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Class	Index Number	Name

HENDERSON SECONDARY SCHOOL

MID-YEAR EXAMINATION 2016
SECONDARY 2 EXPRESS

LOWER SECONDARY SCIENCE

WEDNESDAY 18TH MAY

2 hours

Additional materials:
Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Do not use staples, paper clips, highlighters, glue or correction fluid.
Write your Name, Index number and Class on all the work you hand in.
For Booklet A, write in soft pencil.
For Booklet B, write in dark blue or black pen. You may use a soft pencil for any diagrams or graphs.

Booklet A – Section A
There are **thirty** questions in Section A. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft 2B pencil** on the separate Multiple Choice Answer Sheet.

Read the instructions on the Answer Sheet very carefully.
Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.

Hand in Booklet A, Booklet B, and MCAS separately.

Booklet A

This document consists of **10** printed pages.

Setter: Ms K Chandran

[Turn over

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Section A (30 marks)

1 The chemical name for table salt is sodium chloride.

It is made up of elements sodium and chlorine.

Which of the following statements is **not** correct?

A Both elements are able to conduct electricity at room temperature.

B It cannot be separated into their elements by physical means.

C The elements are joined together in fixed proportions by mass.

D The properties of its components differ from that of sodium chloride.

2 Which of the following only contains compounds?

A bronze, gold, iron

B chlorine, carbon dioxide, lead

C salt, sugar, water

D silicon, sulfur, zinc

3 Which of the following is a molecule of an element?

A Co

B CO

C CO_2

D O_2

4 The table shows information related to three different substances, **P**, **Q** and **R**. Substances **Q** and **R** have more than two components.

substance	information
P	made up of one type of atoms
Q	components that make up the substance exist in a fixed ratio
R	components that make up the substance can still be seen

Based on the table, which of the following statements is true?

A A chemical reaction is involved to produce substance **Q** but not substance **R**.

B If substance **R** is mixed with substance **P** by physical means, the properties of the substances will change.

C Substance **P** and **Q** cannot be separated into simpler substances.

D Substance **P** must be a metal.

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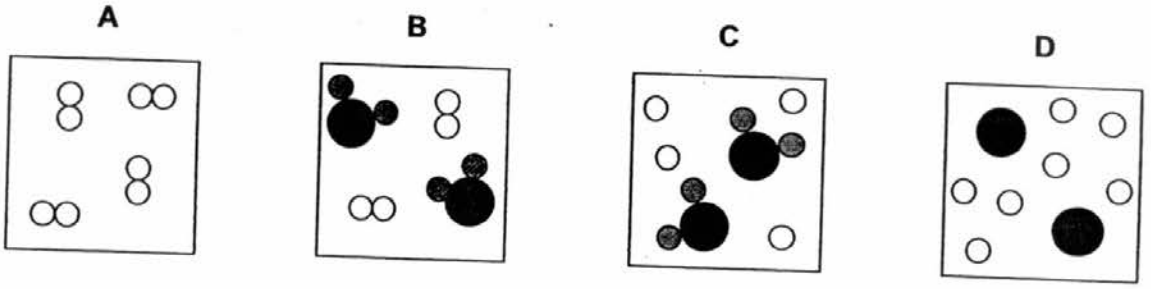
5 Which of the following diagrams represents a mixture of two elements?



6 You are given a mixture of ethanol and a dilute solution of sodium chloride in water. Ethanol boils at 78°C and sodium chloride dissolves in water.
To obtain ethanol and solid sodium chloride, what two techniques would you use?

	first technique	second technique
A	distillation	evaporation
B	evaporation	distillation
C	filtration	distillation
D	filtration	evaporation

7 A very old painting has been sprayed accidentally with new paint. The solubilities of the old paint and the new paint in different solvents are shown below.

Which solvent could be used to remove the new paint without damaging the original painting?

solvent	old paint	new paint
A	insoluble	insoluble
B	insoluble	soluble
C	soluble	insoluble
D	soluble	soluble

8 Some table salt has been mixed with sand. What is the correct order of techniques needed to obtain the pure salt from the mixture?

A dissolving → evaporating → filtering

B dissolving → filtering → evaporation

C evaporating → dissolving → filtration

D filtration → evaporating → dissolving

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9 Which factor given below does **not** affect the solubility of a substance?

