Name :	Class	Index no.

DEYI SECONDARY SCHOOL

Mid-Year Examination 2016
Secondary One Express

SCIENCE

6 May 2016
0800 – 1000h
2 hours

Additional Material: OTAS

READ THESE INSTRUCTIONS FIRST

Write your name, class and register number on the cover page of the question booklet.

This paper consists of three sections.

Section A (30 marks)
There are 30 questions in this section.
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 in the OTAS provided.

Section B (40 marks)
Answer **all** the questions in the spaces provided on the question booklet.

Section C (30 marks)
Answer **all** the questions in the spaces provided on the question booklet.

At the end of the examination, hand in separately
(i) OTAS
(ii) Question Booklet

A copy of the Periodic Table is printed on page **19**.

CALCULATORS MAY BE USED.

For Examiner's Use	
Section	Marks
A	/ 30
B	/ 40
C	/ 30

Section A (30 marks)

Answer **all** the questions on the OTAS provided.

1 Which of the following is **not** a laboratory rule for handling chemicals?

A Do not smell or taste the chemicals.
B Keep hands away from eyes, face and mouth.
C Return unused chemicals to their original containers.
D Wear safety goggles when heating or mixing chemicals.

2 Which of the following **cannot** be used to hold a liquid in a heating experiment?

A conical flask
B evaporating dish
C round-bottomed flask
D test tube

3 A chemical powder has the following symbol on its bottle.

What precaution should a person take when using the powder?

A Keep the powder away from the flame, spark or any heat source.
B Use a spatula when taking out the powder from its bottle.
C Wash down unused powder into the sink with a lot running water.
D Wear a face shield and lead-lined clothing before handling the powder.

4 Which of the following shows the correct sequence for lighting up a Bunsen burner?

A Close the air-hole, ignite the burner, turn on the gas, open the air-hole
B Close the air-hole, turn on the gas, ignite the burner, open the air-hole
C Open the air-hole, ignite the burner, turn on the gas, close the air-hole
D Open the air-hole, turn on the gas, ignite the burner, close the air-hole

5 Which of the following mixtures can be separated by magnetic attraction?

I iron and nickel
II nickel and carbon
III carbon and iodine
IV iron and iodine

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

6 Which of the following correctly explains why crystallization, instead of evaporation, is used to obtain sugar from sugar solution?

A Evaporation is for separating mixture but sugar solution is a compound.
B Evaporation is a slower method as compared to crystallization.
C Sugar formed through evaporation is less pure than crystallization.
D Sugar will decompose upon direct heating when using evaporation method.

7 The table below shows the solubility of solids **X**, **Y** and **Z** in solvents **S**, **T** and **U**.

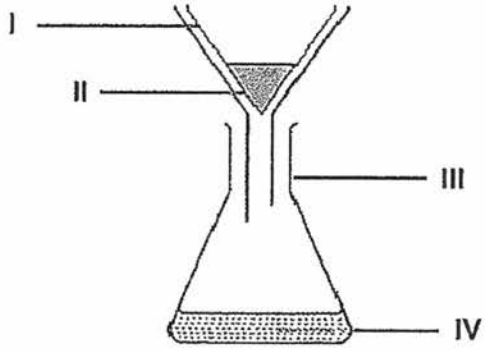
	Solvent S	Solvent T	Solvent U
Solid X	×	√	√√
Solid Y	×	√	√√
Solid Z	√√	√√	×

Key
× : insoluble
√ : partially soluble
√√ : very soluble

Which of the following allows the two solids to be separated by filtration when mixed?

A Solids **X** and **Y** in solvent **S**.
B Solids **X** and **Y** in solvent **U**.
C Solids **X** and **Z** in solvent **T**.
D Solids **Y** and **Z** in solvent **U**.

8 The diagram below shows the setup of a filtration experiment.



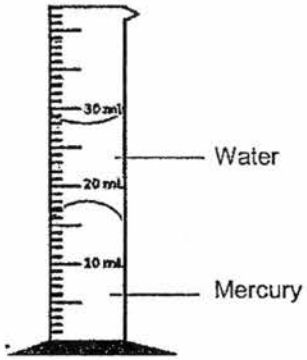
Which of the following shows the correct names of the labelled parts?

	I	II	III	IV
A	Filter funnel	Filtrate	Beaker	Residue
B	Filter funnel	Residue	Conical flask	Filtrate
C	Filter paper	Filtrate	Beaker	Residue
D	Filter paper	Residue	Conical flask	Filtrate

9 What is the SI unit of density?

A g/cm^3
B g/ml
C kg/m^3
D kg/l

10 The diagram below shows a measuring cylinder containing water and mercury.



What is the volume of the water?

A 10 ml
B 12 ml
C 13 ml
D 15 ml

*For Questions **11** and **12**, refer to the information below.*

Audrey used a pair vernier calipers to measure the diameter of a coin as shown below.

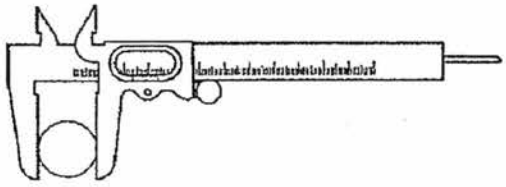


Diagram **I** shows the reading when the jaws are closed. Diagram **II** shows the reading when measuring the coin.

