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KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2016/2017 ACADEMIC YEAR

FIRST YEAR SECOND SEMESTER
SUPPLEMENTARY/SPECIAL EXAMINATIONS

FOR THE DEGREE OF B.ED AND B.SC (SCIENCE)

COURSE CODE: SCH 100

COURSE TITLE: FUNDAMENTALS OF CHEMISTRY I

DURATION: 2 HOURS

DATE: 14TH SEPTEMBER 2017 **TIME:** 2 – 4PM

INSTRUCTIONS TO CANDIDATES

- Answer **QUESTION ONE** (Compulsory) and any other two (2) Questions.
- Indicate **answered questions** on the front cover.
- Start every question on a new page and make sure question's number is written on each page.

This paper consists of 4 printed pages. Please Turn Over



KIBU observes ZERO tolerance to examination cheating

Question 1(30 marks)

a) Draw the structures of the following compounds **(5 marks)**

i) 1,1,2-trimethylcyclopentane ii) propan-1-ol

iii) diethylamine iv) 2-butene

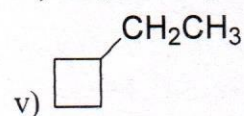
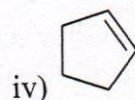
v) 2-chlorohex-3-yne

b) Give the IUPAC names of the following **(5 marks)**

i) $\text{CH}_3\text{CH}_2\text{CHClCH}_2\text{CH}_3$

ii) $\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3$

iii) $\text{CH}_3\text{NHCH}_2\text{CH}_2\text{CH}_3$

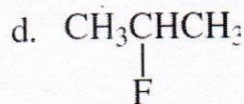
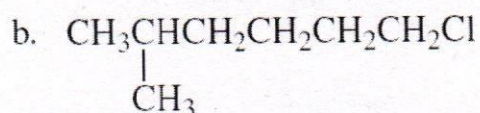
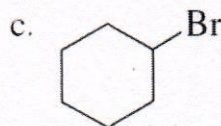
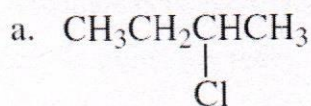


c) Define the following terms; **(4 marks)**

- i. Ionization energy
- ii. Electron affinity
- iii. Hydrogen bond
- iv. hybridization

d) Explain the effect on effective nuclear charge across a period of the periodic table. **(3 marks)**

e) Classify the following alkyl halide is primary, secondary, or tertiary. **(2 marks)**



f) Find the pH of $0.500 \text{ mol dm}^{-3}$ sodium hydroxide solution **(2 marks)**

g) i). Define a Lewis structure. **(1 mark)**

ii) What is the difference between sigma (σ) and pi (π) bonds **(2 marks)**

h) Give the Lewis structures for the following molecules **(3 marks)**

- a) SO_4^{2-}
- b) Nitrogen molecule
- c) Nitromethane

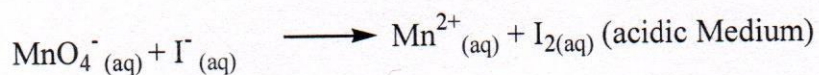
i) State three characteristics of ionic compounds **(3 marks)**

Question 2 (20 marks)

- a) Explain what happens to the following properties (4 marks)
- i) Atomic radius across period two elements
 - ii) atomic size trend down a group
 - iii) Electron affinity across a given period
 - iv) Metallic character down group VA
- b) Explain the following observations;
- i) Ionic compounds are usually solids with high melting points while covalent compounds are not (2 marks)
 - ii) Electrical conductivity of metals decreases with increasing temperature (2 marks)
 - iii) Lithium and magnesium have similar characteristics (2 marks)
 - iv) The ionization energy of an element in a given group of periodic table decreases with the increase in atomic number (1 marks)
 - v) The ionization potential of beryllium is much larger than that of boron though boron is slightly larger in size than beryllium (1 marks)
- c) Explain why sigma bond is stronger than pi bond (2 marks)
- d) Using ammonium ion, explain diagrammatically the meaning of coordinate bond (2 marks)
- e) Give four postulates of Dalton atomic theory. (4 marks)

Question 3 (20 marks)

- a) i) Differentiate between oxidation and reduction (2 marks)
- b) Balance the following redox reaction, (6 marks)



- c) i. Explain the factors affecting formation of ionic bond (3 marks)
- ii. Give any two characteristics of a covalently bonded compound. (2 marks)
- d) An impure sample of iron of mass 2.55 g was dissolved in dilute sulphuric acid and the solution made up to 250 cm³. The solution contained iron(II) ions together with some impurities. 25 cm³ of the solution were titrated with potassium manganate(VII) solution of concentration 0.02 mol dm⁻³. The average titre to reach end point was 28.50 cm³. Calculate the percentage purity of the sample of iron (Fe = 56.0). (4 marks)

e). For a given shell with $n=3$, give all the possible values of l and m (2 marks)

f). Explain why H_2O is a liquid at room temperature while H_2S is a gas (1 mark)

Question 4 (20 marks)

- a) i) States five industrial applications of radioisotopes (5 marks)
b) Write electronic configuration of Cr ($Z = 24$). Explain why it takes the configuration. (2 marks)
- c) i) Give four Postulates of Bohr' theory (4 marks)
ii) Explain the shortcomings of the Bohr model of an atom (4 marks)
- d) For the shell with $n=2$, what are the possible m_l values? (1 mark)
e) Calculate the wavelength in the Balmer Series as given by $n=4$ (2 marks)
f) Give two failures of the Rutherford model of the atom. (2 marks)