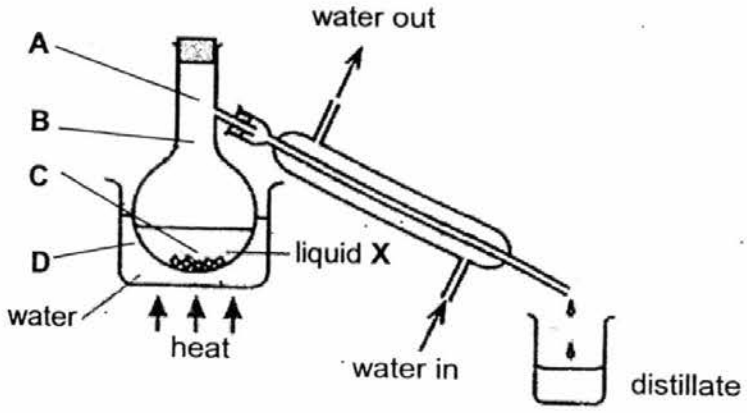
A rate of stirring

B temperature

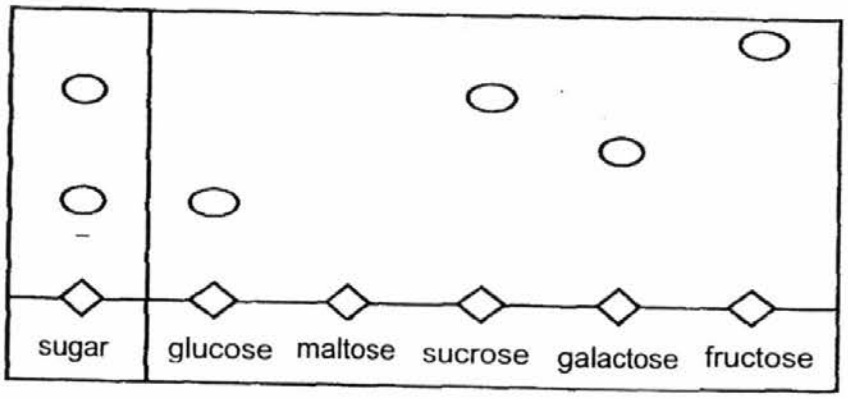
C type of solute

D type of solvent

10 The set-up shown below is used to measure the boiling point of a liquid **X**. Where should the bulb of the thermometer be placed?



11 Sugar was treated with dilute hydrochloric acid. The resulting solution was analysed by chromatography. The following chromatogram was obtained.



This chromatogram suggests that dilute hydrochloric acid breaks down the sugar into

A fructose, galactose and glucose.

B fructose, glucose, and sucrose.

C glucose, maltose and one sugar not among the reference sugars.

D glucose and sucrose.

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12 What is used to decompose copper chloride solution into copper and chlorine gas ?

A electricity

B heat

C light

D oxygen

13 Which of the following is a physical change?

A baking cakes

B burning paper

C cooking food

D dissolving sugar in a cup of tea

14 Which separation technique is used to show that sea water contains dissolved substances?

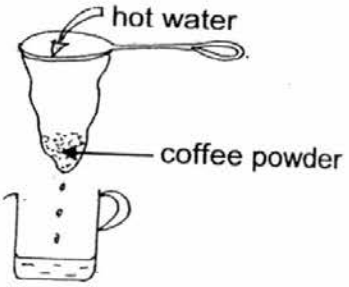
A condensation

B distillation

C evaporation

D filtration

15 The following diagram shows a coffee bag used in a coffee shop to separate the coffee powder from the black coffee after pouring hot water into the coffee bag.



The coffee powder that is left behind in the coffee bag is known as the .....(1)..... and the black coffee is the .....(2)..... .

	(1)	(2)
A	filtrate	residue
B	residue	filtrate
C	solute	solvent
D	solvent	solute

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16 Timothy heated four different substances. Based on his observations, which one of them underwent a physical change upon heating?

	appearance at the start	observation made during heating	appearance after cooling
A	clear liquid	clear liquid	clear liquid
B	green powder	black solid	black solid
C	purple crystals	purple vapour	purple solid on sides of test tube
D	white solid	white solid	white solid

17 During respiration, glucose reacts with oxygen to form carbon dioxide and water.
Which of the following word equations correctly represents this change?

A carbon dioxide + glucose ⟶ oxygen + water

B carbon dioxide + water ⟶ glucose + oxygen

C glucose + oxygen ⟶ carbon dioxide + water

D glucose + water ⟶ carbon dioxide + oxygen

18 Jerry is stung by a bee. His mother rubs baking soda on his wound to relieve the pain.
What can you infer from this observation?

A The bee sting contains an element which reacts with the baking soda.

B The bee sting is acidic.

C The bee sting is alkaline.

D The bee sting is neutral.

19 Calcium hydroxide reacts with sulfuric acid to form a salt and water.
Which of the following is the **correct** name of the salt formed?

A calcium hydrate

B calcium oxide

C calcium sulfate

D calcium sulfuric

20 Which of the following solutions when mixed may form a solution of pH 7?

A ammonia solution and water

B hydrochloric acid and potassium hydroxide

C sodium chloride solution and nitric acid

D sodium hydroxide and water

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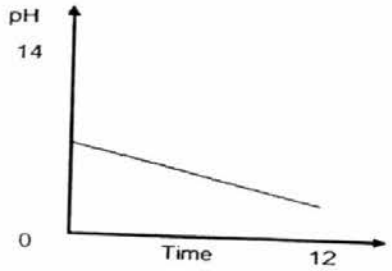
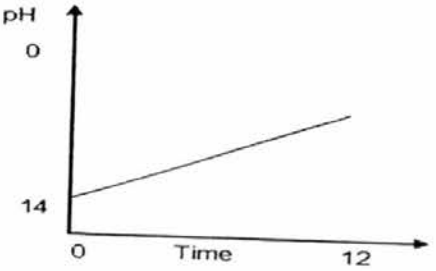
21 Jackson wanted to do a simple experiment. He bought a carton of orange juice and a carton of yoghurt from the supermarket. He mixed them together in equal proportions and tested the pH level of the mixture at 2-hour intervals. The table below shows the results obtained. Choose the correct graph that the student had plotted based on his experimental results.

