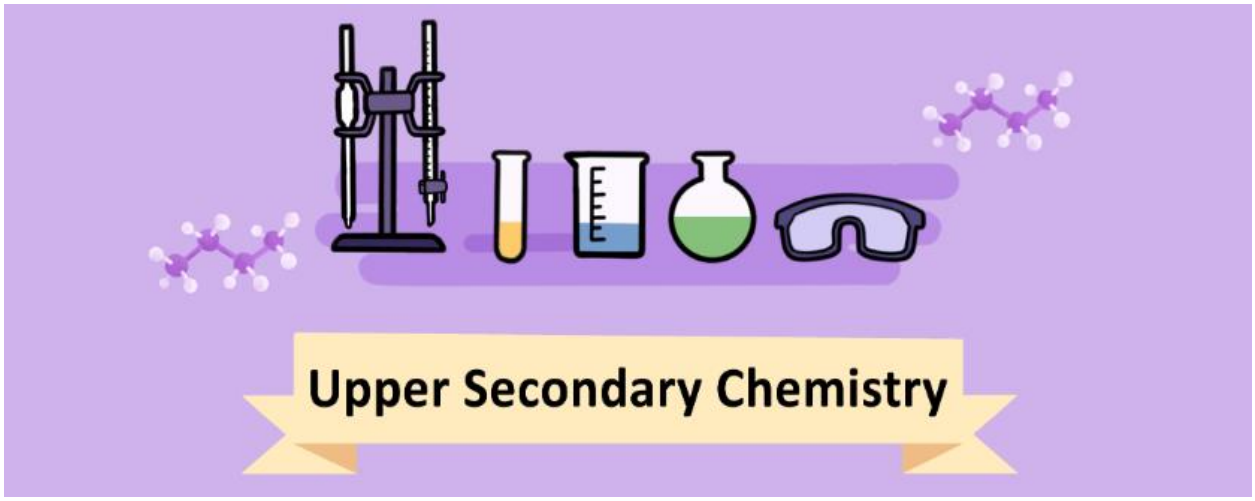


END-OF-YEAR HOLIDAY ASSIGNMENT

Science (Chemistry) SEC 3E/NA

NAME: _____ ( ) CLASS: _____

This is a revision of lower secondary science and preparation for Sec 3 Chemistry.
Place a tick in the table when you complete the sections.

- Read chapters 1, 2 and 5 of the Chemistry textbook
- Complete SLS lessons (by 15 Dec)
- Complete worksheets

	Chapter	Textbook chapter	SLS lessons	Worksheets	Mark
1	Experimental Chemistry • apparatus and gas collection				/15
	• separation and purification techniques				/20
2	The Particulate Nature of Matter • Kinetic Particle Theory				/15
5	Elements, Compounds and Mixtures				/20

CHAPTER 1: EXPERIMENTAL CHEMISTRY

APPARATUS & GAS COLLECTION

(a) name appropriate apparatus for the measurement of time, temperature, mass and volume; including burettes, pipettes, measuring cylinders and gas syringes

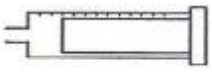
(b) suggest suitable apparatus, given relevant information, for a variety of simple experiments, including collection of gases *and measurement of rates of reaction*

Apparatus for measurement

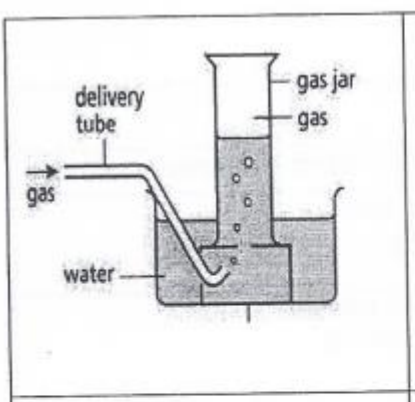
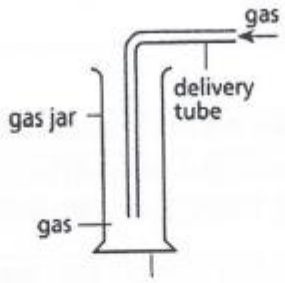
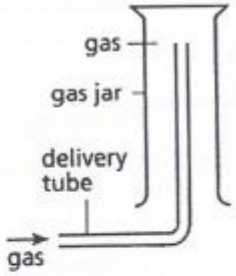
<table>
<tr><th>physical quantities</th><th>name and symbol of SI unit</th><th>other units</th><th>apparatus used</th></tr>
<tr><td>mass</td><td>kilogram(kg)</td><td>gram(g)</td><td>electronic balance</td></tr>
<tr><td>time</td><td>second(s)</td><td>minute(min)</td><td>stopwatch</td></tr>
<tr><td>temperature</td><td>Kelvin(K)</td><td>degree Celsius(°C)</td><td>thermometer</td></tr>
<tr><td rowspan="2">volume</td><td rowspan="2">cubic metre (m^3)</td><td rowspan="2">cubic centimetre (cm^3)

