

NAME.....
P525/1
CHEMISTRY
PAPER 1
2¼ HOURS

.....STREAM.....



LUGAZI DIOCESE MOCK EXAMINATIONS BOARD
Uganda Advanced Certificate of Education
CHEMISTRY
PAPER 1
2 HOURS 45 MINUTES

INSTRUCTIONS TO CANDIDATES

- This paper consists of **TWO** Sections A and B.
- Section A has **TWO Compulsory** Items.
- Section B has two parts, I and II. Respond to only **ONE** Item from each part.
- Responses to Section A and B must be written in the answer booklet(s) provided. Respond to **FOUR** Items in all.
- **BEGIN EACH QUESTION ON A FRESH PAGE**

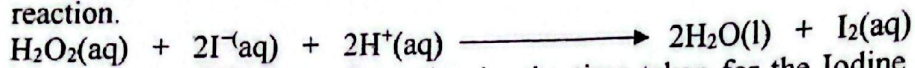
Item No	Basic Code	Weighted Score	Initials
1			
2			
3/4			
5/6			

SECTION A

Attempt **all** Items in this part

Item 1

Volatile radioactive Iodine species can pose biological and environmental hazards. The S.5 Chemistry class carried out research on the factors affecting rate of Iodine production for the reaction.

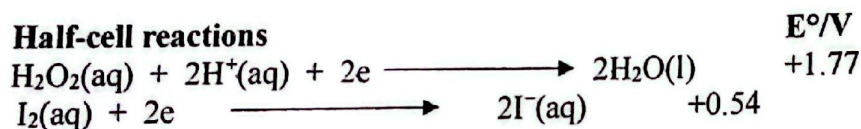


They measured the rate of reaction by the time taken for the Iodine produced to react with a small fixed amount of Sodium thiosulphate added to the constant volume system and obtained the following data.

Experiment	$[\text{I}^-]$ (mol dm^{-3})	Time (s)
1	0.004	74.0 ~~23.4~~
2	0.006	49.4 ~~12.4~~
3	0.008	37.0
4	0.010	30.0
5	0.012	25.0

The students are interested in the order of reaction with respect to I^- ions, factors affecting the rate of reaction, and feasibility of the reaction. When they consulted their chemistry teacher, he told them that the following additional data could be of help.

Half-cell reactions



Task: As a student of Chemistry, analyse and interpret the data provided to address the learners' concerns.

(Assuming the reaction is first order with respect to H_2O_2 and also first order with respect to I^-)

Item 2

Equilibrium reactions are widely employed in optimization of industrial processes.

In a bid to improve agricultural yield, a new factory has been constructed in Uganda to produce fertilizer. However, locals have complained about the fumes released by the factory.

In one of the Local Councils meetings, a suggestion was arrived at to take the fumes for analysis, and it was discovered that the fumes were of gas Z which contains 50.05% Sulphur and the rest Oxygen. Gas Z burns in oxygen to form gas W according to the following equation:



The process was carried out in the presence of Vanadium pentoxide at about 700 K and at a pressure of 120 kPa. Under these conditions, the partial pressures of Z and W at equilibrium are 33 kPa and 39 kPa respectively.

The production Manager is interested in the molecular formula of Z, factors that can increase the equilibrium yield of W, and the value of equilibrium constant K_p . Your Chemistry teacher got this information.

Task: As a student of Chemistry, analyse and interpret the data provided to address Managers' concerns, and analyse the application of the process.

SECTION B

PART I

(Attempt only **one** Item from this part)

Item 3

Knowledge of the chemistry of group (II) elements is employed in the medical profession. A group of S.5 Chemistry students, after a tour visit in one of the pharmaceutical industries, noticed that most medicines contain at least one group (II) element.

The tour guide told them periodic properties affect reactivity of the elements and that during the manufacture they incorporate reactions of elements with water, alkalis and dilute acids. When they returned to school, their Chemistry teacher gave them the following additional information and said it may be of help.

Element	Be	Mg	Ca	Sr	Ba
Atomic Radius (nm)	0.112	0.160	0.197	0.215	0.222
Ionisation Energy (kJmol^{-1})	890	738	590	550	503

The S.5 students are interested in how periodic properties affect reactivity, reactions of elements and any health implications of the elements.

Task: As a learner of Chemistry, analyse and interpret the data to address the issues of the S.5 Chemistry Class.

