



FACULTY: BASIC AND APPLIED SCIENCES

DEPARTMENT: PHYSICAL AND CHEMICAL SCIENCES

FIRST SEMESTER EXAMINATIONS

2017/2018 ACADEMIC SESSION

ILARA MOKIN

COURSE CODE: CHM 201

COURSE TITLE: INORGANIC CHEMISTRY I

DURATION: 2 HOURS

HOD's SIGNATURE

Matriculation Number: _____

TOTAL MARKS: 60

INSTRUCTIONS: ATTEMPT TWO QUESTIONS FROM EACH SECTION

SECTION A [30 Marks]

QUESTION ONE

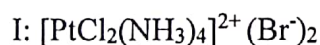
- A. Write complete, balanced equations for the following processes: [4 Marks]
- The reaction of borane B_2H_6 with oxygen
 - The preparation of borazine
- B. Draw the structure of an inorganic benzene [1 Mark]
- C. State 2 major differences between graphite and diamond [4 Marks]
- D. Predict the product of this reaction $SiCl_4(l) + 2H_2O(l) \implies$ [1 Mark]
- E. Starting with impure N_2 and H_2 , describe completely the Haber process for the synthesis of ammonia [4 Marks]
- F. Draw the molecular structure of Hydrazine [1 Mark]

QUESTION TWO

- A. Describe the chemical process for the production of H_2O_2 [2 Marks]
- B. Explain why ozone is useful in water purification [3 marks]
- C. Draw structures for each of the following species [3 Marks]
- ClF_3
 - IF_7
 - Cl_2O_7
- D. On the basis of energy, explain why fluorine is a more reactive element than might be expected when compared to the reactivity of the other halogens [2 Marks]
- E. Give the IUPAC names to the following coordination compounds [3 Marks]
- $K_2[Co(NH_3)_2Cl_4]$
 - $[Co(NH_3)_4Cl_2]Cl$
- F. What is crystal field theory [2 Marks]

QUESTION THREE

- A. Compounds I and II are isomeric, exhibiting different reactions with silver (I) nitrate (V).



- What is the oxidation number of platinum in each of the compounds? [2 Marks]
- What is the coordination number of platinum in each of the compounds? [2 Marks]

- c. What shape would you expect for the complex ion in compound I? [2 Marks]
- d. State the products of the reaction between compound I and silver (I) nitrate (V). [2 Marks]
- B. Chromium, manganese and iron are *d*-block elements and their atomic numbers are 24, 25 and 26 respectively.
- I. Explain what is *d*-block elements [2 Marks]
- II. Give two characteristic properties of the *d*-block elements, illustrate your answer by reference to the above elements [2 Marks]
- III. Give the electronic configuration of Cr(III) ion, Mn(VI) ion and Fe metal [3 Marks]

SECTION B

ATTEMPT ANY TWO QUESTIONS FROM THIS SECTION

- 1.
- a. List three properties which illustrate the diagonal relationship between lithium and magnesium. [3marks]
- b. Describe the properties of an ore which is to be concentrated by
- i. Leaching with an alkali [1mark]
- ii. Leaching with an acid [1mark]
- iii. Flotation [1mark]
- iv. Panning [1mark]
- c. Explain why the compounds of Beryllium are covalent, and those of the other group II elements are predominantly ionic. [3marks]
- d. Magnesium burns in air to give a white ash which when dissolved in water produces an odour of ammonia. Suggest with the aid of balanced chemical equations an explanation for this observation. [2marks]
- e. Complete the following reactions [3marks]
- i. $\text{Ca} + \text{H}_2\text{O}(\text{l})$
- ii. $\text{Mg}_3\text{P}_2 + \text{HCl}$
- iii. $\text{Xe}(\text{g}) + \text{F}_2(\text{g})$
- 2.
- a. A pure nuclide ${}_{24}^{90}\text{Y}$ is bombarded with alpha particles undergoes two reactions to produce neutrons and deuterons as product particles. Write equations showing the formation of the possible products nuclides [2marks]
- b. A radioactive nuclide has an initial activity of 28dis/min; 30 minutes later the activity is 14 dis/min. How many atoms of the radioactive nuclide were there originally? [3marks]
- c. Explain how Argon reacts with Fluorine to form a compound. [5marks]
- d. It has been suggested that hydrogen could be placed in Group 1 or Group 17 of the periodic table. Argue for or against each of these positions. [5marks]
- 3.
- a. Enumerate the differences and similarities between the chemistry of group I and group II elements [9marks]
- b. Mention at least three uses of name elements in Groups 1, 2 and 18 [6marks]