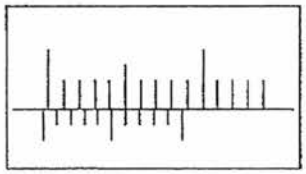


Diagram **I**

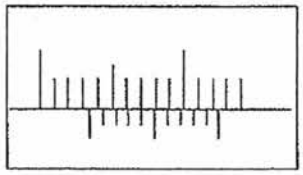


Diagram **II**

11 What is the diameter of the coin?

A 3.28 cm
B 3.30 cm
C 3.38 cm
D 3.40 cm

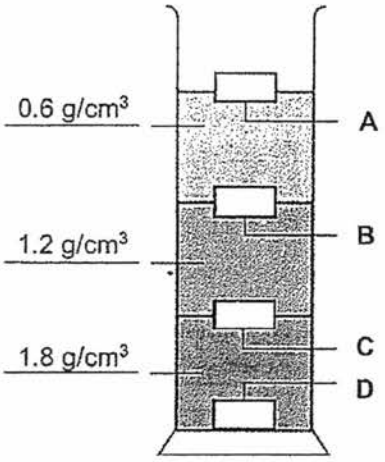
12 When Audrey told her teacher the corrected reading of the coin, he commented that her reading was inaccurate.

Which of the following could be the reason for the inaccurate reading?

A She only took one measurement of the diameter.
B She used the outer jaws instead of the inner jaws.
C She used the outer jaws instead of the tail.
D She used the wrong instrument to take the measurement.

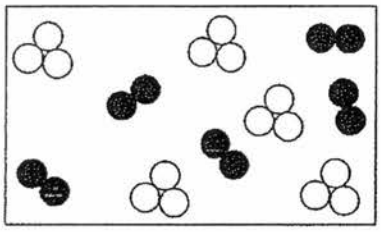
13 The diagram below shows a cylinder with 3 liquids of different densities. A block with density of 0.9 g/cm^3 is dropped into the cylinder.

Which position will the object likely to be at?

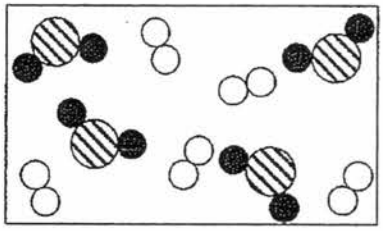


14 Which of the following diagrams shows a mixture of two Group 0 elements?

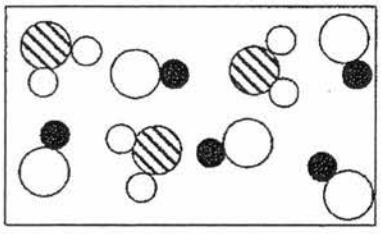
A



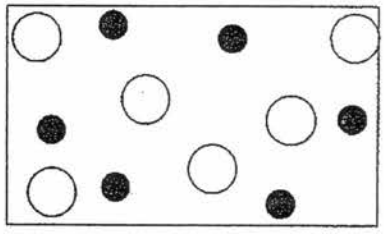
B



C



D



15 Which of the following contains an element, a compound and a mixture?

A Air, salt solution and sodium
B Aluminium, seawater and sugar
C Magnesium, mercury and carbon dioxide
D Sulfur, sodium chloride and water

16 Which of the following non-metals is **not** a gas at room temperature?

A Bromine
B Chlorine
C Helium
D Neon

17 The chemical formula of chalk is $CaCO_3$.

Which of these statements is true?

A Chalk contains five elements.
B Chalk contains two non-metals - carbon and oxygen.
C Chalk has three atoms in each molecule.
D The chemical name of chalk is calcium carbon oxide.

18 Ali is trying to dissolve sugar in a cup of coffee.

Which of the following would increase the rate at which the sugar dissolves?

I Add milk powder before adding sugar.
II Stir the mixture.
III Use cold water.
IV Use fine sugar instead of sugar cubes.

A I and III
B I, II and IV
C II and IV
D III and IV

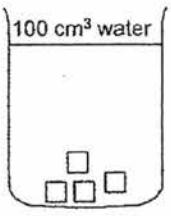
19 The table below describes two mixtures, **X** and **Y**.

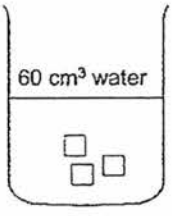
Mixture X	**Mixture Y**
• Allows some light to pass through • Solid particles are trapped when being filtered	• Allows light to pass through • No solid particle is trapped when being filtered

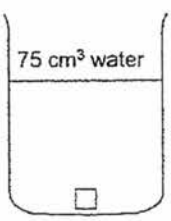
What could mixtures **X** and **Y** be?

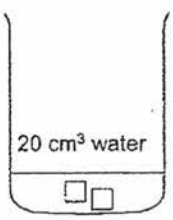
	Mixture X	**Mixture Y**
A	Chalk and water	Sand and water
B	Sand and water	Sugar solution
C	Salt solution	Chalk and water
D	Salt solution	Sugar solution