Item 4

Access to safe and clean drinking water is important in human life. A chemical plant is exploring the use of one of group 17 elements for water treatment. An industrial chemist has advised that knowledge of the reactivity of the elements and their reactions with water and alkalis should be considered and has provided the following data;

Element	F	Cl	Br	I
Atomic radius (nm)	0.072	0.099	0.114	0.133

The Plant's Management is now interested in reactivity of the elements, their reactions with water and alkalis and the associated health implications of the elements. Your Chemistry teacher came across this information and has contacted you.

Task: As a chemistry learner your teacher has requested you to analyse and interpret the data for the company.

PART II

(Attempt only **one** Item from this part)

Item 5

Use of perfumed deodorants is becoming of high demand in Uganda. A manufacturing company has decided to enter into business. The company chemist has advised that a perfume, methyl ethanoate can be obtained from chloroethane. And in a parallel chain synthetic route, ethene can be used as a starting material for preparation of propanoic acid.

In a mitigation side chain reaction, the chemist recommended reacting the unreacted chloroethane with benzene and ethene with unreacted ethene with bromine in organic solvent. The company's management interested in the suitability of its product for their applications, synthetic pathways for the products, mitigation reactions for the unreacted raw materials and the associated environmental impact of the application of its products.

Task: As a learner of chemistry, analyse and interpret the data to address the company's concerns.

Item 6

Use of polymers and solvents for grease is becoming of high demand in Uganda. A manufacturing company uses propene to manufacture polythene and propanol to prepare a solvent for grease.

In a parallel chain reaction as a mitigation measure, the company reacts propene with bromine water and propanol with concentrated sulphuric acid at 180°C .

The technical team of the company wants to know the suitability of its raw materials for its operations, synthetic pathways for its products, mitigation reactions, and an evaluation of the environmental impacts of the application of its products.

Task: As a student with knowledge of Chemistry, prepare a write up to help the technical team of the company.

END

1 H 1.008	2 He 4.00																																														
3 Li 6.94	4 Be 9.01											13 B 10.81	14 C 12.01	15 N 14.01	16 O 16.00	17 F 19.00	18 Ne 20.18																														
11 Na 22.99	12 Mg 24.30											13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.06	17 Cl 35.45	18 Ar 39.95																														
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.87	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.38	31 Ga 69.72	32 Ge 72.63	33 As 74.92	34 Se 78.97	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 95.95	43 Tc 101.07	44 Ru 101.07	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 121.76	52 Te 127.60	53 I 126.90	54 Xe 131.29																														
55 Cs 132.91	56 Ba 137.33	57-71 †	72 Hf 178.49	73 Ta 180.95	74 W 183.84	75 Re 186.21	76 Os 190.23	77 Ir 192.22	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	85 At	86 Rn																														
87 Fr	88 Ra	89-103 †	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Cn	113 Nh	114 Fl	115 Mc	116 Lv	117 Ts	118 Og																														
*Lanthanoids <table border="1"> <tr> <td>57 La 138.91</td> <td>58 Ce 140.12</td> <td>59 Pr 140.91</td> <td>60 Nd 144.24</td> <td>61 Pm</td> <td>62 Sm 150.36</td> <td>63 Eu 151.97</td> <td>64 Gd 157.25</td> <td>65 Tb 158.93</td> <td>66 Dy 162.50</td> <td>67 Ho 164.93</td> <td>68 Er 167.26</td> <td>69 Tm 168.93</td> <td>70 Yb 173.05</td> <td>71 Lu 174.97</td> </tr> </table> *Actinoids <table border="1"> <tr> <td>89 Ac</td> <td>90 Th 232.04</td> <td>91 Pa 231.04</td> <td>92 U 238.03</td> <td>93 Np</td> <td>94 Pu</td> <td>95 Am</td> <td>96 Cm</td> <td>97 Bk</td> <td>98 Cf</td> <td>99 Es</td> <td>100 Fm</td> <td>101 Md</td> <td>102 No</td> <td>103 Lr</td> </tr> </table>																		57 La 138.91	58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm	62 Sm 150.36	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 173.05	71 Lu 174.97	89 Ac	90 Th 232.04	91 Pa 231.04	92 U 238.03	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr
57 La 138.91	58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm	62 Sm 150.36	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 173.05	71 Lu 174.97																																	
89 Ac	90 Th 232.04	91 Pa 231.04	92 U 238.03	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr																																	