

MARKER CODE			



TONGA GOVERNMENT
MINISTRY OF EDUCATION AND TRAINING

Student Personal Identification Number (SPIN)					

TONGA FORM SIX CERTIFICATE

2015

CHEMISTRY

QUESTION AND ANSWER BOOKLET

Time allowed: 3 Hours

INSTRUCTIONS

1. Write your **Student Personal Identification Number (SPIN)** on the top right hand corner of this page and on the last page of this booklet. Write the Marker Code in the box at the top left hand corner of this page.
2. This Examination Paper consists of **TWO** sections. Answer ALL QUESTIONS.

SECTION A : MULTIPLE CHOICE

40 MARKS

SECTION B : SHORT ANSWERS

160 MARKS

TOTAL

200 MARKS

3. Write the answer to the Multiple Choice Questions in the answer sheet at the back of this Booklet.
4. In **SECTION B**, write the answers to the questions in the spaces provided.
5. Check that this booklet contains pages 2-31 in the correct order and that none of these pages are blank.

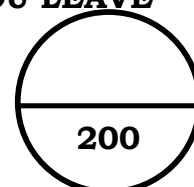
A group of the Periodic Table of the Elements is provided. The table gives the Symbol, Atomic Number and the Relative Atomic Mass of the elements. The Groups (Columns) are numbered I, II, III, IV etc.

NOTE : The symbol M is used for molar mass.

$M(\text{Na}) = 23 \text{ g mol}^{-1}$ and $M(\text{CO}_2) = 44 \text{ g mol}^{-1}$

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR BEFORE YOU LEAVE THE EXAMINATION ROOM.

TOTAL MARKS



SECTION A:**MULTIPLE CHOICE****(40 MARKS)**

Answer all the questions in this section. Write the LETTERS of the best answers in the boxes on the fold-out flap provided on the back flap of this booklet. Question 1-27, 29 are worth 1 mark each. Questions 28, 30-34 are worth 2 marks each.

QUESTION 1.

The electron configuration (arrangement) of the phosphide ion, P^{3-} , is:

- A. 3
- B. 2, 8
- C. 2, 8, 5
- D. 2, 8, 8
- E. 2, 8, 8, 3

QUESTION 2.

Which solid dissolves best in tetra-chloromethane (carbon tetrachloride)?

- A. Iodine
- B. Graphite
- C. Diamond
- D. Sodium chloride
- E. Silicon dioxide

QUESTION 3.

Which of the following elements has the highest first ionization energy?

- A. Li
- B. Be
- C. N
- D. K
- E. Ca

QUESTION 4.

In order to measure out 21.4 mL of liquid a student should use a:

- A. beaker.
- B. pipette.
- C. burette.
- D. test tube.
- E. measuring cylinder.

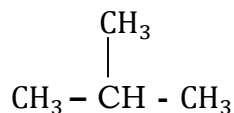
QUESTION 5.

In a homologous series of hydrocarbons, all the members have the same:

- A. general formula.
- B. physical formula.
- C. molecular formula.
- D. relative molecular masses.
- E. number of carbon atoms.

QUESTION 6.

The molecules $\text{CH}_3 \text{CH}_2 \text{CH}_2 \text{CH}_3$ and



are related in that they:

- A. are isomers.
- B. are isotopes.
- C. both white solids at 20°C .
- D. have the same systematic name.
- E. have the same physical properties.

QUESTION 7.

When the colorless gas of ethene, $\text{C}_2 \text{H}_4$ is bubbled through bromine water, the solution is seen to turn:

- A. blue.
- B. clear.
- C. green.
- D. purple.
- E. dark brown.

QUESTION 8.

The reaction of bromine with acetylene (ethyne) is an example of what type of reaction?

- A. Addition.
- B. Substitution.
- C. Precipitation.
- D. Esterification.
- E. Neutralization.

QUESTION 9.

What would be observed when a mixture of ethanol and acidified potassium dichromate is warmed in a test tube?

- A. A brown gas is evolved.
- B. The mixture turns green.
- C. The mixture turns colourless.
- D. The mixture separates into two layers.
- E. A pleasant fruity smelling vapour is detected.

QUESTION 10.

When a mixture of ethanol, ethanoic acid and sulfuric acid is warmed in a test tube:

- A. a dense purple vapour is seen.
- B. an orange-brown vapour is seen.
- C. a pleasant, sweet vapour is smelt.
- D. the mixture separates into two layers.
- E. a white solid collects around the neck of the test tube.