20 Which of the salt solutions will be the most saturated after the salt has dissolved?

A 

B 

C 

D 

21 Sodium burns when reacted with excess water, forming sodium hydroxide and hydrogen gas.

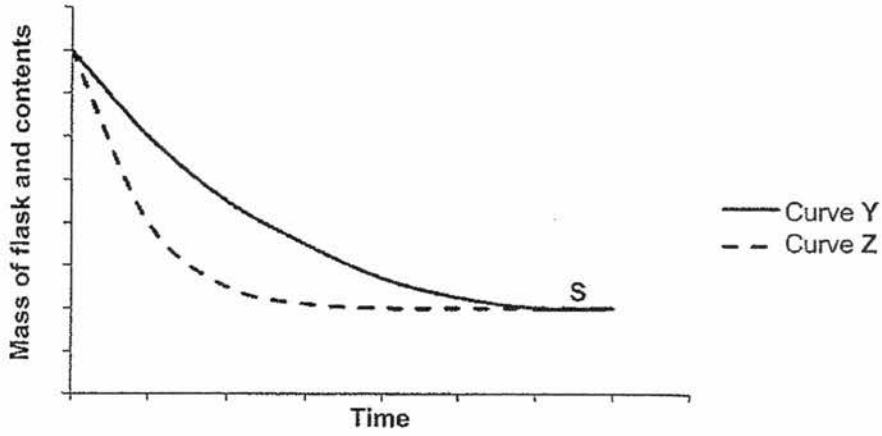
sodium (s) + water (l) → sodium hydroxide (aq) + hydrogen (g)

Which of the following changes will **not** increase the rate of reaction?

A Increase the amount of water.
B Increase the amount of sodium.
C Increase the temperature of reaction.
D Increase the surface area of sodium.

*For Questions **22** and **23**, refer to the information below.*

Curves **Y** and **Z** were obtained by two reactions between magnesium and sulfuric acid. Curve **Y** shows the results when excess magnesium ribbons was added to dilute sulfuric acid in a flask.



22 Which of the following would result in Curve **Z**?

A Breaking magnesium ribbons into smaller pieces.
B Increase the amount of magnesium ribbons used.
C Increase the pressure of the reaction.
D Decrease the temperature of the reaction.

23 Why are both curves horizontal at **S**?

A All the sulfuric acid has reacted.
B All the magnesium has reacted.
C The reaction is occurring at a constant rate.
D The reaction is slowing down.

24 In a chemical reaction, oxygen gas is produced as a by-product. The table below shows the data that was collected during the reaction.

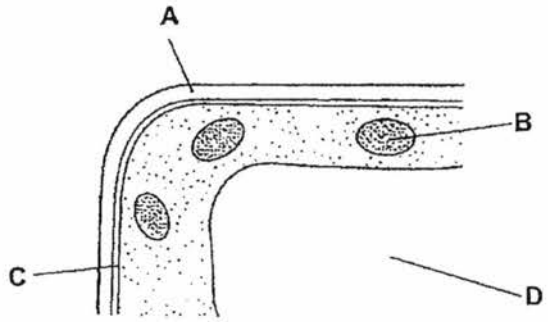
Time (s)	Volume of oxygen collected (cm^3)
0	0
10	10
20	15
30	20
40	20

How long did it take for the reaction to stop?

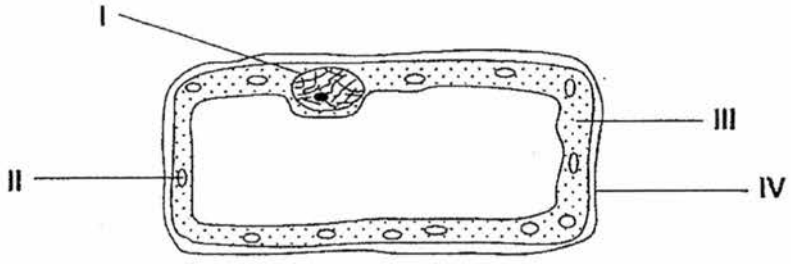
A about 0 second
B about 20 seconds
C about 30 seconds
D about 40 seconds

25 The diagram shows part of a plant cell.

Which part controls the entry of substances into the cell?



26 The diagram below shows a plant cell.



Which of the labelled structures can also be found in an animal cell?

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

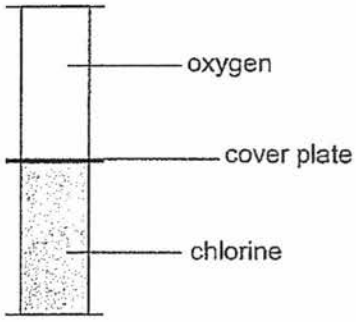
27 Which of the following statements correctly describes the function of a vacuole?

A It captures sunlight so that cell can make food.
B It contains the genetic materials of the cell.
C It produces energy for the cell to use.
D It stores food and water in the cell.

28 What would happen to the helium particles in a balloon when the balloon is compressed?

A The arrangement of the particles becomes irregular.
B The spaces between the particles decrease.
C The size of the particles decreases.
D The speed of the particles increases.

29 The cover plate was removed from the gas jar as shown in the diagram below. After several days, the colour of the gas was the same in both jars.



Which statement explains this change?

A The densities of the oxygen and chlorine gases are the same.
B The numbers of oxygen and chlorine molecules are the same.
C The rates of diffusion of the oxygen and chlorine molecules are the same.
D The oxygen and chlorine molecules are in constant random motion.

30 Which of the following statements about a liquid is **false**?

A The forces between the particles are stronger than those particles in solid.
B The spaces between the particles are wider than those particles in solid.
C The energy level of the particles is lower than those particles in gas.
D The arrangement of the particles is irregular like those particles in gas.

Section B (40 marks)

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

1 **(a)** Complete the following table. [2]

Hazard warning symbol	What does the symbol represent?
	