milli-litre (ml)

litre (l)</td><td><u>volume of liquids</u>
1. measuring cylinder
measures to the nearest 0.5 cm^3
e.g. 12.0 cm^3, 50.5 cm^3
 

2. pipette
accurately measures out <u>fixed</u> volumes of liquids e.g. 20.0 cm^3 or 25.0 cm^3
 
3. burette
accurately measures out volume of liquid to nearest 0.05 cm^3
e.g. 24.00 cm^3, 12.45 cm^3, 34.10 cm^3
 
** Beaker is only used to measure approximate volumes of liquids or for boiling of liquids.**
e.g. approximately 100 cm^3, 200 cm^3, 250 cm^3</td></tr>
<tr><td><u>volume of gases</u>
gas syringe
  </td></tr>
</table>

Gas collection methods

		
Displacement of water	**Downward delivery**	**Upward delivery**
Property of gases: **Insoluble in water** or slightly soluble in water	Property of gases: (a) Denser than air	Property of gases: (a) Less dense than air
gases: carbon dioxide (CO_2), oxygen (O_2), hydrogen (H_2)	gases chlorine gas (Cl_2), hydrogen chloride gas (HCl)	gases: ammonia gas (NH_3)

Complete the questions below.

1 Name the apparatus that is suitable for:

(a) collecting 50.0 cm^3 of oxygen gas

[1]

(b) measuring out 25.0 cm^3 of sulfuric acid

[1]

(c) measuring accurately 32.50 cm^3 of sodium hydroxide

[1]

(d) clamping a burette

[1]

(e) measuring 3.50 g of copper(II) sulfate crystals

[1]

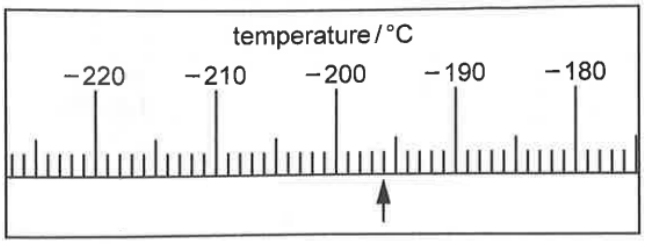
(f) measuring the time it takes for a reaction to complete

[1]

2 Name three key apparatus required for dissolving 5 g of sodium chloride in 100 cm^3 of water

[3]

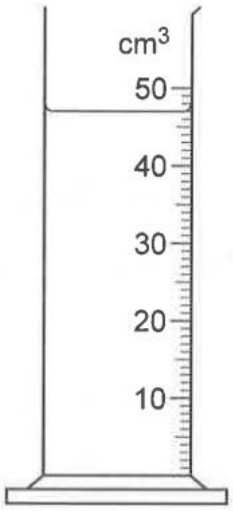
3 Temperatures below zero can be measured using a thermometer.
Part of the thermometer scale is shown below.



Record the reading shown by the arrow. _____ °C

[1]

4 What is the volume of liquid shown in the measuring cylinder?



Volume = _____ cm^3

[1]

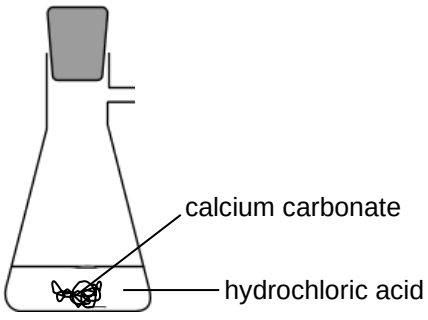
5 The method of collecting a gas depends on the physical properties of the gas.
State these two properties.

