



UNIVERSITY EXAMINATIONS

1ST SEMESTER 2022/2023 ACADEMIC YEAR

**SECOND YEAR EXAMINATION FOR THE DEGREE OF
BACHELOR OF SCIENCE (GEN), BACHELOR OF
EDUCATION (SCIENCE)**

**CHEM 211: COMPARATIVE STUDY OF S- AND P- BLOCK
ELEMENTS**

STREAM: R

TIME: 2 HRS

DAY: TUESDAY [8.30AM – 10.30AM]

DATE: 13/12/2022

THIS QUESTION PAPER CONSISTS OF FOUR (4) PAGES

PLEASE DO NOT OPEN UNTIL THE INVIGILATOR SAYS SO.



INSTRUCTIONS: - ANSWER ALL QUESTIONS**QUESTION ONE (30 MARKS)**

- (a) Lithium cannot be kept in Kerosene other like alkali metals. Explain. (3 marks)
- (b) The chemistry of Lithium is very much similar to that of magnesium even though they are placed in different groups - Explain. (2 marks)
- (c) Which is the weakest base among NaOH, Ca(OH)_2 , KOH and Be(OH)_2 . Give a reason (3 marks)
- (d) NaHCO_3 and NaOH cannot exist together in solution. Explain with aid of an equation. (2 marks)
- (e) BaO_2 is a peroxide but PbO_2 is not a peroxide why? (2 marks)
- (f) Using an equation, show which products are formed when Epsom salt ($\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$) is strongly heated? (2 marks)
- (g) The following compounds have been arranged in the order of increasing thermal stabilities. Identify the correct order. Explain briefly (3 marks)
(I) K_2CO_3 , (II) MgCO_3 , (III) CaCO_3 , (IV) BeCO_3
- (A) $\text{I} < \text{II} < \text{III} < \text{IV}$ (B) $\text{IV} < \text{II} < \text{III} < \text{I}$
- (C) $\text{IV} < \text{II} < \text{I} < \text{III}$ (D) $\text{II} < \text{IV} < \text{III} < \text{I}$
- (h) Explain using equation why AlCl_3 fumes in air (2 marks)
- (i) Classify the following oxides as acidic or basic or amphoteric or neutral. (3 marks)
- (A) CO (B) SnO_2
- (C) SiO_2 (D) ZnO
- (j) The first ionization energies of alkaline earth metals are higher than those of the alkali metals. Explain. (2 marks)
- (k) Arrange the following halides of boron in the increasing order of acidic character. BF_3 , BCl_3 , BBr_3 , BI_3 . (2 marks)

- (l) What happens when aluminum metal is dipped in conc. nitric acid? (2 marks)
- (m) Aluminum forms $[\text{AlF}_6]^{3-}$, but boron does not form $[\text{BF}_6]^{3-}$ why? (2 marks)

QUESTION TWO (20 MARKS)

- (a) Which of the following is superoxide? (3 marks)
 K_2O Na_2O MgO KO_2
- (b) A mixture of $\text{Al}(\text{OH})_3$ and $\text{Fe}(\text{OH})_3$ is given to you. Using an equation, how would you separate it? (4 marks)
- (c) Give reason for decreasing order of conductivity of following: (4 marks)
 $\text{Cs}^+ > \text{Rb}^+ > \text{K}^+ > \text{Na}^+ > \text{Li}^+$
- (d) Why BBr_3 is a stronger Lewis acid than BF_3 ? (3 marks)
- (e) Why CO_2 is a gas whereas SiO_2 is solid. Explain why? (2 marks)
- (f) Account for the fact that PbX_2 is more stable than PbX_4 . [$\text{X} = \text{Cl}, \text{Br}$] (2 marks)
- (g) PbCl_4 is less stable than SnCl_4 , but PbCl_2 is more stable than SnCl_2 . Why? (2 marks)

QUESTION THREE (20 MARKS)

- (a) ns^1 and ns^2 are the outer shell configurations of elements in s-block. TRUE OR FALSE Explain (2 marks)
- (b) Diamond is covalent, yet it has a high M.P. Why? (2 marks)
- (c) Mention three important uses of borax (3 marks)
- (d) Select the member (s) of group 14 that: (1 mark)
 i. forms the most acidic oxide (1 mark)
 ii. is commonly found in the +2 oxidation state (1 mark)
 iii. used as a semi-conductor. (1 mark)
- (e) Carbon exhibits catenation, whereas silicon does not. Explain. (3 marks)
- (f) Write reactions to justify amphoteric nature of aluminium. (2 marks)
- (g) What is meant by catenation? (2 marks)



- (h) The tendency for catenation decreases down the group in Group 14. Explain.
(3 marks)

PERIODIC TABLE OF THE ELEMENTS

1 H 1.0079												2 He 4.0026											
3 Li 6.941		4 Be 9.012										5 B 10.811	6 C 12.011	7 N 14.007	8 O 16.00	9 F 19.00	10 Ne 20.179						
11 Na 22.99		12 Mg 24.30										13 Al 26.98	14 Si 28.09	15 P 30.974	16 S 32.06	17 Cl 35.453	18 Ar 39.948						
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.90	23 V 50.94	24 Cr 52.00	25 Mn 54.938	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.39	31 Ga 69.72	32 Ge 72.59	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80						
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (98)	44 Ru 101.1	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.75	52 Te 127.60	53 I 126.91	54 Xe 131.29						
55 Cs 132.91	56 Ba 137.33	57 *La 138.91	72 Hf 178.49	73 Ta 180.95	74 W 183.85	75 Re 186.21	76 Os 190.2	77 Ir 192.2	78 Pt 195.08	79 Au 196.97	80 Hg 200.59	81 Tl 204.38	82 Pb 207.2	83 Bi 208.98	84 Po (209)	85 At (210)	86 Rn (222)						
87 Fr (223)	88 Ra 226.02	89 †Ac 227.03	104 Rf (261)	105 Db (262)	106 Sg (266)	107 Bh (264)	108 Hs (277)	109 Mt (268)	110 Ds (271)	111 Rg (272)	112 § (277)	§Not yet named											

*Lanthanide Series

†Actinide Series

58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm (145)	62 Sm 150.4	63 Eu 151.97	64 Gd 157.25	65 Tb 158.93	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.04	71 Lu 174.97
90 Th 232.04	91 Pa 231.04	92 U 238.03	93 Np 237.05	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (262)