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KENT RIDGE SECONDARY SCHOOL MID-YEAR EXAMINATION 2017

SCIENCE

BOOKLET 1

SECONDARY 2 EXPRESS

Friday 12 May 2017

2 hours

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Name: _____ () Class: Sec _____

Additional materials provided

Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number clearly in the spaces at the top of this page, on the Multiple-Choice Answer Sheet and any separate writing paper used.

Do not turn open this paper until you are told to do so.

Section A

Answer **all** questions. Choose the one you consider correct and record your choice in **soft pencil** on the separate Multiple Choice Answer Sheet.

Section B

Answer **all** the questions in the spaces provided on the question paper.

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

Use of electronic calculators is allowed.

A copy of the Periodic Table is printed on page 20.

FOR EXAMINER'S USE	
SECTION A	30
SECTION B	40
SECTION C	30
Total	100

This Question Paper consists of 20 printed pages, including this page.

Setter: Ms Siti Fad.

[Turn over

Section A

The total mark for this section is 30.

- 1 Which of the following substances is not an element?

A ammonia
B beryllium
C platinum
D silicon

- 2 In the outline of the Periodic Table, some elements are shown as numbers.

Which two numbers are metals in the same period?

- A 1 and 2
B 1 and 7
C 3 and 5
D 5 and 6

- 3 Which of the following properties can be used to describe a mixture?

A It boils over a range of temperature.
B It cannot be decomposed into anything simpler.
C It can only be separated by passing electric current through it.
D It has fixed proportions by mass.

- 4 How many elements does MgCO_3 contain?

A	2
B	3
C	4
D	5

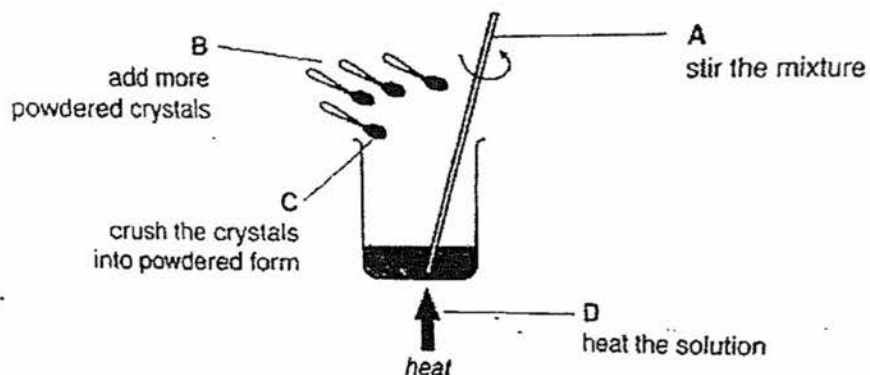
- 5 The following information is given:

X: Calcium nitrate crystals
 Y: Water
 Z: A mixture of calcium nitrate and water

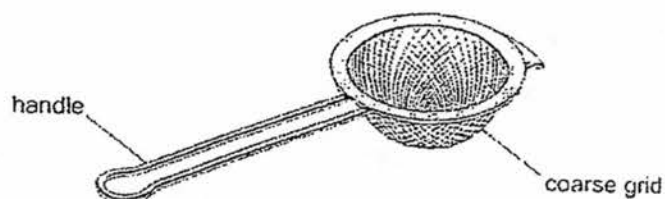
Calcium nitrate crystals are soluble in water. Based on the information above, which of the following correctly represents the solute, solvent and solution?

	X	Y	Z
A	solute	solution	solvent
B	solvent	solute	solution
C	solute	solvent	solution
D	solution	solvent	solute

- 6 A soluble salt is added to a beaker of water. Which one of the following actions do not cause the salt to dissolve faster?



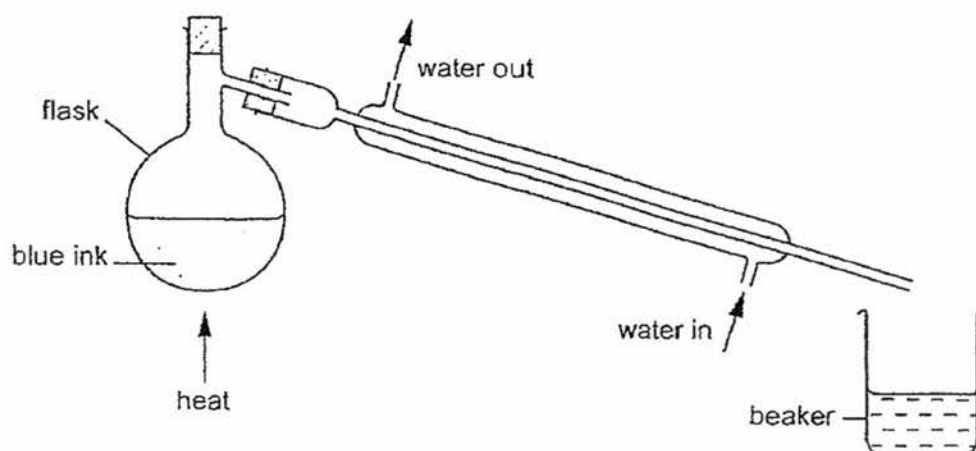
- 7 A tea strainer removes tea leaves from tea.



Which method of separation does it use?