1. .....

2. .....

[2]

6 Carbon dioxide is given off when calcium carbonate reacts with hydrochloric acid.
Complete and label the diagram below to show how the volume of carbon dioxide produced can be collected and measured.



[2]

SEPARATION & PURIFICATION TECHNIQUES

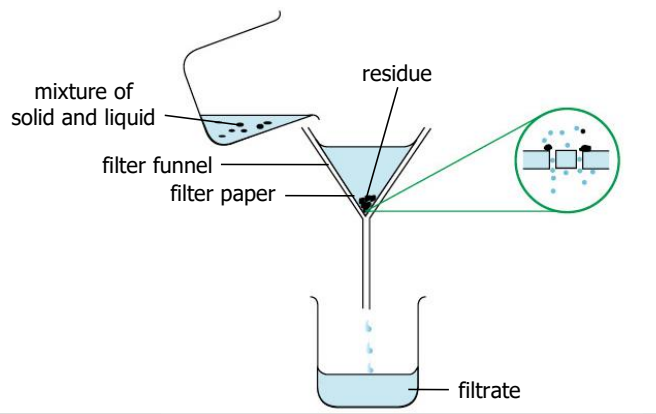
(a) describe methods of separation and purification for the components of mixtures, to include:
  (i) use of a suitable solvent, filtration and crystallisation or evaporation
  (ii) distillation and fractional distillation
  (iii) paper chromatography

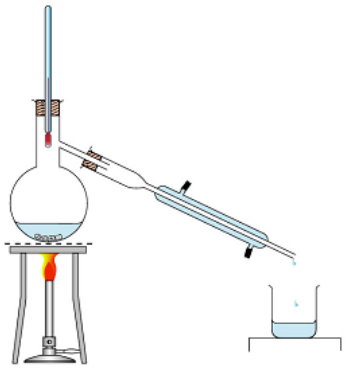
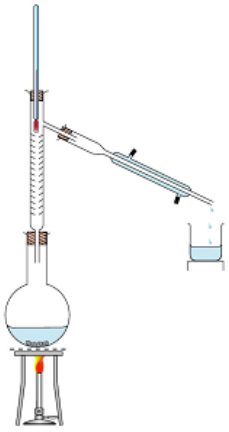
(b) suggest suitable separation and purification methods, given information about the substances involved in the following types of mixtures:
  (i) solid-solid
  (ii) solid-liquid
  (iii) liquid-liquid (miscible)

(c) interpret paper chromatograms including comparison with 'known' samples

(d) deduce from given melting point and boiling point data the identities of substances and their purity

Complete the table below by filling in the blanks.

No	Term	Definition
1.	Pure substance	is made up of one single element or compound and not mixed with other substances. Pure substances have f_____ melting and boiling points. Impurities will l_____ the melting point of a substance and raise its b_____ point. There will be a range of temperatures at which it melts or boils.
2.	Mixture	is made up of two or more substances that are not c_____ c_____.
3.	_____	is used to separate insoluble solid particles (residue) from a liquid (filtrate). 
4.	Evaporation to dryness	is used to obtain a soluble solid (residue) from a solution by heating the solution until all the water has boiled off. The soluble solid must not d_____ upon strong heating.
5.	_____	is the substance that is dissolved in a solvent to form a solution.
6.	_____	is the liquid that dissolves the solute to form a solution.

