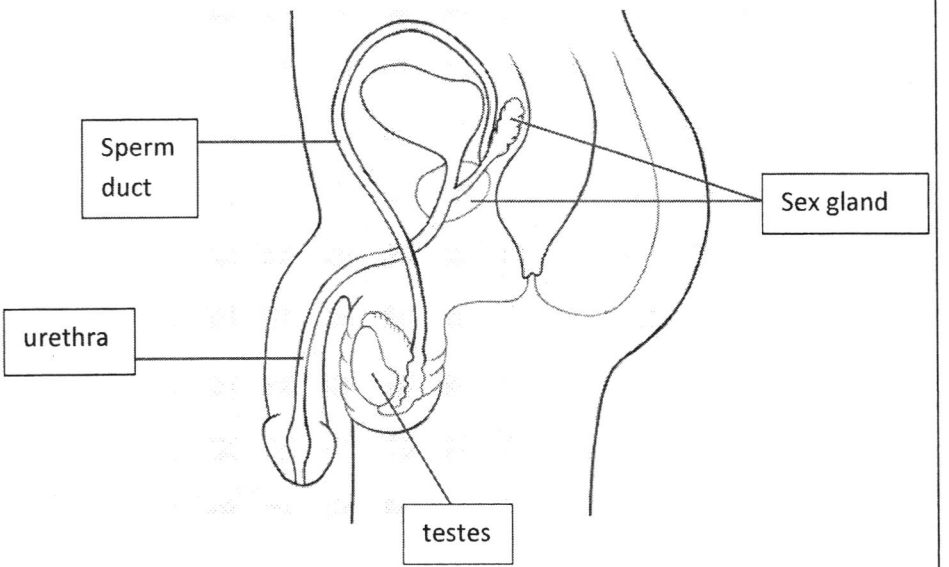
Q 1	Answer	Marks
a	X: WHITE BLOOD CELL Y: RED BLOOD CELL *1m each*	 2
b	*Z placed WITHIN CAPILLARY IN THE EMPTY SPACE*	1
c	White blood cells will identify the red blood cells as foreign entities. White blood cells will destroy donor's red blood cells. *Accept any logical answer.*	1 1
d	Difference: Unicellular organisms require only diffusion/osmosis to obtain their nutrients. Difference: Humans have dedicated pathways (also accept circulatory/transport system, blood/bloodvessels, etc) to transport nutrients along blood vessels. Or Unicellular organisms only rely on diffusion/osmosis without the need for transport systems. *Accept any logical answer.*	1 1 or 1 1
		Total 7

Q 2	Answer	Marks
a	mouth	1
b	Amylase is an enzyme which can catalyse the breakdown of starch to maltose/glucose/reducing sugars. Reducing sugars are able to diffuse across the Visking tubing to enter the water in the beaker.	1 1
c	**Step 1**: 2cm^3 of the solution inside the Visking tubing is placed in a test tube. **Step 2**: IODINE solution is added to the mixture. **Step 3**: A YELLOW-BROWN colour is obtained.	 1 1
		Total 5

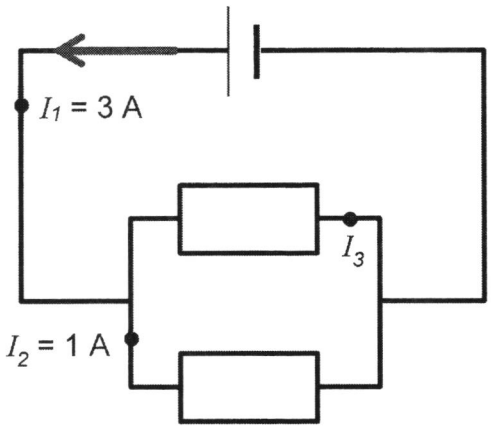
Q 3	Answer	Marks
a	X: artery Y: vein	1 1
b	Artery has thicker muscular/elastic walls. *Accept any logical answer.*	1
		Total 3

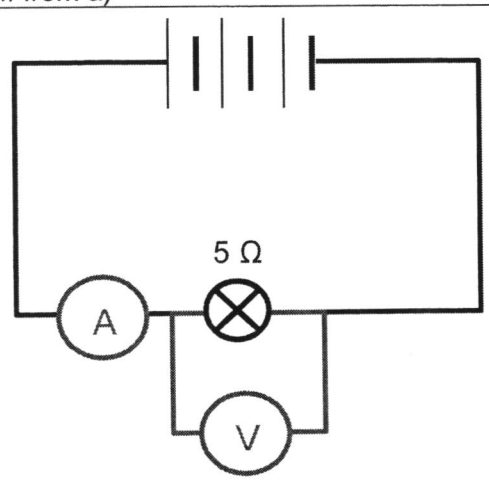
Q 4	Answer	Marks
a	Enzyme X: protease Food substance Y: proteins Product Z : amino acids	1 1 1
b	Product Z will enter the small intestines and be <u>absorbed</u> into the blood stream.	1
		Total 4

