Name:	Class: Sec _____	Index No.: _____

2E

MERIDIAN SECONDARY SCHOOL
END-OF-YEAR EXAMINATION 2022

LOWER SECONDARY SCIENCE

SECONDARY 2 EXPRESS

11 October 2022

BOOKLET A

1 hour 30 minutes
(For Booklets A and B)

Additional Material:
OTAS

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, class and index number on the OTAS.

Section A: Multiple Choice Questions [30 marks]
There are **thirty** questions in this booklet. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the one you consider correct and record your choice in soft pencil on the separate OTAS.

Read the instructions on the OTAS very carefully.

Each correct answer will score one mark.
Any rough working should be done in this booklet.

The use of an approved scientific calculator is expected, where appropriate.
A copy of the Periodic Table is printed on **page 16** of Booklet **B**.

At the end of the exam, hand in Booklet A, Booklet B and OTAS separately.

For Examiner's Use	
Section A	

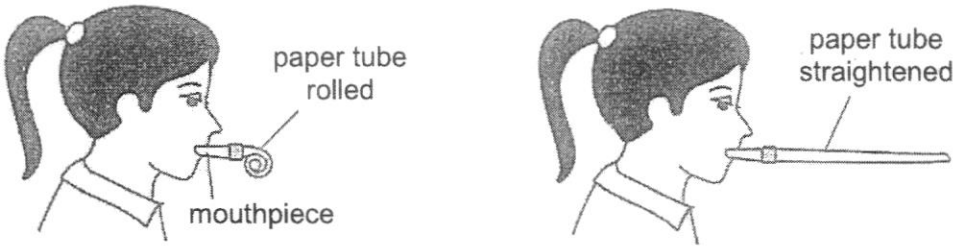
This question paper consists of **12** printed pages, including this page.

[Turn over

SECTION A [30 Marks]

Answer **all** questions in the OTAS.

1 When Mariam blew air into the rolled paper tube, it straightened.



Which of the following explains why the paper tube straightened?

A Air can be compressed.

B Air does not have a fixed shape.

C Air has weight.

D Air has a fixed volume.

2 Which of the following statements best describes water evaporating?

A The water molecules gain energy from the surroundings.

B The water molecules lose energy to the surroundings.

C The water molecules move about in fixed positions.

D The water molecules move closer together.

3 An inflated balloon will shrink if placed in a refrigerator.

How does the lower temperature affect the movement of the gas particles in the balloon?

A The gas particles move faster and become closer together.

B The gas particles move slower and become closer together.

C The gas particles move faster and become further apart.

D The gas particles move slower and become further apart.

4 Which element has the same number of neutrons and protons?

A argon

B boron

C oxygen

D phosphorus

5 The electronic structures of atoms of 4 elements are given.

Which of these elements is in the same period as bromine (proton number = 35)?

A 2,5

B 2,7

C 2,8,7

D 2,8,8,2

6 Given that a molecule of a compound consists of one carbon atom, three hydrogen atoms and one chlorine atom, which chemical formula represents the compound?

A CCl_4

B C_2H_4

C CH_3Cl

D C_2H_6

7 A stone on Mars has a mass of 2 kg. It is brought back to Earth where the gravitational field is stronger.

On Earth, the stone will have

A less mass and more weight.

B more mass and less weight.

C the same mass and less weight.

D the same mass and more weight.

8 A man wants to cross over from the roof of one building to another using a wooden plank.

What should he do to ensure that the plank will not break while he is crossing it?

A run across as quickly as possible

B tip-toe all the way across slowly

C walk sideways slowly

D crawl across slowly

9 Which is a non-renewable energy?

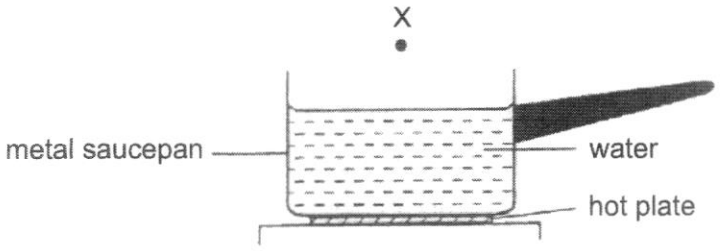
A geothermal energy

B nuclear energy

C solar energy

D tidal energy

10 The diagram shows a metal saucepan containing water and placed on a hot plate. After some time, the air at point X also becomes hot.



What are the main processes by which heat travels from the hot plate through the base of the metal saucepan, through the water and through the air to point X?

	through the base of the saucepan	through the water	through the air
A	conduction	convection	convection
B	conduction	radiation	convection
C	convection	convection	radiation
D	radiation	convection	conduction

11 How does a styrofoam box keep your takeaway food warm for a longer time?

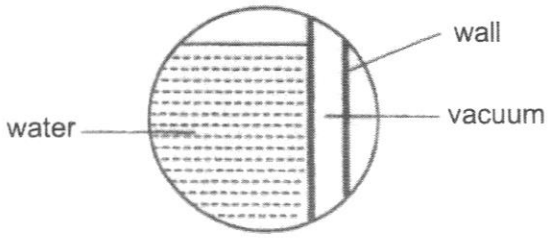
A It is a good absorber of heat.