- A chromatography
 - B distillation
 - C evaporation
 - D filtration
- 8 Which of the following methods can be used to separate a mixture of iron and sulfur?
- A crystallisation
 - B filtration
 - C magnetic attraction
 - D paper chromatography
- 9 How many times does a substance experience changes in physical state when it is collected as a distillate in a simple distillation?
- A 1
 - B 2
 - C 3
 - D 4
- 10 A mixture produces a residue when it is filtered. Which of the following statements about the nature of this mixture is correct?
- A It contains two solutions.
 - B It does not allow light to pass through.
 - C It does not have particles settling after being left for a period of time.
 - D It is a homogeneous mixture.

11 The diagram shows an experimental set up.



What are the colours of the liquids in the flask and the beaker at the end of the experiment?

	flask	beaker
A	blue	blue
B	blue	colourless
C	colourless	blue
D	colourless	colourless

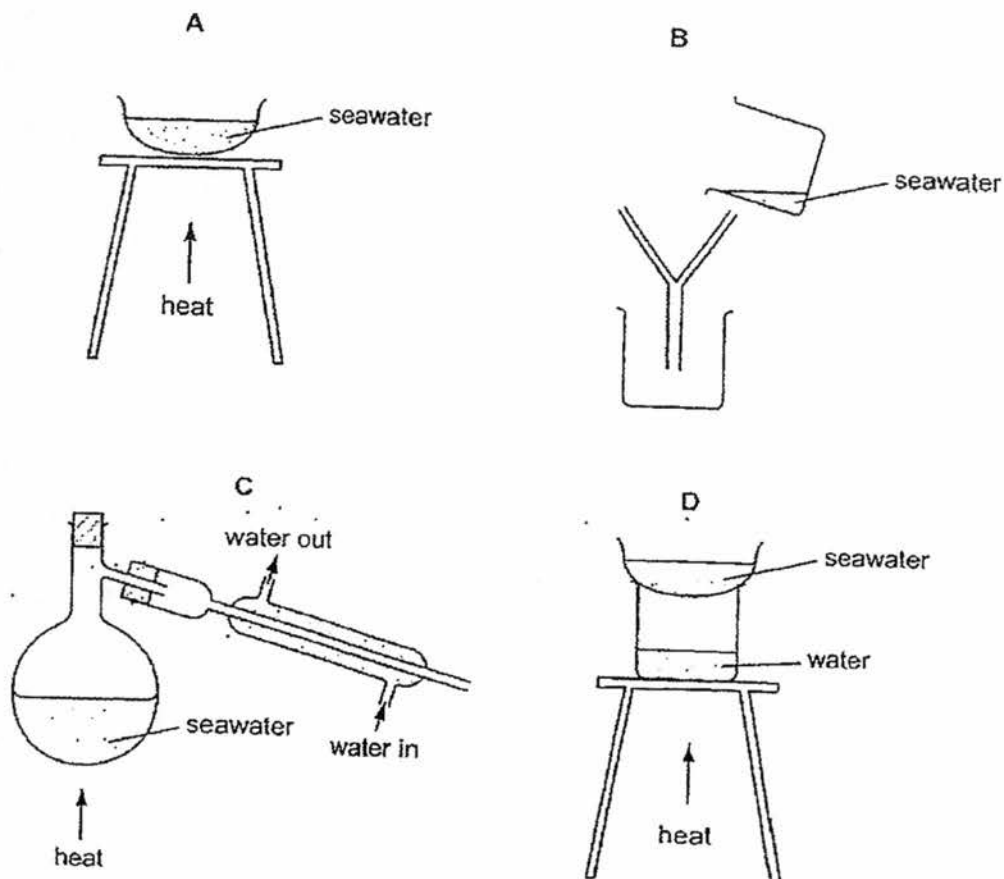
12 A student wishes to extract a coloured solution from some berries to make an indicator solution.

Which of these instructions should the student follow?

- 1: add acid
- 2: add water
- 3: crush the berries
- 4: distil the filtrate
- 5: filter the mixture

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

- 13 Which apparatus could be used to show the desalination of seawater to make it drinkable?



- 14 How many atoms does one molecule of ethanol, C_2H_5OH , contain?

A 3
B 4
C 7
D 9

- 15 Elements are arranged in the Periodic Table according to their

A number of electrons
B number of neutrons
C number of protons
D total number of protons and neutrons

- 16 Which letter in the table represents a value of -1?

particle	relative charge	relative mass
electron	A	B
neutron	C	1
proton	D	1

- 17 Which of the following statements about atoms of all elements is correct?

- A The electrons are located outside the nucleus.
- B They are not electrically neutral.
- C They all have the same number of protons.
- D They all have neutrons and protons in their nucleus.

- 18 Which of the following is a molecule of an element?

	name	chemical formula
A	carbon monoxide	CO
B	methane	CH ₄
C	ozone	O ₃
D	table salt	NaOH

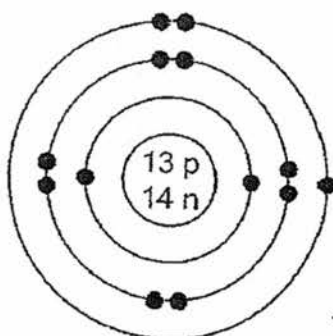
- 19 Which row represents an ion?

	number of protons	number of neutrons	number of electrons
A	1	0	1
B	3	4	3
C	6	6	6
D	11	12	10

- 20 The element Y has the chemical symbol of ${}^{39}_{19}\text{Y}$.
Which statement about this element Y is correct?

- A The number of electrons and neutrons is equal.
- B There are 20 electrons in the atoms of Y.
- C The number of electrons is more than the number of protons.
- D The sum of protons and electrons is 38.