time (hour)	0	2	4	6	8	10	12
pH	5	4.5	4	3.5	3	2.5	2

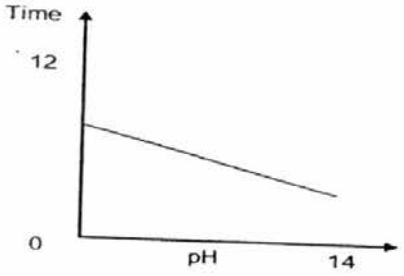
A



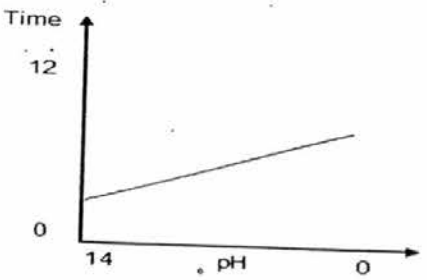
B



C



D



22 Jack was told to heat four substances. Which substance will undergo a chemical change upon heating?

A	iodine
B	salt
C	sugar
D	wax

23 Which of the following changes are caused by exposure to light?

I burning of charcoal
II decomposition of silver bromide on film
III manufacturing food by green plants
IV production of vitamin D in skin

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

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The table gives information about three indicators.
Use the following table to answer questions 24 and 25

indicator	colour at pH 2	pH at which color changes	colour at pH 13
phenolphthalein	colourless	8	red
thymol blue	blue	4	pink
congo green	orange	12	green

24 Which colours would be obtained when each indicator is added to a neutral solution?

	phenolphthalein	thymol blue	congo green
A	colourless	blue	orange
B	colourless	pink	orange
C	red	blue	green
D	red	pink	green

25 When the three indicators are added to three test tubes of solution **Y**, the colours of the indicators are as shown in the table below.

phenolphthalein	thymol blue	congo green
red	pink	orange

Which of the following pH could be the pH of solution **Y**?

A pH 2

B pH 3

C pH 9

D pH 14

26 A fish in a pond appears to be 1.6 m from the surface of a pond. Given that the refractive index of water is 1.33, what is the real depth of the fish?

A 0.84 m **B** 1.20 m **C** 2.13 m **D** 2.93 m

27 A boy is having his eyesight tested by an optician. The chart is located 5 m behind him. There is a mirror 4 m in front of him. How far does this chart appear from him?

A 4m

B 9 m

C 10 m

D 13 m

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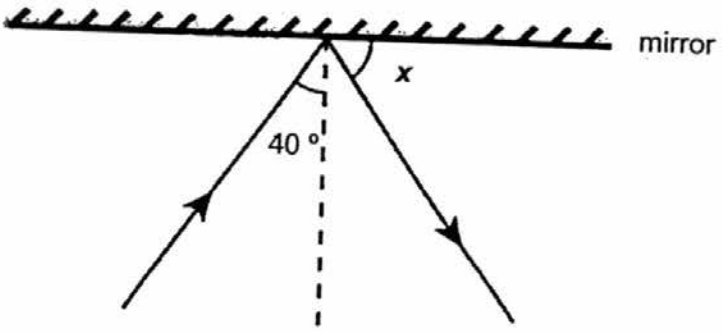
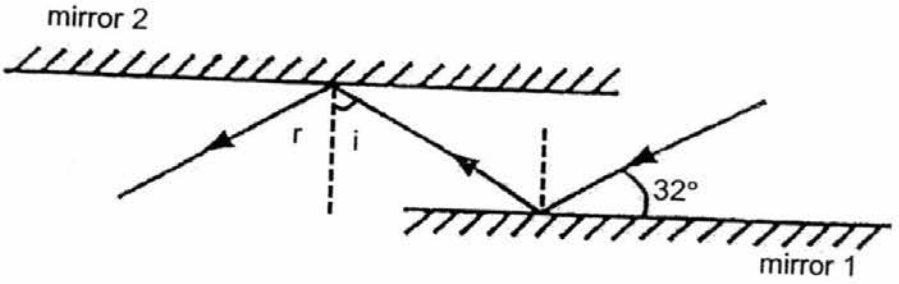
28 The diagram below shows a light ray which is incident on a plane mirror.



What is the value of ***x***?