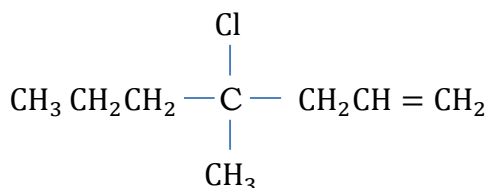
QUESTION 11.

Which of the following classes of organic compounds does soap belong to?

- A. Esters.
- B. Alkanes.
- C. Alcohols.
- D. Carboxylic acids.
- E. Salts of Carboxylic acids.

QUESTION 12.

An organic compound has the constitutional (structural) formula



The IUPAC name for this compound is:

- A. 4-chloro-4-propyl-1-pentene.
- B. 4-chloro-4-methyl-1-heptene.
- C. 4-chloro-4-methyl-6-heptene.
- D. 4-chloro-4-methyl-2-heptene.
- E. 2-chloro-2-(2-propenyl)-pentene.

QUESTION 13.

Which of the following molecules would most likely undergo a polymerization reaction?

- A. $\text{F}_2\text{C} = \text{FC}_2$
- B. $\text{H}-\text{CO}-\text{O}-\text{CH}_3$
- C. $\text{Br}-\text{CH}_2-\text{CH}_2-\text{Br}$
- D. $\text{CH}_3-\text{CH}_2-\text{CO}-\text{OH}$
- E. $\text{CH}_3-\text{CH}_2-\text{CH}_2-\text{OH}$

QUESTION 14.

A clear blue solution gave a royal blue solution when excess ammonia was added to it.

The original solution gave no precipitate with either silver nitrate solution or barium chloride solution. The clear blue solution probably contained:

- A. Zinc nitrate.
- B. Zinc chloride.
- B. Copper II sulfate.
- C. Copper II nitrate.
- D. Copper II chloride.

QUESTION 15.

When dilute nitric acid is added to a white solid it fizzes, it is likely that the solid is a compound of:

- A. Sulfate.
- B. Sodium.
- C. Calcium.
- D. Carbonate.
- E. Magnesium.

QUESTION 16.

What colour is the complex ion $\text{Fe}(\text{NCS})^{2+}$?

- A. Blood-red
- B. Blue-green
- C. Royal blue
- D. Blue-black
- E. Fluorescent yellow

QUESTION 17.

Which one of the following reagents would be most useful to distinguish between solutions of sodium nitrate and sodium sulfate?

- A. Aqueous ammonia.
- B. Aqueous silver nitrate.
- C. Dilute hydrochloric acid.
- D. Aqueous barium chloride.
- E. Aqueous sodium hydroxide.

QUESTION 18.

The fastest reaction between marble, $\text{CaCO}_3(\text{s})$ and hydrochloric acid, $\text{HCl}(\text{aq})$ would take place between:

- A. powdered marble and $0.2 \text{ molL}^{-1} \text{ HCl}(\text{aq})$.
- B. powdered marble and $0.1 \text{ molL}^{-1} \text{ HCl}(\text{aq})$.
- C. large lumps of marble and $0.1 \text{ molL}^{-1} \text{ HCl}(\text{aq})$.
- D. large lumps of marble and $0.2 \text{ molL}^{-1} \text{ HCl}(\text{aq})$.
- E. small lumps of marble and $0.2 \text{ molL}^{-1} \text{ HCl}(\text{aq})$.

QUESTION 19.

A reaction will take place if the required activation energy for effective collisions is present.

Activation energy is the:

- A. energy released midway through a reaction.
- B. energy released as reactant particles collide.
- C. maximum energy required to speed up the particles.
- D. energy released from a reaction as the products form.
- E. minimum energy added to the reactants to produce an effective collision.

QUESTION 20.

Which one of the following statements is correct when applied to the equation below?



The :

- A. reaction observed above is exothermic.
- B. reaction only occurs if pure oxygen is used.
- C. mass of product is less than the total mass fraction.
- D. reaction will speed up if the temperature is decreased.
- E. total number of moles of reactant and product are the same.

QUESTION 21.

In a system at equilibrium, which statement is **not** true?

- A. There are both reactants and products present.
- B. The concentrations of reactants and products are equal.
- C. The forward and reverse reactions occur at the same rate.
- D. The concentrations of reactants and products remain constant.
- E. The forward and reverse reactions have different activation energies.