- 21 The diagram shows the structure of an atom of an element.



key

● = electron

n = neutron

p = proton

What is the nucleon number of this element and to which group does it belong?

	nucleon number	group
A	13	III
B	14	V
C	27	III
D	27	V

- 22 Which of the following elements are likely to form negative ions?

- 1: calcium
- 2: nitrogen
- 3: sodium
- 4: sulfur

- A 1 and 3
- B 2 and 4
- C 3 and 4
- D 1, 2 and 3

- 23 Which is the correct formula for nitrogen dioxide?

- A No
- B NO
- C NO₂
- D NO²⁻

24 Which of the following is not a property of an acid?

- A Conducts electricity in aqueous solution.
- B Has a sour taste.
- C Releases a gas when a reactive metal is added to it.
- D Turns damp red litmus paper blue.

25 Which word is missing from the equation?

acid + reactive metal $\rightarrow$ salt +

- A carbon dioxide
- B hydrogen
- C oxygen
- D water

26 Baking powder is dissolved in water. When universal indicator is added to the solution, the indicator turns from green to blue.

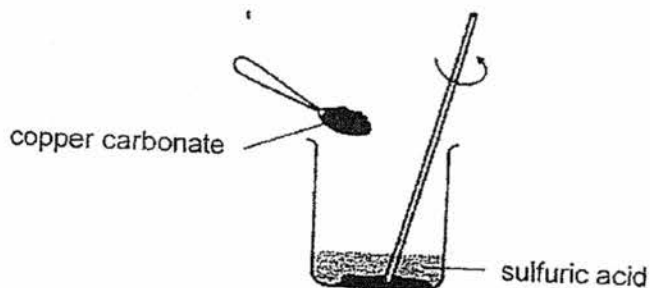
A pH colour chart shows the solution to have a pH of 9.

What can be deduced about the baking powder solution?

- A a strong acid
- B a strong alkali
- C a weak acid
- D a weak alkali

Refer to the following and answer questions 27 and 28.

The following shows a reaction between an acid and a carbonate.



- 27 When the acid reacts completely with copper carbonate, what is the name of the salt formed?
- A copper nitrate
 - B copper chloride
 - C copper hydroxide
 - D copper sulfate
- 28 Which of the following can be used to show that the acid is used up completely in a reaction?
- A The colour of the solution remains blue.
 - B There are some copper(II) carbonate left in the mixture.
 - C The crystals of the salt produced in the reaction start to form.
 - D The solution remains clear.
- 29 Four solutions have the pH values shown in the table.

Solution	P	Q	R	S
pH	2	6	8	10

If two solutions are mixed, which pair must produce an acidic mixture?

- A P and Q
- B P and R
- C P and S
- D Q and R

30 The chart shows the colour ranges of four different indicators.

Which indicator is blue in acidic solution?

indicator	pH value													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
A	yellow → ← blue													
B	— red —→ ← blue → ← yellow —													
C	— red —→ ← blue —													
D	— colourless —→ ← blue —													

Section B

The total mark for this section is 40.

1 Substances may be described as containing

- A a pure element
- B a pure compound
- C a mixture of elements
- D a mixture of elements and compounds

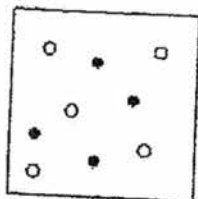
Complete the table by writing the letter corresponding to the most appropriate description for each of the substances listed.

Each letter may be used once, more than once or not at all.

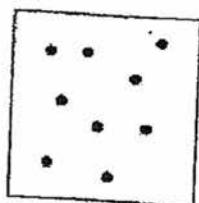
substance	description
e.g. carbon dioxide	B
water	
air	
steel	

[3]

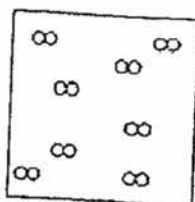
2 In the boxes, different atoms are shown as O and ●.



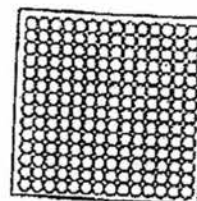
A



B



C



D

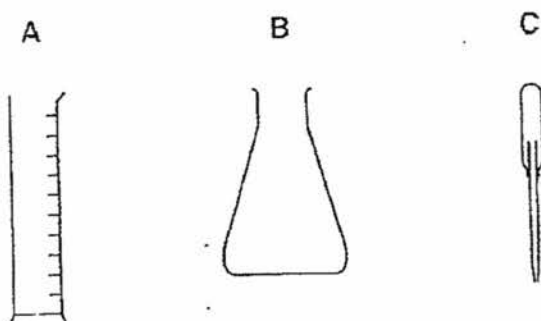
Use A, B, C and D to identify

- (a) a mixture of gases, _____ [1]
- (b) an iron metal, _____ [1]
- (c) argon gas, _____ [1]
- (d) hydrogen gas. _____ [1]

- 3 (a) A student wants to separate the coloured pigments in a plant leaf by chromatography. He grinds the plant leaf and separates the solids from the green solution.

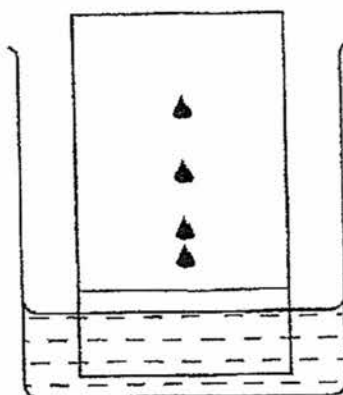
The student takes a drop of the green solution and puts a spot of it onto a piece of chromatography paper.

From the diagrams below, **circle** the letter for the most suitable piece of apparatus for this task.