	

(b) In the table below, draw a two-dimensional diagram of each piece of the following apparatus. [2]

Apparatus	Two-dimensional diagram
(i) test tube 	
(ii) tripod stand 	

2 When Alex was lighting up a Bunsen burner to boil a beaker of water, a "strike back" occurred.

(a) What is a "strike back"? [1]

_____

(b) What has Alex done that resulted in a "strike back"? [1]

_____

_____

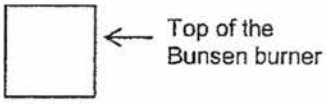
(c) Name the type of flame that Alex should use to boil the water. [1]

_____

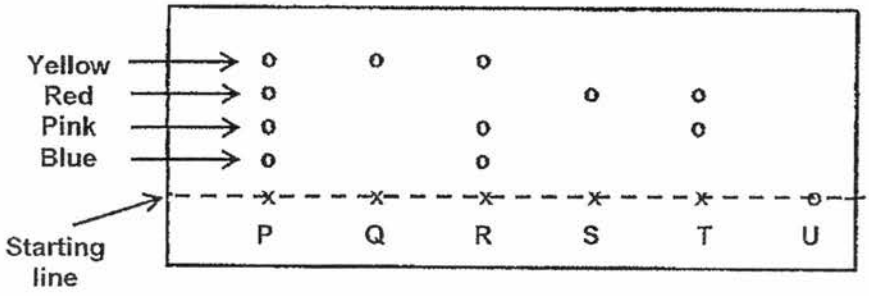
(d) What needs be done to the air-hole in order to obtain the type of flame stated in (c)? [1]

_____

(e) (i) Draw the shape of the flame stated in (c) in the space below and [1]
(ii) label the two colours that you will see. [1]



3 Alvin performed a paper chromatography to investigate the coloured dyes found in different brands of markers **P**, **Q**, **R**, **S**, **T** and **U**. The solvent used is water. The results of the experiment are shown below.



(a) What can be inferred from the result on marker **U**? [1]

_____

_____

(b) Which marker(s) is(are) only made up of a single dye? [1]

_____

(c) Which dye colour is least soluble in water? [1]

_____

(d) Can marker **P** be a mixture of markers **Q**, **S** and **T**? Explain your answer. [2]

_____

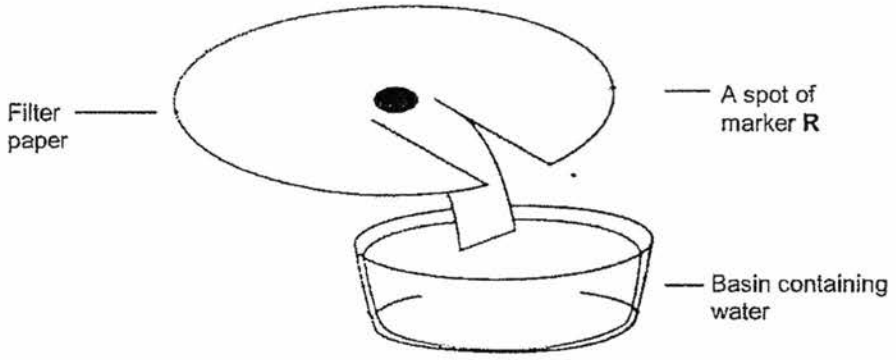
_____

_____

(e) Explain why the starting line cannot be drawn with a pen? [1]

_____

(f) Alvin repeated the experiment with marker **R** using another method of chromatography as shown below.

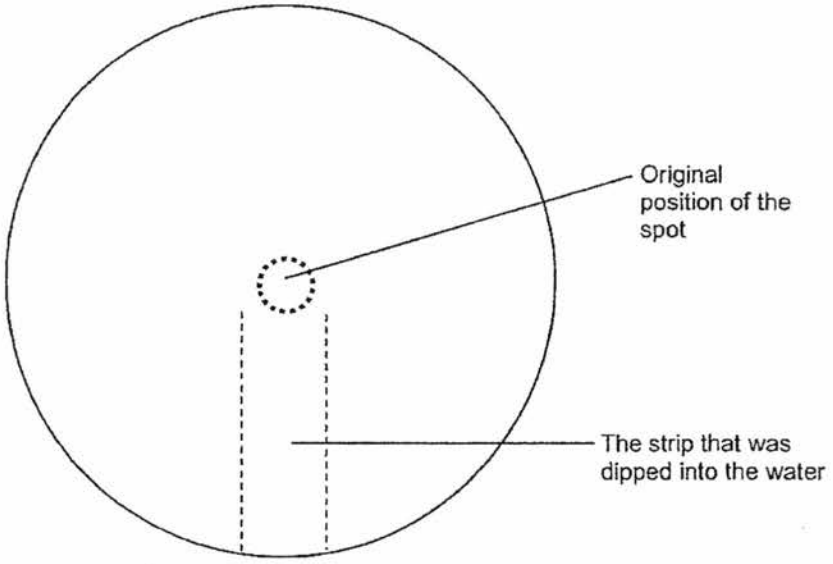


(i) Explain why a strip of the filter paper is cut and dipped into the basin. [1]

_____

_____

(ii) In the diagram below, draw and label the results that would be obtained for marker **R** on the filter paper. [3]



Top-view of filter paper

4 **(a)** Write down the chemical symbol for aluminium. [1]

_____

(b) Name a non-metal element which is in the same period as aluminium. [1]

_____

(c) The boxes below contain descriptions of four different substances, **W**, **X**, **Y** and **Z**.

