

Q1- Write the electron configuration of C (atomic number 6) and Ne (atomic number 10), write the four quantum numbers for the last electron

Q2- Write the Summary of Common Properties of the noble gas elements (group 8A) of the periodic table

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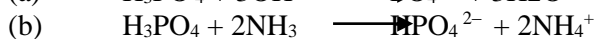
Q1-Fill out the blank (answer eight) (8 marks)

- The Volhard titration can be used for the determination of  $\text{Ag}^+$  by titration with thiocyanate ion  $\text{SCN}^-$  using \_\_\_\_\_ as an indicator.
- Positive standard potential indicates a strong oxidizing agent, while a low positive or a negative potential is characteristic of a \_\_\_\_\_ reducing agent \_\_\_\_\_
- Ethylenediaminetetraacetic acid has \_\_\_\_\_ binding sites
- Using titration method the difference in volume between the equivalent point and end point is the \_\_\_\_\_
- No of protons + no of \_\_\_\_\_ neutrons = \_\_\_\_\_ of the atom
- \_\_\_\_\_ is a chemical rule states that atoms of low (<20) atomic number tend to combine in such a way that they each have eight electrons in their valence shells
- For 4<sup>th</sup> energy level  $n = 4$ , Maximum number of electrons in the 4<sup>th</sup> energy level = \_\_\_\_\_
- \_\_\_\_\_ principle: no two electrons in an atom can have the same lot of quantum numbers
- \_\_\_\_\_ is the outermost shell of an atom. It is the important shell during a chemical reaction.

Q2 - Answer three:

(15 marks)

- If the density of mercury is 13.534 g/mL and you have 62.5 mL of mercury, how many grams, moles, and atoms of mercury do you have?
- Calculate the equivalent weight and normality for a solution of 6.0 M  $\text{H}_3\text{PO}_4$  given the following reactions:



- If solutions of hydrochloric acid and ammonia are used in a titration, the titration curve should look like this: (4 marks)

Complete the sentences using chemical equations if necessary:

3- A student is provided with 500mL of 700ppm solution of sucrose. What volume of this solution in millilitres contains 0.2g of sucrose?

4- The concentration of lead (Pb) in an industrial waste stream is 0.4 ppm. What is its molar concentration?

Q3- Explain the following (why), use equations if necessary

Ionization energy is Decreased if we go down the group of the periodical table

1- Decreasing the radius of the atoms if we go across the period of the periodic table

Q4- Answer the following:

a- Write the common features that Ionic compounds share .

b- Write the electron configuration of Ne and K (atomic number Ne=10, K=19) , write the four quantum numbers for the last electron for both of them.

**the geometry of carbon in acetylene , HC≡CH**

- 1- **Characteristics of metals, such as strength**, malleability, ductility, luster, conduction of heat and electricity are due to :
- 2- **Dissociation energy** is the amount of energy required to break the bond that holds together the atoms in the molecule.
- 3- The type of atomic bonding that occurs when atoms share electrons are called
- 4- Unidentate ligands: A ligand that has **single** donor group
- 5- **Octate rule** is a chemical rule states that atoms of low (<20) atomic number tend to combine in such a way that they each have eight electrons in their valence shells
- 6- bonds form between elements which readily lose electrons and others which readily gain electrons.
- 7- de Broglie (1923), de Broglie suggested that particles can exhibit properties of waves. The same should be true of electrons. This phenomenon is referred as wave **Wave-Particle Duality**
- 8- The **Heisenberg** Uncertainty Principle says that since electron has wave – like properties, **it is impossible to define with absolute precision, at the same time, both the position and the momentum of an electron**
- 9- **electrons in fact occupy regions of space known as orbitals**
- 10- **Bidentate ligand** Which has two groups available for coordinate covalent bonding
- 11- **Polydentate ligand** Which have more than two donor atoms available for coordinate covalent bonding .
- 12- **covalent bonding occurs when two (or more) elements share electrons.**
- 13- **Tritium** is a hydrogen isotope consisting of one proton, two neutrons and one electron. It is radioactive, with a half-life of 12.32 years.

Rubidium is a soft, silvery-white metal that has two common isotopes,  $^{85}\text{Rb}$  and  $^{87}\text{Rb}$ . If

- the abundance of  $^{85}\text{Rb}$  is 72.2% and the abundance of  $^{87}\text{Rb}$  is 27.8%, what is the average atomic mass of rubidium?

