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**Department of chemistry**

**College of Science**

**University of Salahadin**

**Subject: Inorganic chemistry**

**Course Book – (Year 1 )**

**Lecturer's name: MSc Sardar Hamad Fathullah**

**Academic Year: 2018/2019**

**Course Book**

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| **1. Course name** | **Inorganic chemistry** | |
| **2. Lecturer in charge** | **Sardar hamad fathullah** | |
| **3. Department/ College** | **Chemistry - science** | |
| **4. Contact** | **e-mail:** [**sardar.fathullah@su.edu.krd**](mailto:sardar.fathullah@su.edu.krd)  **e-mail:** [**sardarinorganic@gmail.com**](mailto:sardarinorganic@gmail.com)  **Tel: (optional)** | |
| **5. Time (in hours) per week** | **theoritical: 3** | |
| **6. Office hours** | **12 (2 theoretical first stage+3h student research)** | |
| **7. Course code** |  | |
| **8. Teacher's academic profile** | **BSc in 2005 chemistry**  **MSc in 2011 inorganic chemistry** | |
| **9. Keywords** | **Atoms, periodic table,** | |
| **10. Course overview:**  **Inorganic chemistry** is the study of the synthesis, reactions, structures and properties of compounds of the elements. This subject is usually taught after students are introduced to organic chemistry, which concerns the synthesis and reactions of compounds of carbon (typically containing C-H bonds). Inorganic chemistry encompasses the compounds - both molecular and extended solids - of everything else in the [periodic table](http://www.webelements.com/), and overlaps with organic chemistry in the area of organometallic chemistry, in which metals are bonded to carbon-contaning ligands and molecules. Inorganic chemistry is fundamental to many practical technologies including catalysis and materials (structural, electronic, magnetic,...), energy conversion and storage, and electronics. Inorganic compounds are also found in biological systems where they are essential to life processes. | | |
| **11. Course objective:**  The periodic table of the elements contains 118 elements that are known to date. Consider for a moment the fact that it takes a semester to teach the basics of understanding a single element in Organic Chemistry, and you will realize why it is impossible to cover all the topics important to the modern study of Inorganic Chemistry. However, we will strive in this course to address the most important concepts and applications of Inorganic Chemistry in research and societal applications. Topics ranging from car batteries to cancer treatments can be explained with many of the topics encompassed by the field of inorganic chemistry. | | |
| **12. Student's obligation**  In this section the lecturer shall write the role of students and their obligations throughout the academic year, for example the attendance and completion of all tests, exams, assignments, reports , essays…etc | | |
| **13. Forms of teaching**  **By Data show** | | |
| **14. Assessment scheme**  Breakdown of overall assessment and examination  The students are required to do two closed examinations at the course besides other assignments, for example daily quizzes and other activities which may held 3% of total grades ( 3 marks), final examination which bears 40% from the total degrees. Over all degrees 100% theory( 2 hours per week) .  **Quizzes**  In class every week, the students should already have knowledge of subject that they had taken before, and ready for any quizzes**.**  ‌ | | |
| **15. Student learning outcome:**   * -an understanding of major concepts, theoretical principles and experimental findings in chemistry. * -an ability to work effectively in diverse teams in both classroom and laboratory. * -an ability to employ critical thinking and efficient problem-solving skills in the four basic areas of chemistry (analytical, inorganic , organic, and physical). * -an ability to conduct experiments, analyze data, and interpret results, while observing responsible and ethical scientific conduct. * -effective written and oral communication skills, especially the ability to transmit complex technical information in a clear and concise manner. * -the ability to use modern instrumentation for chemical analysis and separation. * -the ability to use computers for chemical simulation and computation. * -the ability to employ modern library search tools (e.g. SciFinder) to locate, retrieve, and evaluate scientific information. * -a familiarity with, and application of safety and chemical hygiene regulations and practices. * -an ability to gain entry into professional schools, graduate programs, or the job market. | | |
