10

Name: _____( ) Class: Sec _____

St. Gabriel's Secondary School

2016 First Semestral Examination

Subject : **Lower Secondary Science**
Level/Stream : **Sec 2 Express**
Duration : **1 hour 45 minutes**
Date : **3 May 2016**
Setter : **Mr C J Tan**

Additional materials: *Multiple Choice Answer Sheet*

READ THESE INSTRUCTIONS FIRST

Do not use staples, paper clips, highlighters, glue or correction fluid.
Write your name, register number and class in the spaces above.

Section A

Answer **all** the questions using the multiple choice answer sheet provided.
Four suggested answers are given for each question.
Choose the best answer and use a 2B pencil to shade each corresponding bubble clearly.
Each question carries one mark. The total marks for this section is 30 marks.

Section B

Answer **all** the questions in the spaces provided. The total marks for this section is 40 marks.

Section C

Answer **all three** questions in the spaces provided.
The total marks for this section is 30 marks.

For Examiner's Use	
Section A	
Section B	
Section C	
Total	100

This question booklet consists of **21** printed pages including this cover page.

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SECTION A : MULTIPLE-CHOICE QUESTIONS [30 marks]

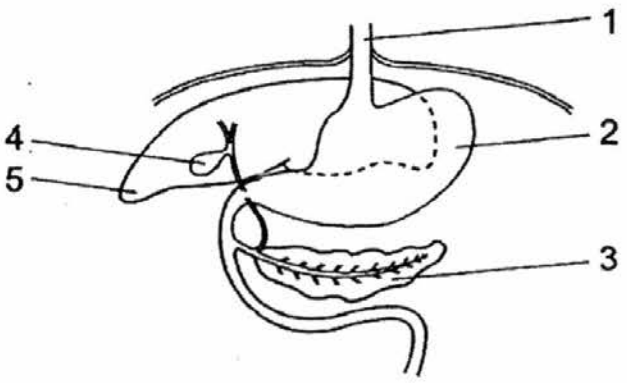
1 Three statements about water are listed below.

I Water is used as a solvent for many reactions.
II Water is involved in many metabolic reactions.
III Water cools down a surface area when it evaporates.

Which statement(s) make(s) water suitable for use in a blood transport system?

A I only
B II only
C I and III only
D II and III only

2 The diagram shows part of the human alimentary canal.



Which two structures produce substances involved in the digestion of fats?

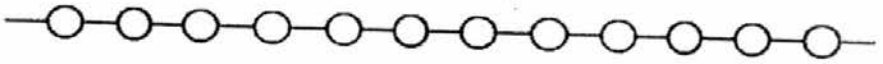
A 1 and 4
B 2 and 3
C 3 and 5
D 4 and 5

3 Lipase solution was added to milk. After 30 minutes, the milk had become more acidic. What were the reactant and product(s) in this reaction?

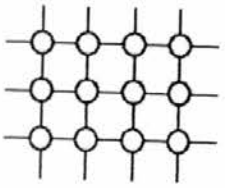
	Reactant	Product(s)
A	Fats	Amino acids
B	Fats	Fatty acids and glycerol
C	Proteins	Amino acids
D	Proteins	Fatty acids and glycerol

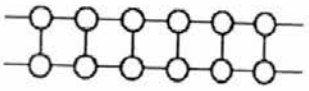
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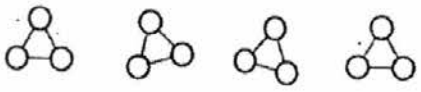
4 The diagram shows part of a starch molecule.



Which diagram shows this molecule after it has been completely digested?

A 

B 

C 

D 

5 What digestive enzyme works best in a very acidic environment?

A Amylase in the mouth
B Protease in the stomach
C Lipase in the small intestine
D Carbohydrase in the small intestine

6 Which structure has a large surface area for the absorption of digested food?

A liver
B stomach
C small intestine
D gall bladder

7 Which of the following is **not** one of the applications of plane mirrors?

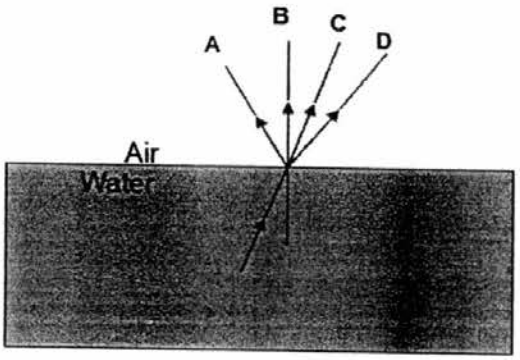
A Cosmetics mirror
B Periscopes
C Blind corner mirror
D As decorative purpose to make a room appear bigger

8 An object is placed at a distance of 20 cm from a plane mirror initially. It is then moved away from the mirror by another 25 cm. What is the distance between the object and its image now?

A 25 cm
B 45 cm
C 50 cm
D 90 cm

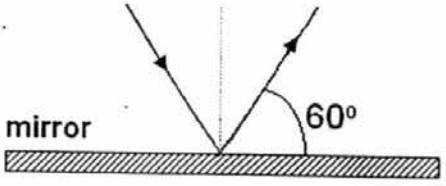
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9 A light ray passes from water to air as shown in the diagram below



Which labelled arrow shows the correct direction of the ray of light in air?

10 The diagram below shows a ray of light reflected at the surface of a plane mirror. Which of the following angle of incidence and angle of reflection is correct?