7.	Crystallisation	is used for obtaining a pure solid sample from its saturated solution. This is the method to use when substances can decompose on heating. Steps for crystallisation: 1. Heat solution to s_____ 2. C_____ solution to allow for crystals to form 3. F_____ to collect crystals 4. Wash crystals with a small volume of cold d_____ water 5. Dry crystals between pieces of filter paper
8.	Saturated solution	refers to the solution whereby no more additional solid can be dissolved in the solution.
9.	_____ distillation	is used to separate a pure liquid (distillate) from a solution. • The liquid with the lower boiling point will distil out first • The bulb of the thermometer must be placed at the entrance of the condenser to provide the most accurate temperature of the gaseous substance that will be condensed and distilled out • Boiling chips smoothen out the boiling • Cold water enters from bottom leave at top to ensure that all vapour is condensed. (maximize the cooling effect) 
10.	_____ distillation	is used to separate a mixture of miscible liquids with different b_____ p_____. There is an additional fractionating column containing many glass beads which provides a large surface area for the condensation of vapour. 
11.	_____	is the method of separating two or more components that have different s_____ in the same solvent. This method can also be used to identify the presence or absence of substances. More soluble substances will travel f_____ away from the start line.
12.	Chromatogram	is the chromatography paper with the separated components.

Complete the questions below.

1 State the most suitable method for the following processes:

(a) to obtain pure water from soft drinks _____[1]

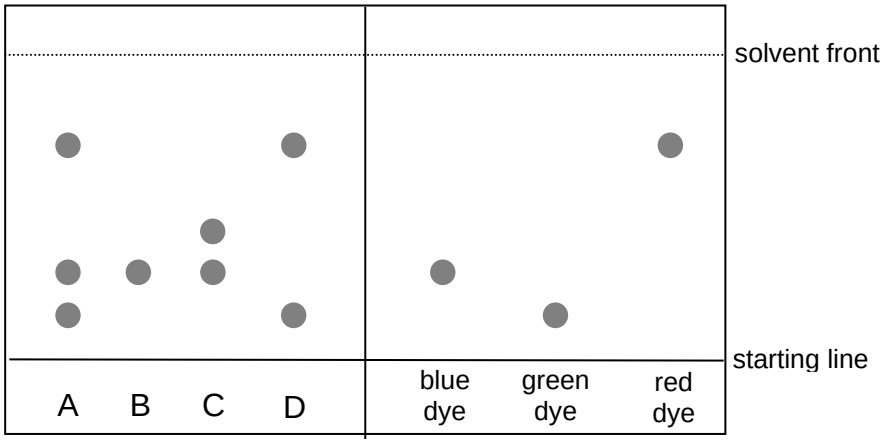
(b) to separate kerosene from crude oil _____[1]

(c) to separate tea leaves from tea _____[1]

(d) to obtain pure sugar from sugar solution _____[1]

(e) to obtain oxygen from liquified air _____[1]

2 The diagram below shows a chromatography obtained using solutions of three single dyes (blue, green and red) and four other solutions (**A**, **B**, **C** and **D**).



(a) Which solution(s) **A, B, C** or **D**

(i) is a pure substance? _____[1]

(ii) contains green and red dyes only? _____[1]

(iii) contains a dye other than blue, green and red dyes? _____[1]

(b) Which dye (blue, green or red) is the most soluble in water? Explain.

.....

[2]

.....

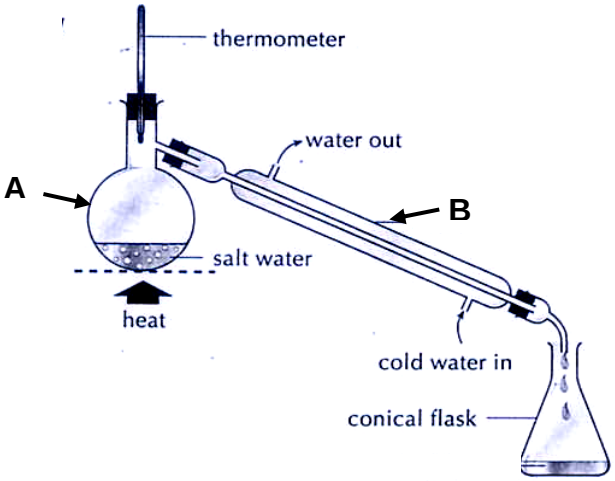
(c) Explain why the start line should be drawn with a pencil.

.....

[1]

.....

3 The diagram below shows apparatus that is used to obtain pure water from sea water.



(a) Name the state change that is taking place in **A**.

[1]

(b) What is the purpose of apparatus **B**?

[1]

(c) What temperature does the thermometer show when water is being distilled out?