B It is a good radiator of heat.

C It is a good insulator of heat.

D It is a good conductor of heat.

12 The diagram shows part of the structure of a flask used to contain hot water.



Which mode of heat flow is reduced by having vacuum in the flask?

A conduction

B convection

C conduction and convection

D conduction, convection and radiation

13 A student was stung by a wasp. The venom of the wasp is alkaline.

What could he apply onto the area he was stung to neutralise the venom?

A copper carbonate

B potassium hydroxide

C sodium chloride

D vinegar

14 Which of the following reactions are examples of physical change?

1 rusting of iron
2 breaking a rock
3 switching on a light bulb
4 boiling water

A 1 and 2

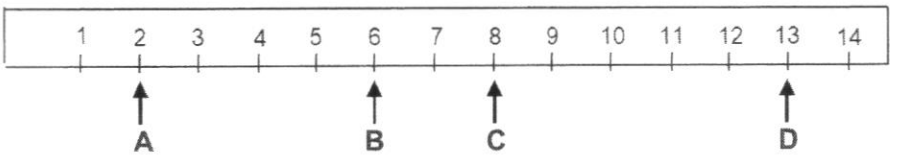
B 3 and 4

C 2, 3 and 4

D 1, 2, 3 and 4

15 The chart shows the position of four substances on the pH scale.

Which substance is a strong alkali?



16 Which of the following does **not** describe a chemical change?

A heating sugar to form a black substance

B mixing iron filings and sulfur to form a grey mixture with yellow specks

C adding vinegar to egg shells or marble chips to produce bubbles of gas

D mixing hydrochloric acid with sodium hydroxide to form sodium chloride

17 Which of the following appliances does **not** make use of the heating effect of electricity?

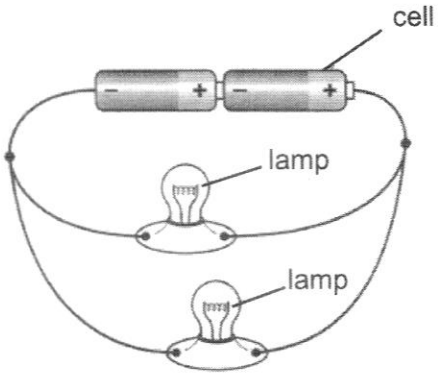
A electric fan

B electric hotplate

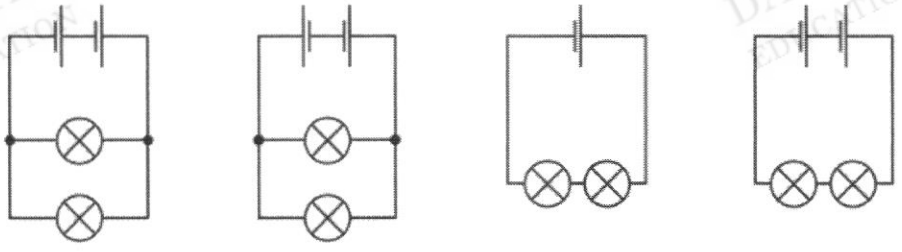
C electric kettle

D electric radiator

18 The diagram shows the setup of a circuit.



Which circuit diagram shows this setup correctly?



A **B** **C** **D**

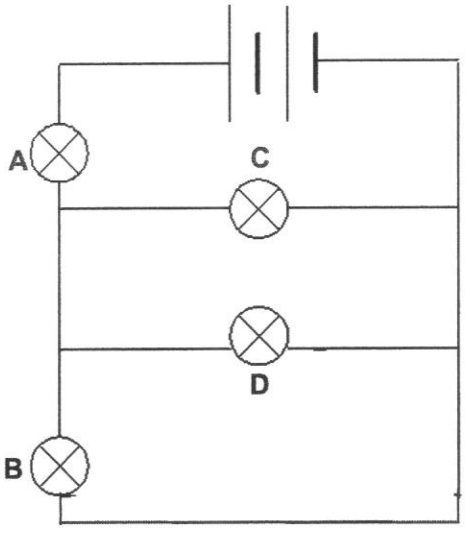
19 A variable resistor connected in series to a lamp acts as a dimmer in a lighting circuit.

What happens to the resistance and current when someone turns the dimmer to dim the light?

	resistance	current
A	decreases	decreases
B	increases	decreases
C	decreases	increases
D	increases	increases

20 When one of the light bulbs in the following circuit is spoilt, the other 3 bulbs cannot light up as well.

Which bulb is the faulty one?



21 Which part of the alimentary canal is most acidic?

A large intestine

B mouth

C small intestine

D stomach

22 Which of the following breaks down molecules of fat into fatty acids and glycerol?

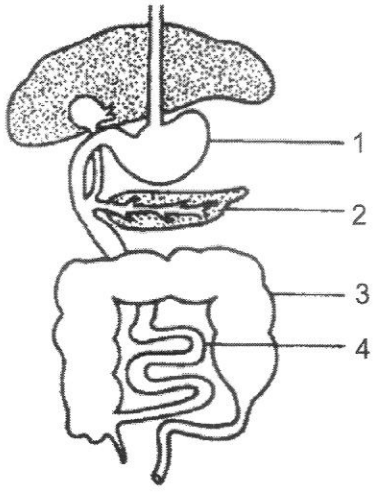
A amylase

B carbohydrase

C lipase

D protease

23 The diagram shows part of the human digestive system.



Which **two** structures are involved in the digestion of proteins?