	Angle of incidence/ °	Angle of reflection/ °
A	30	30
B	30	60
C	60	30
D	60	60

11 A student uses a length of wire as a resistor. He discovers that the resistance of the wire is too small. To make a resistor of higher value, he should use a piece of wire that is

A shorter and thinner.
B shorter and thicker.
C longer and thinner.
D longer and thicker.

12 What is an electric current?

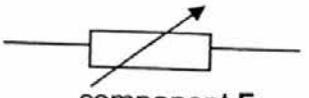
A Flow of molecules
B Rate of flow of charges
C Flow of energy
D Rate of change of potential difference

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13 Consider the two electrical symbols shown below:



component E



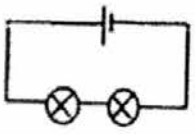
component F

What does each symbol represent?

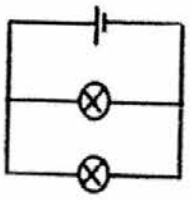
	component E	component F
A	fuse	rheostat
B	fuse	resistor
C	resistor	rheostat
D	resistor	fuse

14 Which circuit gives the brightest lamp(s)?

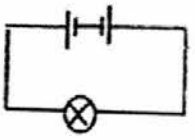
A



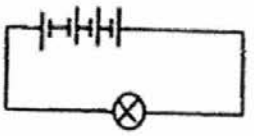
B



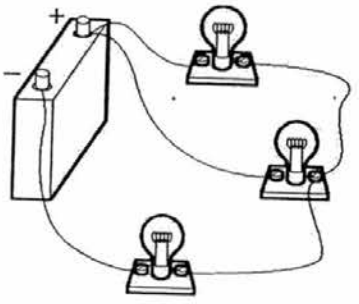
C



D

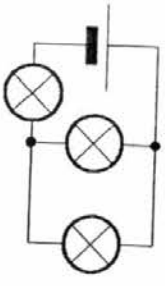


15 The diagram shows a circuit with three lamps and a cell.

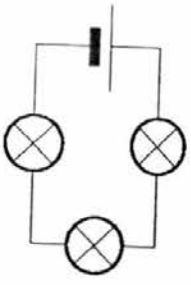


Which is the circuit diagram for the above arrangement?

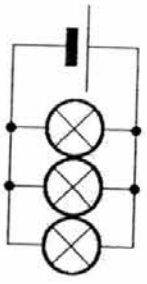
A



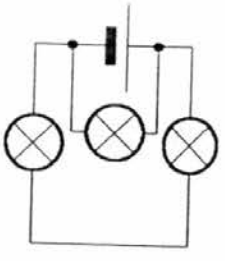
B



C

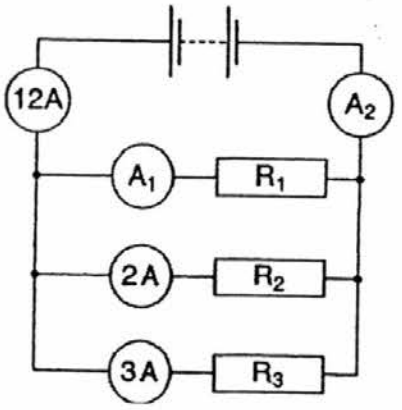


D



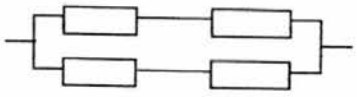
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16 What is the reading on ammeter A_1 and A_2 respectively?

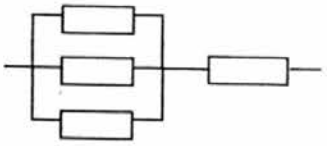


	A_1	A_2
A	2 A	12 A
B	7 A	12 A
C	7 A	9 A
D	12 A	12 A

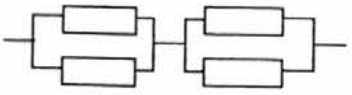
17 Four identical resistors with a resistance of 1 Ω each are arranged in the four ways shown in the diagrams below.



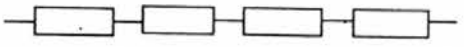
arrangement I



arrangement II



arrangement III

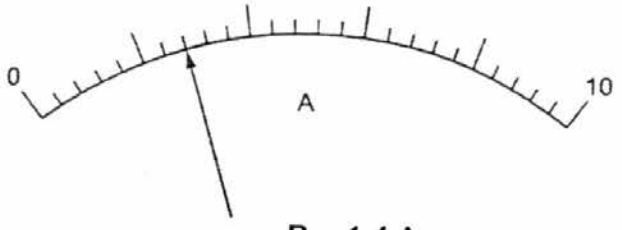


arrangement IV

How many of these arrangements will result in an effective resistance of more than 1 Ω?

A 1
B 2
C 3
D 4

18 The diagram shows a scale of an ammeter. What is the reading?



A 1.2 A
B 1.4 A
C 2.4 A
D 2.8 A

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19 The heating effect of an electric current is used in some appliances. In which appliance is the heating effect a nuisance?

A Electric drill
B Electric iron
C Electric kettle
D Electric oven

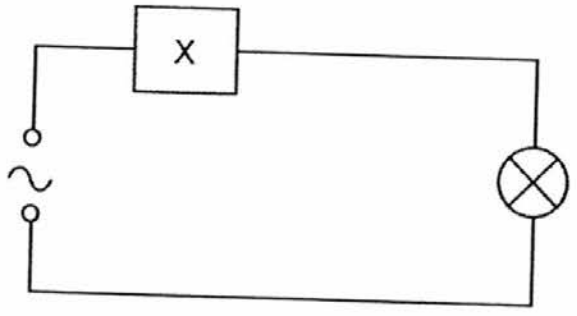
20 Which one of the following correctly matches the colours of the wires in a three-pin plug?