W is a yellow solid. Upon heating, it turns into yellow liquid which cannot be broken into simpler substances.	**X** has a fixed composition. It decomposed into simpler substances when heated.	When **W** and **X** are mixed and heated, bright light is given out. A black solid, **Y**, is then formed.	**Z** is black and can dissolve in water. Its solution can be separated into four dyes by chromatography.

(i) Decide whether each substance is an element, compound or mixture by ticking in the correct box below. [2]

Substance	Element	Compound	Mixture
W			
X			
Y			
Z			

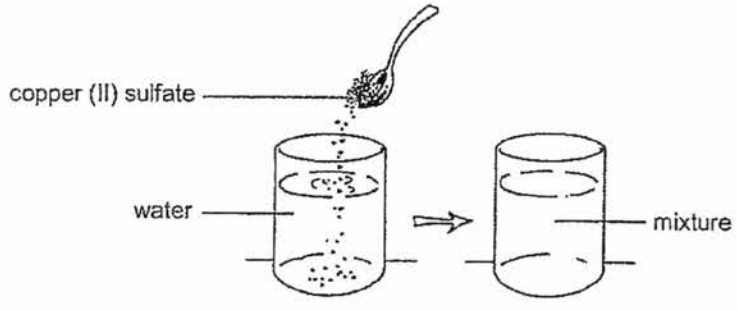
(ii) Explain how you arrive at your decision in **(c)(i)** for substance **Y**. [2]

_____

_____

_____

5 The diagram below shows how a mixture is made.



(a) Is the mixture formed a solution or suspension? Explain your answer. [2]

_____

_____

(b) Identify [1]

(i) the solute : _____

(ii) the solvent : _____

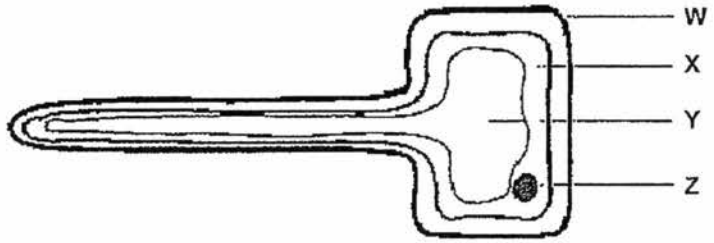
(c) List **three** factors that can affect the solubility of a substance in a solvent. [3]

_____

_____

_____

6 The diagram below shows a cell obtain from the root of a plant.



(a) Describe two ways the diagram shows that this is a plant cell and not an animal cell. [2]

1. _____
2. _____

(b) Identify the labelled structures **W**, **X**, **Y** and **Z**. [4]

W : _____

X : _____

Y : _____

Z : _____

(c) What structure, found in a typical plant cell, is **not** present in this cell? [1]

_____

(d) Explain why the structure named in **(c)** is not found in this cell. [1]

_____

_____

Section C (30 marks)

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

1 Angeline bought a gold bangle recently. She suspects that it is an alloy and not made of real gold.

She learns from Science that pure gold has a density of 19.3 g/cm^3.

Below are the materials available to her.

	Her bangle	***Electronic balance***
Displacement can	***Measuring cylinder***	***Beaker of water***

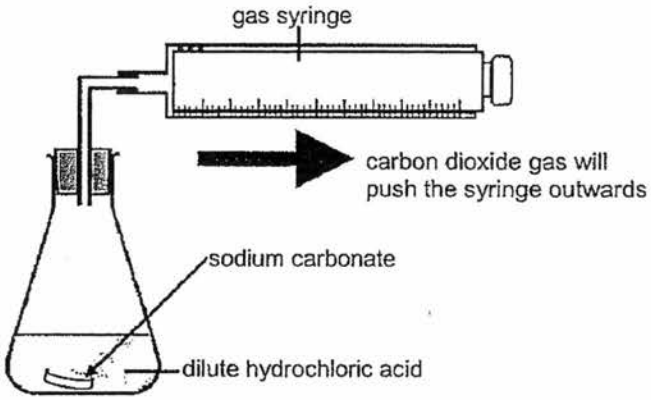
(a) Describe in detail, how she can use **all** the above materials to determine whether her bangle is made of pure gold. [5]

(b) She later found out that her bangle is made from 230 g of gold and 5 cm^3 of iron. Calculate the overall density of her bangle.

[Density of gold = 19.3 g/cm^3 ; Density of iron = 7.87 g/cm^3] [5]

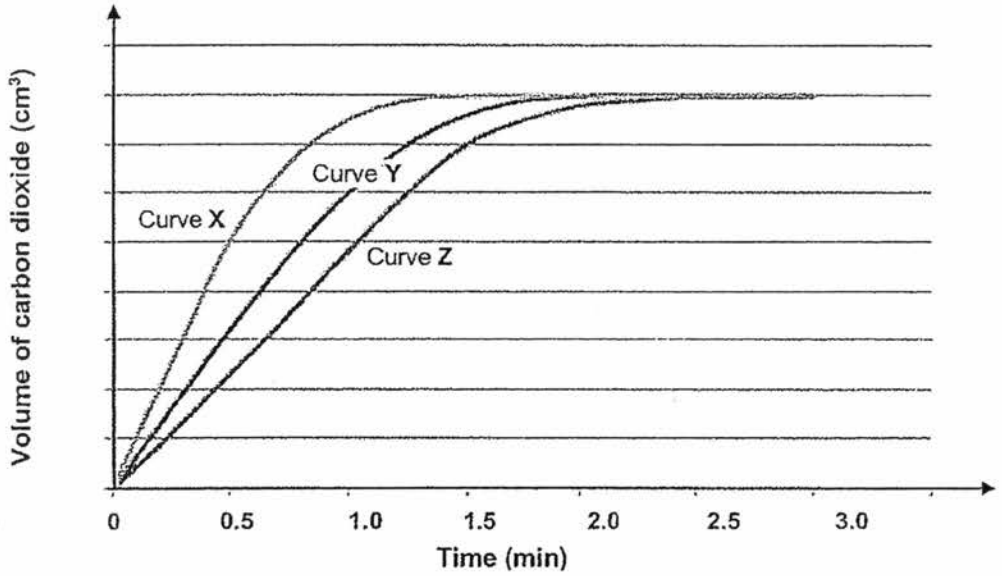
2 When sodium carbonate reacted with **excess** dilute hydrochloric acid, carbon dioxide gas is produced. This reaction can be represented in a word equation as follows:

sodium carbonate + **Hydrochloric acid** → **sodium chloride** + **Carbon dioxide** + **Water**



Three experiments, using different temperatures, were conducted:
Flask **A** – reaction conducted at 10 °C
Flask **B** – reaction conducted at 20 °C
Flask **C** – reaction conducted at 30 °C

Same volume of same concentration of hydrochloric acid and 5 g of sodium carbonate tablets were used in each experiment.The amount of carbon dioxide collected for each of the three reaction flasks was measured at regular time intervals. The results are shown in the graph below.



(a) Which flask, **A**, **B** or **C**, is presented by curve **X**? Explain your answer. [2]

_____

_____

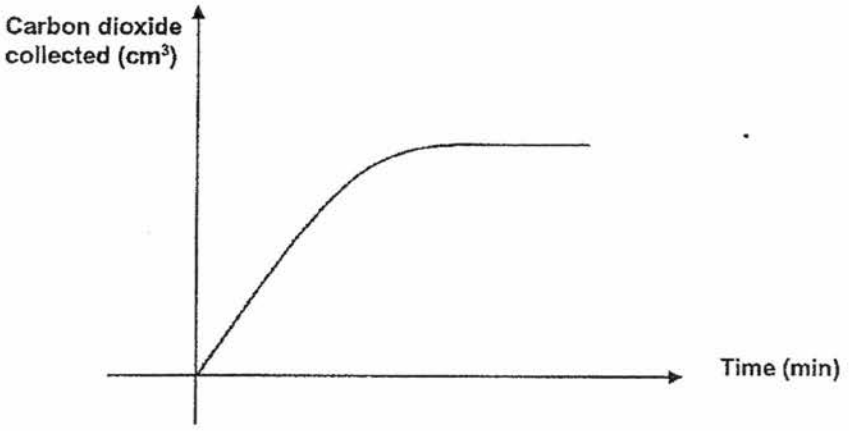
_____

(b) The results of the flask **B** is shown in the graph below.
Sketch on the same graph, the curve you would expect if the reaction in flask **B** is repeated

[4]

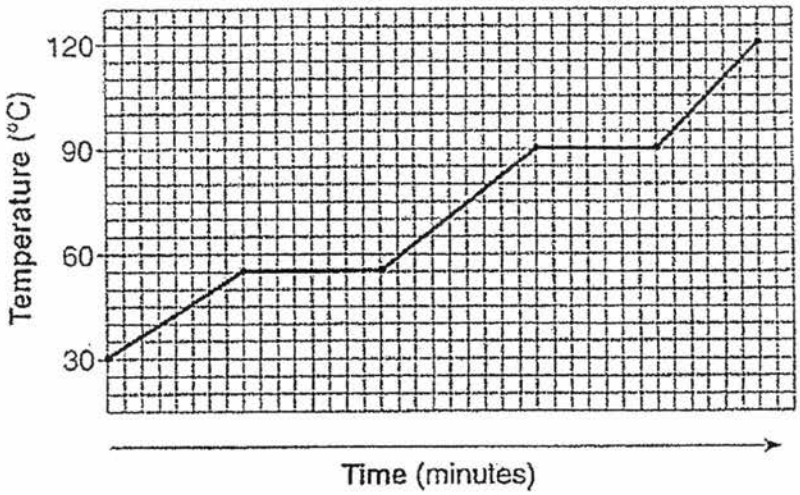
(i) using the same volume of concentrated hydrochloric acid instead of diluted acid. Label this curve as **M**.

(ii) using 2.5 g of powdered sodium carbonate instead of 5 g of sodium carbonate tablets. Label this curve as **N**.



(c) Explain how the size of the sodium carbonate affects the rate of reaction. [4]

3 The diagram below shows the heating curve of substance **K**.



(a) State the boiling point of **K**. [1]

_____

(b) Draw the arrangement of particles of **K** at 50 °C and 100 °C respectively. [2]

50 °C

100 °C

(c) Explain, in terms of kinetic particle theory, what happens to the particles of **K** when it is heated [7]

(i) from 70 °C to 90 °C;

_____

_____

_____

_____

(ii) at 90 °C and

_____

_____

_____

_____

(iii) from 90 °C to 100 °C.