[1]

- (b) The student sets up the chromatography apparatus. The results are shown in the diagram below.



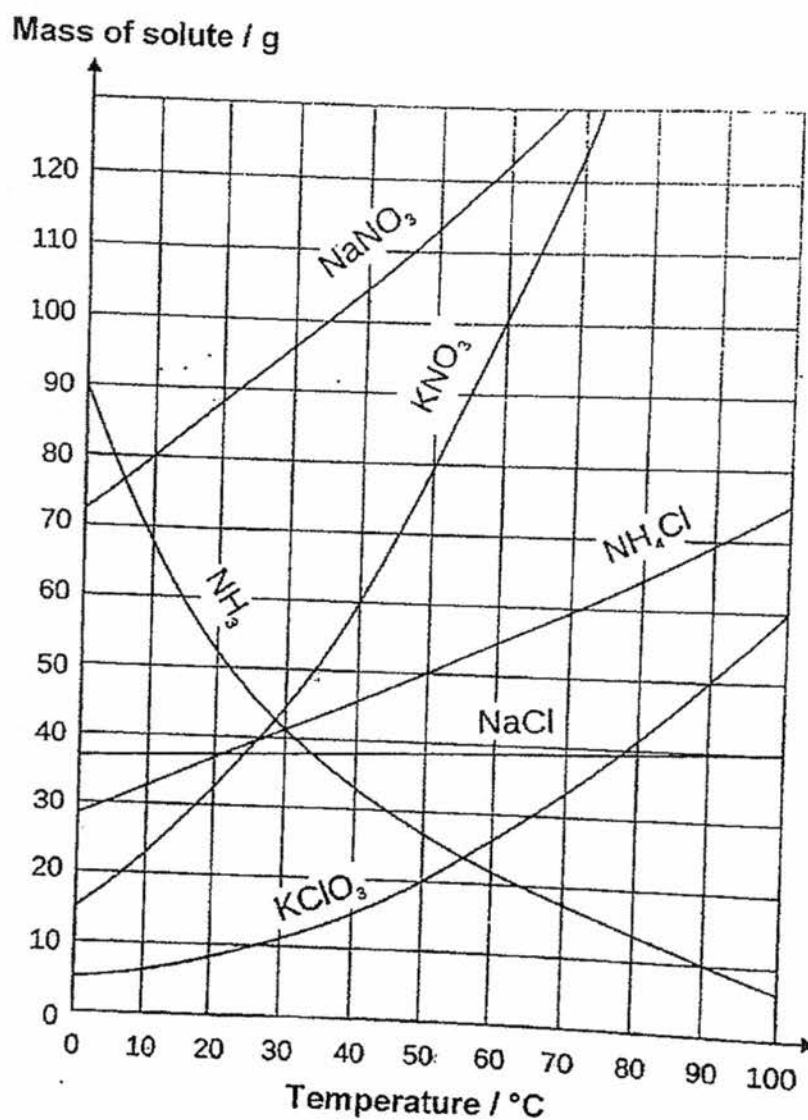
- (i) Label the solvent in the diagram. [1]
- (ii) On the diagram, **draw** and **label** the original position of the spot of green solution. [1]
- (iii) How many pigments were present in the plant leaf?

[1]

- 4 The graph shows the solubility curves of different substances.

Solubility refers to the maximum mass of a solute that can dissolve in 100 g of a solvent at a particular temperature.

The graphs plotted shows the maximum mass of solute that can dissolve in 100 g of water.



By using the solubility curve shown, answer the following questions.

- (a) After looking at the graphs above, Jeremy concluded "when the temperature increases, the mass of solute that can dissolve in a fixed volume of solvent increases as well."

Do you agree with him? Give your reason.

 _____ [2]

- (b) (i) Which substance is the most soluble at 60 °C?

_____ [1]

- (ii) Which two substances show the same solubility at about 30 °C?

_____ [1]

- (iii) Which substance shows that its solubility is least affected by the change in temperature?

_____ [1]

- (c) A saturated solution contains the maximum mass of solute dissolved in a solvent at a particular temperature.

- (i) What is the maximum mass of KClO_3 in 100 g of water at

50 °C, _____

90 °C? _____ [2]

- (ii) Using your answer in (c)(i), deduce the mass of the crystals when the saturated solution of KClO_3 cools from 90 °C to 50 °C.

_____ [1]

- (iii) What is the maximum mass of KClO_3 that can dissolve in 300 g of water at 50 °C?

[1]

- 5 The table gives information about five elements.

element	symbol	proton (atomic) number
lithium	Li	3
carbon	C	6
sodium	Na	11
magnesium	Mg	12
chlorine	Cl	17

- (a) The arrangement of the electrons in one carbon atom can be written as 2, 4.

State, in a similar way, the arrangement of electrons in one atom

(i) lithium, _____ [1]

(ii) sodium, _____ [1]

(iii) Hence, draw the electronic structure of a lithium atom.

[1]

- (b) (i) Write the symbol for a magnesium ion and chloride ion.

magnesium ion _____

chloride ion _____

[2]

- (ii) Write the formula of magnesium chloride.

_____ [1]

- 6 The following diagram shows the pH values of various substances found in the home.

pH	1	2	3	4	5	6	7	8	9	10	11	12	13	14
		lemon juice	vinegar					toothpaste			washing powder	ammonia		

Use the diagram above to answer the following questions.

- (a) Which substance is the most acidic?

_____ [1]

- (b) To show that a substance is acidic, you can use an indicator. Name a suitable indicator.

