

NAME:..... Stream.....

P525/1

CHEMISTRY

PAPER 1

2¾ Hours



ACEITEKA JOINT MOCK EXAMINATIONS 2026
Uganda Advanced Certificate of Education

CHEMISTRY PAPER 1

2 Hours 45 Minutes

INSTRUCTIONS TO CANDIDATES

The paper consists of two Sections: A and B. It has six examination items.

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.

Responses to each item should start on a fresh page.

Any additional item(s) responded to will not be scored.

For Scorer's Use Only

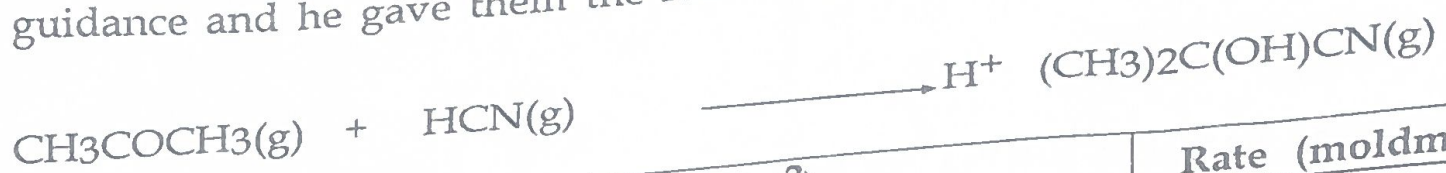
Item No	Basic Code	Weighted Score	Scorer's Initials
1			
2			
(3/4)			
(5/6)			

SECTION A

Attempt all questions in this Section

Item 1

Rates of reactions are very important in optimizing industrial processes. As Senior 5 chemistry class interested in the rate of reaction between acetone and hydrogen cyanide in acidic conditions approached their chemistry teacher for guidance and he gave them the following information.



Experiment	Concentration (mol dm^{-3})			Rate ($\text{mol dm}^{-3} \text{s}^{-1}$)
	$[\text{CH}_3\text{COCH}_3]$	$[\text{HCN}]$	$[\text{H}^+]$	
1	1×10^{-2}	1×10^{-2}	1×10^{-2}	2×10^{-2}
2	1×10^{-2}	2×10^{-2}	1×10^{-2}	2×10^{-2}
3	2×10^{-2}	1×10^{-2}	1×10^{-2}	4×10^{-2}
4	1×10^{-2}	1×10^{-2}	2×10^{-2}	4×10^{-2}

Bond	Energy / kJ mol^{-1}
C=O	+743
C-H	+412
C-O	+360
C-C	+348
H-O	+463

The chemistry teacher further advised that the rate constant, factors affecting rate of reaction, enthalpy change for the reaction and the associated applications of the enthalpy of reaction are all vital in understanding the reaction rate. The S.5 chemistry class is now challenged and have approached you.

Task: As a student of chemistry analyse and interpret the data to address the concerns of the S.5 chemistry class.

Item 2

A pharmaceutical company dealing in syrups has realized a decline in its sales after persistent complaints from its customers for its bitterness. The chemist has advised the company to procure salt X labelled:
29.27% Carbon, 3.71% Hydrogen, 28.05% Sodium and 38.98% Oxygen with molar

mass of 82. The laboratory attendant provided 1dm^3 of ethanoic acid of concentration 0.1 M and $K_a = 1.86 \times 10^{-5}\text{ mol dm}^{-3}$.

The company's management is now interested in the molecular formula of the salt, the amount of the salt that must be added to the acid provided to produce a buffer solution of $\text{pH} = 5.73$ and the associated applications of the resultant solution. The laboratory attendant is challenged and has approached you.

Task: As a student of chemistry analyse the data provided to address management concerns.

SECTION B PART I

(Attempt only one Question from this Section)

Item 3

Gastric ulcers is a major complaint in one of the schools in Uganda. In one of the meetings of the science club, one chemistry student suggested that one of the Group II elements can be a better remedy. Their chemistry teacher advised that periodic trends for the elements and their compounds can affect reactivity and reactions of elements with water, alkalis and dilute acids should be put into consideration and also an assessment of the health implications of any element or compound and provided the following information

Element	Be	Mg	Ca	Sr	Ba
Atomic radius (nm)	0.112	0.160	0.197	0.215	0.222
Solubility of the hydroxide (mol per 100cm^3 of water)	1.1×10^{-5}	2×10^{-5}	1.5×10^{-3}	3.4×10^{-3}	1.5×10^{-2}

Members of the science club are now challenged and have approached you.

Task: As a Senior 6 student of chemistry, help the members of the science club to analyse and interpret the data provided to address their concerns.

Item 4

In chemistry, enzymes and cell receptors act like locks while molecules are the keys. Transition metal complexes facilitate highly efficient catalysis, power biological systems and drive advancements in medicines and material science. S.5 chemistry students under their science club put themselves in two groups. One group is to use the principle of electron pair repulsion theory to explain and

analyse the shapes of simple molecules by illustrating how it determines molecular shapes and bond angles. The second group is to analyse transition complexes by giving the IUPAC name of the complex, oxidation state of the central metal atom and its coordination number.