_____

_____

End of Paper

The Periodic Table of the Elements

Group I	Group II											Group III	Group IV	Group V	Group VI	Group VII	Group 0
							1 H hydrogen 1										4 He helium 2
7 Li lithium 3	9 Be beryllium 4											11 B boron 5	12 C carbon 6	14 N nitrogen 7	16 O oxygen 8	19 F fluorine 9	20 Ne neon 10
23 Na sodium 11	24 Mg magnesium 12											27 Al aluminium 13	28 Si silicon 14	31 P phosphorus 15	32 S sulfur 16	35.5 Cl chlorine 17	40 Ar argon 18
39 K potassium 19	40 Ca calcium 20	45 Sc scandium 21	48 Ti titanium 22	51 V vanadium 23	52 Cr chromium 24	55 Mn manganese 25	56 Fe iron 26	59 Co cobalt 27	59 Ni nickel 28	64 Cu copper 29	65 Zn zinc 30	70 Ga gallium 31	73 Ge germanium 32	75 As arsenic 33	79 Se selenium 34	80 Br bromine 35	84 Kr krypton 36
85 Rb rubidium 37	88 Sr strontium 38	89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	– Tc technetium 43	101 Ru ruthenium 44	103 Rh rhodium 45	106 Pd palladium 46	108 Ag silver 47	112 Cd cadmium 48	115 In indium 49	119 Sn tin 50	122 Sb antimony 51	128 Te tellurium 52	127 I iodine 53	131 Xe xenon 54
133 Cs caesium 55	137 Ba barium 56	139 La lanthanum 57 *	178 Hf hafnium 72	181 Ta tantalum 73	184 W tungsten 74	186 Re rhenium 75	190 Os osmium 76	192 Ir iridium 77	195 Pt platinum 78	197 Au gold 79	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	– Po polonium 84	– At astatine 85	– Rn radon 86
– Fr francium 87	– Ra radium 88	– Ac actinium 89 †															

*58-71 Lanthanoid series
†90-103 Actinoid series

140 Ce cerium 58	141 Pr praseodymium 59	144 Nd neodymium 60	– Pm promethium 61	150 Sm samarium 62	152 Eu europium 63	157 Gd gadolinium 64	159 Tb terbium 65	162 Dy dysprosium 66	165 Ho holmium 67	167 Er erbium 68	169 Tm thulium 69	173 Yb ytterbium 70	175 Lu lutetium 71
232 Th thorium 90	– Pa protactinium 91	238 U uranium 92	– Np neptunium 93	– Pu plutonium 94	– Am americium 95	– Cm curium 96	– Bk berkelium 97	– Cf californium 98	– Es einsteinium 99	– Fm fermium 100	– Md mendelevium 101	– No nobelium 102	– Lr lawrencium 103

Key: a = relative atomic mass; X = atomic symbol; b = proton (atomic) number

The volume of one mole of any gas is 24 dm^3 at room temperature and

Answer Key

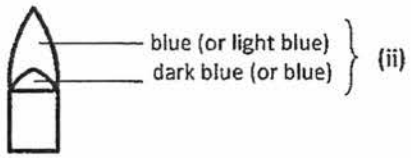
Qn 1	Qn 2	Qn 3	Qn 4	Qn 5	Qn 6	Qn 7	Qn 8	Qn 9	Qn 10
C	A	B	B	C	D	D	D	C	A

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

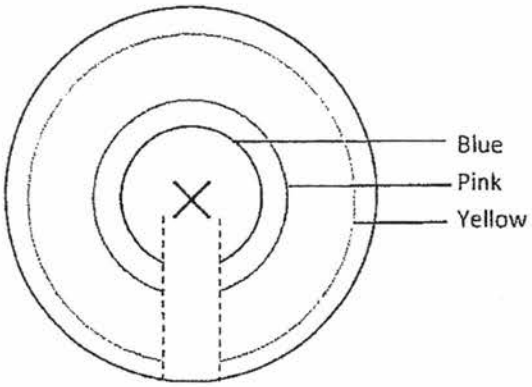
Qn 21	Qn 22	Qn 23	Qn 24	Qn 25	Qn 26	Qn 27	Qn 28	Qn 29	Qn 30
A	A	A	C	C	B	D	B	D	A

A: 8 B: 8 C: 7 D: 7

Section B

Question			Answer	Marks	Remark
1	a		Biohazard or Biohazardous [1] Radioactive [1]	2	rej: radiation
	b	(i)		1	Deduct 1 m from overall if student use pen
		(ii)		1	
2	a		When a flame forms at the air-hole/inside the barrel.	1	rej: flame is not burning at the top of the barrel
	b		He did not close the air-hole before lighting up the Bunsen burner.	1	
	c		Non-luminous flame.	1	
	d		Air-hole needs to be opened.	1	
	e		(i) Flame should not be flickering 	2	no ½ m for part (e) (i) and (ii) rej: if both labelings are 'blue'
3	a		The dyes in marker **U** are insoluble in water. OR Marker **U** does not contain the coloured dyes – yellow, red, pink and blue.	1	
	b		Markers **Q** and **S**.	1	no ½ m
	c		Blue	1	
	d		No. [1] Marker **P** contains blue dye, but none of markers **Q**, **S** and **T** contain blue dye. [1]	2	
	e		The ink in pen may dissolve/be soluble in water.	1	rej: pencil mark does not dissolve in water

Answer Key

<table>
<tr><td rowspan="2">3</td><td>f</td><td></td><td>The strip is dipped into the solvent to draw it up to the marker spot.</td><td>1</td><td></td></tr>
<tr><td>g</td><td></td><td> 

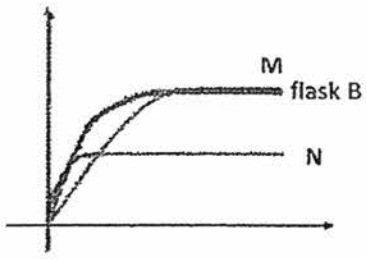
1m for drawing 3 rings
1m for correct labelings
1m for correct spacing (space between blue and pink is smaller, space between pink and yellow is bigger)</td><td>3</td><td>Perfect circle is not a marking point.