QUESTION 22.

Hydrochloric acid is a strong acid. Given HCl of 0.01molL^{-1} solution, the pH is:

- A. 0.01
- B. 12
- C. 2
- D. -2
- E. 10^{-12}

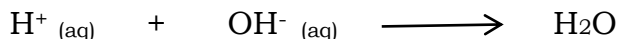
QUESTION 23.

Which one of the following species in **bold** behaves as a base?

- A. 2NO + $\text{O}_2 \longrightarrow 2\text{NO}_2$
- B. CO_3^{-2} + $\text{H}^+ \longrightarrow \text{HCO}_3^-$
- C. NH_4^+ + $\text{H}_2\text{O} \longrightarrow \text{NH}_3 + \text{H}_3\text{O}^+$
- D. Cu^{2+} + $2\text{OH}^- \longrightarrow \text{Cu}(\text{OH})_2$
- E. CH_4 + $2\text{O}_2 \longrightarrow \text{CO}_2 + 2\text{H}_2\text{O}$

QUESTION 24.

In the reaction below:



- A. The oxygen is reduced.
- B. The oxygen is oxidized.
- C. The hydrogen ion is oxidized.
- D. The hydrogen ion is reduced.
- E. Neither oxidation nor reduction is occurring.

QUESTION 25.

Which one of the following metals is the most powerful reductant?

- A. Iron.
- B. Zinc.
- C. Lead.
- D. Copper.
- E. Magnesium.

QUESTION 26.

The factors that affect the rate of a reaction are:

- A. concentration, temperature, volume and catalyst.
- B. types of particles, concentration, volume and catalyst.
- C. catalyst, temperature, types of particles and concentration.
- D. temperature, concentration, size of particles and catalyst.
- E. types of particles, concentration, temperature, volume.

QUESTION 27.

Which one of the following ions or molecules **does not** normally behave as an oxidant?

- A. Fe^{3+}
- B. Cl_2
- C. SO_2
- D. H_2O_2
- E. MnO_4^-

QUESTION 28.

A compound has the empirical formula $\text{C}_6\text{H}_{12}\text{O}$ and a molar mass of 200 g mol^{-1} .
 $M(\text{H}) = 1$, $M(\text{C}) = 12$, $M(\text{O}) = 16$

Which of the following is its molecular formula?

- A. $\text{C}_6\text{H}_{12}\text{O}$
- B. $\text{C}_{12}\text{H}_{24}\text{O}_2$
- C. $\text{C}_{18}\text{H}_{36}\text{O}_3$
- D. $\text{C}_{24}\text{H}_{48}\text{O}_4$
- E. $\text{C}_{30}\text{H}_{60}\text{O}_5$

QUESTION 29.

The compound in **QUESTION 28** on page 8 could be a/an:

- A. acid
- B. soap
- C. ester
- D. alcohol
- E. triglyceride

QUESTION 30.

The empirical formula of a substance is HO. Its molar mass is 34g. The molecular formula of the substance is:

- A. OH
- B. H_2O
- C. HO_2
- D. H_2O_2
- E. H_3O_4

Ar values: (H) = 1; (O) = 16

QUESTION 31.

One mole of nitrogen gas has the same number of atoms as:

- A. one mole of neon.
- B. one mole of chlorine.
- C. half a mole of oxygen.
- D. four moles of sulfur dioxide.
- E. one third mole of a mole of carbon dioxide.

QUESTION 32.

A student heats a crystalline solid to remove the water of crystallization. In the results the following was noted:

Weight of crucible = 18.611 g

Weight of crucible + solid = 20.453 g

Weight of crucible + solid after 10 min heating = 19.678 g

Weight of crucible + solid after 15 min heating = 19.654 g

Weight of crucible + solid after 25 min heating = 19.654 g

The amount of water (in mol) in the crystals was:

- A. 0.102
- B. 0.044
- C. 0.058
- D. 0.0044
- E. 1,043

QUESTION 33.

The oxidation state (oxidation number) of chlorine in HClO_4 is:

- A. -1
- B. -5
- C. -7
- D. +7
- E. +5

QUESTION 34.

The element Q has an electron configuration 2, 4 The type of bonding most likely to occur in the compound of Q with Chlorine would be:

- A. covalent by sharing six electrons.
- B. covalent by sharing two electrons.
- C. covalent by sharing four electrons.
- D. ionic by transferring two electrons to form Q^{2+} .
- E. ionic by transferring four electrons to form Q^{4+} .