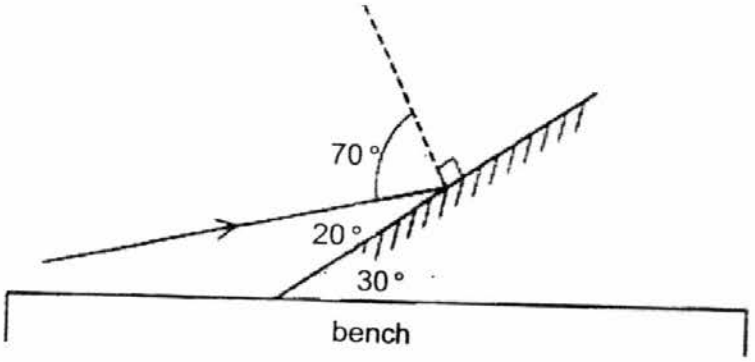
A 35 ° **B** 50 ° **C** 55 ° **D** 65 °

29 Given that mirror 1 and 2 are parallel to each other, what will be the **angle of reflection** of the the reflected ray at mirror 2, when a single ray of blue light hits the surface of plane mirror 1 at 32° ? (*Note: The diagram is **not** drawn to scale.*)



A 32 ° **B** 58 ° **C** 68 ° **D** 116 °

30 A mirror is placed tilted at an angle of 30 ° to the bench. A ray of light is directed so that it hits the mirror at an angle of 20 ° to the surface of the mirror.



What is the angle of reflection of the ray?

A 20 ° **B** 30 ° **C** 50 ° **D** 70 °

- End of Booklet A -

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DATA SHEET
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 Sulphur 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	226 Ra Radium 88	227 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
X
b

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 pressure (r.t.p.).

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5

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SECONDARY 2 EXPRESS

LOWER SECONDARY SCIENCE

WEDNESDAY 18TH MAY

2 hours

Additional materials:
Writing paper (on request)

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Write your Name, Index number and Class on all the work you hand in.
For Booklet A, write in soft pencil.
For Booklet B, write in dark blue or black pen. You may use a soft pencil for any diagrams or graphs.

Booklet B – Sections B and C
Answer **all** questions in Section B and Section C.
Write your answers in the spaces provided on the question paper.
In calculations, you should show all the steps in your working, giving your answer at each stage.

The number of marks is given in brackets [ ] at the end of each question or part question.

Section	Mark
A	/30
B	/40
C	/30
Total:	/100

Booklet B

Hand in Booklet A, Booklet B and MCAS separately.

This document consists of **10** printed pages.

Setter: Ms K Chandran

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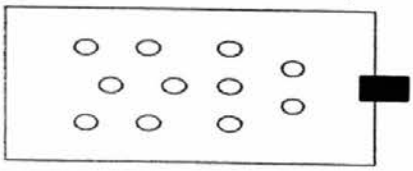
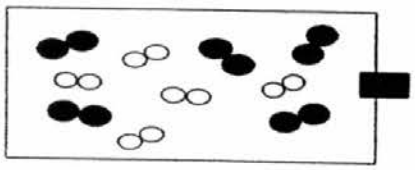
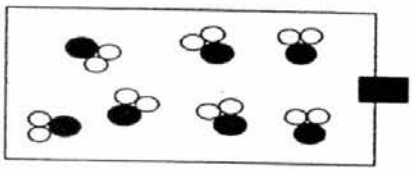
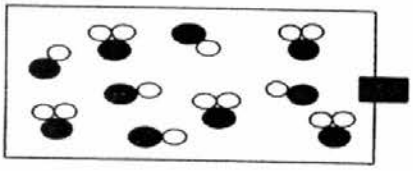
Section B (40 marks)

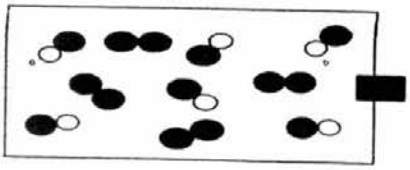
1 **(a)** The diagrams below show the arrangement of particles in some substances. Match each diagram to one of the descriptions on the right. [5]











mixture of 2 compounds

compound

mixture of molecules of an element and molecules of a compound

atoms of an element

mixture of 2 elements made up of diatomic molecules

(b) State one similarity and one difference between molecules of an element and molecules of a compound.

.....

.....

.....

.....[2]

(c) The table shows some information about atoms of elements W and X. (The letters do not represent the symbols of the elements.)
Complete the table by filling in information for these elements. [3]

element	mass number	atomic number	number of electrons	number of neutrons
W	27	13		
X	23		11	12