| **16. Course Reading List and References‌:**  **Textbook:**   * **“*Inorganic Chemistry*” by C. E. Housecroft and A. G. Sharpe, Prentice Hall (1st ed., 2001; 2nd ed., 2005)** * ***Inorganic Chemistry*, 3rd ed., by D. F. Shriver et al., OUP (1999).** * ***Basic Inorganic Chemistry*, 3rd ed., by F. A. Cotton et al., Wiley (1995)** * ***Concepts and Models of Inorganic Chemistry*, 3rd ed., by B. Douglas et al., Wiley (1994)** * ***Inorganic Chemistry,* 3rd ed., by G.L. Miessler and D.A. Tarr, Prentice Hall (2004).** * **Course homepage:** [**http://webct.ust.hk**](http://webct.ust.hk/) * **Useful links** * **Department of Chemistry:** [**http://www-chem.ust.hk/**](http://www-chem.ust.hk/) * **Textbook website:** [**www.pearsoned.co.uk/housecroft**](http://www.pearsoned.co.uk/housecroft) * **Periodic table: For example,** * [**http://www.webelements.com/**](http://www.webelements.com/) * [**http://www.rsc.org/is/viselements.htm**](http://www.rsc.org/is/viselements.htm) * [**http://pubs.acs.org/cen/80th/elements.html**](http://pubs.acs.org/cen/80th/elements.html) * **Conduct in classroom:** [**http://www.ust.hk/vpaao/conduct/con\_classroom\_Aug04.ppt**](http://www.ust.hk/vpaao/conduct/con_classroom_Aug04.ppt) | | |
| **17. The Topics:**   * **- Structure of the atom.** * **-Periodic table of the elements , Who made the design of the Periodic -Table, Parts of periodic Table & Periodic Laws.** * **-Quantum Numbers.** * **-Atomic state derived from electronic configuration** * **-Nuclides ( atomic, mass numbers and eletronic configuration** * **-The physical picture of atomic orbitals.** * **-Ground state term symbol.** * **-Effective Nuclear Charge(*Z*\* )** * **-Periodicity Characters, Atomic size ,radius).Ionization energy. Electron affinity. Electronegativity.** * **-Type of Chemical bonding.** * **- Lewis Structures and Octet rule** * **-Valence Shell Electron Pair Repulsion (VSEPR).** * **- Formal Charge and Binary Compounds** * **-Determination of oxidation states of the elements.** * **- Molecular Orbital theory** | | **Lecturer's name**  **Sardar Hamad**  ex: (2 hrs)  ex: |
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| **18. Practical Topics (If there is any)** | |  |
| No practical. | |  |
| **19. Examinations:**  ***1. Compositional:***  Q/ Use Slater’s rules to estimate values of Zeff (Z\*) for Vanadium **V** atom  **(a)** 4s and **(b**) 3d electron in a **V**(Vanadium) atom. Explain why the valence configuration of the ground state of a **V**‏+ ion is likely to be 3d34s1 rather than 3d24s2?  **Answer**  V atom : *Z* = 23  Electron configuration: 1s2 2s2 2p6 3s2 3p6 4s2 3d3  (1s2) (2s2 2p6) (3s2 3p6) (3d3) (4s2)  For a 3d electron:  σ = (18 \* 1.00) + (2 \* 0.35) = 18.7  1s,2s,2p,3s,3p 3d  *Z*\* = *Z* - σ *Z*\* = 23 – 18.7 = 4.30  For a 4s electron:  σ = (10 \* 1.00) + (11 \* 0.85) + (1 \* 0.35) = 19.7  1s,2s,2p 3s,3p,3d 4s  *Z*\* = *Z* - σ *Z*\* = 23 – 19.7 = 3.30, because an electron in the 3d atomic orbital is under the influence of a greater effective nuclear charge than 4s, Z\* 3d > Z\* 4s there for when (V atom converted to V+ ions) electron remove from 4s rather than 3d &,4S need lower energy than 3d to remove electons.  **Answer**  Q/ Give the set quantum number(n,ml,ms and l ) for **Ba** (Barrium) atom and write name of group?  **Answer**  The set quantum numbers.  (n= 6 , ml = 0 , ms= -½ , l=o) , group name= Alkaline earth  Q/ The------------- is one-half the distance between the nuclei of two atoms in contact in the crystalline solid metal:   1. ionic radius **B- metallic radius**   **C**-covalent radius  Q/ Define electron affinity and write factors affecting on it is?  **Answer**  - Electron affinity : Energy change that occurs when an electron is added to an isolated gaseous atom  - measure of an element’s ability to gain an electron (ability to form an anion)  -Equation: atom + e- → ion-  (ΔE = Electron affinity), -Electron affinity is usually negative  - ΔE < 0 , - exothermic process  **Factors affecting electron affinity**   * When the nuclear charge is high there is greater attraction for the incoming electron. Therefore electron affinity increases as the nuclear charge increases. * With the increase in the size of the atom the electron affinity decreases because the distance between the nucleus and the incoming electron increases.   Electron affinities are low or almost zero in elements having stable electronic configurations (half filled and completely filled valence subshells) because of the small tendency to accept additional electron.  Q/ Which one has higher first Ionization energy **P**(phosphorus) or **S** (sulfur), why ?  **Answer**      ***2.******True or false type of exams:***  \* The second ionization energy ( I2 ) of K potassium is lowest energy than( I2 ) of Ca (calcium).  A- True **B- False**  ***3. Multiple choices:***  \*The main group elements consist :   1. The *d*-block elements **. B-** The *f*-block elements. 2. **Both s-block and p-block elements.** | | |
| **20. Extra notes:** | | |
| **21. Peer review** | | |