	Earth Wire	Live Wire	Neutral Wire
A	Blue	Brown	Green and Yellow
B	Brown	Green and Yellow	Blue
C	Green and Yellow	Brown	Blue
D	Green and Yellow	Blue	Brown

21 Singapore Power charges 10 cents for each kWh of electrical energy used.
What is the cost of using a 6000 W electric oven for 6 hours?

A $ 3.60
B $ 36
C $ 360
D $ 3 600

22 The device **X** in this circuit is designed to cut off the electricity supply automatically if too much current flows.



What is device **X**?

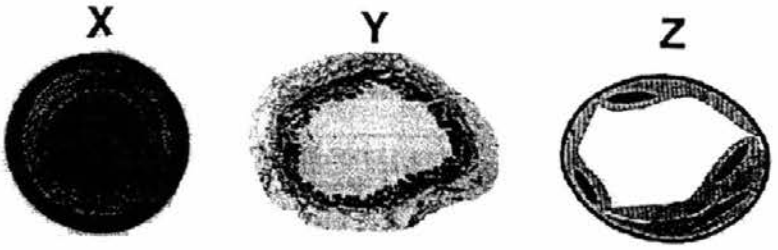
A A fuse
B A switch
C A variable resistor
D An ammeter

23 Which of the following does **not** describe the correct function for the given part of blood?

	Part of Blood	Function
A	Plasma	Transports carbon dioxide from all parts of the body to the lungs.
B	Platelets	Help blood to clot.
C	Red blood cells	Transport oxygen from all parts of the body to the lungs.
D	White blood cells	Fight infection and kill germs.

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24 The cross section of three types of blood vessels are given below. Which of the following options indicates the correct type of blood vessel?



	X	Y	Z
A	Artery	Capillary	Vein
B	Vein	Artery	Capillary
C	Artery	Vein	Capillary
D	Capillary	Vein	Artery

25 The density of liquid oxygen is higher than oxygen gas because the particles in liquid oxygen _____.

A are closer together
B have a greater mass
C have a higher density
D have a smaller volume

26 Why does ice float on water?

A Ice has a smaller volume than water.
B Ice has a lower density than water.
C Ice is a solid but water is a liquid.
D Ice is converted from water when it is freezed.

27 Which method could be used to obtain pure water from a sugar solution?

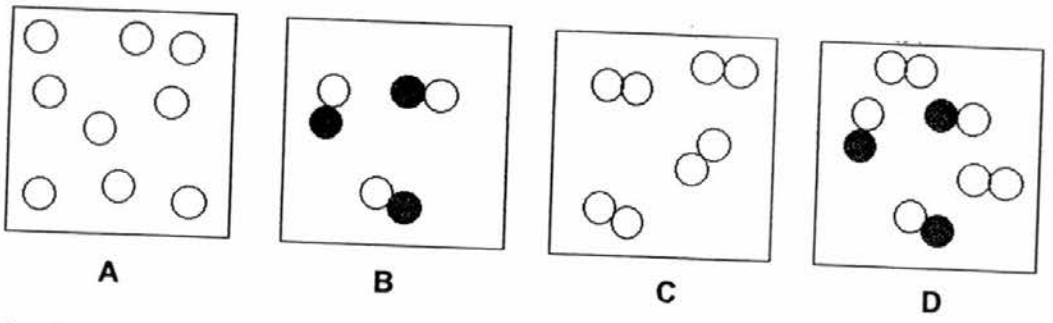
A Simple distillation
B Filtration
C Crystallisation
D Chromatography

28 What is the physical property that allows substances to be separated by chromatography?

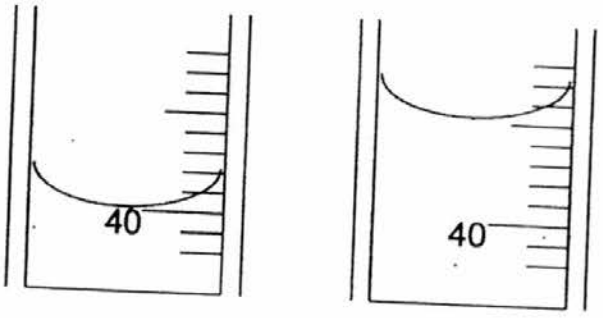
A They have different colours.
B They have different densities.
C They have different boiling points.
D They have different solubilities in the same solvent.

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29 Which one of the following diagrams represents molecules of a compound?



30 The figures below show the difference in water level (in cm^3) before and after a solid **Q** was submerged in a measuring cylinder. Given that solid **Q** is 20 g, what is the density of solid **Q**?



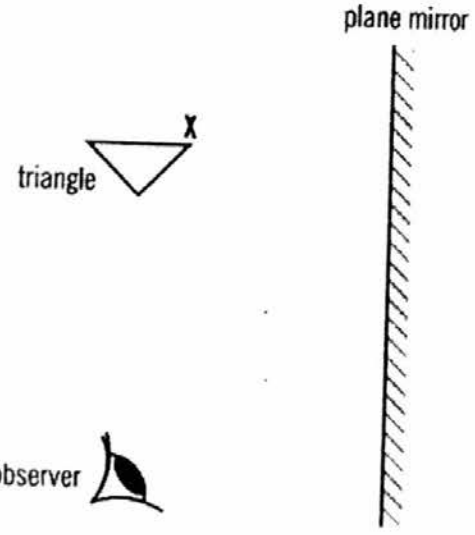
A 0.3 g/cm^3
B 0.5 g/cm^3
C 2.0 g/cm^3
D 4.0 g/cm^3

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SECTION B : STRUCTURED QUESTIONS [40 marks]
Answer all the questions in the spaces provided.