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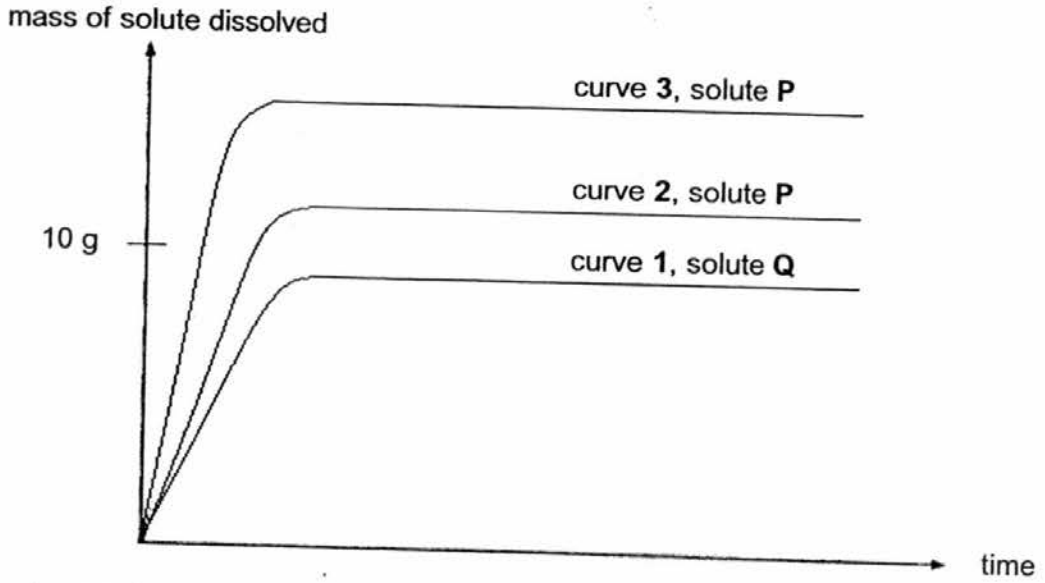
2 Tricia dissolved 18 g of two different solutes, **P** and **Q**, into two beakers each containing 50 cm^3 of water at room temperature. The mixture in each beaker was stirred until no more solutes could be dissolved.



(a) With reference to curves **1** and **2** in the graph above, compare the difference in solutes **P** and **Q** in terms of their solubility in water.

.....

.....[1]

(b) What does the horizontal line of each curve represent?

.....

.....[1]

(c) Tricia repeated the experiment with the same conditions as above, except using smaller particle size of solute **Q** only.
Draw, on the same axes, the curve that would result. [1]

(d) **(i)** Suggest how curve **3** for solute **P** can be obtained if 18 g of solute **P** is dissolved in 50 cm^3 of water.

.....

.....[1]

(ii) Explain your answer in (d)(i).

.....

.....[2]

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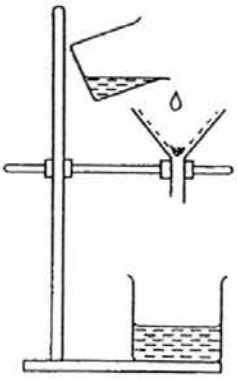
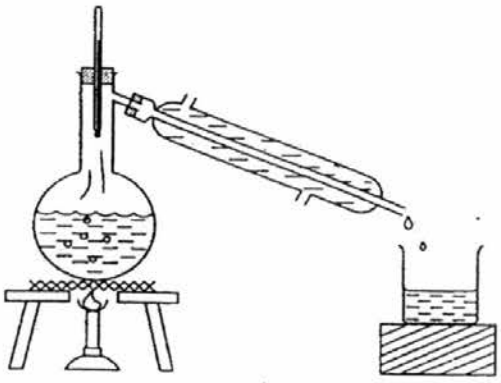
3 The diagram shows two methods of separating water from the mixtures.



M



N

(a) Name the two methods, **M** and **N**.

.....

.....[2]

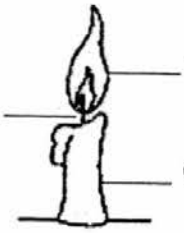
(b) Which of the two methods is a better way of purifying water? Why?

.....

.....

.....[2]

4 The diagram below shows a candle burning.



(a) Identify a physical change in the diagram and explain why it is considered a physical change.

.....

.....

.....[2]

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(b) Identify a chemical change in the diagram and explain why it is considered a chemical change.

.....

.....[2]

(c) **(i)** State the other reactant that is needed for the reaction to take place.

.....[1]

(ii) The candle wick is a form of carbon.
Write down the word equation for the chemical change.

.....[2]

5 Study the following activities carefully. State the name of the process and whether it is a chemical change or physical change. [3]

(a) **(i)** Heat magnesium ribbon in a jar of oxygen gas.

(ii) Heat iron filings and sulfur powder in a test tube.

(iii) Heat a piece of candle wax in a test tube.

	name of the process	chemical change or physical change
(i)		
(ii)		
(iii)		

(b) A list of chemicals is given below:

- zinc
- calcium hydroxide
- nitric acid

Select chemicals from the list and write down a word equation that will give each of the following products. Each chemical may be used more than once or not at all.

(i) salt and water only

.....[2]

(ii) hydrogen gas

.....[2]

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6 **(a)** State the laws of refraction.