_____ [1]

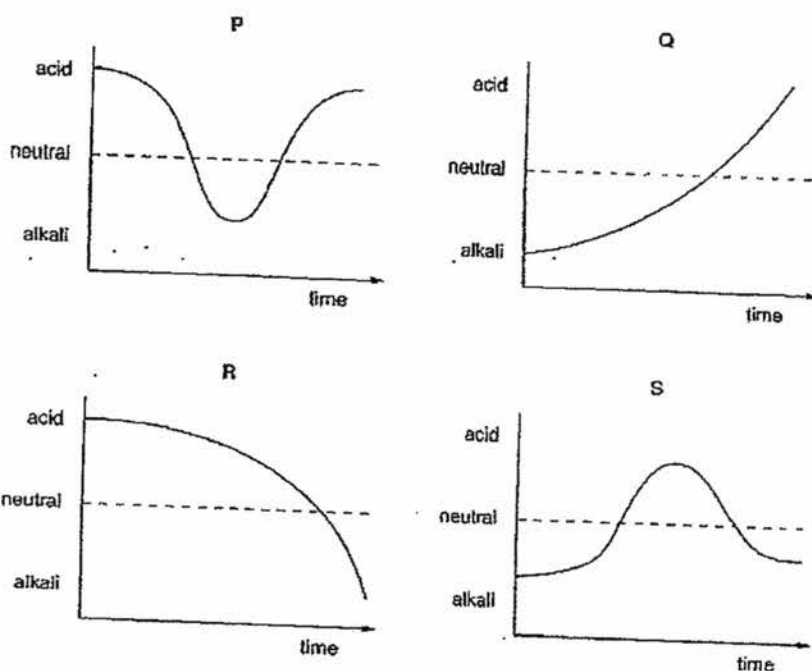
- (c) What colour would this indicator turn in

lemon juice, _____

ammonia? _____ [2]

- 7 The mouth contains saliva which is an alkali. When sweets containing sugar are eaten, bacteria in the mouth change the sugar into acids.

(a) Four graphs are shown below. Circle the letter of the graph which best shows the change in acidity in the mouth during and after eating the sweets.



[1]

- (b) A student eats some sweets and then cleans his teeth with toothpaste. Toothpaste contains an alkali which react with the acid produced by eating the sweets.

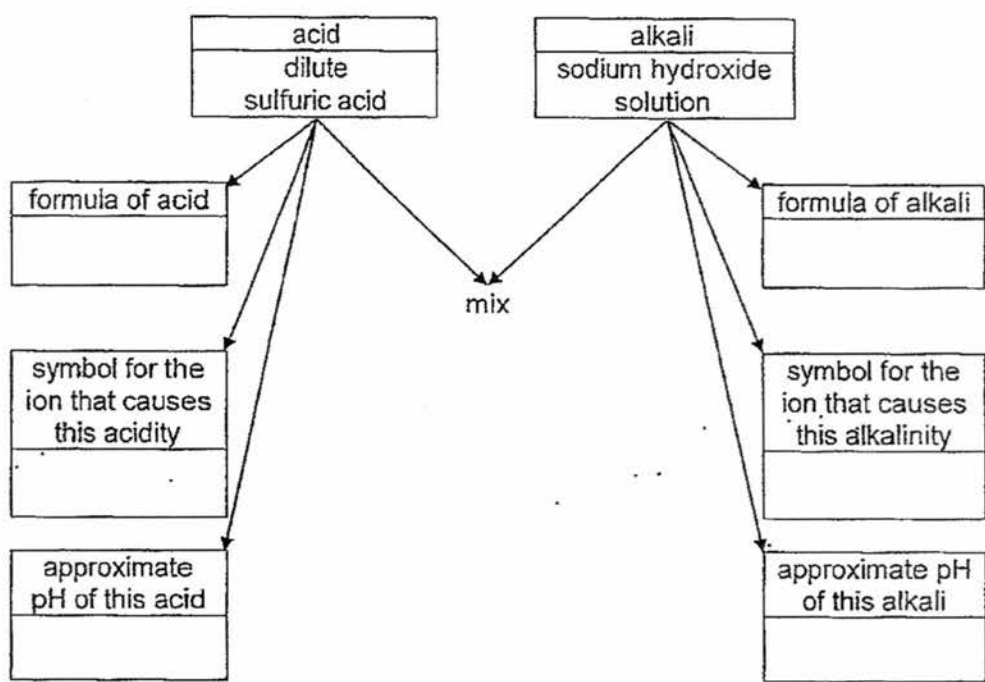
Name this chemical process.

[1]

ZX

- 8 The figure below describes some properties and reactions of an acid and an alkali.

(a) Fill in the empty boxes.



[6]

- (b) Write the word equation for the reaction between dilute sulfuric acid and sodium hydroxide solution.

[2]

End of Paper

The Periodic Table of Elements

Periodic Table of Elements

Group

I	II	III										IV	V	VI	VII	0

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).



KENT RIDGE SECONDARY SCHOOL MID-YEAR EXAMINATION 2017

SCIENCE

BOOKLET 2

SECONDARY 2 EXPRESS

Friday 12 May 2017

2 hours

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Name: _____ () Class: Sec _____

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number clearly in the spaces at the top of this page.

Do not turn open this paper until you are told to do so.

Section C

Answer **three** questions in the spaces provided on the question paper. The last question is presented in an **either/or** form.

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

Use of electronic calculators is allowed.

FOR EXAMINER'S USE	
Q 9	
Q 10	
Q 11 either /or	
TOTAL	30

This Question Paper consists of 10 printed pages, including this page.