A 1 and 3

B 1 and 4

C 2 and 3

D 2 and 4

24 Which of the following organs will **not** produce any digestive enzymes?

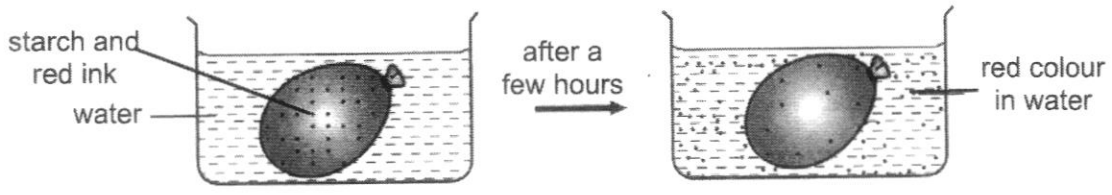
A oesophagus

B salivary glands

C small intestine

D stomach

25 A cellophane bag (partially permeable) containing starch and red ink is immersed in a beaker of water. After some time, the water in the beaker turns red.



What is the reason for this?

A Osmosis occurs through the cellophane bag.

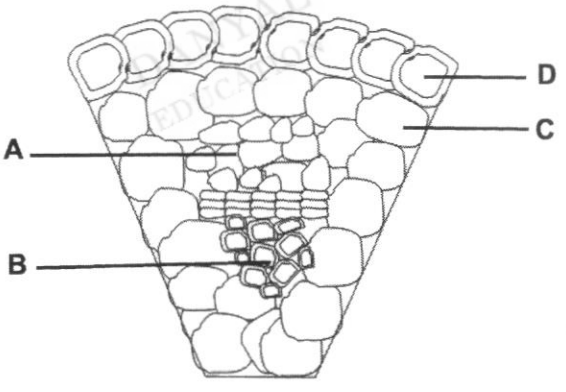
B The red ink molecules absorb water continuously.

C The red ink molecules have diffused out from the cellophane bag.

D The starch molecules have diffused out from the cellophane bag.

26 A leafy shoot is placed in a beaker containing a solution of a blue coloured dye. The diagram shows a part of section of the stem after two days.

Which part will be coloured by the blue dye?



27 Exchange of nutrients and wastes takes place across the walls of

A artery.

B capillary.

C heart.

D vein.

28 Which of the following body systems does the Human Immunodeficiency Virus (HIV) attack?

A digestive system

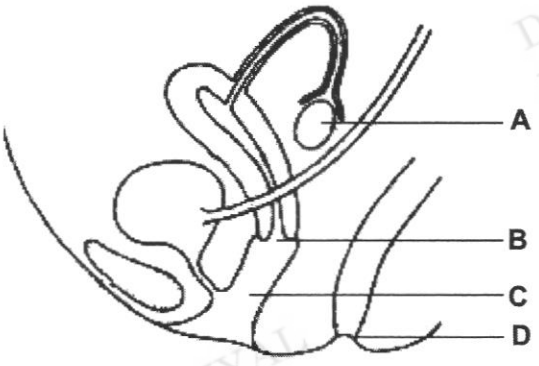
B immune system

C reproductive system

D transport system

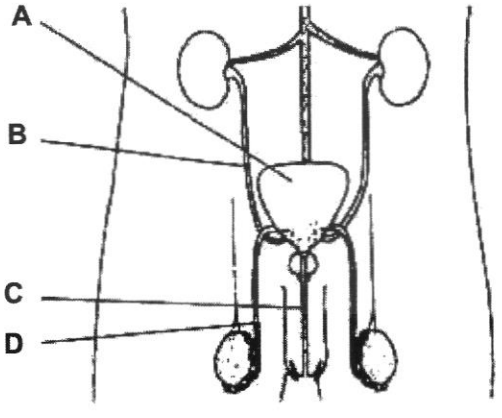
29 The diagram shows the side view of the female reproductive system.

Which position, **A**, **B**, **C** or **D**, would the diaphragm be placed?



30 The diagram shows the reproductive system and urinary system of males.

Which structure allows both urine and sperms to pass through?



~ END OF SECTION A ~

Name:	Class: Sec _____	Index No.: _____

2E

MERIDIAN SECONDARY SCHOOL
END-OF-YEAR EXAMINATION 2022

LOWER SECONDARY SCIENCE

SECONDARY 2 EXPRESS 11 October 2022

BOOKLET B

1 hour 30 minutes
(For Booklets A and B)

Additional Material:
NIL

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number on all the work that you hand in.
You may use an HB pencil for any diagrams, graphs, tables or rough working.
Write in dark blue or black pen.
Do not use staples, paper clips, glue or correction fluid.

The use of an approved scientific calculator is expected, where appropriate.
You may lose marks if you do not show your working or if you do not use appropriate units.

Section B: Structured Questions [40 marks]
Answer **all** questions.
Write your answers in the spaces provided on the question paper.

Section C: Free Response Questions [30 marks]
Answer **all** questions.
Write your answers in the spaces provided on the question paper.