1 The diagram below shows a triangle placed in front of a plane mirror. One of the characteristics of the image formed is that it is virtual.



(a) What does a virtual image means? [1]

.....

.....

(b) Draw the image of the triangle in the mirror. [1]

(c) Hence, complete the ray diagram by drawing two rays of light to show how the observer sees the image of point **X** of the triangle in the mirror. [2]

(d) Other than the image being virtual, list two other characteristics of the image formed. [2]

.....

.....

(e) The following diagrams show two types of reflection of light rays.

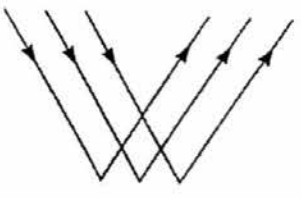


Diagram A

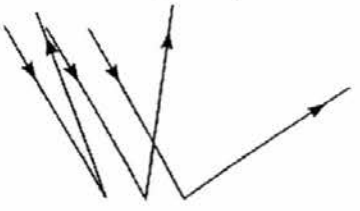


Diagram B

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(i) Name the type of reflection as shown in diagram **B**. [1]

.....

(ii) What kind of surface, rough or smooth, will produce the reflection shown in diagram **B**? [1]

.....

2 (a) What is refraction of light? [1]

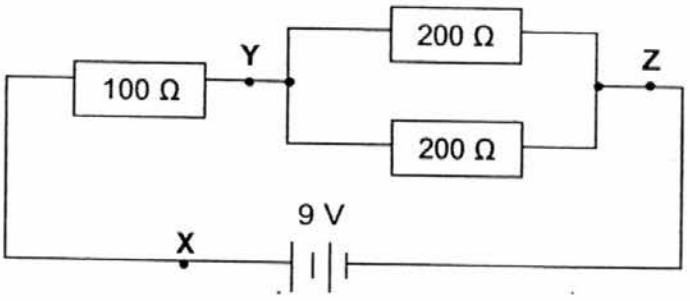
.....

.....

(b) How does the speed of light change as it moves from an optically less dense medium to an optically denser medium? [1]

.....

3 The diagram below shows an electric circuit.



(a) Calculate the total resistance across **Y** and **Z**. [2]

Total resistance = ...

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(b) Calculate the total resistance of the whole circuit. [1]

Total resistance = ...

(c) Calculate the current flowing in point **X**. [1]

Current = ...

(d) Using the correct symbol, add an ammeter to the circuit diagram, to measure the current at point **X**. [1]

4 **Figure 4.1** below shows some food just before it enters the stomach and **Figure 4.2** shows the same food as it leaves the stomach four hours later.

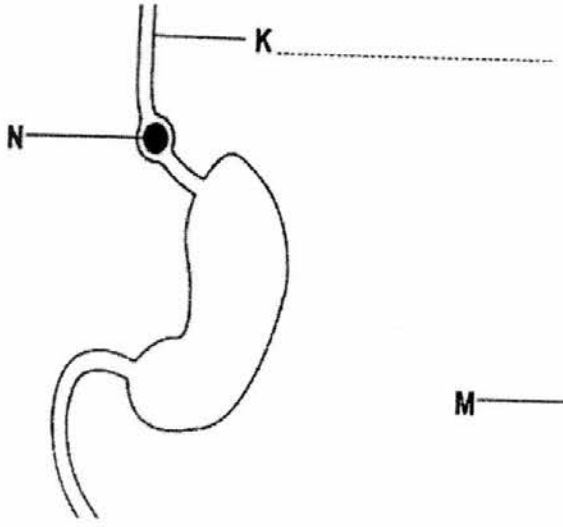


Figure 4.1

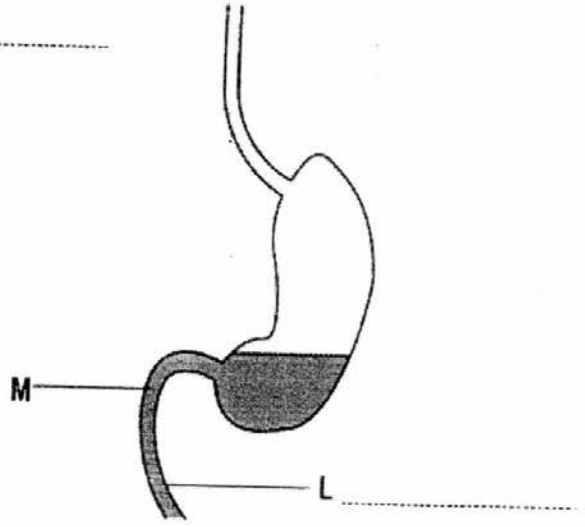


Figure 4.2

(a) On **Figure 4.1 and Figure 4.2**, label structures **K** and **L**. [2]

(b) Name the enzyme present in the ball of food at **N**. [1]

.....