SECTION B: SHORT ANSWERS**(160 Marks)****Answer ALL the questions in this section in the spaces provided.****QUESTION 1: ATOMIC STRUCTURE AND BONDING****(20 Marks)**

1. What is meant by the **electronegativity** of an atom?

1 Mark	
1	
0	
NR	

2. The relative atomic radii of the period 2 elements are **shown in Table 1**:

Table 1: Relative atomic radii of period 2 elements.

Li	Be	B	C	N	O	F
1.23	0.89	0.80	0.77	0.74	0.74	0.72

Use **Table 1** to:

- i) State the element with the most non-metallic property.

- ii) Explain the observed trends in these atomic radii.

1 Mark	
1	
0	
NR	

2 Marks	
2	
1	
0	
NR	

3. a) A sample of sulfuric acid contains 3×10^{23} molecules.

- i) How many moles of sulfuric acid is this?

- ii) How many atoms of hydrogen will there be?

1 Mark	
1	
0	
NR	

1 Mark	
1	
0	
NR	

- b) How many atoms of sulfur will the sample contain?

1 Mark	
1	
0	
NR	

- c) A compound of carbon, hydrogen and oxygen only, with a molar mass of 110 g mol^{-1} contains 65.5% carbon and 5.5% hydrogen. What is its molecular formula?

4 marks	
4	
3	
2	
1	
0	
NR	

4. a) Distinguish between the meaning of **saturated** and **unsaturated** hydrocarbon.

2 Marks	
2	
1	
0	
NR	

- b) 2-Butene exists in two different forms known as geometric isomers. They are **cis**-2-butene and **trans**-2-butene. Distinguish between “cis” and “trans” isomers using 2-Butene.

4 marks	
4	
3	
2	
1	
0	
NR	

5. **Table 2** contain the chlorides of the elements in the short period of the periodic table (sodium to chlorine)

Table 2: Some Chlorides

NaCl	MgCl ₂	I	II	PCl ₃	SCl ₂
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Use **Table 2** to:

- a) Write the formula for the missing chlorides I and II.

I: _____

II: _____

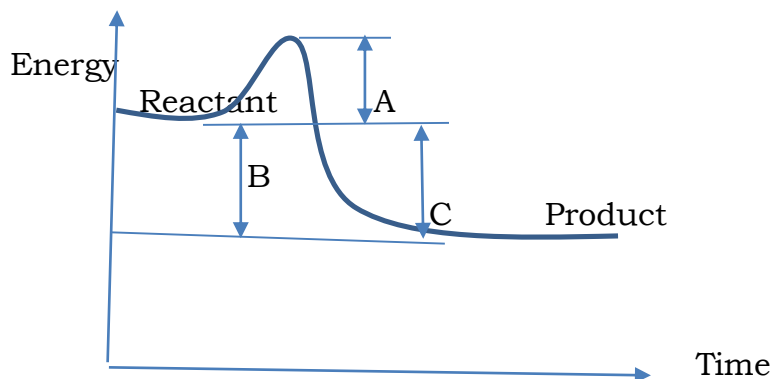
2 Marks	
2	
1	
0	
NR	

- b) Name the type of bonds that exist in compounds across the table from NaCl to SCl₂.

1 Mark	
1	
0	
NR	

QUESTION 2: PHYSICAL CHEMISTRY**(20 Marks)**1. a) What is **activation energy**?

1 Mark	
1	
0	
NR	

b) **Graph 1: Energy vs Time graph**From **Graph 1**, which letter represents the activation energy?

1 Mark	
1	
0	
NR	

c) Explain the effect of catalyst in terms of activation energy.

1 Mark	
1	
0	
NR	

2. Write the missing words on the space provided.

Electrochemical cells in the laboratory consist of two half cells with two different electrolytes connected internally by a salt bridge. If these are connected by an external conductor **(i)** _____ occurs readily at the anode releasing electrons which move through the external conductor to bring about **(ii)** _____ at the other electrode called the **(iii)** _____. The anions and **(iv)** _____ carry the current through the solution.

The overall cell equation is the overall summation of the two half cells.

4 marks	
4	
3	
2	
1	
0	
NR	

3. **Table 3** gives the electronic structure of two elements A and B.