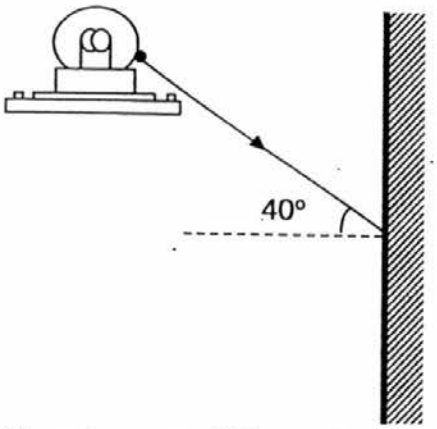
.....

.....

.....

.....[2]

The diagram shows a light ray from a light bulb hitting the surface of a plane mirror. Consider the light ray as coming from the point on the light bulb.



(b) The light ray bounces off the surface of the plane mirror.
What is the name for this change in direction of the light ray?

.....[1]

(c) On the diagram,

(i) mark accurately, with a dot and letter **B**, the position of the image of the bulb,

(ii) show the path of the light ray after it bounces off the surface of the plane mirror, and

(iii) mark and write the angle of reflection. [3]

- End of Section B -

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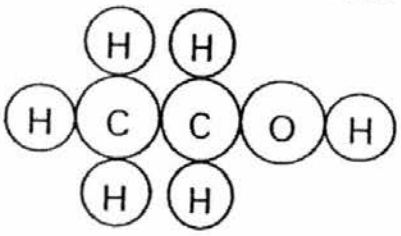
Section C (30 marks)

7 **(a)** Ethanol (also commonly called alcohol) is a liquid at room temperature. It is found in many perfumes and deodorants. The diagram represents a molecule of ethanol.

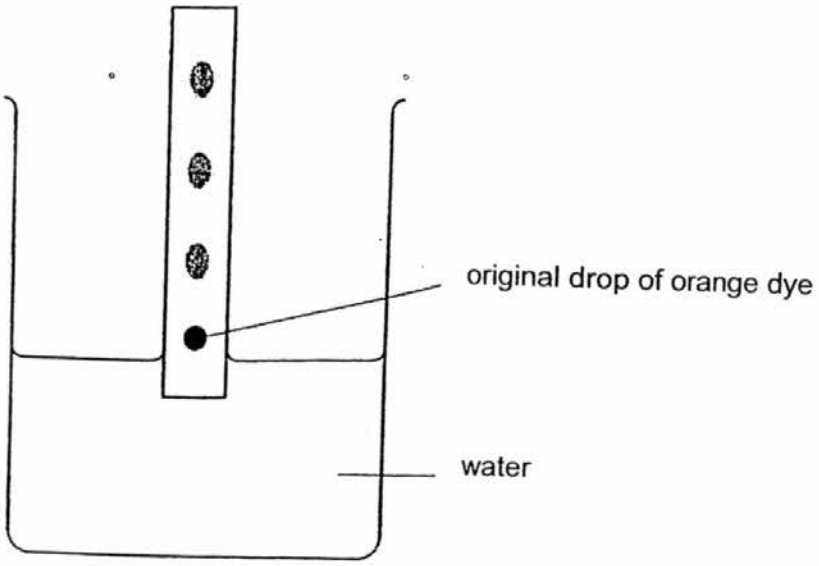


(i) State the number of each type of atom present in the molecule.

.....[2]

(ii) What is the formula of the molecule? .....[1]

(b) Dyes are used to colour some sweets. A student placed a drop of orange dye on a piece of filter paper. The end of the paper was then dipped into a beaker of water. The results are shown below.



(i) What is the name of the process shown in the diagram?

.....[1]

(ii) Is the orange dye a mixture or a compound? Give a reason for your answer.

.....

.....[2]

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(iii) What would have happened if the original drop of dye had been placed below the water level?

.....

.....[1]

(c) Given a mixture of iron, sulfur and copper sulfate crystals, how would you obtain iron and sulfur from the mixture?

.....

.....

.....

.....[3]

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8 'A carbonate is found in egg shells and sea shells.'

(a) (i) Using the properties of acid, describe how you would carry out a test to show that egg shells contain a carbonate. Draw a suitable labelled diagram to aid your explanation.

.....

.....

.....

.....

.....

.....[5]

(ii) Write a general equation for the reaction in your answer to **(a)(i)**.

.....[2]

(b) A laboratory technician forgets to label 3 bottles of colourless solution. He only knows that one solution has pH exactly 7, one has pH less than 7 and one has pH more than 7. He has one bottle of blue litmus paper and one bottle of red litmus paper available.

Describe what you would do to help the laboratory technician sort out the bottles and label the bottle as acid, alkali or neutral.

.....

.....

.....

.....

.....

.....

.....