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(c) The food consisted of meat, potatoes and spinach. Tick the appropriate boxes in **Table 4.3** to show the comparison of food at positions **M** and **N**. [3]

	More at **M** than **N**	Less at **M** than **N**	Almost the same at **M** and **N**
Starch			
Protein			
Fibre			

Table 4.3

(d) Name the region of the alimentary canal which will contain fibre in the largest proportion and give a reason for your answer. [2]

.....

.....

.....

5 The table below shows the amounts of carbohydrate, fat and protein present in 100 g portions of 5 different foods.

food	mass in 100 g portion / g		
	carbohydrate	fat	protein
P	0	20	80
Q	5	95	0
R	97	3	0
S	60	10	30
T	25	25	50

Using the letters **P** to **T**, which food

(a) is likely to be a piece of beef? [1]

.....

(b) contains the greatest amount of a type of nutrient that is used for the growth and repair of body cells? [1]

.....

(c) contains the greatest amount of a type of nutrient that is needed for keeping an animal warm? [1]

.....

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6 **Figure 6.1** shows an electric kettle. It has a metal casing and a fuse.

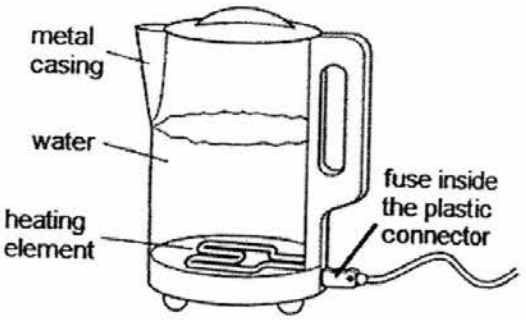


Figure 6.1

(a) State, with a reason, whether a 2-pin plug or 3-pin plug, has to be used for this electric kettle. [2]

.....

.....

(b) How should the fuse be connected to the wires? (Tick the correct box.) [1]

To Live Wire	To Neutral Wire	To Earth Wire

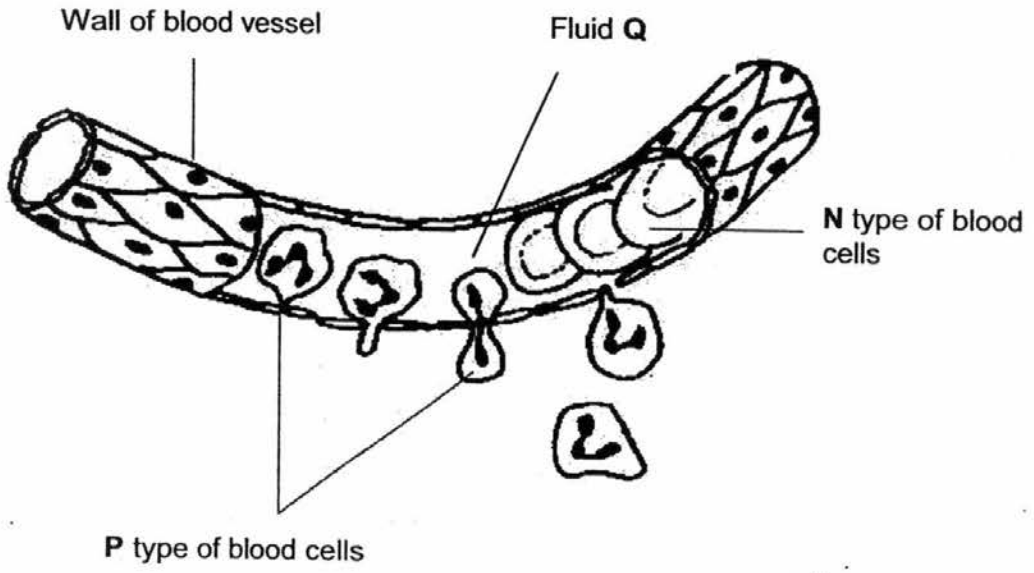
(c) The electrical power input to the kettle is 2000 W and the kettle is used for 400 s. Calculate the electrical energy, supplied to the kettle in **i)** SI unit and **ii)** kwh. [3]

i) Electrical energy supplied to the kettle (in SI unit) = ...

ii) Electrical energy supplied to the kettle (in kWh) = ...kWh

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7 The content inside a blood capillary is shown in the diagram below.



(a) Identify **N** and **P** type of cells. [2]

N: .....

P: .....

(b) State two characteristics of **N** type of cells and explain how each of the characteristics support the function(s) of the cells. [4]

.....

.....

.....

.....

.....

.....

(c) What is fluid **Q**? Suggest a function of fluid **Q**. [2]

.....

.....

.....

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SECTION C : FREE RESPONSE QUESTIONS [30 marks]
Answer **all** questions in this section.

9 **(a)** **Figure 9.1** below shows an apparatus set up to investigate digestion.

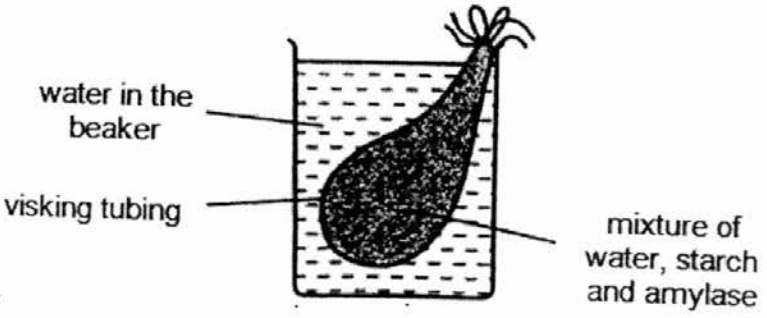


Figure 9.1

The apparatus was left at 30°C for one hour. The water in the beaker was then tested and was found to contain reducing sugars.

