TORORO GIRLS SCHOOL

SENIOR SIX CHEMISTRY 2017

TERM ONE

1. (a) Define a transition metal element.

.....

.....

.....

(b) State three major characters of transition metal elements.

.....

.....

.....

.....

(c) State the name of the following complexes.

(i) $Al(OH)_4^-$

.....

(ii) $CuCl_4^{2-}$

.....

(iii) $Co(NH_3)_6^{2+}$

.....

(d) state the oxidation state of the central ion in each of the following molecules/ complex

(i) $Fe(CN)_6^{3-}$

.....

(ii) $[Al(H_2O)_4 2OH]^+$

.....

2. You are provided with the following standard electrode potentials.

electrode	Standard Electrode potential
Cu^{2+}/Cu	+ 0.34 V
Ag^+/Ag	+ 0.80 V

The two electrodes were combined with a salt bridge to form a cell.

(a) Write the half-cell reaction that occurred at the:

(i) Anode

.....

(ii) Cathode

.....

(b) Write the equation for the overall cell reaction.

.....

(c) Write the:

(i) Cell notation

.....

(ii) Emf of the cell.

.....

3. (a) Beryllium differs from the rest of the members of group (II) elements of the periodic table.

(i) State two properties in which beryllium differs from the rest of the elements in the group.

.....

.....

(ii) Give reason for why beryllium shows different properties from the rest of the elements.

.....

.....

.....

.....

(b) Name one reagent that can be used to distinguish between each of these ions. In each state what is observed and write the equation for the reaction.

(i) barium ion and magnesium ion.

Reagent

.....

Observation

.....

(ii) calcium ion and barium ion.

Reagent

.....

Observation

.....

(iii) Calcium ion and magnesium ion.

Reagent

.....

Observation

.....

4. (a) Use the data below to construct a cycle to determine the value for the lattice enthalpy of rubidium chloride.

Enthalpy change	Energy/kjmol^{-1}
Formation of rubidium chloride	-435
Atomization of rubidium	+81
Atomization of chlorine	+122
1st ionization energy	+403
1st electron affinity of chlorine	-349

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(b) Explain why lattice enthalpy of lithium chloride is more exothermic than that of rubidium chloride.

.....

.....

.....

5. A chemist set up an equilibrium system between dinitrogen tetroxide and nitrogen dioxide, at 25^0C.

$$N_2O_{4(g)} \rightleftharpoons 2NO_{2(g)}$$

The equilibrium concentrations were $[N_2O_4] = 0.0390$ moldm^{-3} and $[NO_2] = 0.0150$ moldm^{-3}.

(a) (i) write the expression for the equilibrium constant, K_c.

.....

.....

(iii) calculate the equilibrium constant K_c at 25^0C.

.....

.....

.....

(b) The standard enthalpy changes for the formation of N_2O_4 and NO_2 are shown in the table below.

Compound	ΔH_f(kjmol^{-1})
N_2O_4	+9
NO_2	+33

(i) Calculate the standard enthalpy change for the forward reaction in the equilibrium.

.....

.....

.....

.....

(ii) The equilibrium was heated at constant pressure; how would you expect this to affect the equilibrium position of the system?

.....

6. State what is observed and write an equation for the following:
   (a) Passing Sulphur trioxide gas through acidified potassium managanate (VII).

   observation

.....

   Equation

.....

   (b) Addition of potassium iodide solution to copper (II) sulphate solution.

   observation

.....

   Equation

.....

   (c) Addition of hydrogen peroxide to a solution of acidified potassium dichromate.

   observation

.....

   Equation

.....

7. Alpha hydroxyl acids (AHA), are monobasic organic acids, used in creams to combat the appearance of aging. Approximately 1%solutions of AHAs removes wrinkles, as the low pH aggravates the skin causing to swell, more concentrated solutions (approximately 12%) are used to remove dead skin.

(a) An AHA was analyzed and had a composition by mass of:

$$C, 40\%; H, 6.7\%; O, 53.3\%. Mr = 90$$

(i) Calculate the molecular formula of this AHA.

.....

.....

.....

.....

.....

.....

(ii) AHA has both an alcohol group and a carboxylic acid group, write the structural formula of AHA.

.....

.....

.....

(b) Calculate the pH of a 1.5moldm^{-3} solution of an AHA with acid dissociation constant, K_a of $1.2 \times 10^{-5} moldm^{-3}$.

.....

.....

.....

(c) Beauty treatments often contain buffers. An example of a buffer is a mixture of ethanoic acid and sodium ethanoate.

(i) Explain what is meant by a buffer solution.

.....

.....

.....

(ii) Write the chemical equation for equilibrium in this buffer system.

.....

(iii) Explain how this buffer solution works.

.....

.....

.....

8. Iron compounds commonly exist as iron (II) and Iron (III).

(a) Write the electronic configuration of iron (II) ion.

.....

(b) (i) state one reason why transition metals are good catalyst.

.....

.....

.....

(ii) State one example of iron compound being used as a catalyst.

.....

.....

(c) State the observation and write an equation for the reaction between a solution of iron (II) sulphate solution and:

(i) Sodium hydroxide solution.

Observation

.....

Equation

.....

(ii) Ammonia solution

Observation

.....

Equation

.....

(iii) Potassium hexacyanoferate (II) solution.