On the basis of these electronic structures, predict the formula of the compound that these elements would form and the type of bonding that would occur between the atoms.

Table 3: Element A and B electronic structures.

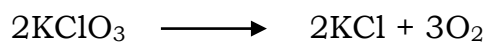
Element A	Element B	Formula	Bond Type
2,4	1		
2,8,5	2,8,7		
2,1	2,8,6		
2,8,3	2,6		

4 marks	
4	
3	
2	
1	
0	
NR	

4. Draw Lewis diagram of HCN molecule:

3 marks	
3	
2	
1	
0	
NR	

5. When potassium chlorate is heated, it decomposes to potassium chloride and oxygen according to the equation



- a) How many moles of oxygen are produced by heating 8 moles of potassium chlorate?

2 Marks	
2	
1	
0	
NR	

- b) What mass of potassium chlorate does this correspond to?

2 Marks	
2	
1	
0	
NR	

- c) What mass of oxygen is produced?

2 Marks	
2	
1	
0	
NR	

QUESTION 3: BONDING, PHYSICAL CHEMISTRY and OXIDATION & REDUCTION **(20 Marks)**

1. **Table 4** has eight pieces of information missing from it. Write the missing information in the spaces provided in **Table 4**.

Table 4:

OXIDE	STATE AT 20° C	BONDING	STRUCTURE
Na ₂ O	(i) _____	(ii) _____	(iii) _____
SiO ₂	solid	(iv) _____	(v) _____
P ₄ O ₁₀	solid	covalent	Molecules held together by Van der Waals forces
SO ₃	(vi) _____	(vii) _____	(viii) _____

4 marks

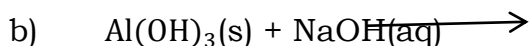
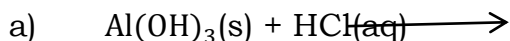
4	
3	
2	
1	
0	
NR	

2. State the effect of the particle size on the rate of reaction in terms of Collision Theory.

3 marks

3	
2	
1	
0	
NR	

3. **Balance** and **complete** the following equations.



4 marks

4	
3	
2	
1	
0	
NR	

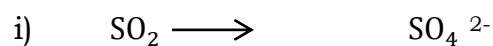
- c) Equations in (a) and (b) show aluminium hydroxide acting as a base and as an acid. The term used to describe this property is:

1 Mark

1	
0	
NR	

4. a) Write balanced ion-electron equations for each equation below.

Balance the atoms and the charges.



3 marks	
3	
2	
1	
0	
NR	



3 marks	
3	
2	
1	
0	
NR	

iii) Indicate which of the ion-electron equations above shows reduction.

1 Mark	
1	
0	
NR	



State the colours of the ions in this ion-electron equation.

1 Mark	
1	
0	
NR	

QUESTION 4: BONDING, QUANTITATIVE, INORGANIC and PHYSICAL
(20 Marks)

1. Strontium chloride is an ionic compound, naphthalene is a covalent solid, scandium is a metal and silicon carbide has a giant covalent structure.

a) Name the substance expected to have the highest melting point.

1 Mark	
1	
0	
NR	

b) Name the substance expected to be soluble in water.

1 Mark	
1	
0	
NR	

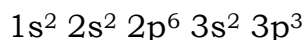
c) Name the substance expected to conduct electricity only when molten, or in solution.

1 Mark	
1	
0	
NR	

d) Write the substance expected to be malleable.

1 Mark	
1	
0	
NR	

e) Identify the element having the following electron configuration:



1 Mark	
1	
0	
NR	

2. Suppose 6.25g of blue hydrated copper(II) sulfate, $\text{CuSO}_4 \cdot x\text{H}_2\text{O}$, (x unknown) was gently heated in a crucible until the mass remaining was a constant 4.00g. Calculate **x**.

4 marks	
4	
3	
2	
1	
0	
NR	

3. **Table 5: Summary of reactions of some pairs of solutions.**

Reacting solutions	Sodium chloride	Sodium sulfate	Sodium carbonate
Silver nitrate	I: _____	A white precipitate of silver sulfate	A white precipitate of silver carbonate
Barium chloride	No reaction	II: _____	A white precipitate of barium carbonate
Copper chloride	III: _____	No reaction	IV: _____

4 marks	
4	
3	
2	
1	
0	
NR	

Several of the spaces have been filled with descriptions of what happens when the solutions are mixed. e.g. When silver nitrate is added to sodium sulfate, a white precipitate of silver sulfate forms.

a) Write similar statements on the spaces **I** to **IV** on **Table 5**.

