



TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Applied and Health Sciences

Department of Pure & Applied Sciences

UNIVERSITY EXAMINATION FOR:

**DIPLOMA IN ANALYTICAL CHEMISTRY AND DIPLOMA IN SCIENCE LABORATORY
TECHNOLOGY**

ACH2205: CHEMISTRY OF S-AND P-BLOCK ELEMENTS

TIME: 2 HOURS

DATE: Pick Date Dec 2024

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **FIVE** questions. Attempt **question ONE (Compulsory)** and any other **TWO** questions.

Do not write on the question paper.

The modern periodic Table is attached as Appendix I

Question ONE

(a) Briefly explain each of the following terms:

(i) Shielding effect of electrons (2 marks)

(ii) Electron affinity (2 marks)

(iii) Ionization energy (2 marks)

(b) Explain any **THREE** factors influencing ionization energy (6 marks)

(c) Explain **TWO** differences between p-and s-block elements (4 marks)

(d) Lithium ion in solution should conduct electricity better than other ions of this group but this is not the case. Explain (4 marks)

(e) Explain why MgSO_4 is readily soluble in water while BaSO_4 is virtually insoluble (4 marks)

(f) Explain the trend of basicity of the oxides of group III elements (3 marks)

(g) State and briefly explain any **THREE** applications of aluminium or its compounds. (3 marks)

Question TWO

Carbon is the first element in group IV of the periodic table with two allotropes graphite and diamond

(a) Draw the structure of diamond and graphite (5 marks)

(b) Using the structure drawn in (2a) above, explain why:

- (i) Diamond is harder than graphite (3 marks)
- (ii) Diamond is a poor electrical conductor while graphite is a good conductor of electricity (3 marks)
- (c) State any **TWO** uses of diamond and graphite (4 marks)

Question THREE

- (a) The first ionization energy of phosphorous is higher than that of sulphur while that of magnesium is lower than that of aluminium. Briefly account for these observations (5 marks)
- (b) Explain why all the halogens are coloured (4 marks)
- (c) Discuss the diagonal relationship of boron with silicon (6 marks)

Question FOUR

- (a) Explain why the first elements in each group exhibit considerable differences from the rest of the elements of the same group (6 marks)
- (b) Outline any **FOUR** properties of beryllium that make it differ from the rest of the alkaline earth metals (4 marks)
- (c) (i) Explain the meaning of the term 'catenation' (1 mark)
- (ii) Briefly discuss the **FOUR main** differences between the hydrides of carbon and silicon (4 marks)

Question FIVE

- (a) Explain each of the following observations:
- (i) In group IV, carbon (1st row element) has a stronger tendency to catenation than its homologues, while in group VI, sulphur (2nd row element) has a stronger tendency to catenation relative to the other group members. (5 marks)
- (ii) The O-O and O-F bonds are much weaker than S-S and S-F bonds, while O-H and O-C bonds are much stronger than S-H and S-C bonds. (5 marks)
- (b) Explain why the solubility products of the carbonates of Group II elements decrease, while those of their fluorides increase down the series. (5 marks)

Appendix I

Modern Periodic Table

	IA																	VIIIA
1	1.008 1H											10.81 5B	12.011 6C	14.007 7N	15.999 8O	18.998 9F	20.179 10Ne	
2	6.941 3Li	9.012 4Be											26.98 13Al	28.09 14Si	30.974 15P	32.06 16S	35.453 17Cl	39.948 18Ar
3	22.990 11Na	24.305 12Mg	III B	IV B	V B	VIB	VII B	VIII B			IB	IIB						
4	39.098 19K	40.08 20Ca	44.96 21Sc	47.88 22Ti	50.94 23V	52.00 24Cr	54.94 25Mn	55.85 26Fe	58.93 27Co	58.69 28Ni	63.546 29Cu	65.38 30Zn	69.72 31Ga	72.59 32Ge	74.92 33As	78.96 34Se	79.904 35Br	83.80 36Kr
5	85.47 37Rb	87.62 38Sr	88.91 39Y	91.22 40Zr	92.91 41Nb	95.94 42Mo	(98) 43Tc	101.1 44Ru	102.91 45Rh	106.4 46Pd	107.87 47Ag	112.41 48Cd	114.82 49In	118.69 50Sn	121.75 51Sb	127.60 52Te	126.90 53I	131.29 54Xe
6	132.91 55Cs	137.33 56Ba	138.91 57La	178.49 72Hf	180.95 73Ta	183.85 74W	186.2 75Re	190.2 76Os	192.2 77Ir	195.08 78Pt	196.97 79Au	200.59 80Hg	204.38 81Tl	207.2 82Pb	208.98 83Bi	(244) 84Po	(210) 85At	(222) 86Rn
7	(223) 87Fr	226.03 88Rd	227.03 89Ac															

Lanthanide Series	140.12 58Ce	140.9077 59Pr	144.24 60Nd	(145) 61Pm	150.36 62Sm	151.96 63Eu	157.25 64Gd	158.93 65Tb	162.50 66Dy	164.93 67Ho	167.26 68Er	168.93 69Tm	173.04 70Yb	174.97 71Lu
Actinide Series	232.04 90Th	231.0359 91Pa	238.03 92U	237.05 93Np	(244) 94Pu	(243) 95Am	(247) 96Cm	(247) 97Bk	(251) 98Cf	(254) 99Es	(257) 100Fm	(258) 101Md	(259) 102No	(260) 103Lr