The number of marks is given in brackets [ ] at the end of each question or part question.
The total number of marks for this booklet is **70**.
A copy of the Periodic Table is printed on **page 16** of Booklet **B**.

At the end of the exam, hand in Booklet A, Booklet B and OTAS separately.

For Examiner's Use	
Section B	
Section C	
Total Marks	

This question paper consists of **16** printed pages, including this page.

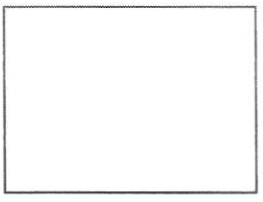
[Turn over

SECTION B [40 Marks]

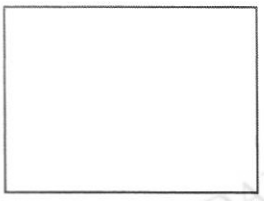
Answer **all** questions in the spaces provided.

1 Hydrazine and hydrogen can be used as fuels for rockets. Hydrazine exists as a liquid while hydrogen exists as a gas.

(a) Taking ◯ to represent a particle, show how such particles are arranged in their respective states in the boxes below.



hydrogen gas



hydrazine liquid [2]

(b) Hydrazine and hydrogen are stored in similar containers. More hydrazine can be stored than hydrogen.

With reference to the arrangement of particles, explain why this is so.

.....

.....

.....

..... [2]

(c) Table 1.1 shows the melting and boiling points of four substances **A** to **D**.

Table 1.1

substance	melting point / °C	boiling point / °C	physical state at 20 °C
A	85	450	
B	– 50	– 25	
C	– 15	60	
D	44	280	

(i) Complete Table 1.1 by stating the physical state (solid, liquid or gas) of each substance at 20 °C. [2]

(ii) What changes happen to the arrangement and movement of the particles of substance **D** when the temperature changes from 0 °C to 100 °C?

.....

.....

.....

..... [2]

2 Fig. 2.1 shows an atom of boron, $^{11}_{5}B$.

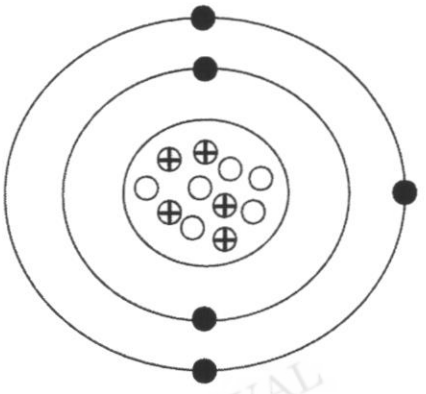


Fig. 2.1

Complete Table 2.1 to describe the particles in the boron atom.

Table 2.1

symbol of particle	name of particle	charge of particle	relative mass of particle
○	neutron		
●			1/1840
⊕		positive	

[6]

3 **(a)** Explain why it is easier for a person to walk on a beach with flat shoes than with high heels.

.....

.....

..... [2]

(b) A concrete block shown in Fig. 3.1 is placed on a table. The force acting on the block is 100 N.

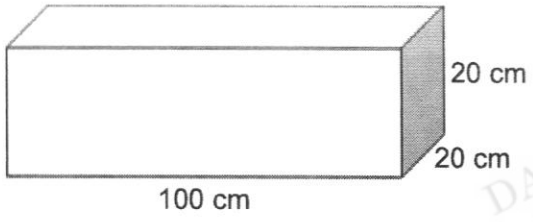


Fig. 3.1

Calculate the maximum pressure in Pa which can be exerted by the block on the table.

maximum pressure = ...Pa [2]

(c) In each of the following situations, state if work is done and explain why.

(i) holding a fish ball with a pair of chopsticks by exerting a force of 0.5 N

.....

..... [1]

(ii) throwing a tennis ball vertically through a distance of 1.5 m

.....

..... [1]

(iii) a man carrying a bag on his shoulder and standing under the tree

.....

..... [1]

4 Andy is investigating how much thermal energy is lost from a house. The results he obtained was displayed in the pie chart in Fig. 4.1.

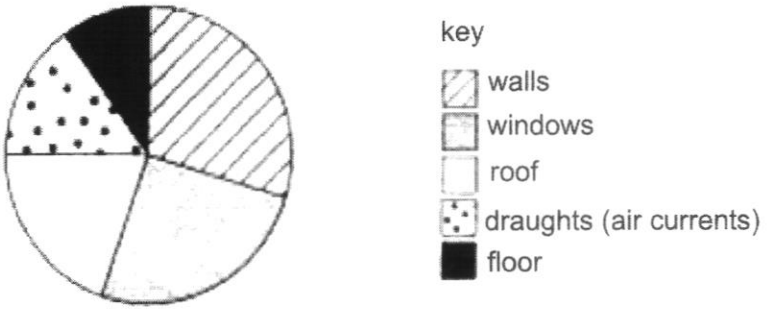


Fig. 4.1

(a) Based on the information provided in Fig. 4.1,

(i) which part of the house loses the **most** thermal energy?

..... [1]

(ii) which part of the house loses the **least** thermal energy?

..... [1]

(iii) Andy found that the roof of the house was lined with fibreglass.

State **one** explanation for this observation.

.....

.....