The digestion of starch present in the visking tubing is expected to complete in four hours.

(i) Explain why reducing sugars were found in the water in the beaker. [3]

.....

.....

.....

.....

(ii) The water in the beaker was also tested for starch after an hour since the start of the experiment. State if starch will be present or absent, in the water. Explain your answer. [2]

.....

.....

(b) Amylase is an enzyme commonly used in beer production. A study is carried out in a beer manufacturing company to find out the effect of temperature on amylase so as to obtain the best condition for beer production.
The result is shown in **Table 9.2** on page 17.

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Temperature (°C)	Amylase activity (arbitrary unit)
0	0.0
10	0.2
20	0.5
30	1.0
40	2.2
50	4.5
60	8.2
70	9.0
80	1.0
90	0.0

Table 9.2

(i) Describe the trend in amylase activity as temperature increases from 0°C to 70°C. [1]

.....

(ii) Explain why the amylase activity decreases when the temperature increases above 70°C. [1]

.....

(iii) Explain why only a small amount of amylase is required in the experiment. [1]

.....

(iv) Another study is then carried out to find out the effect of pH on amylase activity. The result of the study is shown in **Table 9.3**.

pH	Amylase activity (arbitrary unit)
4	0.3
5	0.7
6	2.0
7	4.0
8	9.0
9	5.0
10	3.0

Table 9.3

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Based on **Table 9.2** and **Table 9.3**, if you were the manager of the beer manufacturing company, what are the two conditions (temperature and pH) you would choose to otain the greatest yield of beer? [2]

.....

.....

.....

10 **(a)** The following experiment in **Figure 10** was set up to separate a mixture of ethanol and water. Ethanol has a boiling point of 78°C while water has a boiling point of 100°C.

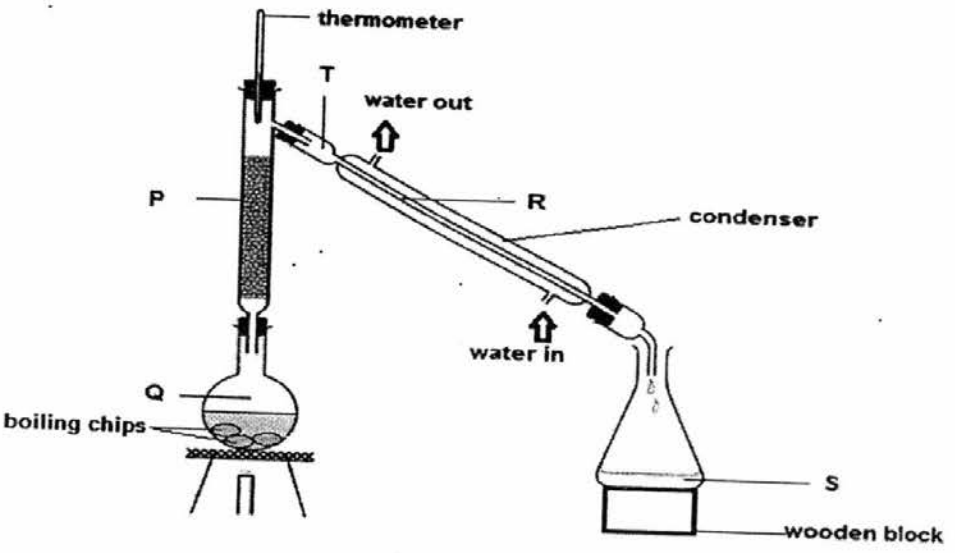


Figure 10

(i) State the method used in this experiment to separate the two liquids. [1]

.....

(ii) Identify the apparatus labeled **P**. [1]

.....

(iii) What process(es) take(s) place in **Q**? [1]

.....

(iv) What process takes place in **R**? [1]

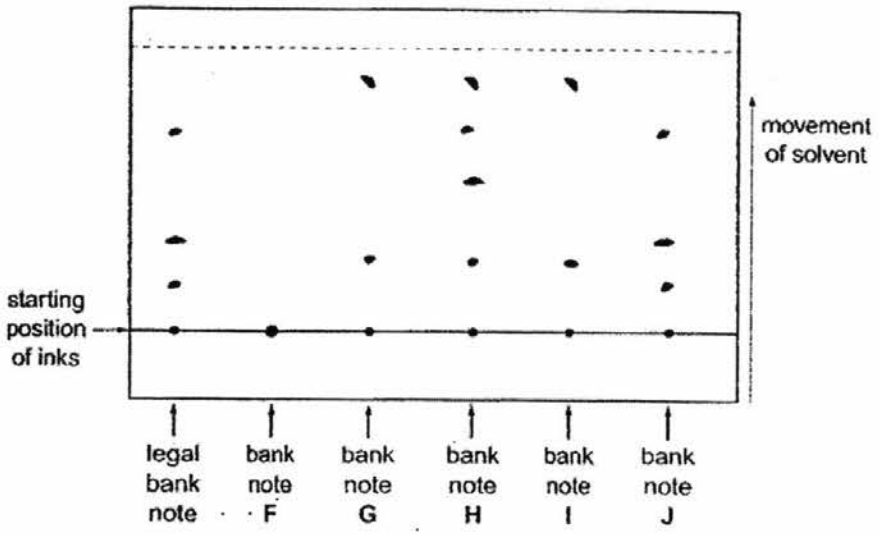
.....