Q 5	Answer	Marks
a	B→ C→ A (accept A → B→ C, and C→ A → B)	1
b	*X placed INSIDE THE VAGINA*	1
c	Stage B Egg has disintegrated / is being discharged out/ no egg available. OR Lack of uterine lining for implantation of embryo *Do not accept if a mere description of Stage B is given. Accept other stages if the reasoning is logical.*	1 1
		Total 4

Q 6	Answer	Marks
a	Correct identification of all 4 structure with labels  0M for 1 correct 1 M for 2-3 correct 2M for 4 correct	2
b	Sex glands produces fluids that nourish the sperms. *Accept any logical answer.*	1
c	Ligation. It is a permanent method./ irreversible method. *Accept other logical answer.*	1 1
d	Male sperm needs to fuse with female egg to produce an offspring. Amoeba can divide itself to product offspring without any sex cells. Human male reproduce sexually whereas Amoeba reproduced asexually. Offspring from human male is genetically dissimilar from parent but offspring from Amoeba is genetically identical as compared to parent. *Accept any 2 logical answer.*	1 1
		Total 7

Q 7	Answer	Marks

a	**circuit A** 9 V  (Current flows from the positive terminal of the cell to its negative terminal)	1
bi	2 A	1
bii	3 V	1
		Total 3

Q 8	Answer	Marks
a	4.5 V	1
b	I = V / R = 4.5 / 5	1
	= 0.9 A (e.c.f. from a)	1
ci, ii	 	1 Ammeter connected in series to the bulb 1 Voltmeter connected in parallel across the bulb
		Total 5

Q 9	Answer	Marks
a	Overloaded socket	1
b	Too much (excessive) current may flow through the wires, causing them to overheat which may result in a fire.	1
		Total 2

Section C

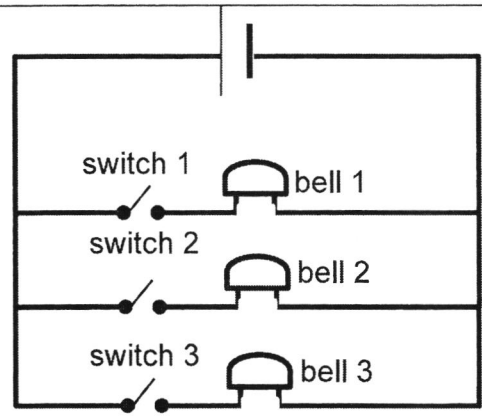
Q 1	Answer	Marks
a	Females from ages 25 to 29	1
b	130 / 100000 X 100% = 0.13% 1 mark for identifying 130 per 100000 and 1m for percentage calculation.	2
c	Practice abstinence. Use of condoms for males. Do not engage in casual sex. Do not abuse drugs *Accept any 2 logical answer.*	2
		Total 5

Q 2	Answer	Marks
a	Fats and carbohydrates/starch	1
b	371 + 230 = 601 calories	1
ci	454 divide by 2 = 227 calories burnt	1
cii	601 – 374 = + 374 There will still be a net gain of 374 calories. *Allow ECF.*	1
d	Swimming: moderate Cycling: high 1m for both correct	1
		Total 5

Q 3	Answer	Marks
a	diffusion	1
b	Carbon dioxide exits the leaf to enter the outside air.	1
c	There is a higher concentration of carbon dioxide inside the leaf as compared to outside. *Allow ECF.*	1
d	There will not be any movement of carbon dioxide into or out of the leaf as grease acts as a physical barrier/ blocks the carbon dioxide.	1
		Total 5

Q 4	Answer	Marks
a	- Protein in the stomach in churned into smaller pieces - which increases its surface area. / churned in the stomach to mix with digestive juices - Enzymes in the stomach chemically - breaks down proteins into polypeptides/amino acids.	1 1 1 1
b	Food molecules are <u>large and complex</u>. Hence, they are <u>unable to diffuse across cells</u>/cross cell membranes to enter the blood to reach body cells. OR alternative wording Digestion breaks down food into simpler and smaller molecules, which allows them to diffuse across cells to enter the blood to reach body cells.	1 1
		Total 6

Q 5	Answer	Marks
	The bulb in circuit X is brighter.	1
	The effective resistance in circuit X is less than Y, so the current flowing through circuit X is more than Y.	1
		Total 2

Q 6	Answer	Marks
a	The bell of the first person to close the switch will not ring until all the other switches are closed. OR The bells will all ring at the same time.	1 o.e.
b		1 Correct (parallel) arrangement of bells.
		1 Correct (parallel) arrangement of switches.
		1 Correct labels. (Note that switch 1 must be parallel to counterpart bell 1, etc.)
		Total 4

Q 7	Answer	Marks
a	0.325 kW	1
b	E = P x t = 0.325 x 3	1 e.c.f. from (a)
	= 0.975 kWh	1
c	19.5 cents	1 e.c.f. from (b)
		Total 4