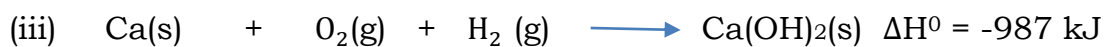
b) Describe what happens when dilute hydrochloric acid is added to the product in **IV** above.

1 Mark	
1	
0	
NR	

4. Calcium oxide reacts with water as follows:



a) Calculate the enthalpy change for the reaction above using the following data:



4 marks	
4	
3	
2	
1	
0	
NR	

b) Is the hydration of quicklime exothermic or endothermic? State a reason for your answer.

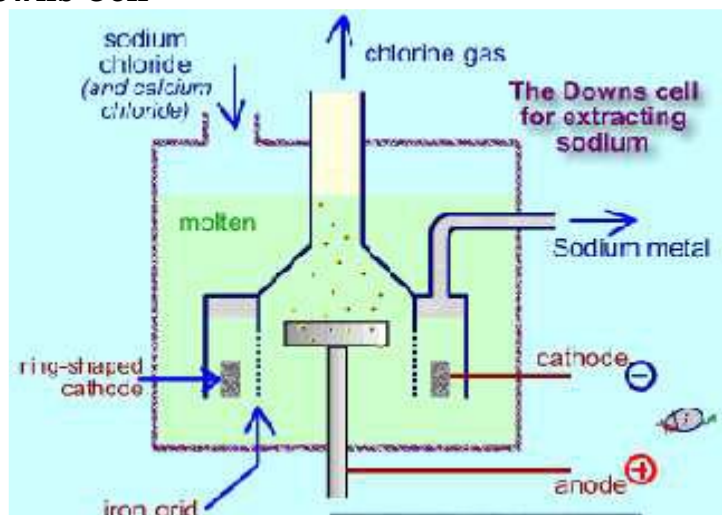
2 Marks	
2	
1	
0	
NR	

QUESTION 5: OXIDATION & REDUCTION and QUANTITATIVE CHEMISTRY

(20 Marks)

1. Sodium metal is produced by electrolysis in the Downs Cell. **Figure 1** is a simplified diagram of a Downs Cell.

Figure 1: Downs Cell



- a) Name the raw material used as the reactant in this process.

1 Mark	
1	
0	
NR	

- b) The raw material is usually mixed with calcium chloride and then melted. State a reason for adding calcium chloride.

1 Mark	
1	
0	
NR	

- c) State **TWO** important properties of graphite which allow it to be used as the anode.

i) _____

ii) _____

2 Marks	
2	
1	
0	
NR	

- d) i) Write an **ion-electron equation** for the reaction that occurs at the cathode.

1 Mark	
1	
0	
NR	

- ii) State clearly whether this is oxidation or reduction.

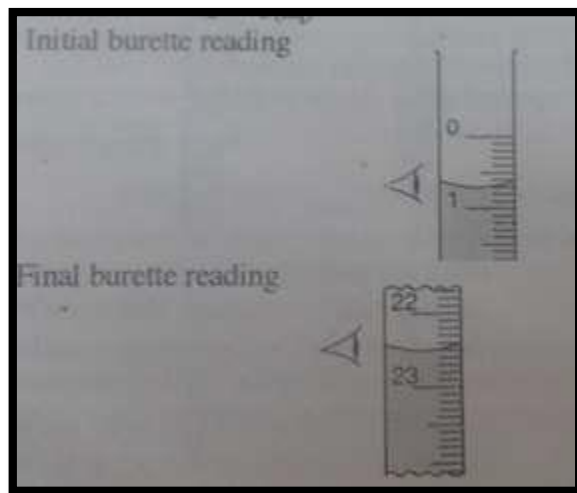
1 Mark	
1	
0	
NR	

2. The following question refers to a titration with HCl(aq) in a burette against $\text{Na}_2\text{CO}_3\text{(aq)}$ in a conical flask. The $\text{Na}_2\text{CO}_3\text{(aq)}$ is prepared by dissolving 1.375g of pure anhydrous $\text{Na}_2\text{CO}_3\text{(s)}$ in distilled water to make 250 mL of solution.