..... [1]

(b) A significant amount of thermal energy is lost through the windows.

Suggest **one** way to reduce the thermal energy transfer from the windows and explain how it works.

.....

.....

.....

..... [2]

5 You are given two solids, **X** and **Y**. The possible identities of the solids are calcium hydroxide powder, magnesium powder and/or zinc carbonate powder (not in any order).

Use Table 5.1 to find the true identities of the solids.

Table 5.1

solid	reaction with sulfuric acid	test of gas using lighted splint	test of gas using limewater
X	effervescence (bubbles)	flame extinguished	turned chalky
Y	effervescence (bubbles)	flame extinguished with a 'pop' sound	no visible reaction

(a) **(i)** Identify solid **X**.

Give a reason for your answer.

.....

.....

..... [2]

(ii) Write word equation for the reaction between solid **X** and sulfuric acid.

..... [1]

(b) **(i)** Identify solid **Y**.

Give a reason for your answer.

.....

.....

..... [2]

(ii) Write a word equation for the reaction between solid **Y** and sulfuric acid.

..... [1]

6 Fig. 6.1 shows an experiment setup to investigate the action of saliva on starch. The setup was left for one hour so that all the starch can be digested.

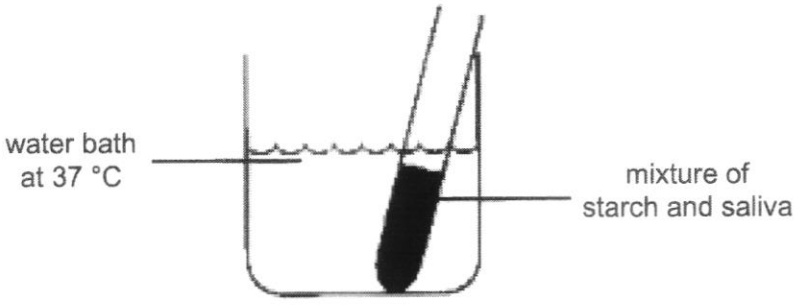


Fig. 6.1

(a) Name the enzyme found in saliva which digests starch and name the product formed by this digestion.

enzyme .....

product ..... [2]

(b) Starch can be detected by the iodine test. A few drops of iodine solution (brown) added to starch will produce a blue-black colour.

After one hour, a few drops of iodine solution was added to the test tube in Fig. 6.1.

State the observation you would expect to see in the test tube.

.....

..... [1]

(c) Starch is digested in the digestive system.

Fig. 6.2 shows how the percentage of undigested starch changes as food passes along the alimentary canal.

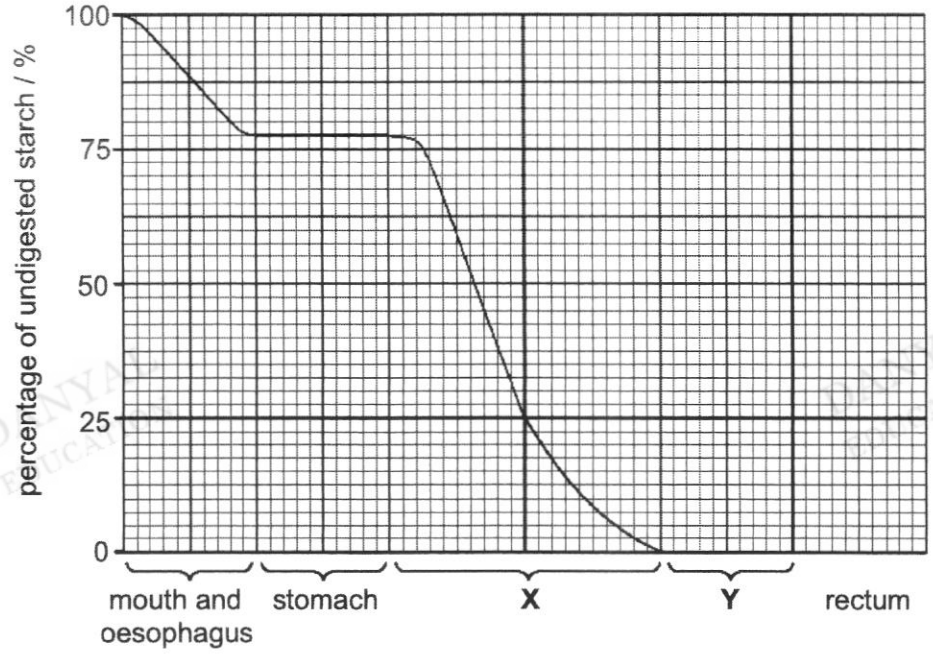


Fig. 6.2

(i) Use Fig. 6.2 to determine the percentage of starch which is digested before the food reaches the stomach.

starch digested = ... % [1]

(ii) Explain why there is no starch digestion in the stomach.

.....

..... [1]

(iii) State the function of **Y**.

.....

..... [1]

(d) A patient has one-third of his small intestines surgically removed due to a severe case of small intestine cancer.

Explain why a diet that is low in fats and proteins will be suitable for the patient.

.....

.....

.....

..... [2]

Section C (30 marks)

Answer **all** questions in the spaces provided.

7 **(a)** Table 7.1 shows different appliances often used at home.