Accept if the rings cut the strip as well.</td></tr>
<tr><td colspan="6"></td></tr>
<tr><td>4</td><td>a</td><td></td><td>Al</td><td>1</td><td>rej: AL, al</td></tr>
<tr><td></td><td>b</td><td></td><td>Silicon / Phosphorus / Sulfur / Chlorine / Argon
[Any 1]</td><td>1</td><td></td></tr>
<tr><td></td><td>c</td><td>(i)</td><td><table><tr><th>Substance</th><th>Element</th><th>Compound</th><th>Mixture</th></tr><tr><td>W</td><td>√</td><td></td><td></td></tr><tr><td>X</td><td></td><td>√</td><td></td></tr><tr><td>Y</td><td></td><td>√</td><td></td></tr><tr><td>Z</td><td></td><td></td><td>√</td></tr></table></td><td>2</td><td>½ m each</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>There is <u>chemical reaction/energy changed</u> [1] during the formation of Y as <u>bright light [1]</u> was seen.</td><td>2</td><td></td></tr>
<tr><td colspan="6"></td></tr>
<tr><td rowspan="4">5</td><td>a</td><td></td><td>Solution. [1]

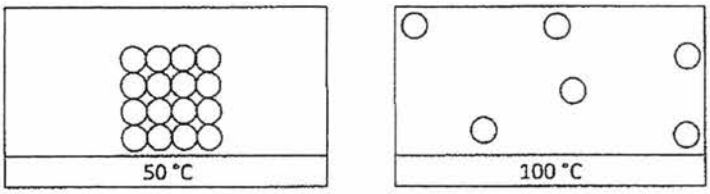
Copper (II) sulfate dissolves in the water.
The mixture does not have any particles settled at the bottom.
The mixture is clear.
[Any 1]</td><td>2</td><td></td></tr>
<tr><td rowspan="2">b</td><td>(i)</td><td>copper (II) sulfate</td><td rowspan="2">1</td><td rowspan="2">no ½ m</td></tr>
<tr><td>(ii)</td><td>water</td></tr>
<tr><td>c</td><td></td><td>Temperature [1]; Nature of solute [1]; Nature of solvent [1]</td><td>3</td><td></td></tr>
<tr><td colspan="6"></td></tr>
<tr><td>6</td><td>a</td><td></td><td>Presence of cell wall.
Presence of large central/big vacuole.
Regular shape.
[Any 2]</td><td>2</td><td>rej: vacuole w/o adjective</td></tr>
<tr><td></td><td>b</td><td></td><td>W: cell wall;
X: cytoplasm;
Y: large central vacuole;
Z: nucleus</td><td>4</td><td>1m each
-1m from overall for spelling error</td></tr>
<tr><td></td><td>c</td><td></td><td>chloroplast</td><td>1</td><td></td></tr>
<tr><td></td><td>d</td><td></td><td>It does not need to carry out photosynthesis as it is not exposed to sunlight.</td><td>1</td><td>any logical answer</td></tr>
<tr><td colspan="6"></td></tr>
</table>

Answer Key

Section C

Question			Answer	Marks	Remark
1	a		• Use an electronic balance to measure the mass of the bangle. [1] ➢ Pour in the water from the beaker into the displacement can until it is overflow. ➢ Place the measuring cylinder at the spout/outlet of the displacement can. ➢ Place the bangle in the displacement can. ➢ The water displaced into the measuring cylinder will be the volume of the bangle. [any 2 points] • Calculate the density of the bangle/ Using the formula Density = Mass/Volume [1] • Compare the density of bangle to gold/ See whether the density of bangle is 19.3g/cm^3. [1]	5	
	b		Volume of gold = 230 / 19.3 = 11.9170984456 ≈ 11.917 cm^3 ---------- [1m]] Mass of iron = 7.87 x 5 = 39.95 g ---------- [1m] Overall density = (230 + 39.95) / (11.917 + 5) ------ [1m for total vol, 1m for total mass] 269.35 / 16.917 ≈ 15.9 g/cm^3 ---------- [1m, allow ecf]	5	-1m for missing or wrong unit or sig.fig error for final answer
2	a		Flask C. [1] Temperature is highest, hence reaction is fastest[1].	2	
	b		 **Curve M:** 1 m for steeper gradient, 1 m for leveling off at the same height as B **Curve N:** 1 m for steeper gradient, 1 m for leveling off at the lower height as B	4	
	c		Smaller size sodium carbonate particles have higher surface area [1] Frequency of effective collisions [1] between sodium carbonate particles and acid particles increases [1] Faster rate of reaction [1] Answer accepted if students explain for larger size sodium carbonate particles instead.	4	

Answer Key

3	a		90°C	1	
	b		 Particles should be similar size and not overlapping.	2	
	c	i	• At 70°C, the particles will gain in kinetic energy • and they start to move/slide across each other faster • The spaces among the particles will slowly increase	7	
		ii	• At 90°C the particles will have enough energy to overcome the attractive force between them OR the attractive forces between the particles will be weaken • Particles starts to get very far apart from one another • and some able to move randomly and freely		
		iii	• After 90°C At 100°C, all the particles will be wide apart and moving randomly in high energy; K will be in gaseous state.		