The results are as follows:

Volume of $\text{Na}_2\text{CO}_3\text{(aq)}$ used = 25.0 mL

Figure 2



- a) Define a **standard solution**.

1 Mark	
1	
0	
NR	

- b) Calculate the **concentration** of the $\text{Na}_2\text{CO}_3\text{(aq)}$ in (mol L^{-1}) .

2 Marks	
2	
1	
0	
NR	

- c) Name the glassware which is used:

- i) to prepare the 250 mL of $\text{Na}_2\text{CO}_3\text{(aq)}$.

- ii) to measure and transfer 25.0 mL $\text{Na}_2\text{CO}_3\text{(aq)}$ to the conical flask.

1 Mark	
1	
0	
NR	

1 Mark	
1	
0	
NR	

- d) Write the balanced equation for the reaction of $\text{HCl}_{(\text{aq})}$ and $\text{Na}_2\text{CO}_{3(\text{aq})}$.

2 Marks	
2	
1	
0	
NR	

- e) Use **Figure 2** to determine the titre value.

2 Marks	
2	
1	
0	
NR	

- f) Calculate the **concentration** of the $\text{HCl}_{(\text{aq})}$ (mol L^{-1}).

4 marks	
4	
3	
2	
1	
0	
NR	

- g) Before the burette is filled with acid it is noticed that there is liquid from a previous experiment still in the burette. Explain how should the burette be cleaned?

1 Mark	
1	
0	
NR	

QUESTION 6: ORGANIC CHEMISTRY, PHYSICAL CHEMISTRY and REDOX
(20 Marks)

2 Marks	
2	
1	
0	
NR	

1. Write an equation showing how to convert ethyl bromide to ethyl alcohol.

1 Mark	
1	
0	
NR	

2. State the important observations that is expected to be made in the following test tube reaction: **Propanol is warmed with dilute acidified potassium dichromate.**

3. In order to differentiate the following alcohols write next to each compound either primary, secondary or tertiary alcohol.

3 marks	
3	
2	
1	
0	
NR	

a) $\text{CH}_3\text{CH}(\text{OH})\text{CH}_3$: _____

b) $\text{CH}_3\text{CH}_2\text{OH}$: _____

c) $(\text{CH}_3)_3\text{OH}$: _____

4. An important reaction in the production of sulfuric acid is represented by the equation:



What changes would occur in the yield of sulfur trioxide at equilibrium in each of the following cases:

2 Marks	
2	
1	
0	
NR	

- (a) the mixture is heated?

2 Marks	
2	
1	
0	
NR	

- (b) oxygen is added?

- (c) the total pressure of the system is reduced by increasing the volume of the container?

2 Marks	
2	
1	
0	
NR	

5. Magnesium metal can be attached to the steel pipeline to prevent rusting. What name is given to this type of protection provided by magnesium?

1 Mark	
1	
0	
NR	

6. Steel cars can be protected from rusting in a number of ways. Dipping steel in molten zinc can also physically protect steel from rust. Explain why the steel will not rust even if the zinc is scratched?

1 Mark	
1	
0	
NR	

7. a) What is meant by the term “**strong acid**”? Write an equation as an example.

2 Marks	
2	
1	
0	
NR	

- b) The ammonium ion is a **weak acid**. Show what this means by writing the **balanced equation** for the reaction between ammonium ions and water.

2 Marks	
2	
1	
0	
NR	

8. Consider the neutralization reaction between hydrochloric acid and sodium hydroxide:



The concentration of the hydrochloric acid is $10^{-1} \text{ mol L}^{-1}$.

- a) What is its pH?
b) What is the pH of the solution when neutralization is complete?

2 Marks	
2	
1	
0	
NR	

QUESTION 7: ORGANIC CHEMISTRY**(20 Marks)**

1. Consider the compounds C, D, and E.
- a) Compound C, C_3H_8O , is oxidized to acetone.

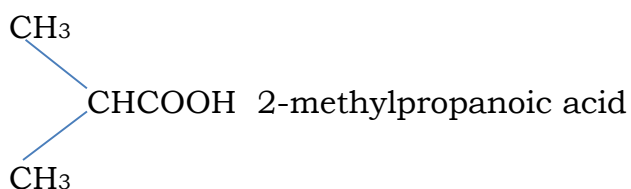
Write the: i) structure and ii) **name** of C.

i) Structure : _____

ii) Name : _____

2 Marks	
2	
1	
0	
NR	

- b) Compound D, C_4H_{10} , is oxidized in two steps to 2-methylpropanoic acid.