Table 7.1

electrical appliance	power rating (W)	usage per day (h)
standing fan	200	6
washing machine	800	2
television	500	4
air conditioner	2300	8

(i) What is the total energy consumed (in kWh) by all these appliances in one week?

total energy consumed = ... kWh [2]

(ii) Given that 1 kWh costs $0.23, calculate the cost incurred in one month. (Take 1 month = 4 weeks)

cost = $..... [2]

(b) A 40 W fluorescent lamp gives out more light (brighter) than a 40 W filament lamp even though both are using electrical energy at the same rate.

Explain why this is so.

.....

..... [1]

(c) A doctor wants to use a small torch to look down a patient's throat. When he switches the torch on, it does not work.

Fig. 7.1 shows the circuit diagram for the torch.

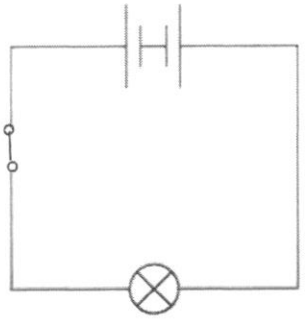


Fig. 7.1

(i) State why the torch does not work, even though all the electrical components are working.

.....

..... [1]

(ii) The doctor corrected the fault stated in **(i)**.

Draw the correct circuit diagram in the space provided.
Include in your diagram, the electrical components to measure

- the current through the bulb
- the voltage across the bulb

[3]

(d) State **one** factor that can affect the resistance of a wire.

..... [1]

8 **(a)** Fig. 8.1 shows how blood is circulated in the human body.

The arrows show the direction of blood flow.

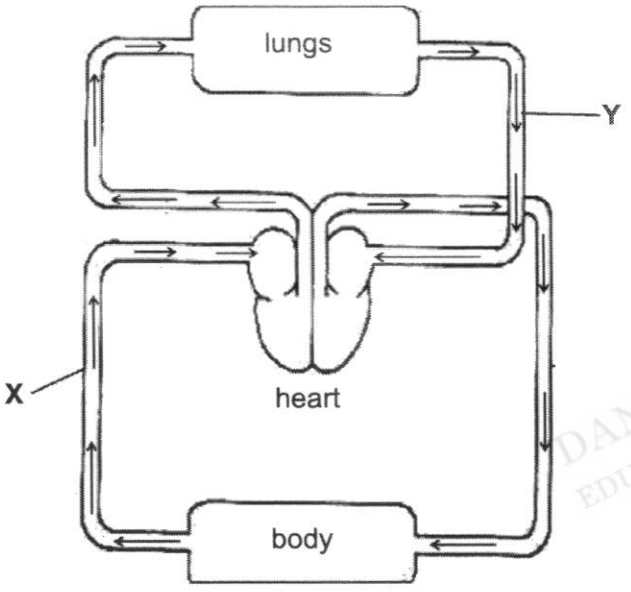


Fig. 8.1

(i) Identify blood vessel **X** with reason.

.....

.....

..... [2]

(ii) State the function of the heart

.....

..... [1]

(iii) State **one** difference between the blood in blood vessels **X** and **Y**.

.....

..... [1]

(iv) Explain why it is essential for blood to pass through the lungs.

.....

.....

.....

..... [2]

(b) Fig. 8.2 shows the pressure of the blood as it completes one circulation of the body (excluding the lungs).

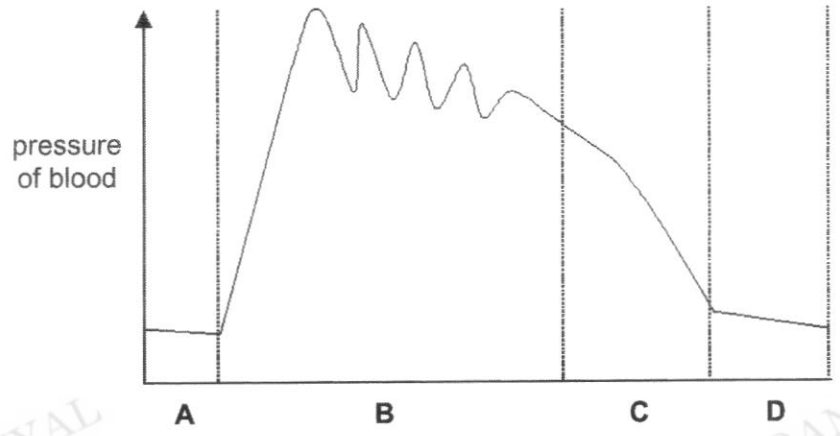


Fig. 8.2

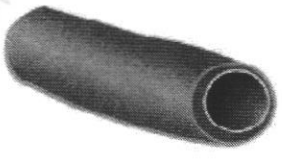
(i) State which labelled section (**A**, **B**, **C**, or **D**) of the graph in Fig. 8.2 shows the correct pressure of the blood as it passes through.

structure	**A**, **B**, **C** or **D**
arteries	
capillaries	
veins	

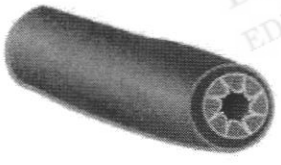
[2]

(ii) Eating foods rich in animal fats and cholesterol may cause it to accumulate in the blood vessels.