[1]

(d) Briefly describe how you could find out whether the water collected in the conical flask is pure.

[1]

4 Glauber's Salt is a white solid that is soluble in water. It is found in the ground mixed with sand. Describe how you would obtain pure and dry crystals of Glauber's Salt from this mixture. (Hint: There are 7 key steps.)

[5]

Chapter 2: Kinetic Particle Theory

(a) describe the solid, liquid and gaseous states of matter and explain their interconversion in terms of the kinetic particle theory and of the energy changes involved

Complete the table below by filling in the blanks.

No	Term	Definition
1	Kinetic particle theory	It states that all matter is made up of tiny particles and that these particles are in constant random motion.
2	_____	A process by which a solid takes in heat to change to a liquid. Melting point is the temperature at which a solid becomes a liquid.
3	_____	A process by which a liquid gives out heat to change to a solid. Freezing point is the temperature at which a liquid becomes a solid.
4	_____	A process by which a liquid takes in heat to change to a gas. Boiling point is the temperature at which a liquid becomes a gas.
5	_____	A process by which a liquid takes in heat to change to a gas at temperature below boiling point at the surface of the liquid.
6	_____	A process by which a gas gives out heat to change its physical state to a liquid.

During a change in state, the temperature remains constant.

- During melting and boiling, energy is taken in by the particles to o_____ the forces of a_____ between particles.
- During freezing and condensation, energy is given out as the particles are attracted to each other.

Complete the table about the three states of matter.

	Solid	Liquid	Gas
Shape, Volume, Compressibility	Fixed shape, fixed volume, cannot be compressed	No fixed shape, fixed volume, cannot be compressed	No fixed shape, no fixed volume, can be compressed
Draw a diagram to show the arrangement of particles			
Forces of attraction			
Arrangement			
Motion of particles			
Energy (kinetic) of particles	Very low	Low	High

Complete the questions below.

1 The boiling and melting points of the four substances are given in the table below.

substance	melting point / ^{o}C	boiling point / ^{o}C	physical state at 20 ^{o}C	physical state at -100 ^{o}C
ethane	-183	-89		
nitrogen	-210	-196		gas
iodine	114	184	solid	
titanium	1941	3287		

(a) Complete the table by stating the physical states of each substance at 20 ^{o}C and -100 ^{o}C. [3]

(b) Which substance exists in the liquid state over the largest range of temperature?

[1]

2 Sodium metal has a melting point of 371 ^{o}C and boiling point of 883 ^{o}C. It is being heated from room temperature to 235 ^{o}C.

(a) What is the physical state of sodium metal at 235 ^{o}C? _____ [1]

(b) Draw the arrangement of the particles of sodium at

(i) room temperature

(ii) 890 ^{o}C

[2]

3 Precious metal, gold, has a melting point of 1064 ^{o}C and boiling point of 2856 ^{o}C.

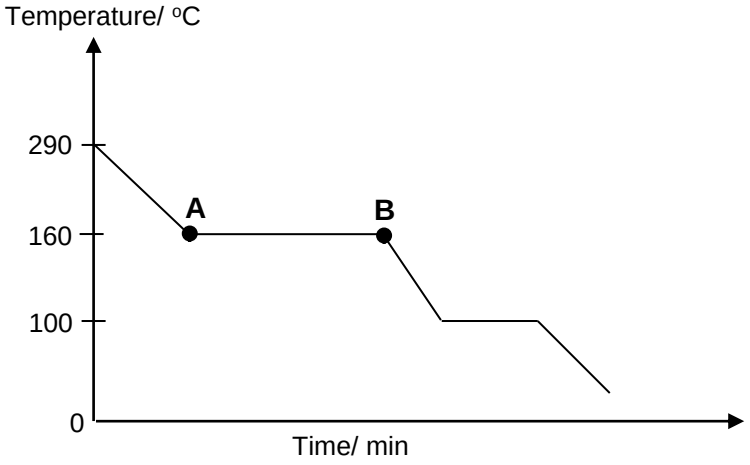
(a) The physical state of gold at room temperature is _____. [1]

(b) Gold will in a physical state of _____ at 1560 ^{o}C. [1]

(c) Describe the arrangement and arrangement of gold particles at 100 ^{o}C.