Setter: Mrs Roszana Teo

[Turn over

Section C

The total mark for this section is 30.

Answer **three** questions from this section. The last question is in the form of **either/or** and only **one** alternative should be attempted.

- 9 (a) What is an element? Name an example of an element. [2]

.....

.....

- (b) What is a compound? Name an example of a compound. [2]

.....

.....

- (c) A student was carrying out some experiments in the laboratory with three different substances.

substance	composition	test
X	constant	Shiny silvery solid X conducts electricity. When solid X was added to hydrochloric acid, effervescence was observed which extinguished a lighted splint with a 'pop' sound.
Y	varies	5 g of white solid Y was stirred in excess water. Some of the white solid dissolves in the water. The mixture was filtered to remove the remaining solid.
Z	constant	Green solid Z was heated strongly. A black solid was formed and a gas was given off.

For each of the substances X, Y and Z, state whether they are element, compound or mixture and explain with evidence from the above table.

[6]

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- 10 (a) An element has an isotope with the nucleon number of 7. An atom of this isotope has 3 electrons and a nucleus containing two different types of particles.

(i) Give the names of the particles and the number of each particle present in the nucleus.

[2]

.....

.....

(ii) Draw a table with appropriate headings to compare the relative masses and the electrical charges of the particles identified in (a)(i).

[3]

(iii) The element has another isotope with a nucleon number of 6. Describe a similarity and a difference of the particles in the nuclei (plural of nucleus) of these two isotopes.

[2]

.....

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- (b) A sample of solid sodium chloride was found to be contaminated with solid calcium carbonate and solid ammonium chloride. The effects of water, dilute hydrochloric acid and heat on these substances are shown in the table below.

substance	effect of		
	water	dilute hydrochloric acid	heat
sodium chloride	dissolves to produce a colourless solution	dissolves to produce a colourless solution	no effect
calcium carbonate	no effect	reacts to produce a colourless solution	no effect
ammonium chloride	dissolves to produce a colourless solution	dissolves to produce a colourless solution	solid changes to gas upon heating

Describe how you would obtain pure solid sodium chloride from the impure sample of sodium chloride. The first step has been done for you.

- 1) *Heat the solid mixture to remove solid ammonium chloride.*

[3]

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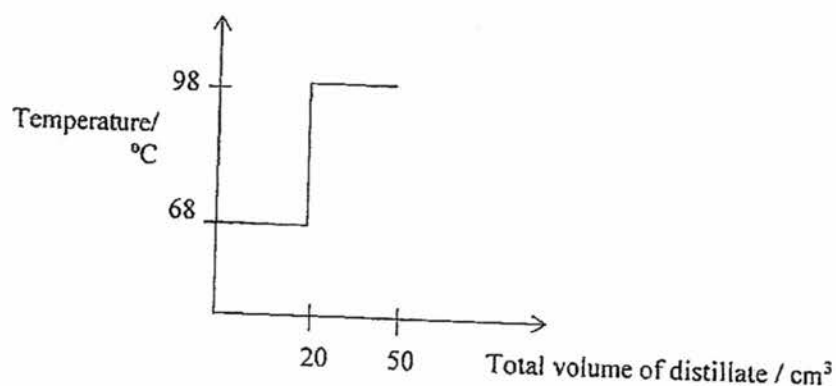
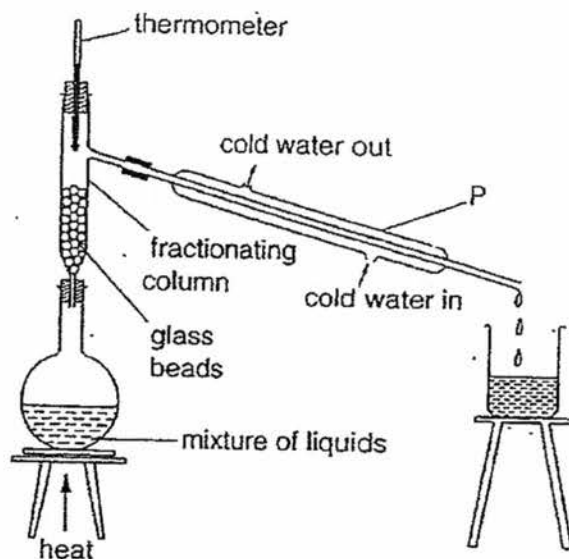
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either

- 11 (a) Hexane and heptane are found in crude oil. Hexane boils at 68°C and heptane boils at 98°C . The following was set up to separate a mixture of these two liquids and the total volume of the distillate was recorded in the graph below.



- (i) What is the name of this method of separation? [1]

- (ii) State the physical property that this method of separation is based on. [1]

- (iii) Which of the two liquids will be collected first? [1]

- (iv) What is the purpose of the piece of apparatus labelled P? [1]

- (v) From the graph, determine the total volume of the distillate that was collected and hence determine the volume of heptane in the mixture. [2]