Explain the consequence of this unhealthy diet.



normal blood vessel



clogged blood vessel

.....

.....

.....

..... [2]

9 **(a)** Fig. 9.1 shows a calendar page on which Sheela has marked the day she started menstruation with a shaded square

JANUARY						
MON	TUE	WED	THU	FRI	SAT	SUN
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

Fig. 9.1

(i) Based on a 28-day menstrual cycle, **circle** on the diagram, the day she would expect her next menstruation to start. [1]

(ii) State what happens in her reproductive system after menstruation stops.

.....

..... [1]

(iii) Mark with a **cross** (x) the day she would expect ovulation to occur. [1]

(iv) Shade ▭ four continuous days within her fertile period. [1]

(v) For a couple that uses the menstrual cycle as a means of birth control, what are the dates when sexual intercourse is very likely to be safe?

Explain your answer.

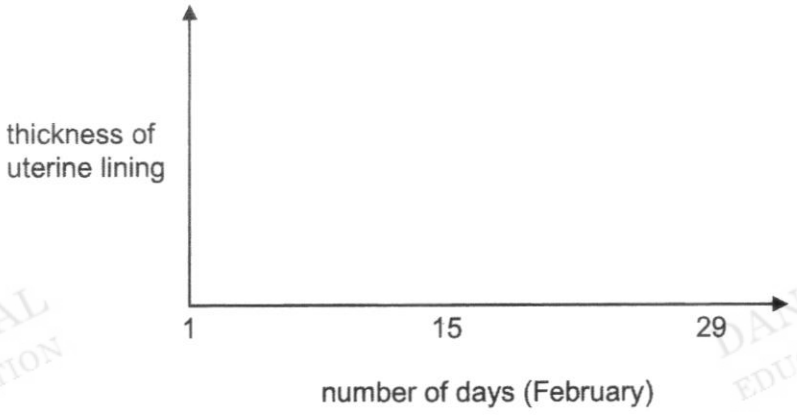
.....

.....

..... [2]

(b) Below are the axes of the thickness of Sheela's uterine lining against the number of days in February.

Make a sketch on the graph in Fig. 9.2 to show the thickness of Sheela's uterine lining if fertilisation took place in January.



[1]

Fig. 9.2

(c) A practice in the past required eunuchs (servants) of the royal court to have their testes removed.

Explain how the removal of testes is similar to male sterilization.

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.....

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.....

..... [3]

~ END OF PAPER ~

Meridian Secondary School
Sec 2E Lower Sec Science End-Of-Year Examination 2022
Answer Scheme

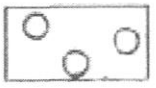
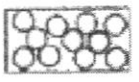
SECTION A (30 marks)

Qn	1	2	3	4	5	6	7	8	9	10
	B	A	B	C	D	C	D	D	B	A

Qn	11	12	13	14	15	16	17	18	19	20
Ans	C	C	D	C	D	B	A	A	B	A

Qn	21	22	23	24	25	26	27	28	29	30
Ans	D	C	B	A	C	B	B	B	B	C

Section B (40 marks)

1	a	 hydrogen gas  hydrazine liquid	2
	b	Hydrogen gas particles are <u>far apart and irregularly arranged, more empty spaces</u> thus less particles per unit volume Hydrazine particles are <u>closely packed and irregularly arranged less empty spaces</u> thus more particles unit volume compared to gas [Reject gas can be compressed]	1 1
	ci	Solid; gas; liquid; [every 2 correct = 1m]	2
	cii	At 0 °C, D is solid . Particles are closely packed in an orderly <u>arrangement</u> <u>and are vibrating</u> in fixed positions At 44 °C melting occures and D becomes liquid particles are closely <u>packed in a disorderly arrangement and are able to slide</u> pass one another OR When temperature increases from 0° to 100 °C, particles become less orderly [1] and can slide past each other [1]	1 1
			[8]

2			

symbol of particle	name of particle	charge of particle	relative mass of particle
○	neutron	<u>Neutral/0</u>	<u>1</u>
●	<u>electron</u>	<u>negative</u>	1/1840
⊕	<u>proton</u>	positive	<u>1</u>

[6]

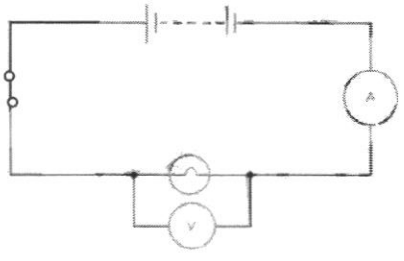
3	a	Flat shoes have <u>larger contact area</u> than high heels <u>Pressure is lower</u> to prevent us from sinking into the sand <u>[Reject larger surface area; force is lower]</u>	1 1
	b	Smallest area of contact = 0.2 m X 0.2 m = 0.04 m^2 Maximum pressure = force ÷ area = 100 N / 0.04 m^2 = 2500 Pa [if only formula is correct, award 1m]	1 1
	ci	No. Fish ball is **<u>not moving</u>**	1
	cii	Yes. Tennis ball is <u>moving in the direction of the force applied</u>	1
	ciii	No. <u>Bag is not moving</u> <u>[Reject man is not moving]</u>	1
			[7]