Observation

.....

Equation

.....

(d) Aqueous potassium manganate (VII) solution was titrated with 25.0 cm^3 of 0.005M iron (II) ions. The volume of aqueous potassium managanate required to reach end point was 12.3 cm^3. Calculate the concentration of aqueous potassium manganate (VII) solution.

.....

.....

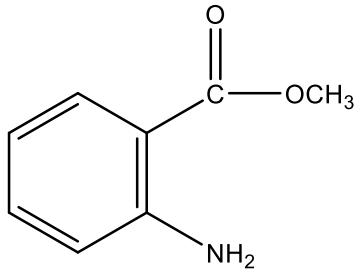
.....

.....

.....

.....

9. May organic compounds can be used to add flavor to foods and drinks. Compound A (structure shown below) is used to add grape flavor to soft drinks.



(a) Apart from benzene ring, name two other functional groups in A.

.....

.....

(b) (i) Write the molecular formula of A.

.....

(ii) A 33O cm^3 bottle of soft drink contains 0.100g of A. calculate the concentration, in $moldm^{-1}$, of A.

.....

.....

.....

.....

.....

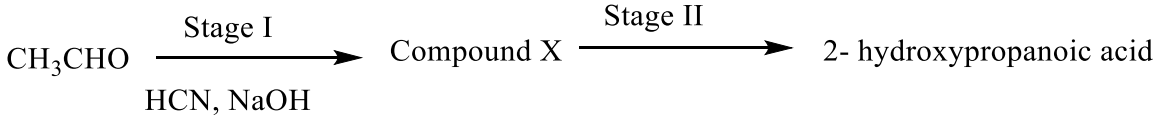
(c) Write the equation and a mechanism for the reaction between A and sodium hydroxide solution.

.....

.....

.....

(d) 2-hydroxypropanoic acid is present in milk, it can be made in two stages as shown below.



(i) Give the mechanism for stage I.

.....

.....

.....

.....

.....

(ii) State the suitable reagent used in the second stage of synthesis.

.....

.....

.....

(iii) Draw the structure of 2-hydroxypropanoic acid.

.....

.....

.....

(e) Ketones of different chain length are important to the flavor of dairy foods. You are given a sample Z of unknown ketone. Describe how you would:

(i) Detect the presence of a carbonyl compound in your compound.

.....

.....

.....

.....

.....

.....

(ii) Confirm that it's a ketone and not an aldehyde.

.....

.....

.....

.....

.....

.....

10. In aqueous solution, some organic compounds are either acidic, bases or neither.

(a) Identify and organic compound that acts as an acid, give an equation to show its behavior as an acid.

Example

.....

Equation

.....

(b) Phenyl amine acts as a base in water.

(i) Give an equation to show its behavior in water.

.....

.....

.....

(ii) Explain why phenylamine is a weaker base than ethylamine.

.....

.....

.....

(c) (i) State the four three classes of amines.

.....

.....

.....

(iii) Describe how you would be able to differentiate the different classes of organic amines.

.....

.....

.....

.....

.....

.....

11. Carbon, silicon, tin and lead are elements of group (IV) of the periodic table.

(a) Describe the type of chlorides formed by these elements and state how they react with water.

.....

.....

.....

(b) Describe the trend in basicity of the oxides of group (IV) elements and write equations to show how the oxides of Carbon, silicon, germanium and lead react with sodium hydroxide.

.....

.....

.....

12. There are two major types of polymerization, Addition polymerization and condensation polymerization.

(a) (i) Propene undergoes addition polymerization. Give a balanced equation for the polymerization of propene.

.....

.....

(ii) Explain the differences between addition polymerization and condensation polymerization.

.....

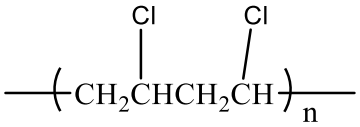
.....

.....

.....

.....

(b) Polymer G is formed by addition polymerization.



Deduce the structural monomer from which G could be made.

.....

.....

.....

(c) The monomer below can form a condensation polymer, H.

$HOCH_2CH_2COOH$.

(I) Show the structural formula of the polymer formed.

.....

.....

(II) Concentrated sodium hydroxide can be transported in containers made of polypropene, but no in containers made of H. suggest a reason for this difference.

.....

.....

.....

13. (a) Describe the reactivity of Fluorine, chlorine and bromine with

(i) Sodium hydroxide

.....

.....

.....

.....

.....

.....

.....

.....

.....

(ii) water.

.....

.....

.....

.....

.....

.....

.....

.....

.....

(c) Describe the general method of preparing halogens in the laboratory. (exclude fluorine).

.....

.....

.....

.....

14. The reaction of benzene with bromine requires a halogen carrier but the reaction of a phenol with bromine does not.

(a) (i) Write the equation for the reaction between benzene and bromine.

.....

.....

(iI) State the substance that will act as a halogen carrier for this reaction.

.....

(b) The reaction of a phenol with excess bromine give an organic compound C.

(i) Draw the organic structure of C.

.....

.....

.....

.....

(ii) Cold aqueous sodium hydroxide solution was added t substance C. write the equation for the reaction that took place.

.....

.....

(iii) Explain why the reaction between a phenol and bromine does not require a halogen carrier.

.....

END