Their chemistry teacher gave them the following support data:

Molecule	NH_3 , BF_3 , SF_4 , PCl_5 , CCl_4
----------	---

Complex	$[\text{Co}(\text{NH}_3)_5\text{H}_2\text{O}]\text{Cl}_3$, $\text{Cu}(\text{NH}_3)_4^{2+}$, $\text{Co}(\text{SCN})_4^{2-}$, CoCl_6^{2-} , CuCl_4^{2-}
---------	---

The S.5 students have been challenged and have approached you.

Task: As a chemistry student help the S.5 students to address their concerns.

PART II

(Attempt only one Question from this Section)

Item 5

Coolants for car engines are of high demand in a Ugandan population. A manufacturing company is using 1,2-dibromoethane to make ethane-1,2-diol and benzene to make 1-phenylethyne to address the high demand. As a mitigation measure the manufacturing company reacts excess 1,2-dibromoethane with hot alcoholic potassium hydroxide solution and the unreacted benzene with bromomethane. The company's management is interested in the suitability of ethane-1,2-diol to its application, an analysis of the mitigation reactions with equations and an evaluation of the company's synthetic routes with the possible environmental implications of its operations.

Task: As a chemistry student, analyse and interpret the data to address the management's concerns.

Item 6

In a move to improve agricultural output in a certain country, an industrial plant is using benzene to make a fertilizer, phenyl ethanamide ($\text{C}_6\text{H}_5\text{NHCOCH}_3$), and propene to make propanoic acid. In integrating the plant, it reacts the unreacted benzene with a mixture of concentrated nitric acid and concentrated sulphuric acid and then reacts propene with acidified warm water.

The company's management wants to know the suitability of its fertilizer to its application, an analysis of the integration reactions with equations, an evaluation of its synthetic pathways with the possible associated health implications. The plant's management is challenged and your teacher came across this information.

Task: As a student of chemistry analyse and interpret the data to address the plant's management concerns.

END

The Periodic Table of the Elements

The Periodic Table of the Elements																		2
1																	He	
H																	Helium 4.003	
3	4															10		
Li	Be															Ne		
Lithium 6.941	Beryllium 9.012182															Neon 20.1797		
11	12	13	14	15	16	17	18											
Na	Mg	Al	Si	P	S	Cl	Ar											
Sodium 22.989770	Magnesium 24.3050	Aluminum 26.981538	Silicon 28.0855	Phosphorus 30.973761	Sulfur 32.066	Chlorine 35.4527	Argon 39.948											
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr	
Potassium 39.0983	Calcium 40.078	Scandium 44.955910	Titanium 47.867	Vanadium 50.9415	Chromium 51.9961	Manganese 54.938049	Iron 55.845	Cobalt 58.933200	Nickel 58.6934	Copper 63.546	Zinc 65.39	Gallium 69.723	Germanium 72.61	Arsenic 74.92160	Selenium 78.96	Bromine 79.904	Krypton 83.80	
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe	
Rubidium 85.4678	Strontium 87.62	Yttrium 88.90585	Zirconium 91.224	Niobium 92.90638	Molybdenum 95.94	Technetium (98)	Ruthenium 101.07	Rhodium 102.90550	Palladium 106.42	Silver 107.8682	Cadmium 112.411	Indium 114.818	Tin 118.710	Antimony 121.760	Tellurium 127.60	Iodine 126.90447	Xenon 131.29	
55	56	57	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn	
Cesium 132.90545	Barium 137.327	Lanthanum 138.9055	Hafnium 178.49	Tantalum 180.9479	Tungsten 183.84	Rhenium 186.207	Osmium 190.23	Iridium 192.217	Platinum 195.078	Gold 196.96655	Mercury 200.59	Thallium 204.3833	Lead 207.2	Bismuth 208.98038	Polonium (209)	Astatine (210)	Radon (222)	
87	88	89	104	105	106	107	108	109	110	111	112	113	114					
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt										
Francium (223)	Radium (226)	Actinium (227)	Rutherfordium (261)	Dubnium (262)	Seaborgium (263)	Bohrium (264)	Hassium (265)	Meitnerium (266)	(269)	(272)	(277)							

58 Ce Cerium 140.116	59 Pr Praseodymium 140.90765	60 Nd Neodymium 144.24	61 Pm Promethium (145)	62 Sm Samarium 150.36	63 Eu Europium 151.964	64 Gd Gadolinium 157.25	65 Tb Terbium 158.92534	66 Dy Dysprosium 162.50	67 Ho Holmium 164.93032	68 Er Erbium 167.26	69 Tm Thulium 168.93421	70 Yb Ytterbium 173.04	71 Lu Lutetium 174.967
90 Th Thorium 232.0381	91 Pa Protactinium 231.03588	92 U Uranium 238.0289	93 Np Neptunium (237)	94 Pu Plutonium (244)	95 Am Americium (243)	96 Cm Curium (247)	97 Bk Berkelium (247)	98 Cf Californium (251)	99 Es Einsteinium (252)	100 Fm Fermium (257)	101 Md Mendelevium (258)	102 No Nobelium (259)	103 Lr Lawrencium (262)