[2]

4 Look at this cooling curve for substance **X**.



(a) Name the process happening at point **A** to **B**. _____[1]

(b) Name the states of matter present at point **A** to **B**. _____[1]

(c) Describe the changes in arrangement and movement of particles in **X** when freezing occurs.

.....

.....

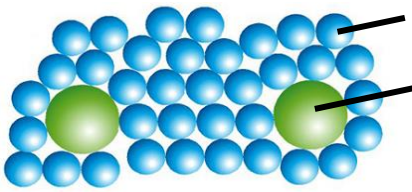
[2]

.....

CHAPTER 5: ELEMENTS, COMPOUNDS & MIXTURES

(a) describe the differences between elements, compounds and mixtures
(b) describe the general physical properties of metals as solids having high melting and boiling points, malleable and good conductors of heat and electricity
(c) describe an alloy as a mixture of a metal with another element, e.g. brass; stainless steel
(d) identify representations of metals and alloys from diagrams of structures

Complete the table below by filling in the blanks.

No	Term	Definition
1	_____	is a pure substance that cannot be broken down into two or more simpler substances by chemical processes.
2	_____	are the smallest particles of an element that have the chemical properties of that element.
3	_____	is a group of two or more atoms that are chemically joined together.
4	_____	is a pure substance containing two or more elements that are chemically combined in a fixed ratio.
5	_____	is made up of two or more substances that are not chemically combined.
6	_____	It is a m_____ of a metal with one or a few other elements. 

Differences between a compound and a mixture:

	compound	mixture
separation	can be separated into its constituents by _____ _____	can be separated into its constituents by _____ _____
properties	_____ from its constituents	_____ as its constituents
energy change	usually there is energy change	usually no energy change
composition	constituents are combined in a _____	constituents are combined in _____

Complete the questions below.

1 Circle the molecule that contains more atoms.

(a) HC*l* or POBr

(b) C_3H_8 or C_2H_5OH

(c) CH_3COOH or C_6H_6

[2]

2 Circle the molecule that contains more types of elements.

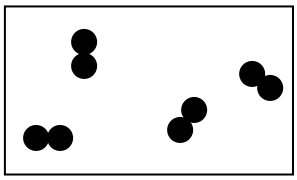
(a) HC*l* or POBr

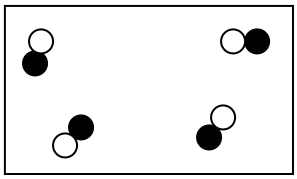
(b) C_3H_8 or C_2H_5OH

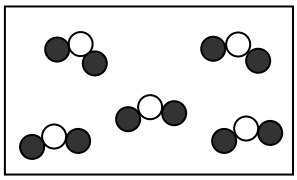
(c) CH_3COOH or C_6H_6 [2]

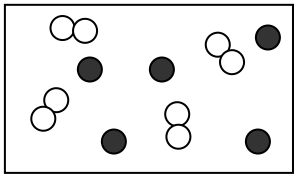
3 Identify the description that best represents each diagram and write the correct description in the corresponding blank.

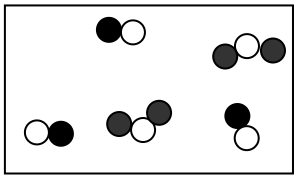
A mixture of compounds	An element	A mixture of elements
A compound made up of two atoms	A compound made up of three atoms	

(a)  _____

(b)  _____

(c)  _____

(d)  _____

(e)  _____

[5]

4 Classify the following as elements, compounds or mixtures.

(a) air _____

(b) iodine _____

(c) sodium _____

(d) brass _____

(e) water _____

(f) ammonia _____

(g) sodium chloride _____

(h) steel _____

[8]

5 Draw a diagram representation of nitrogen (N_2) gas.
(use ◯ to represent nitrogen atoms)

[1]

6 Draw a diagram representation of carbon dioxide (CO_2) gas.
(use ◯ to represent carbon atoms and ● to represent oxygen atoms)

[1]

7 Draw a diagram representation of a mixture of chlorine (Cl_2) and helium (He) gas.
(use ◯ to represent chlorine atoms and ● to represent helium atoms)

[1]