

## **WARNING**

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Family Name	
Given Names	
Student Number	
Teaching Period	Semester 1, 2017

FINAL EXAMINATION	DURATION
<b>SCH104 – Introductory Chemistry A</b>	Reading Time: <b>10</b> minutes
	Writing Time: <b>180</b> minutes

### INSTRUCTIONS TO CANDIDATES

Section A must be answered on the multiple choice answer sheet provided and must be handed in with your answer booklet.

Section B to be answered must be answered in the answer booklet provided.

### EXAM CONDITIONS

**You may begin writing from the commencement of the examination session.** The reading time indicated above is provided as a guide only.

This is a CLOSED BOOK examination

Any calculator is permitted

No handwritten notes are permitted

No dictionaries are permitted

ADDITIONAL AUTHORISED MATERIALS	EXAMINATION MATERIALS TO BE SUPPLIED
No additional printed material is permitted	1 x 16 Page Book 1 x Scrap Paper Faculty/School Multiple Choice Answer Sheet Formula Sheet/s

**THIS EXAMINATION IS PRINTED  
DOUBLE-SIDED.**

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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) Density of petrol is 0.77 kg/L. How many grams will 5.00L of petrol weigh?  
[3 marks]
- (b) The temperature of a metal plate weighing 25.35 g changes from 25.0°C to 45.0°C when supplied 105 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 J/g·°C]  
[3 marks]
- (c) Explain the methods and physical properties you would use to separate a mixture of petrol and water?  
[2 marks]
- (d) Classify each of the following as an element, a compound, or a mixture.
- (i) glucose
  - (ii) smoke
  - (iii) tin
  - (iv) sodium
- [2 marks]

## Question 2

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

- (i) boron trichloride
- (ii) diboron tetrahydride
- (iii) cobalt(III) chloride

[3 marks]

(b) Name the following compounds:-

- (i)  $\text{Al}_2\text{O}_3$
- (ii)  $\text{N}_2\text{O}_5$
- (iii)  $\text{Mn}(\text{NO}_3)_2$

[3 marks]

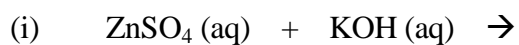
(c) A radioactive isotope is labelled  ${}_{31}^{68}\text{X}$  where X is the element.

- (i) Give the symbol and name of element X.
- (ii) How many neutrons and protons does the element have?
- (iii) What is the mass number of the element?
- (iv) What would be the charge of the ion if formed?

[4 marks]

### Question 3

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



(ii) Potassium metal reacts with liquid bromine producing a white crystalline solid.

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

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

[6 marks]

(b) Calculate the molar mass of carbon dioxide.

[1 marks]

(c) Find the number of moles and number atoms present in 0.50 g of aluminium wire?

[3 marks]

#### Question 4.

- (a) When magnesium wire is burned in air it oxidises to magnesium oxide. What mass of magnesium oxide will be produced when 0.250g of magnesium completely burns?

[3 marks]

- (b) Calculate the concentration (molarity) of a solution prepared by dissolving 5.4 g of KOH in enough water to prepare 200.0 mL of solution.

[2 marks]

- (c) Give the electron configuration (i.e. clearly indicate the orbitals occupied) for the following atoms:-

(i) Si

(ii) Mn

[2 marks]

- (d) Draw Lewis structures and then using VSEPR theory, predict the structure of the following molecule and clearly indicate the bond angle.

(i)  $\text{CCl}_4$

(ii)  $\text{SiO}_2$

[3 marks]

### Question 5

- (a) A solution has a  $\text{H}^+$  ion concentration of  $2.20 \times 10^{-6}$  mol/L. Calculate the pH of the solution. Is the solution an acid or a base?

[2 marks]

- (b) A solution has a pH of 9.3. Calculate the **pOH** of the solution.

[1 marks]

- (c) Give the structural formula of the following:

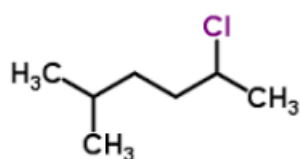
(i) 3,2-dimethyl hexane

(ii) pentan-2-ol

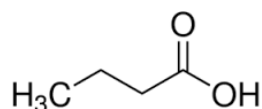
[3 marks]

- (d) Name the following organic compounds:

(i)

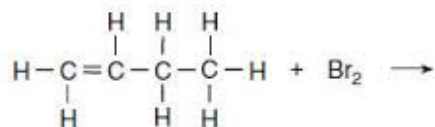


(ii)



[3 marks]

- (c) Complete the following reaction and name the product:



[1 mark]

**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 $\text{Ag}^+, \text{Hg}_2^{2+}, \text{Pb}^{2+}$
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$\text{SO}_4^{2-}$ salts	Except for those containing $\text{Ba}^{2+}, \text{Pb}^{2+}, \text{Ca}^{2+}$
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(b) Insoluble compounds

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

$\text{OH}^-$ salts	Except for those containing $\text{Na}^+, \text{K}^+, \text{Ca}^{2+}$
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