

## **WARNING**

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Family Name					
Given Name/s					
Student Number					
Teaching Period	Semester 1, 2019				

SCH104 – Introductory Chemistry A	<b>DURATION</b>	
	Reading Time:	<b>10</b> minutes
	Writing Time:	<b>180</b> minutes
<b>INSTRUCTIONS TO CANDIDATES</b>		
<p><b>Section A</b> must be answered on the multiple choice answer sheet provided and must be handed in with your answer booklet. Total Marks:50</p> <p><b>Section B</b> to be answered must be answered in the answer booklet provided.</p> <p>Periodic table and Formula sheet are attached at the end of the exam paper. Total Marks:50</p>		
<b>EXAM CONDITIONS</b>		
<p><u>You may begin writing from the commencement of the examination session.</u> The reading time indicated above is provided as a guide only.</p>		
This is a CLOSED BOOK examination		
Any calculator is permitted		
No handwritten notes are permitted		
No dictionaries are permitted		
<b>ADDITIONAL AUTHORISED MATERIALS</b>	<b>EXAMINATION MATERIALS TO BE SUPPLIED</b>	
No additional printed material is permitted	1 x 16 Page Book 1 x Scrap Paper College Multiple Choice Answer Sheet Formula Sheet/s	

THIS EXAMINATION IS PRINTED  
DOUBLE-SIDED.

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**Section A**  
**Multiple Choice Questions**

This section should be answered on the **multiple choice booklet** provided. Please ensure that your name and student number is written (and circle filled in) on the **multiple choice booklet** and placed in the completed answer Booklet.

**1 mark** for each question. **Total Marks for this section: 50**

**Suggested Time allocation for Section A: 75 minutes**

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**Section B**  
**Short Answer Questions**  
**Answer all 5 questions.**

**Total No of Marks for this section: 50 marks**

This section should be answered in the Answer Booklet provided.

**Show all formulas and working. Final numerical answers should be expressed in scientific notation and rounded off to the appropriate significant figures.**

Marks for each question are indicated. Suggested Time allocation for Section B: 105 minutes

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**Question 1**

- (a) If you are given a mixture of salt and sand, what physical properties of these substances would you use to separate the mixture into two pure substances (sand and water)? Explain the process of separation?  
[3 marks]
- (b) A glass object has a density of  $2.05 \text{ g/cm}^3$ . If the glass object weighing  $20.66 \text{ g}$  is dropped into a graduated cylinder containing  $20.00 \text{ mL}$  of water, what will be the new water level?  
[2 marks]
- (c) The temperature of a metal plate weighing  $25.35 \text{ g}$  changes from  $25.0^\circ\text{C}$  to  $45.0^\circ\text{C}$  when supplied  $105 \text{ J}$  of heat. Calculate the specific heat of this metal plate that appears like silver. Is the plate made of pure silver? [Hint: specific heat of pure silver is  $0.24 \text{ J/g}\cdot^\circ\text{C}$ ]  
[3 marks]
- (d) Which of the following metals would you use to make fence posts? Explain your answer using the data provided in the following table.

Metal	Specific heat (J/K.g)
Al	0.903
Fe	0.449
Cu	0.385
Au	0.129

[2 marks]

## Question 2

(a) Name the following compounds :-

- (i)  $\text{CaCl}_2$
- (ii)  $\text{N}_2\text{O}_5$
- (iii)  $\text{FePO}_4$

[3 marks]

(b) Give the formulae for the following compounds:-

- (i) nitrogen trichloride
- (ii) diboron trioxide
- (iii) nickle(II) oxide

[3 marks]

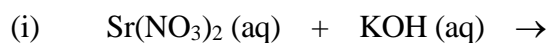
(c) Complete the following table for the element Sulphur.

- (i) Number of protons
- (ii) Number of electrons in neutral atom
- (iii) Group number in periodic table
- (iv) Formula of a normal ion formed by this atom
- (v) Full electronic configuration of this atom
- (vi) number of valence electrons in this atom

[4 marks]

### Question 3

- (a) Give complete **balanced** chemical equations for the following reactions & **identify** as precipitation (P) or acid-base (AB) or oxidation-reduction reaction (OR):-



(ii) Strontium metal reacts with oxygen gas producing a white crystalline solid.

(iii) Carbon dioxide gas reacts with calcium hydroxide solution producing a white precipitate.

(iv) Nitric acid reacts with calcium hydroxide producing a salt and water.

[6 marks]

- (b) Calculate the molar mass of fructose ( $\text{C}_6\text{H}_{12}\text{O}_6$ ).

[1 marks]

- (c) Find the number of moles of fructose and number of carbon atoms present in 2.50 g of fructose ( $\text{C}_6\text{H}_{12}\text{O}_6$ )?