(v) Which liquid will be collected as the distillate first? Explain your answer. [2]

.....

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(b) Forensic scientists use paper chromatography to compare the inks from five different bank notes with the ink used to make legal bank notes. The results are shown below.



(i) Which of the bank notes is legal? [1]

.....

(ii) Which of the bank notes are printed with identical inks? [1]

.....

(iii) Which of the bank notes is printed with ink containing four different dyes? [1]

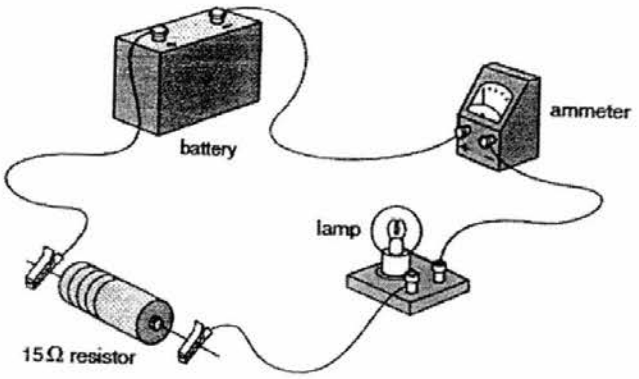
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(iv) Explain why the ink from bank note **F** remained at the starting position. [1]

.....

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11 A student set up an electric circuit as shown.



(a) **(i)** The lamp lights up but the needle of the ammeter moves below the zero mark. What change should be made so that the ammeter works correctly?

.....

[1]

(ii) In the space below, draw a circuit diagram, with the correct symbols to represent the above circuit.

[2]

(b) **(i)** Name the instrument that would be needed to measure the potential difference (p.d.) across the 15 Ω resistor.

[1]

.....

(ii) Using the correct symbol, add this instrument to your circuit diagram in **(a)(ii)**, in a position to measure the p.d. across the 15 Ω resistor.

[1]

(c) **(i)** The potential difference across the 15 Ω resistor is 6 V.
Calculate the current in the resistor.

[2]

.....

.....

.....

(ii) State the value of the current in the lamp.

[1]

.....

.....

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(d) Another 15 Ω resistor is connected in parallel with the 15 Ω resistor that is already in the circuit. State what effect, if any, adding this extra resistor has on the current in the lamp. Explain your answer. [2]

.....

.....

.....

[End of Paper]

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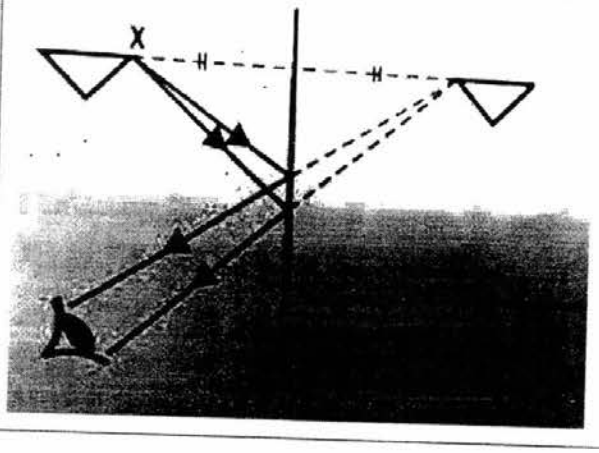
St. Gabriel's Secondary School
2016 Sec 2E SA1 Marking Scheme

Section A

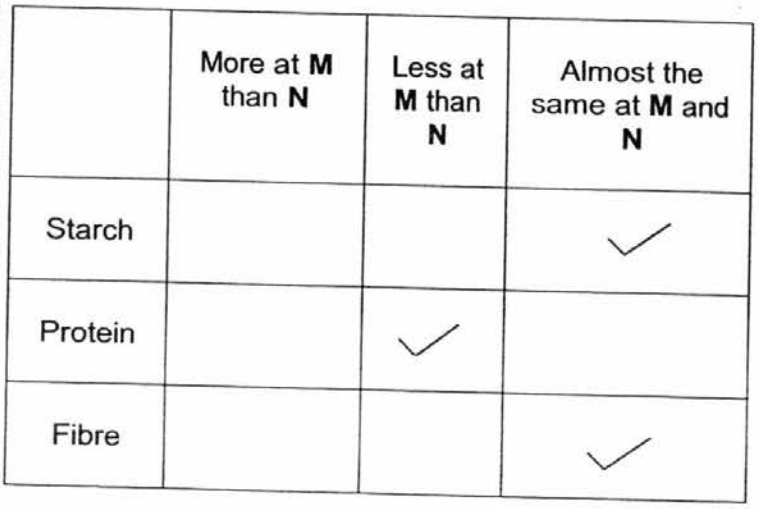
1	2	3	4	5	6	7	8	9	10
A	**C**	**B**	**D**	**B**	**C**	**C**	**D**	**D**	**A**
11	12	13	14	15	16	17	18	19	20
C	**B**	**C**	**B**	**A**	**B**	**B**	**D**	**A**	**C**
21	22	23	24	25	26	27	28	29	30
A	**A**	**C**	**C**	**A**	**B**	**A**	**D**	**B**	**D**