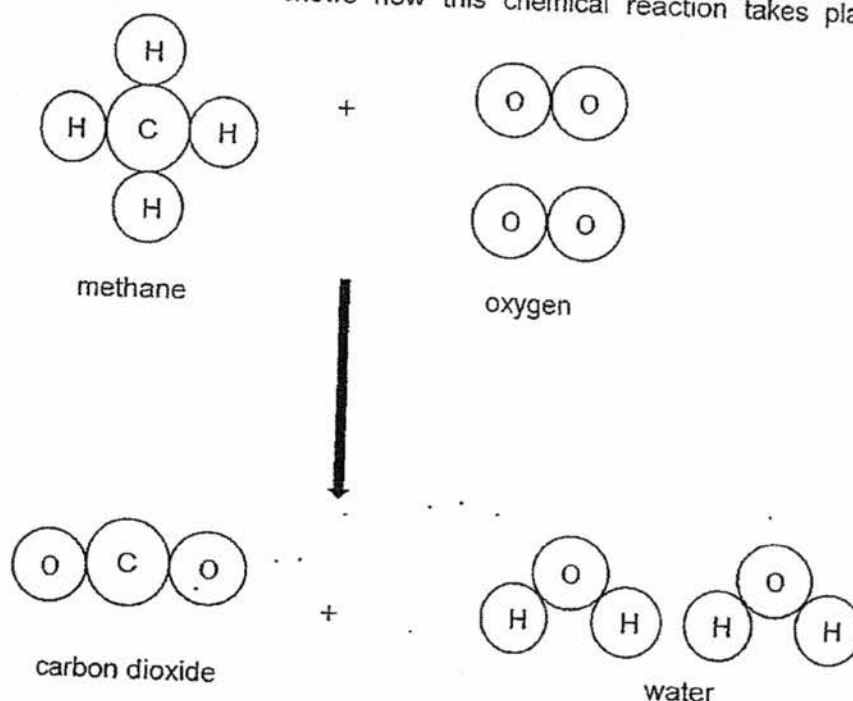
Total volume of distillate iscm³

Volume of heptane iscm³

- (b) Methane is also a type of fuel found in the crude oil. It is often used as fuel in the kitchen for cooking food.
- (i) Is cooking food a chemical reaction? Explain your answer. [1]

.....

- (ii) Methane burns with oxygen gas to provide the energy for cooking food. The diagram below shows how this chemical reaction takes place.



Complete the table.

	number of carbon atoms	number of hydrogen atoms	number of oxygen atoms
before reaction			
after reaction			

Based on the table above, deduce what happens to the number of atoms during a chemical reaction.

[3]

.....

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OR

- 11 A farmer uses water from a pond to water his fields. He finds the pond water has become too acidic. To reduce the acidity, he adds slaked lime (calcium hydroxide) to the pond. He takes pH readings for every two bags of lime added.

The following table shows the farmer's results.

number of bags of lime	pH of pond water
0	4.0
2	4.2
4	4.4
6	4.6
8	7.0
10	12.0
12	12.2
14	12.4
16	12.4
18	12.4

- (a) (i) How many bags of lime are needed to neutralise the acid? [1]

.....

- (ii) Describe a simple test the farmer could use to measure the pH of the pond water. [1]

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.....

.....

.....

- (iii) State the pH value of slaked lime (calcium hydroxide). [1]

.....

- (b) (i) Explain why rainwater in industrial areas is acidic. [1]

.....

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.....

- (ii) Describe briefly one effect acid rain has on the environment. [1]

.....

.....

.....

- (c) A student added calcium carbonate into the sample of acidic pond water in a test-tube. A reaction immediately took place.

- (i) Describe two observations that the student made during the experiment. [2]

.....

.....

- (ii) Name the gas that was produced in the above reaction. [1]

.....

- (iii) Describe a chemical test to identify the gas produced in 11(c)(ii). [2]

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End – of – paper



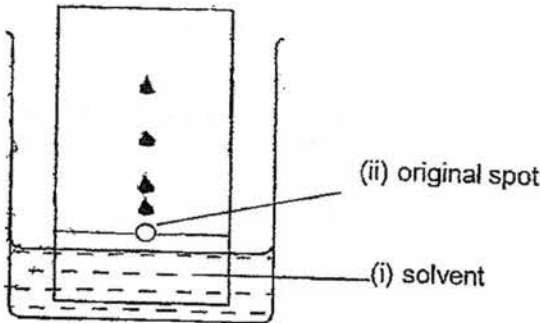
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 Secondary 2 Express
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 SCIENCE
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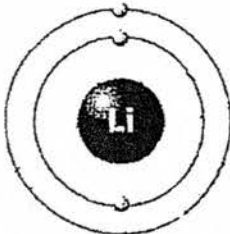
Booklet 1

Section A (30 marks)

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

Section B [40 marks]

S/No.	Answers		Marks										
1	<table border="1"> <thead> <tr> <th>substance</th> <th>description</th> </tr> </thead> <tbody> <tr> <td>carbon dioxide</td> <td>B</td> </tr> <tr> <td>water</td> <td>B</td> </tr> <tr> <td>air</td> <td>D</td> </tr> <tr> <td>steel</td> <td>C</td> </tr> </tbody> </table>		substance	description	carbon dioxide	B	water	B	air	D	steel	C	3
substance	description												
carbon dioxide	B												
water	B												
air	D												
steel	C												
2	(a)	A	1										
	(b)	D	1										
	(c)	B	1										
	(d)	C	1										
3	(a)	Circle letter 'C'	1										
	(b)(i) and (ii)	 Reject if student did not draw and label for part (ii).	2										
	(b)(iii)	4	1										
4	(a)	No For NH_3 <u>Solubility decreases as temperature increases</u> Accept: <i>mass of NH_3 that <u>dissolves</u> <u>decreases</u> instead.</i>	1 1										