[3 marks]

#### Question 4.

- (a) When fructose ( $C_6H_{12}O_6$ ) is burned in excess of oxygen it forms carbon dioxide and water. What mass of carbon dioxide will be produced when 2.50g of fructose completely burns?  
[2 marks]
- (b) Calculate the concentration (molarity) of a solution prepared by dissolving 2.5 g of fructose ( $C_6H_{12}O_6$ ) in enough water to prepare 200.0 mL of solution.  
[2 marks]
- (c) What is the empirical formula of fructose ( $C_6H_{12}O_6$ )?  
[1 marks]
- (d) Draw Lewis structures and then using VSEPR theory, predict the structure of the following molecule and clearly indicate the bond angle.  
[3 marks]
- (i)  $CCl_4$
- (ii)  $SiO_2$
- (e) What is a covalent bond? Briefly explain how it differs from an ionic bond?  
[2 marks]



### Question 5

(a) Give the formulae of:

- (i) Sulfuric acid
- (ii) Nitrous acid

[2 marks]

(b) Calculate the pH and pOH of the solution with a  $H^+$  ion concentration of  $2.20 \times 10^{-6}$  mol/L.

[2 marks]

(c) Name the following functional groups.

- (i)  $-CH_2OH$
- (ii)  $-COOH$
- (iii)  $-CH_2-O-CH_2-$
- (iv)  $-CO-$

[2 marks]

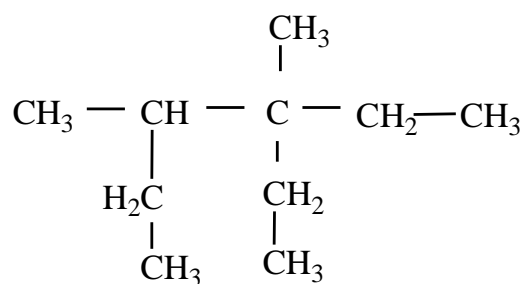
(d) Give the structural formula of the following:

- (i) 2-bromo-pentane
- (ii) pentan-2-ol

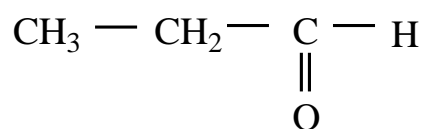
[2 marks]

(e) Name the following organic compounds:

(i)



(ii)



[2 marks]

End of Examination paper

## Some constants:

$$0^{\circ}\text{C} = 273.15\text{K}, 1\text{cal} = 4.184\text{ J}, N_{\text{A}} = 6.022 \times 10^{23}$$

## Some common polyatomic ions

Ion	Name	Ion	Name
$\text{NH}_4^+$	ammonium	$\text{CO}_3^{2-}$	carbonate
$\text{NO}_2^-$	nitrite	$\text{HCO}_3^-$	hydrogen carbonate (bicarbonate is a widely used common name)
$\text{NO}_3^-$	nitrate		
$\text{SO}_3^{2-}$	sulfite	$\text{ClO}^-$	hypochlorite
$\text{SO}_4^{2-}$	sulfate	$\text{ClO}_2^-$	chlorite
$\text{HSO}_4^-$	hydrogen sulfate (bisulfate is a widely used common name)	$\text{ClO}_3^-$	chlorate
$\text{OH}^-$	hydroxide	$\text{ClO}_4^-$	perchlorate
$\text{CN}^-$	cyanide	$\text{C}_2\text{H}_3\text{O}_2^-$	acetate
$\text{PO}_4^{3-}$	phosphate	$\text{MnO}_4^-$	permanganate
$\text{HPO}_4^{2-}$	hydrogen phosphate	$\text{Cr}_2\text{O}_7^{2-}$	dichromate
$\text{H}_2\text{PO}_4^-$	dihydrogen phosphate	$\text{CrO}_4^{2-}$	chromate
		$\text{O}_2^{2-}$	peroxide

## Solubility Table

(a) Soluble compounds

$\text{NO}_3^-$  salts

$\text{Na}^+, \text{K}^+, \text{NH}_4^+$  salts

$\text{Cl}^-, \text{Br}^-, \text{I}^-$  salts

Except for those containing

$\text{Ag}^+, \text{Hg}_2^{2+}, \text{Pb}^{2+}$

$\text{SO}_4^{2-}$  salts

Except for those containing

$\text{Ba}^{2+}, \text{Pb}^{2+}, \text{Ca}^{2+}$

(b) Insoluble compounds

$\text{S}^{2-}, \text{CO}_3^{2-}, \text{PO}_4^{3-}$  salts

$\text{OH}^-$  salts

Except for those containing

$\text{Na}^+, \text{K}^+, \text{Ca}^{2+}$