Write the i) structure and ii) **name** of D

i) structure: _____

ii) name: _____

2 Marks	
2	
1	
0	
NR	

- c) Alcohol E is oxidized partially to CH_2O_2 .

Write the i) structure and ii) **name** of E.

i) Structure: _____

ii) Name: _____

iii) Write the oxidation product of the reaction.

2 Marks	
2	
1	
0	
NR	

1 Mark	
1	
0	
NR	

2. Compound F (butanal) and compound G (butanone) have the same molecular formula, C_4H_8O .

- a) What term is used to describe the compounds with the same molecular formula?

1 Mark	
1	
0	
NR	

- b) Name the functional group common to both F and G.

1 Mark	
1	
0	
NR	

3. Explain why the compounds CH_3COOH and $\text{C}_3\text{H}_7\text{COOH}$ tend to have similar chemical properties.

1 Mark	
1	
0	
NR	

4. Write the chemical equations for the reaction of CH_3COOH with sodium hydroxide solution.

2 Marks	
2	
1	
0	
NR	

5. Ethanol and acetic acid were refluxed with a little concentrated sulfuric acid.

- a) Name the organic product expected from the reaction.

1 Mark	
1	
0	
NR	

- b) Write the chemical equation for the reaction.

2 Marks	
2	
1	
0	
NR	

- c) State the function of sulfuric acid.

1 Mark	
1	
0	
NR	

6. Draw the **cyclic** structure of glucose

3 marks	
3	
2	
1	
0	
NR	

7. Both Fehling's and Benedict's reagent contain a blue copper (II) complex compound.

What will be observed if glucose is present when tested with Fehling's or Benedict's reagent?

1 Mark	
1	
0	
NR	

QUESTION 8: ATOMIC STRUCTURE and ORGANIC CHEMISTRY (20 Marks)

1.a) What shapes would you predict for the following compounds?

i) NF_3 _____

1 Mark	
1	
0	
NR	

ii) CCl_4 _____

1 Mark	
1	
0	
NR	

b) Use the shapes in **a)** to predict whether the molecules will be polar or non-polar.

i) NF_3 _____

1 Mark	
1	
0	
NR	

ii) CCl_4 _____

1 Mark	
1	
0	
NR	

2. A few drops are added to a sample of Calcium Carbide (CaC_2) in a test tube.

a) Name the gaseous product.

1 Mark	
1	
0	
NR	

b) Write a balanced equation for the formation of this product.

2 Marks	
2	
1	
0	
NR	

3. The main difference between the three types of alcohols is in their oxidation. Deduce the products formed from oxidation of the three types of alcohols.

1 Mark	
1	
0	
NR	

i) Primary: _____

1 Mark	
1	
0	
NR	

ii) Secondary: _____

iii) Tertiary: _____

1 Mark	
1	
0	
NR	

4. The term **saponification** is derived from the fact that the alkaline hydrolysis of fats produces soaps.

a) Name the functional group present in all fats.

1 Mark	
1	
0	
NR	

b) State the experimental conditions necessary to obtain a high conversion of fat to soap.

2 Marks	
2	
1	
0	
NR	

c) Explain how soap remove grease from dirt.

4 marks	
4	
3	
2	
1	
0	
NR	

- e) Glycerol is an important by-product in soap making. State its formula.

1 Mark	
1	
0	
NR	

4. Explain the production of polythene (polyethylene) using structural formula.

2 Marks	
2	
1	
0	
NR	

Student Personal Identification Number (SPIN)

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SECTION A : MULTIPLE CHOICE

Write the letter of your Best Answer in the boxes below

☐	☐
☐	☐
☐	☐
☐	☐
☐	☐
☐	☐
☐	☐
☐	☐
☐	☐
☐	☐
☐	☐
☐	☐
☐	☐
☐	☐
☐	☐
☐	☐
☐	☐
☐	☐
☐	☐

S.A

40	
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TONGA FORM SIX CERTIFICATE CHEMISTRY

2015

FOR MARKER'S USE ONLY

Sections	Marks		C/Marks
Section A	40		
Section B	160		
Question 1	20		
Question 2	20		
Question 3	20		
Question 4	20		
Question 5	20		
Question 6	20		
Question 7	20		
Question 8	20		
TOTAL	200		