Define ionic bond and mention the features that Ionic compounds share

Define the first and second electron affinity

The important characteristics of hybridization

a- **Laboratory Preparation of Hydrogen**

- Write the reasons behind each of the followings (answer three):
- Why is the ionisation energy increases crossing the periodic table?
  - The bond between H-O in H<sub>2</sub>O is a polar bond?
  - Molecular hydrogen can react with many elements and compounds, but at room temperature the reaction rates are usually so low as to be negligible, why?

Q4

- 
- 
- Decreasing ionization energy if we go down the group at periodical table
- Increasing radius of the atoms if we go across period at the periodic table

• **Summary of the carbon family properties:**

- $\text{H}_2(\text{g}) + \text{S}(\text{l}) \rightarrow \text{H}_2\text{S}(\text{l})$
- $\text{N}_2 + 3 \text{H}_2 \rightarrow 2 \text{NH}_3$
- $2\text{K}(\text{s}) + \text{O}_2(\text{g}) \rightarrow \text{K}_2\text{O}_2(\text{g})$
- $\text{CaO}(\text{s}) + \text{H}_2\text{O}(\text{l}) \rightarrow \text{Ca}(\text{OH})_2(\text{s})$
- $\text{P}_4 + 5 \text{O}_2 \rightarrow \text{P}_4\text{O}_{10}$

**The conclusion of the Rutherford experiment**

Naturally occurring chlorine that is put in pools is 75.53 percent <sup>35</sup>Cl (mass = 34.969 amu)

- and 24.47 percent <sup>37</sup>Cl (mass = 36.966 amu). Calculate the average atomic mass.
- Define the ionization energy, write The factors affecting ionisation energy. (15 marks)

14-

Define ionic bond and mention the features that Ionic compounds share

**Laboratory Preparation of Hydrogen**

- Write the reasons behind each of the followings (answer three):

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- Molecular hydrogen can react with many elements and compounds, but at room temperature the reaction rates are usually so low as to be negligible, why?

**The metal gets more reactive down the group because**

Boron and aluminium occur only with oxidation number +3.

- **Why is the fourth ionisation energy of aluminium so large?**
- beryllium. The reason why beryllium is different
- Barium is so reactive it is stored under oil.
- In all their compounds these metals have an oxidation number of +2.
- The melting and boiling points are higher, G21 and they are harder, stronger and more dense than the adjacent Group 1 metal on the same period

g- Aluminium is one of the most industrially important materials, why?

Q4- Explain the following (why), use equations if necessary

- water is acting as a amphotropic solvent
- Adding a small amount of Acid to the mixture CH<sub>2</sub>CHOOH/CH<sub>2</sub>COONa doesn't change the PH very much
- Adding hydroxide ions to litmus paper changes the colour to blue

- 8- Decreasing ionization energy if we go down the group at periodical table
- 9- Increasing radius of the atoms if we go across period at the periodic table

- **Summary of the carbon family properties:**

- $\text{H}_2(\text{g}) + \text{S}(\text{l}) \rightarrow \text{H}_2\text{S}(\text{l})$
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- $\text{P}_4 + 5 \text{O}_2 \rightarrow \text{P}_4\text{O}_{10}$

### The conclusion of the Rutherford experiment

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Define ionic bond and mention the features that Ionic compounds share

Diffine the first and second electron affinity

The important characteristics of hybridization

b- **Laboratory Preparation of Hydrogen**

- Write the reasons behind each of the followings (answer three):

h- Why is the ionisation energy increases crossing the periodic table?

i- The bond between H-O in H<sub>2</sub>O is a polar bond?

- ionisation energy. (15 marks)

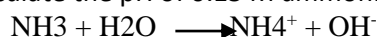
### First term/Second year 2012-2013

Q1-Fill out the blanks (answer 4 blanks only).(4 marks)

- a- \_\_\_\_\_ are solutes that produce ions when dissolved in water creating an electrically conducting medium
- b- \_\_\_\_\_ is the number of moles of solute dissolved in one litre of solution
- c- The reverse of the neutralization reaction is called \_\_\_\_\_
- d- A salt of a weak base and a strong acid will produce a solution with pH \_\_\_\_\_ than 7
- e- \_\_\_\_\_ is a titration in which the reaction between the analyte and titrant involves a precipitation

### Q2 –Answer the following questions:( 8 marks)

1- Calculate the pH of 0.15 M ammonia (NH<sub>3</sub>) with a K<sub>b</sub>=1.8x10<sup>-5</sup>.



