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**Department of Chemistry**

**College of Science**

**University of Salahaddin**

**Subject: periodic table and stoichiometry**

**Course Book – (2nd Year)**

**Lecturer's name: MSc. Bayan Omer Ahmad**

**Academic Year: 2022/2023**

**Course Book**

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| **1. Course name** | ***periodic table and stoichiometry*** | |
| **2. Lecturer in charge** | **MSc. Bayan Omer Ahmad** | |
| **3. Department/ College** | **Chemistry \ Science** | |
| **4. Contact** | **e-mail:bayan.ahmad@su.edu.krd**  **Tel: (optional)** | |
| **5. Time (in hours) per week** | **Theory: 2 hours**  **Practical: 2 hours** | |
| **6. Office hours** | **Tuesday8.30-11.30,Wed 9.30-10.30** | |
| **7. Course code** | **None** | |
| **8. Teacher's academic profile** | [**https://sites.google.com/a/su.edu.krd/Bayan Ahmad 2017**](https://sites.google.com/a/su.edu.krd/Bayan%20Ahmad%202017) | |
| **9. Keywords** | **None** | |
| **10. Course overview:**  The lecture component will introduce students to the fundamental concepts of inorganic chemistry, with an emphasis on the roles of metals in the biological world. Lecture attendance is mandatory and attendance may be taken.   After taking this course you will be able to assess the importance of metal ions in Nature. You will be able to assess news reports and your own reading about the importance of metals in your own life and the lives of your family members and friends. You will be able to address the value of essential metals in your diet, toxic metals to avoid, and metals that play a role therapeutically in drugs you might take in your future.   Overall you will be able to begin to understand the role metals play in a healthy life of all organisms  This course will focus on the molecular structures and properties of inorganic compounds. We will study concepts in bonding, trends in periodic properties, chemical bonding, oxidation reduction reaction, preparation and property for representative element, and descriptive chemistry of selected elements. | | |
| **11. Course objective:**  This course serves as a cursory overview of the basic concepts involved in inorganic chemistry, including basic symmetry and spectroscopy concepts that will prepare the student for advanced coursework in chemistry. Advanced topics in inorganic chemistry are reserved for upper-division coursework.   1. Atomic Structure 2. Molecular Structure, Bonding, and Symmetry 3. Introduction to representative element Chemistry and Bonding 4. Ionic Bonding; Solid State Compounds . 5. Oxidation reduction Reactions. 6. Inorganic Acids and Bases 7. Introduction to Organometallic Chemsitry 8. Descriptive Chemistry of the Elements and Periodic Trends | | |
| **12. Student's obligation**  The role of students and their obligations throughout the academic year comes from  Evaluating them through exams, presence and activity.  The attendance & completion of all tests  Assignments and Quiz  Reports and Seminar  Exams | | |
| **13. Forms of teaching**  Learning resources in this course include white board and PowerPoint presentations and discussion. | | |
| **14. Assessment scheme**  The whole year marks out of 100%, breaking down to 40 marks (25 marks theoretical and 15 mark practically) for two exams, quizzes, classroom activity, and 5 mark forthe absences in the class room) plus 60 mark for final examination (40 marks theoretical and 20 mark practically).‌ | | |
| **15. Student learning outcome:**  The students will learn from the lecturer, and other sources of information including the educational websites, books from the library, etc. Students demonstrate understanding of fundamental concepts of inorganic compound and use of these ideas in laboratory and research exercises and also in daily life | | |
| **16. Course Reading List and References‌:**  ***References:***  1/ F.A.Cotton and Wilkinson , Advanced Inorganic Chemistry , 6thedn .  2/ J.A.Duffy , General Inorganic Chemistry , 2ndedn .  3/ J.E.Huheeyetal. , Inorganic Chemistry .  4/Handbook of preparative Inorganic Chemistry by Brouer, c.,  Academic Press, (1963).  5/Inorganic Synthesis (Book Series).  6/Experimental Inorganic Chemistry by W.G.Palmer.  7/Advanced Practical Inorganic Chemistry by D.M.Adams &O.BRaynor | | |
| **17. The Topics:** | | **Lecturer's name**  **MSc. Bayan Omer Ahmad**  (2hrs) |
| **1/Periodical Properties of the elements**  (i) Relation between the electronic configuration and the properties of the atoms.  (ii) Metallic and Non-metallic properties.  (iii) Atomic Radii.  (iv) Ionization Energy.  (v) Electron Affinity.  (vi) Electron Negativity.  (vii) Chemical bonding.  **3/Chemistry of the Main Group Element (Nontransition Elements)**  **Hydrogen :**  a- Chemical and Physical properties  b- Hydrogen Bonds.  c- Hydrides.  d- Preparation of H₂.  **4/ The Group I Elements , ( Alkali Metals ) Li, Na, K, Rb, C₅, Fr**:  (i) General properties of the group.  (ii) Preparation of the element.  (iii) Compounds of GI elements.  **5/ The Group II Elements (Alkaline earth Metals ) Be, Mg, Ca, Sr, Ba, Ra**:  (i) General properties of GII elements.  (ii) Preparation of the elements.  (iii) Compound of the GII elements.  **6/ Boron Group (GIII elements ) B, Al, Ga, In, Tl** :  (i) General properties of the group.  (ii) Preparations.  (iii) Compound of the GIII elements.  **7/ Carbon Group (GIV elements ) C, Si, Ge, Sn, Pb**:  (i) General properties of the group.  (ii) Preparations.  (iii) Compound of the GIV elements.  **8/ Nitrogen Group ( GV elements ) N, P, As, Sb, Bi** :  (i) General properties of the group.  (ii) Preparations.  (iii) Compounds of the GV elements.  **9/ Oxygen Group ( GVI elements ) O, S, Se, Te, Po** :  (i) General properties of the group.  (ii) Preparations.  (iii) Compound of the GVI elements.  **10/ The Halogens (GVII elements ) F, Cl, Br, I , At** :  (i) General properties of the group.  (ii) Preparations.  (iii) Compounds of the GVII elements.  **11/ The Noble Gases ( GVIII elements ) He, Ne, Ar, Kr, Xe** :  (i) General properties of the group.  (ii) Compound of the xenon. | | 2 Week  2 Week  2 Week  2 Week  2 Week  2 Week  2 Week  2 Week  2 Week  1Week |
| **18. Practical Topics (3 hrs.week)** | | ***Lecturer's name***  ***MSc. Bayan Omer, MSc. Bayan Attalla MSc.shatha jamel*** |
| Introduction of Practical inorganic chemistry  Week (1) Exp: No. (1) Purification of table salt(NaCl) or cooking salt.  Week (2) Exp: No. (2) ) Unknown of pervious experiment.  Week (3) Exp: No. (3) Determination of equivalent weight of Zn  Week (4) Exp: No. (4) Preparation of copper (I) chloride CuI.  Week (5) Exp: No. (5) Preparation of copper (I) iodide CuCl.  Week (6) Exp: No. (6) Preparation of copper (II) iodate dihydrate  Cu (IO3)2.2H2O.  Week (7) Exp: No. (7) Determination of( Cu2+ ) percentage in Cu(IO3)2.2H2O  Week (8) Exp: No. (8) Preparation of potassium periodate KIO4.  Week (9) Exp: No. (9) Preparation of sodium thiosulfate Na2S2O3  Week (10) Exp: No. (10) Quantitative & qualitative analysis of sodium thiosulfate Na2S2O3  **Examination (1) (1 / 2022)**  Week (11) Exp: No.(11) Preparation of potassium chromate K2CrO4  Week (12) Exp: No.(12) Determination of Chromium(%Cr3+) in K2CrO4  Week (13) Exp: No.(13) Preparation of chromium Alum (Double salt) KCr(SO4)2.10H2O  Week (14) Exp: No.(14)Preparation of Potash Alum (Double salt) KAl((SO4)2.12H2O  Week (15) Exp: No.(15) Determination of(%Al+3) in KAl((SO4)2.12H2O  Week (16) Exp: No. (16) Preparation of potassium manganate K2MnO4  **Examination (2) (4/ 2022)**  Week (17) Exp: No. (17) Preparation of calcium peroxide CaO2.  Week (18) Exp: No. (18) Preparation of MnSO4.7H2O  Week (19) Exp: No. (19) Determination of(%SO42-) in MnSO4.7H2O  Week (20) Exp: No. (20) Determination of crystallization water in MnSO4.7H2O  Week (21) Exp: No. (21) Preparation of barium thiocyanate Ba (SCN)2  Week (22) Exp: No. (22) Determination of percentage of water (crystalline water) in CuSO4.5H2O  Week (23) Exp: No. (23)Preparation of barium peroxide BaO2 | |  |
| **19. Examinations:**  1- Use the principles of bonding and molecular structure to explain.  ( i ) H-O-H bond is smaller than F-O-F bond*.*  ( ii) The angle between the N-H bonds in NH3 is greater than the angle between the P-H bonds in PH3.  B. Arrange the following in order of   1. increasing bond length for C – C in(C2 H6 , C2H4 , C2H2 ) 2. Increasing radius. Explain why? P3− , S -2, Cl- , Ar , K+ , Ca2+ 3. increasing ionization energy and explain why? Na, Ar, Cl, P, S, Mg, Al, Si   Q 2: Explain the following terms ,in terms of Coulomb’s Law?  ( i ) Which has a higher first ionization energy, Be or N? Explain why.  ( ii ) Which compound has greater lattice energy: LiBr or CaO?  ( iii ) Which has a stronger ionic bond, NaCl or AlCl3 . Which is more soluble in 80° C  water? Explain why.  Q 3: A. The NH3 and CH4 have a similar molecular masses. NH3 has a much higher normal boiling point (-350C) than CH4 (-1640C).  B. The boiling point of xenon is (-108 °C), whereas the boiling point of radon is (−61.7 °C).  (i) Identify the intermolecular force(s) in each substance, for A and B.  (ii) Account for the differences in the boiling points of the substances, for A and B.  Examination for practical  Q 1. How many oxidation state of iodine? Give an example for each of state  Oxidation states of the iodine are:  Q 2. Preparation of salt  Prepare and balance the chemical reactions .  1-Sodium thiosulfate  Na2SO3 + S Ø Na2S2O3  S S2+ +2e- oxidation  2e- + S4+ S2+ reduction  Q 3. /Determination of chromium percentage in potassium chromate.  Q 4. /What are differences between iodometry and iodimetry titration ?explain in detail.  Write the usages of sodium thiosulphate with chemical equations.  Q 5. Multiple Choice.  1- A 0.9182 g sample of KMnO4 (in neutral medium)is dissolved in enough water to give 500 ml of **solution. What is normality in this solution?**  **a) 0.0459 eq\L (b) 0.2304 eq\L (c) 0.03487 eq \L (d) 0.01162 eq\L**  **2- For 3.2 gm of impure table salt, the mass of BaSO4 is equal to 1.5 gm the percentage of sulfate ion is?**  **a) 19.28% (b) 15.1 % (c) 7.8 % (d) 35.4 %**  **In this type of exam there will be a number of phrases next or below a statement, students will match the correct phrase. Examples should be provided.** | | |
| **20. Extra notes:**  None. | | |
| **21. Peer reviewپێداچوونه‌وه‌ی هاوه‌ڵ**  No need | | |