

COMMONWEALTH OF AUSTRALIA

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Family Name	
Given Names	
Student Number	
Teaching Period	Semester 1, 2016

FINAL EXAMINATION	DURATION
SCH104 – Introductory Chemistry a	Reading Time: 10 minutes
	Writing Time: 180 minutes

INSTRUCTIONS TO CANDIDATES

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

Section B must be answered directly onto this Examination Paper.

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 Scrap Paper 1 x School -5 Multiple Choice Answer Sheet Periodic Table, Formula Sheet

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

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BLANK.**

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 on the **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**

Section B
Short Answer Questions
Answer all 5 questions.

Total No of Marks for this section: 50 marks

This section should be answered directly onto the Examination Paper in the space provided below.
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**

Question 1

- (a) Density of mercury is 13.56 g/cm^3 . How many grams will 10.0 cm^3 of mercury weigh?

[3 marks]

- (b) Calculate the heat given off when 50.0 g of water cools from 95.0°C to 25.0°C . The specific heat capacity of water is $4.184 \text{ J/g } ^\circ\text{C}$.

[3 marks]

(c) Explain the methods and physical properties you would use to separate a sugar solution aerated with carbon dioxide into 3 pure substances in the laboratory?

[2 marks]

(d) Classify each of the following as an element, a compound, or a mixture.

(i) Sugar : _____

(ii) Bronze : _____

(iii) Tin: _____

(iv) Milk _____

[2 marks]

Question 2

(a) Name the following compounds:-

(i) Cr_2O_3 _____

(ii) N_2O_5 _____

(iii) $\text{Ca}(\text{NO}_3)_2$ _____

[3 marks]

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

(i) phosphorous trichloride _____

(ii) diboron trioxide _____

(iii) cobalt(III) chloride _____

[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?

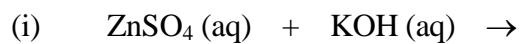
(iii) What is the mass number of the element?

(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 chlorine gas producing a white crystalline solid.

(iii) Nitric acid reacts with sodium 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 2.50 g of copper wire?

[3 marks]

Question 4.

- (a) When propane(C_3H_8) burns in air it produces carbon dioxide and water. What mass of carbon dioxide will be produced when 2.50g of propane completely burns in air?

[3 marks]

- (b) Calculate the concentration (molarity) of a solution prepared by dissolving 2.10 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 eg. $1s^2, \dots$) 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.



[3 marks]

Question 5

- (a) A solution of nitric acid has a concentration of 0.200 mol/L. Calculate the pH of the solution.

[2 marks]

- (b) A solution has a pH of 9.5. Calculate the **pOH** of the solution.

[1 marks]

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

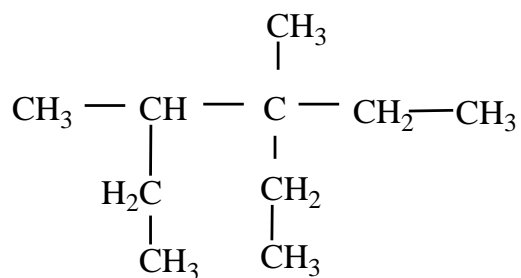
(i) 3,3-dimethyl pentane

(ii) pentan-2-ol

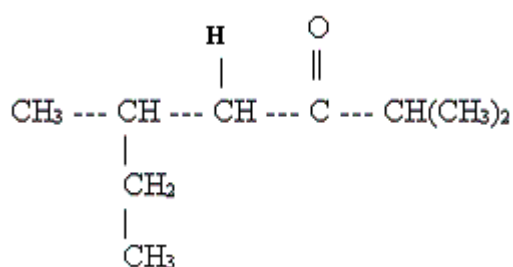
[3 marks]

(d) Name the following organic compounds:

(i)

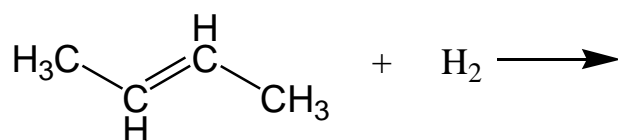


(ii)



[3 marks]

(e) Complete the following reaction:



[1 mark]

End of Examination paper

Some constants:

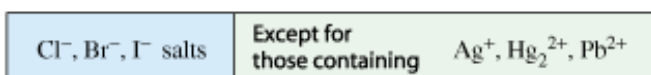
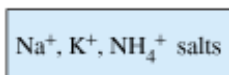
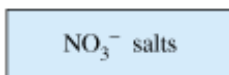
$$0^{\circ}\text{C} = 273.15\text{K}, 1\text{cal} = 4.184\text{ J}, N_{\text{A}} = 6.022 \times 10^{23}$$

Some common polyatomic ions

Ion	Name	Ion	Name
NH_4^+	ammonium	CO_3^{2-}	carbonate
NO_2^-	nitrite	HCO_3^-	hydrogen carbonate (bicarbonate is a widely used common name)
NO_3^-	nitrate		
SO_3^{2-}	sulfite		
SO_4^{2-}	sulfate	ClO^-	hypochlorite
HSO_4^-	hydrogen sulfate (bisulfate is a widely used common name)	ClO_2^-	chlorite
		ClO_3^-	chlorate
		ClO_4^-	perchlorate
OH^-	hydroxide	$\text{C}_2\text{H}_3\text{O}_2^-$	acetate
CN^-	cyanide	MnO_4^-	permanganate
PO_4^{3-}	phosphate	$\text{Cr}_2\text{O}_7^{2-}$	dichromate
HPO_4^{2-}	hydrogen phosphate	CrO_4^{2-}	chromate
H_2PO_4^-	dihydrogen phosphate	O_2^{2-}	peroxide

Solubility Table

(a) Soluble compounds



(b) Insoluble compounds