8A, 7B, 7C, 9D

Section B

			Remarks
1	(a)	Image which cannot be captured on a screen.	[1]
	(b) (c)		[1] for correct shape of image and distance of image from mirror [1] for light rays from object to eye [1] for virtual rays behind mirror No arrow minus 1 mark
	(d)	• The distance of the image from the mirror is equal to the distance of the object from the mirror. • The image and the object are the same size. • The image is upright. • The image is laterally inverted. ***Unacceptable***: *Image is not magnified / diminished; Image is straight (?);* *Image must be positioned (?);* *Image is inverted; Image is inversely opposite (?);* *It will have the same distance; Distance between image in a plane mirror and the object is the same;* *Image is of the same plane (dimension, not size) as the object;* *Normal, reflection ray and incident ray lie on the same plane / Angle of incidence is equal to the angle of reflection (both are not characteristics of the **image f**ormed);* *Image looks the same as object. "Same" is not specific enough. Is it upright? Of the same size?*	[2 marks for any 2 characteristics]
	(a)	(i) Irregular reflection or diffused reflection	[1]

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		(ii) Rough surface	[1]
2	(a)	It is the bending of light when light ray travels from one medium to another medium of different optical density.	[1]
	(b)	It decreases.	[1]
3	(a)	1/R = 1/100 + 1/100 = 2/100 R = 200/2 R = 100Ω	[1] [1]
	(b)	R = 100 + 100 = 200 **Ω**	[1]
	(c)	V = IR I = V / R = 9/ 200 = **0.045 A**	[1]
	(d)	Correct symbol of ammeter across the point X	[1]
4	(a)	**K**: Oesophagus **L**: Duodenum/ small intestine	[1] [1]
	(b)	amylase	[1]
	(c)		[1] each: total [3]
	(d)	Colon/ large intestine. The rest of the digested food products are absorbed in the small intestine.	[1] [1]

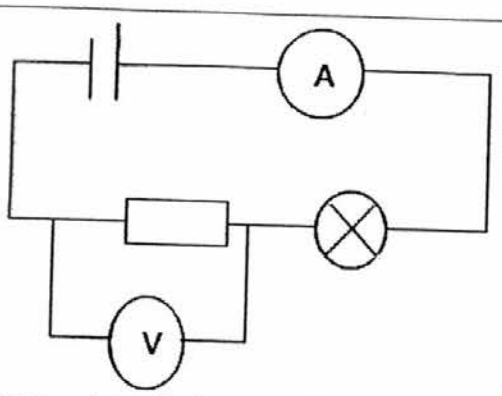
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5	(a)	Q		[1]
	(b)	P		[1]
	(c)	Q		[1]
6	(a)	3 – pin plug The metal casing has to be connected to the Earth wire to prevent electrical shock		[1] [1]
	(b)	The fuse should be connected to the Live wire.		[1]
	(c)	(i) Electrical energy (in SI unit) = 2000 x 400 = 800 000 J Electrical energy (in kWh) = 2 x (400 / 3600) = 0.222 kWh		[1] [1] [1]
	(d)	(ii) Cost = 0.222 x 8 = 1.78 cents		[1] [1]
7	(i)	**N**: red blood cells **P**: white blood cells		[1] [1]
	(ii)	Bi-concave in shape[1]: increases surface-area volume ratio so that more oxygen can be carried/increases rate of diffusion of oxygen[1] Contains haemoglobin[1]: red pigment that binds to oxygen [1] Lacks nucleus [1]: more space for haemoglobin [1] Flexible[1]: able to squeeze into the lumen of capillaries[1]		Any 2 correct answers to get 4 marks
	(iii)	Plasma ; Plasma carries dissolved food substances / antibodies / oxygen /hormones to cells OR waste products away from cells to be expelled from body		[1] Any one of the functions: [1]

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Section C				
				Remarks
9	(a)	(i) Amylase digests starch into reducing sugars. Reducing sugars are <u>small molecules</u> and are able to diffuse through the partially permeable visking tubing, from a region of <u>high concentration</u> to a <u>region of low concentration</u>.		[1] [1] [1]
		(ii) Starch is <u>absent.</u> Starch is a <u>large molecule</u> and <u>cannot pass through the visking tubing</u>.		[1] [1]
	(b)	(i) Amylase activity <u>increases</u>		[1]
		(ii) The enzymes are denatured.		[1]
		(iii) Enzymes <u>do not get broken down or chemically changed at the end of reaction</u> and can be re-used.		[1]
		(iv) 70°C pH 8		[1] [1]
10	(a)	(i)	Fractional distillation [Reject distillation]	[1]
		(ii)	Fractionating column	[1]
		(iii)	Boiling	[1]
		(iv)	Condensation	[1]
		(v)	Ethanol. It has a lower boiling point.	[1] [1]
	(b)	(i)	J	[1]
		(ii)	G and I	[1]
		(iii)	H	[1]
		(iv)	F	[1]
11	(a)	(i)	Connect wire from positive terminal of battery to positive terminal of ammeter.	[1]

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		(ii)	 2 correct symbols to get [1] [voltmeter drawing is for b(ii)]	[2]
	(b)	(i)	Voltmeter	[1]
		(ii)	Connect voltmeter in parallel to the 15Ω resistor with the correct symbol.	[1]
	(c)	(i)	Current = voltage/ resistance = 6/15 = 0.4A	[1] [1]
		(ii)	Lamp current = 0.4A	[1]
	(d)		When the two resistors are connected in parallel, the total resistance will be decreased. As such, the current in the lamp will be higher than 0.4 A.	[1] [1]

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