.....[3]

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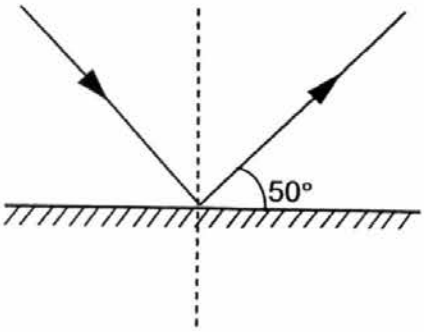
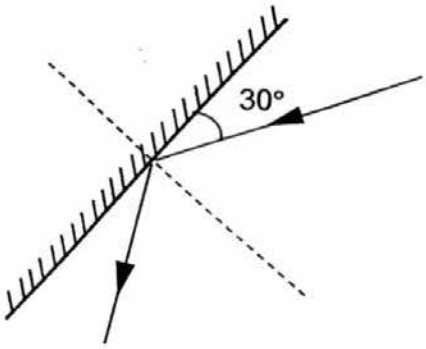
9 (a) For each of the following light rays reflected, state the angle of incidence. [2]





(i) Angle of incidence = _____

(ii) Angle of incidence = _____

(b) An object is placed 5 cm in front of a plane mirror. The mirror is then moved 2 cm towards the object. Calculate the distance between the initial and final position of the image that is seen in the mirror.

distance = ...cm [2]

(c) What is the relationship between the angle of incidence and the angle of reflection for a light ray undergoing reflection?

.....

.....[1]

(d) (i) State the two types of reflection.

.....[1]

(ii) State a difference between the two types of reflection.

.....

.....[2]

(iii) State 2 properties of images in a plane mirror.

.....

.....[2]

- End of Booklet B -

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HENDERSON SECONDARY SCHOOL
MID-YEAR EXAMINATION 2016
SECONDARY TWO EXPRESS SCIENCE
Marking Scheme

Section A (30 marks)

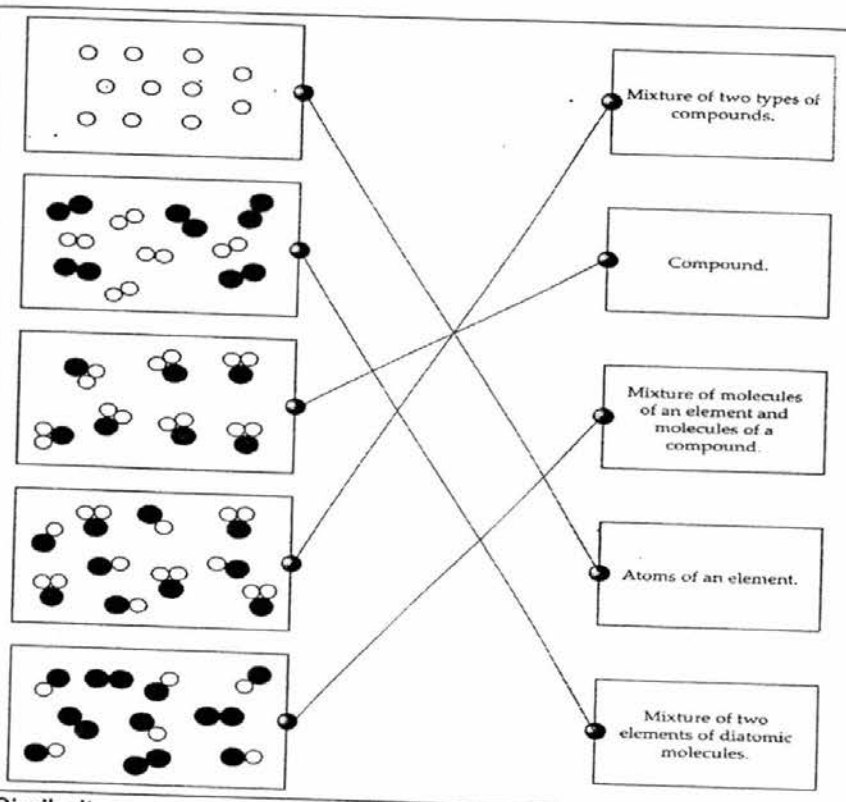
1	2	3	4	5	6	7	8	9	10
A	C	D	A	D	A	B	B	A	A

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

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

Section B (40 marks)

1 a (5)



b

Similarity:
Both are made up of two or more atoms chemically combined together. (1)

Difference:
Molecules of a compound consist of different types of atoms chemically combined together while the molecules of an element consist of the same type of atoms chemically combined together. (1)

c

element	mass number	atomic number	number of electrons	number of neutrons
W	27	13	**13**	**14**
X	23	**11**	11	12

(2)
(1)