- 2- Calculate the (W/W% and W/V%), of a solution containing 24.00 g of ethanol, C<sub>2</sub>H<sub>5</sub>OH and 76.00 g of water, H<sub>2</sub>O (density = 0.998 g/ml).
- 3- Calculate the molarity of 60 mL solution containing 1.25 mmol of solute
- 4- The concentration of a pesticide in a sample of water run-off following a rainstorm is 12.2 ppm. What is the concentration of the pesticide in M? in μM?

### Q3

The Fajan's method is a direct titration of chloride with silver ions using **dichlorofluorescein** as the Indicator

**The standard reduction potential** is the affinity for a chemical species to be reduced, and is measured in volts at standard conditions.

- standard reduction potential: a very

positive standard potential indicates a **strong oxidizing agent**, while a low positive or a negative potential is characteristic of a strong reducing agent

- a moderately strong oxidizing agent; oxidizing ability depends strongly on pH, decreasing rapidly as solution becomes more neutral
- **Complexes** are compounds formed from combination of metal ions with ligands.

A **metal** is an electron poor species while a **ligand** is an electron rich, and thus, **electron donating species**.

- 1- Explain the direct method of Volhard method using equations The Volhard titration can be used for the determination of Ag<sup>+</sup>
- 2- Write the structure of EDTA and explain why determinations using EDTA is not selective titrations

In the acidic solutions when we cant use Mohr method for the determination of Cl, Volhard method can be used which is not sensitive to low pH.

4- EDTA, has

- a. six binding sites
- b. four binding sites

eight binding sites

million, of a solution in which 480 grams of sodium chloride, NaCl, is dissolved in 4 liters of solution.

**First term/Second year 2012-2013**

Q1-Fill out the blanks.(5marks)

- 1- The Fajan's method is a titration method for determination of chloride using \_\_\_\_\_ as the Indicator.
- 2- \_\_\_\_\_ is the affinity for a chemical species to be reduced, and is measured in volts at standard conditions.
- 3- A \_\_\_\_\_ in a Complex compounds are electron poor species while a \_\_\_\_\_ is an electron rich, and thus, electron donating species.
- 4- Potassium Dichromate is a moderately strong oxidizing agent; oxidizing ability depends strongly on pH, \_\_\_\_\_ rapidly as solution becomes more neutral

Q3- Answer two.(8 marks)

- 1- Explain the three conditions of mohr method?
- 2- Write the structure of EDTA and explain why determinations using EDTA is not selective method.
- 3- 3-Explain the direct method of Volhard method for the determination of  $Ag^+$  using equations

**2013-14 s**

Q1-Fill out the blank (8 marks)

1-According to Bronsted – Lowry view, \_\_\_\_\_ is any substance that donates a proton, \_\_\_\_\_ is any substance that can accept a proton.

- 2-A salt of a weak base and a strong acid will produce a solution with pH \_\_\_\_\_ than 7.
- 3-The Volhard titration can be used for the determination of  $Ag^+$  by titration with \_\_\_\_\_ ion  $SCN^-$  using \_\_\_\_\_ as an indicator.

4- A metal in complex compounds are an electron poor species while a \_\_\_\_\_ is an electron rich, and thus, electron donating species.

5-positive standard potential indicates \_\_\_\_\_ oxidizing agent, while a low positive or a negative potential is characteristic of \_\_\_\_\_ reducing agent.

Q2- Answer four.[16 marks]

1-What is the molarity of 5.00 g of NaOH in 750.0 mL of solution?

2- Calculate the pH of a 0.2M  $H_2SO_4$  solution.

— 3- How many moles and the number of atoms of Copper, are in 5 g of copper Cu?