		<i>Reject:</i> - student answer yes and even identify NH, has the different graph. No mark awarded. - mass of NH ₃ decreases.	
	(b)(i)	NaNO ₃	1
	(b)(ii)	NH ₄ Cl and NH ₃	1
	(b)(iii)	NaCl	1
	(c)(i)	50 °: 20 g 90 °: 50 g	1 1
	(c)(ii)	30 g	1
	(c)(iii)	60 g	1
5	(a)(i)	2,1	1
	(a)(ii)	2,8,1	1
	(a)(iii)	 <i>Zero mark if use small letter 'l'</i> <i>Reject if student draw a dot at the centre or others.</i>	1
	(b)(i)	Magneisum ion: Mg ²⁺ Chloride ion: Cl ⁻	1 1
	(b)(ii)	MgCl ₂	1
6	(a)	Lemon juice	1
	(b)	Methyl orange / Universal indicator / Blue litmus paper / Litmus paper <i>Reject: red litmus paper</i>	1

(c)	Lemon Juice: Methyl orange - red Universal indicator - red Blue litmus - red Litmus - blue to red Ammonia: Methyl orange - yellow Universal indicator - blue / purple Blue litmus - remains blue Litmus - red to blue	1
		1
7	(a)	Circle S
(b)	Neutralisation	1
		1
8	(a)	
1 m each Max 6		

(b)	Sulfuric acid + sodium hydroxide $\rightarrow$ sodium sulfate + water When the student written both sodium sulfate and water, 1m is penalised if: • Student name other substance as products; • Equal or double arrow was used. • Reactants were not written	1 m for each product Max 2

KENT RIDGE SECONDARY SCHOOL
Secondary 2 Express
Mid-year Examination 2017
Science
Mark scheme

Booklet 2

Section C

		Answers	Marks						
9	a	An element is a substance that cannot be broken down into simpler substance by chemical means. Any example; Accept chemical formula	1						
	b	A compound is a substance that is made up of two or more different elements chemically combined.; Accept:more elements... different types of elements.. ...chemically joined together.... Any example; Accept chemical formula	1						
	c	X is an element; Evidence: X is a metal as it is shiny silvery solid, conducts electricity and reacts with acid. The metal is an element as it has a constant composition. Y is a mixture; Evidence: either 1) Y does not have a fixed composition; or 2) Y can be separated by physical means. Y is separated by dissolving in water and then by filtration; or 3) Y has the physical properties of its components. One substance in Y is soluble in water but the other substance in Y is not soluble in water. Z is a compound; Evidence: Z can be decomposed into simpler substances.	1 1 1 1 1 1						
10	(ai)	<table border="1"> <thead> <tr> <th></th> <th>Number of particles</th> </tr> </thead> <tbody> <tr> <td>protons</td> <td>3</td> </tr> <tr> <td>neutrons</td> <td>4</td> </tr> </tbody> </table>		Number of particles	protons	3	neutrons	4	2
	Number of particles								
protons	3								
neutrons	4								

		Answers			Marks	
		1m for stating protons and neutrons; 1m for stating the correct numbers				
	(aii)		Relative mass	Electrical charge	2	
		Proton	1	+1		
		neutron	1	0		
		1 m for correct mass; 1m for corr charge.				
		Accept if the values are stated for the total number of protons and total number of neutrons,				
	(aiii)	They have the <u>same number of protons</u> but <u>different number of neutrons</u> ;			1	
		Both have <u>3 protons</u> but one isotope has <u>4 neutrons</u> and the other isotope has <u>3 neutrons</u> ;			1	
	(b)	1. 2. <u>Add water</u> ; to the remaining solid mixture of calcium carbonate and sodium chloride and stir. 3. <u>Pour</u> the <u>mixture</u> into a <u>filter funnel lined with filter paper</u> . Collect the <u>sodium chloride solution as the filtrate</u> 4. Then pour the sodium chloride solution into an evaporating dish and <u>heat it to complete dryness</u> ; to obtain a pure solid sodium sodium chloride crystals.			[3] 1 mark for each correct step	
11	(ai)	Fractional distillation			1	
	(aii)	Boiling point;			1	
	(aiii)	hexane			1	
	(aiv)	To cool down the vapour into liquid.			1	
	(av)	Total volume of distillate = 50 cm ³ ; Volume of hexane = 20 cm ³ Volume of heptane = 50-20 = 30 cm ³ ;			1 1	
	(bi)	Cooking food is a chemical reaction because new products are formed. Accept : It is a chemical reaction because food before or after cooking looks different.			1	
	(bii)		Number of carbon	Number of hydrogen	Number of oxygen	2 (table)
		Before reaction	1	4	4	
		After reaction	1	4	4	

Answers			Marks
		1 m for entering numbers before reaction correctly. 1 m for entering numbers after reaction correctly. <u>The number of atoms</u> before and after a reaction is <u>the same</u> .	1
12	(ai)	8 bags;	1
	(aii)	Insert the probe of <u>pH meter</u> into the solution. The reading will shows the pH of the solution. or Add a few drops of <u>Universal Indicator</u> into the solution and compare the colour of the solution with a <u>colour chart</u> to deduce the pH. Accept: Use pH meter.	1
	(aiii)	pH12.4	1
	(bi)	Acidic gases such as <u>sulfur dioxide / oxides of nitrogen</u> were produced in power stations and factories, which <u>dissolves in rainwater</u> to form acid rain.	1
	(bii)	Any effect: Corrode buildings/ damage vegetation/ kill aquatic animals Reject : destroy buildings	1
	(ci)	Effervescence / Bubbles of gas was seen; Calcium carbonate <u>dissolves</u> in the acid/ the mass (accept amount) of calcium carbonate gets lesser.	1 1
	(cii)	Carbon dioxide	1
	(ciii)	Bubble the gas through <u>limewater</u> . <u>White precipitate</u> was formed with limewater indicates carbon dioxide was present.	1 1