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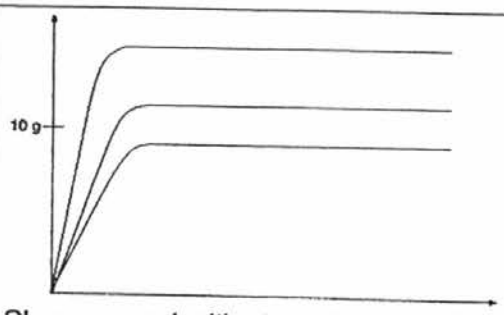
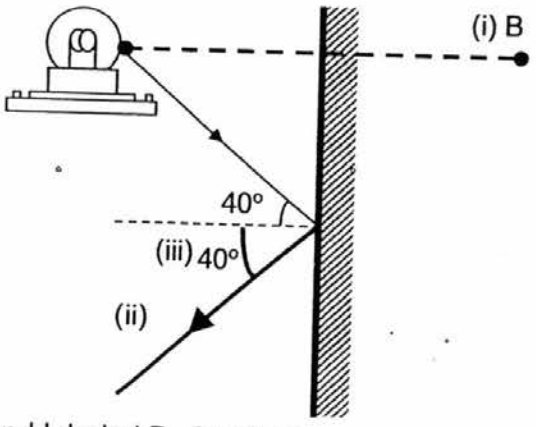
2	(a)		Solute P has **higher solubility** in water than solute Q. Remarks: Do not accept 'larger amount of solute P than Q can be dissolved in water'.	1
	(b)		It represents the **maximum mass of solute** that had **dissolved** in 50 cm^3 of water. Or It represents that the **solution is saturated** with the solute.	1
	(c)		 Show curve 1 with steep initial gradient but same saturation point.	1
	(d)	(i)	Increase temperature of solvent / use hot water / heat up the mixture	1
		(ii)	**More solute can dissolve** (OR it saturates **higher**) because higher temperature will **increase solubility**. It is dissolved in a **shorter time** (OR steeper and saturates faster) because higher temperature **increases the rate of dissolving.**	1 1

3	(a)	M : filtration, N : distillation	2
	(b)	N By boiling the mixture, water boils to become steam and condenses into water.	1 1

4	(a)		Identify: Solid candle wax **melting** to form liquid wax. Explain: Liquid wax can be cooled and solidified to form solid candle Or Melting is a **reversible** change. Remarks: Award mark as long as 'melting' is stated. Do not accept: 'No new substances formed'.	2
	(b)		Identify: **Burning** of the candle/wick. Explain: New product is formed / Carbon dioxide is produced Or Reaction is not reversible / irreversible. Remarks: Accept 'combustion'.	2
	(c)	(i)	Oxygen	1
		(ii)	carbon + oxygen $\xrightarrow{\text{heat}}$ carbon dioxide	2

			Deduct 1 mark if • 'heat' is not stated • reactants and/or products are written wrongly • no '+' sign in equation • no ⟶ used in equation / straight, forward arrow only Do not accept if answer is written in pencil.	

5	(a)	(i)	combustion, chemical change	1
		(ii)	combination, chemical change	1
		(iii)	melting, physical change	1
	(b)	(i)	calcium hydroxide + nitric acid → water + calcium nitrate	2
		(ii)	zinc + nitric acid → hydrogen + zinc nitrate	2

6	(a)		The incident ray, refracted ray and normal all lie on the same plane at the point of incidence. For any two given media, the ratio of sin i / sin r is a constant	1 1
	(b)		Reflection of light	1
	(c)	(i)		1
		(ii)		1
		(iii)	1m only if dot and labeled B , 0 m if no arrow	1

Section C (30 marks)

7a)	i)	6 Hydrogen atoms, 1 oxygen atom and 2 carbon atoms.	[Any 2=1,all 3 =2]
	ii)	C_2H_5OH/ C_2H_6O / CH_3 CH_2OH	[1]
b)	i)	Chromatography	[1]
	ii)	Mixture. As it can be separated into 3 components.	[1] [1]
	iii)	The drop of dye would have dissolved into the water. OR The chromatogram would not have formed.	[Any 1 = 1]
c)		Using a magnet, separate out the iron. Add water to dissolve the copper sulfate as sulfur remains insoluble. Filter to obtain sulfur as residue.	[1] [1] [1]

8ai) 1. Crush egg shells and place some in a test tube. [0]
2. Add some acid to the egg shells and pass the gas produced into limewater [2]
3. If white precipitate forms in the limewater, then the gas is carbon dioxide this shows that egg shells contains carbonate. [1]
Labelled diagram: teat pipette [1] Lime water [1]

(ii) Acid + Carbonate → Salt + water + carbon dioxide [Any 2/3/4=1,all 5 =2]

(b) Dip the blue litmus paper into a bottle of solution –turns red, then it is an acid. [1]
If not, dip the red litmus as well – if it remains red, then the solution is neutral. [1]
Use the red litmus on one of the two remaining solutions, the one that turns red litmus blue is an alkali [1]

9a **i)** 40° **ii)** 60° [Any 1 =1,max 2]

b) 5 + 2 – 3 [1]
=4cm [1]

c) The angle of incidence equals the angle of reflection for a light ray on a plane surface. [1]

di) Diffuse and smooth / Regular and irregular [1]

ii) The angle of incidence equals the angle of reflection for a light ray in regular reflection, does not equal in irregular reflection. [1]
Regular reflection occurs on a smooth surface but regular reflection occurs on a rough surface. [1]
Accept any other reasonable answer.

iii) The image is laterally inverted.
Image distance is equal to object distance.
The image is the same size as the object.
The image is virtual.
The image is upright. [Any 1 =1,max 2]

- End of Examination Marking Scheme -

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