4- Calculate the hydroxide ion concentration of a 0.01 M sodium hypochlorite solution. The equilibrium between  $\text{OCl}^-$  and water is



$K_a$  (Acid dissociation constant) for HOCl is  $3.0 \times 10^{-8}$

— 5- The maximum allowed concentration of chloride in a drinking water supply is  $2.50 \times 10^2$  ppm  $\text{Cl}^-$ . When the supply of water exceeds this limit, it often has a distinctive salty taste. What is this concentration in moles  $\text{Cl}^-$ /liter?

— The Molar mass of O=16, H=1, Cu= 63.55, Cl= 35.45, Na =23, S=32

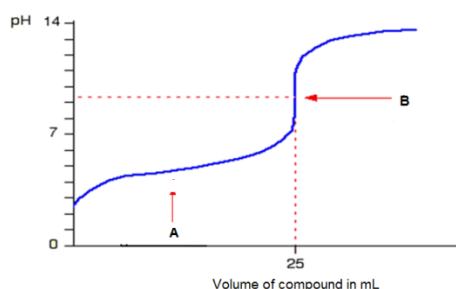
3- (6 marks)

a- The graph below is the titration between acid and a base, Answer the following questions based on the graph

A- Describe the strength of the acid and the base and which of them are placed in the burette?

B- At the very beginning of the curve, the pH starts by raising quite quickly, but the curve very soon gets less steep(A). Why?

C- What does arrow B indicate to?



b- Explain the conditions of titration method. (6 marks)

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28- Which of the following *atoms has the smallest atomic radius?*

- a- Cl
- b- B
- c- N

29- *type of atomic bonding that occurs when atoms share electrons are called*

- a- ionic bonding
- b- covalent bonding
- c- metallic bonding

30- *WHICH is the most polar bond among those listed below.*

- a- H-F
- b- H-O in  $\text{H}_2\text{O}$
- c- C-H in  $\text{CH}_4$

31- *what is the geometry of carbon in acetylene,  $\text{HC}_2\text{CH}_2$*

- a- tetrahedral
  - b- pyramidal
  - c- trigonal planar
  - d- linear
- 32- characteristics of metals, such as strength, malleability, ductility, luster, conduction of heat and electricity are due to :
- a- ionic bond
  - b- covalent bond
  - c- metallic bond
- Q2-Answer two of the following:

- a- Define ionic bond and mention the features that ionic compounds share.
- b- write electron configuration and Describe the type of hybridization of ethylene  $\text{CH}_2\text{CH}_2$
- c- Write the Summary of Common Properties of group 1 in periodic table

Q3- mention the reasons behind each of the followings:

- j- Why is the ionisation energy increases crossing the periodic table?
- k- The bond between H-O in  $\text{H}_2\text{O}$  is a polar bond?
- l- Molecular hydrogen can react with many elements and compounds, but at room temperature the reaction rates are usually so low as to be negligible, why?
- m- Aluminium is one of the most industrially important materials, why?

2014 15 e

Q1, Fill out the blanks (8 marks)

3. d electron from one mole of gaseous atoms to produce 1 mole of gaseous ions each with a charge of  $1+$ .
4. The geometric arrangement of those three hybrid orbitals ( $sp^3$ ) is called \_\_\_\_\_
5. When a weak acid reacts with a strong base the pH of resulting solution will be \_\_\_\_\_ than 7
6. The Heisenberg Uncertainty Principle says that, it is impossible to define with absolute precision, at the same time, both the \_\_\_\_\_ and the \_\_\_\_\_ of an electron.
7. \_\_\_\_\_ is the affinity for a chemical species to be reduced, and is measured in volts at standard conditions.

Q2- Answer the following :

- a. Write the electron configuration of sulphur S (atomic weight 15) and Be (atomic weight 4) and the four quantum numbers of the last electron. (6 marks)
- b. Write factors that affect the ionisation energy value. (3 marks)

2014 15 e

- 1- \_\_\_\_\_ is any substance that donates a proton,.
- 2- \_\_\_\_\_ is the number of moles of solute dissolved in one litre of solution.
- 3- The  $\text{H}_3\text{O}^+$  ion, formed by capture of a hydrogen ion by a water molecule. A strong \_\_\_\_\_ bond is formed between the hydrogen ion and water oxygen
- 4- The mole is equal to \_\_\_\_\_ particles (atoms, ions, molecules,) and called Avogadro's number

Q3 Choose the right answer ( 5 marks)