



MACHAKOS UNIVERSITY

University Examinations 2019/2020 Academic year

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF PHYSICAL SCIENCES

FIRST YEAR FIRST SEMESTER EXAMINATION FOR
BACHELOR OF SCIENCE (APPLIED PHYSICS AND TECHNOLOGY)

BACHELOR OF SCIENCE (ANALYTICAL CHEMISTRY)

BACHELOR OF EDUCATION (SPECIAL EDUCATION)

BACHELOR OF SCIENCE (MATHEMATICS)

BACHELOR OF EDUCATION (SCIENCE)

BACHELOR OF SCIENCE (BIOLOGY)

SCH 100: FUNDAMENTALS OF INORGANIC CHEMISTRY

DATE: 4/12/2019

TIME: 8.30-10.30 AM

INSTRUCTIONS TO CANDIDATES

- The paper consists of **two** sections.
- Section **A** is **compulsory**.
- Answer any two questions from section **B**.
- Find Periodic Table on the last Page.

SECTION A: COMPULSORY

QUESTION ONE (30 MARKS)

- a) Define the following:
- Atomos* (2 marks)
 - Principal Quantum Number? (2 marks)
 - Mole as a unit of measurement (2 marks)
- b) List any three main points in Dalton's atomic theory (3 marks)
- c) Using de Broglie's reasoning, explain what you understand by wave-particle duality (3 marks)
- d) List the two stable nitrogen isotopes (2 marks)
- e) CH_4 has four equivalent bonds yet there are only two single electrons in C atom. Explain

- (3 marks)
- f) Describe the shape of an s-orbital (3 marks)
- g) Using Carbon element as an example, explain what you understand by the term isotopes (3 marks)
- h) Differentiate between electronegativity and electron affinity of an atom. (2 marks)
- i) Calculate $[H^+]$ when $pH = 8.5$ (3 marks)
- j) How many valence electrons does an element in family 8A have? (2 marks)

SECTION B: ANSWER ANY TWO (2) QUESTIONS

QUESTION TWO (20 MARKS)

- a) Derive the formula $[\Delta p \cdot \Delta x \geq \frac{h}{4\pi}]$ using de Broglie's idea and the Heisenberg's Uncertainty principle (where, p =momentum, x =position, h =Planck's constant and λ =lambda) (5 marks)
- b) Explain what is meant by Failure of Bohr Atomic Model (5 marks)
- c) Explain how one can measure the Electromagnetic Spectrum (5 marks)
- d) Explain what was meant by J. J. Thomson's "corpuscles" (5 marks)

QUESTION THREE (20 MARKS)

- a) Define the following terms:
- i. Energy levels
 - ii. Shells
 - iii. Sub-shells (4 marks)
- b) Explain the following:
- i. Principals; Aufbau
 - ii. Pauli's Exclusion (4 marks)
- c) The families in the Periodic table are labeled at the top of the columns in one of two ways: What are the two ways of labeling families in the periodic table? (4 marks)
- d) Differentiate between natural and artificial Isotopes (4 marks)
- e) Outline any four simple rules for working out oxidation states (4 marks)

QUESTION FOUR (20 MARKS)

- a) Determine the hybridization of P in and geometry of PF_5 , (6 marks)
- b) Using NaCl, draw the Born-Haber Cycle to illustrate its formation (10 marks)
- c) Explain how ionization and electron affinity influence the formation of ionic bonds

(4 marks)

QUESTION FIVE (20 MARKS)

- a) Using suitable examples, explain what you understand by the following theories of Acids and Bases;
- i. Arrhenius
 - ii. Brønsted-Lowry
 - iii. Lewis (6 marks)
- b) Balance the following reaction
- $$\text{Cu}^+(\text{aq}) + \text{Fe}(\text{s}) \rightarrow \text{Fe}^{3+}(\text{aq}) + \text{Cu}(\text{s})$$
- (5 marks)
- c) Differentiate between molecular and empirical formulae. (4 marks)
- d) Calculate the number of bonds in CO and then draw its Lewis structure. (5 marks)

1																	
1	2																
H 1.0079																	
3	4													5	6	7	8
Li 6.941	Be 9.0122													B 10.811	C 12.011	N 14.007	O 15.999
11	12													13	14	15	16
Na 22.990	Mg 24.305													Al 26.982	Si 28.086	P 30.974	S 32.065
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
K 39.098	Ca 40.078	Sc 44.956	Ti 47.867	V 50.942	Cr 51.996	Mn 54.938	Fe 55.845	Co 58.933	Ni 58.693	Cu 63.546	Zn 65.409	Ga 69.723	Ge 72.64	As 74.922	Se 78.96	Br 79.904	Kr 83.798
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
Rb 85.468	Sr 87.62	Y 88.906	Zr 91.224	Nb 92.906	Mo 95.94	Tc (98)	Ru 101.07	Rh 102.91	Pd 106.42	Ag 107.87	Cd 112.41	In 114.82	Sn 118.71	Sb 121.76	Te 127.60	I 126.90	Xe 131.29
55	56	57-71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86
Cs 132.91	Ba 137.33	*	Hf 178.49	Ta 180.95	W 183.84	Re 186.21	Os 190.23	Ir 192.22	Pt 195.08	Au 196.97	Hg 200.59	Tl 204.38	Pb 207.2	Bi 208.98	Po (209)	At (210)	Rn (222)
87	88	89-103	104	105	106	107	108	109	110	111	112	113	114	115	116		118
Fr (223)	Ra (226)	#	Rf (261)	Db (262)	Sg (266)	Bh (264)	Hs (270)	Mt (268)	Ds (281)	Rg (272)	Uub (285)	Uut (284)	Uuq (289)	Uup (288)	Uuh (291)		Uuo (294)

* Lanthanide series	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71
	La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
	138.91	140.12	140.91	144.24	(145)	150.36	151.96	157.25	158.93	162.50	164.93	167.26	168.93	173.04	174.97
# Actinide series	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103
	Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
	(227)	232.04	231.04	238.03	(237)	(244)	(243)	(247)	(247)	(251)	(252)	(257)	(258)	(259)	(262)