4	ai	The walls	1
	aii	The floor	1
	aiii	Fibreglass is a <u>poor conductor</u> of thermal energy it reduces thermal energy transfer by conduction	1
	b	Use **<u>double glazed</u>** windows There is a <u>vacuum/air</u> trapped between two layers of glass The vacuum/air is a <u>poor conductor</u> of thermal energy and it reduces thermal energy transfer by conduction	1 1
			[5]

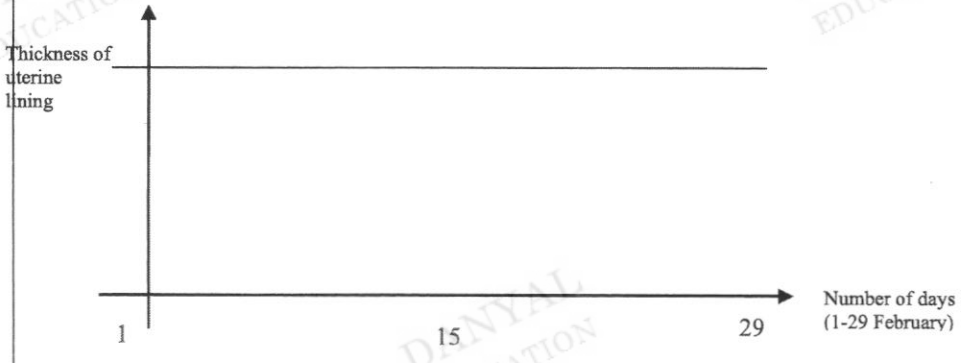
5	ai	<u>Zinc carbonate</u> Carbonate reacts with acid to give <u>carbon dioxide</u> which turns limewater chalky	1 1
	aii	Zinc carbonate + sulfuric acid (or acid) → salt (zinc sufate) + carbon dioxide + water	1
	bi	<u>Magnesium</u> powder Metal reacts with acid to give <u>hydrogen</u> gas, which gives a pop sound with lighted splint.	1 1
	bii	Magnesium + sulfuric acid (or acid) → salt (magnesium sulfate) + hydrogen	1
			[6]

6	a	Enzyme – carbohydrase/amylase/salivary amylase Product – maltose/simple sugars [Reject glucose]	1 1
	b	Iodine remains yellow/brown/yellow-brown	1
	ci	100 – 77.5 = 22.5	1
	cii	No enzymes that digest starch is secreted in the stomach OR salivary amylase destroyed by acid in stomach	1
	ciii	Y absorbs water and/or mineral salts from undigested food.	1
	d	The small intestine contains the enzymes protease and lipase that are needed for the digestion of protein and fats [must include name of the enzymes] With the loss of part of the small intestine, the digestion process will be disrupted and hence a diet low in protein and fats will help the patient	1 1
			[8]

Section C (30 marks)

7	**ai**	Total energy consumed in one week = Power (kW) x time (h) = (0.2 x 6 x 7) + (0.8 x 2 x 7) + (0.5 x 4 x 7) + (2.3 x 8 x 7) = 162.4 kWh	 1 1
	aii	Total cost incurred in one month = 162.4 x 4 x $0.23 = $149.41 [minus 1m if answer is to more than 2dp]	 1 1
	b	Filament lamps waste a lot of energy as heat energy Or fluorescent lamps are energy-saving etc	1
	ci	Batteries has like charges/terminals facing each other	1
		 1m for correct position of ammeter 1m for correct position of voltmeter 1 m for correct arrangement of battery	 1 1 1
	d	cross sectional area of wire (thickness) / length of wire / material of the wire [any 1] [Reject diameter of wire]	1
			[10]

8	**ai**	X is vein; It carries blood towards the heart;	1 1
	aii	To **pump** blood [Reject red blood cells] around the body;	1
	aiii	Blood vessel X carries blood that is poor in oxygen / rich in carbon dioxide and waste substances towards the heart; OR Blood vessel Y carries blood rich in oxygen from the heart to the rest of the body; OR Y carries oxygenated blood and X carries oxygenated blood	 1
	aiv	When blood passes through the lungs, blood becomes oxygenated / takes in oxygen; The oxygen is then transported by the blood to the rest of the body; as cells require oxygen to respire	1 1
	bi	B, C, D [3 correct – 2m; 1-2 correct – 1m]	2
	bii	This will cause the blood vessel to become constricted/blocked; and blood flow will be reduced ; OR leading to high blood pressure; OR increase likelihood of heart attack and stroke;	1 1
			[10]

9	**ai**	Day 30	**1**
	aii	Repair of uterine lining	**1**
	aiii	Day 15	**1**
	aiv	Fertile period (accept any 4 consecutive days) Day12,13,14, **Day 15**, 16,17,18	**1**
	av	**7 to 11** January and **19 to 28** January; The egg will only be released during ovulation on the 14th day from the start of menustration and these dates are not close to ovulation; OR There will not be any mature egg for fertilisation	**1** **1**
	b		
			**1**
	c	Testes are responsible for production of sperms. Thus, removing both of them would mean that the male is no longer able to produce sperms. In male sterilisation, although sperms are produced, they cannot be released as the sperm ducts are cut and tied. In both castration and sterilisation, no fertilisation can occur.	**1** **1** **1**
			[10]