Name: ..... Stream:.....

ST JOSEPH'S SENIOR SECONDARY SCHOOL-NAGGALAMA

S.5 BEGINNING OF TERM TWO 2025

CHEMISTRY PAPER 1

2 HOURS

Attempt all items in this paper

1. During a chemistry practical, a student was given an unknown carboxylic acid of formula

   $(CH_2)_x(COOH)_2$

   A solution of the acid in water has a concentration of 11.2g/l

   This solution was titrated with 0.1M sodium hydroxide using phenolphthalein indicator. 20.0cm^3 of the acid solution required 33.9cm^3 of the alkali for the reaction.

   Calculate;

   (a) the molarity of the acid

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(b) the value of x in the acid, $(CH_2)_x(COOH)_2$. [C = 12, H = 1]

.....

.....

.....

.....

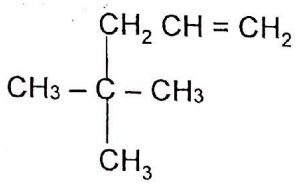
.....

.....

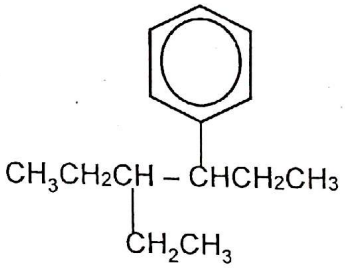
.....

2. The community police department is investigating a suspected clandestine laboratory in the neighborhood. During their search, they found various bottles filled with chemical liquids and powders with structures;

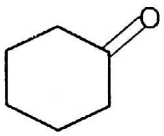
(i)



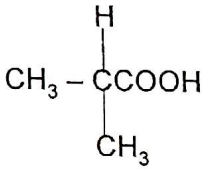
(ii)



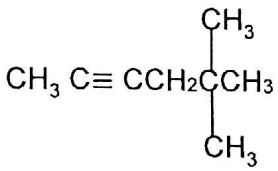
(iii)



(iv)



(v)



The officers suspect these compounds might be related to the production of illegal drugs or explosive but non of them has enough knowledge to identify the compounds accurately.

As a student of senior five with knowledge of organic chemistry;

(a) Help the police to;

(i) understand the part of each of the substances (i), (iii), (iv) and (v) that determines the chemical properties of that substance.

.....

.....

.....

.....

.....

.....

.....

(ii) identify each of the compounds

.....

.....

.....

.....

.....

(b) Suggest to the police;

(i) the specific class of organic compounds to which compound (iii) belongs.

.....

.....

(ii) the physical properties of the compounds in the homologous series to which substance (ii) belongs

.....

.....

.....

.....

.....

.....

.....

3. During a chemistry experiment, a teacher displayed a set of models from balls and sticks. Each model corresponded to a different polyatomic ion or molecule. I.e. hydroxonium ion, nitrate ion, sulphate ion, ammonium ion and sulphur dichloride.

The students to whom the models were shown need clarification about the situation.

As a student with knowledge about bonding and structure;

Help the chemistry class to;

(a) Draw the structure and name the shape of each of the ions and molecule.

Ion/molecule	Structure	Name of shape
Nitrate ion		
Sulphate ion		
Ammonium ion		
Sulphur dichloride		
Hydroxonium ion		

(b) Understand why the hydroxonium ion adopts the named shape.

.....

.....

.....

.....

4. At a science competition students were given a task to identify unknown elements based on their ionization energy data. The table below shows the 1st ionization energies (in KJ/mol) of five unknown elements labeled A to E.

Element	Ionization Energies / KJ/mol)			
	1st	2nd	3rd	4th
A	500	4600	6900	9500
B	740	1500	7700	10500
C	630	1600	3000	4800
D	900	1800	14800	21000
E	580	1800	2700	11600

Task

As a senior five student who has learnt about importance of ionization energies in determining different aspects of elements,

(a) help the students to know the elements that are in the same group of the periodic table

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(b) Assist the students to understand which element is not likely to form an ion with charge of and provide a reason for your answer

.....

.....

.....

.....

.....

.....

.....

(c) Guide the students to know which elements would be the most electropositive among the elements in the table and give a reason for your answer.

.....

.....

.....

.....

.....

END

THE PERIODIC TABLE

1	2											3	4	5	6	7	8
1.0 H 1																1.0 H 1	4.0 He 2
6.9 Li 3	9.0 Be 4											10.8 B 5	12.0 C 6	14.0 N 7	16.0 O 8	19.0 F 9	20.2 Ne 10
23.0 Na 11	24.3 Mg 12											27.0 Al 13	28.1 Si 14	31.0 P 15	32.1 S 16	35.4 Cl 17	40.0 Ar 18
39.1 K 19	40.1 Ca 20	45.0 Sc 21	47.9 Ti 22	50.9 V 23	52.0 Cr 24	54.9 Mn 25	55.8 Fe 26	58.9 Co 27	58.7 Ni 28	63.5 Cu 29	65.7 Zn 30	69.7 Ga 31	72.6 Ge 32	74.9 As 33	79.0 Se 34	79.9 Br 35	83.8 Kr 36
85.5 Rb 37	87.6 Sr 38	88.9 Y 39	91.2 Zr 40	92.9 Nb 41	95.9 Mo 42	98.9 Tc 43	101 Ru 44	103 Rh 45	106 Pd 46	108 Ag 47	112 Cd 48	115 In 49	119 Sn 50	122 Sb 51	128 Te 52	127 I 53	131 Xe 54
133 Cs 55	137 Ba 56	139 La 57	178 Hf 72	181 Ta 73	184 W 74	186 Re 75	190 Os 76	192 Ir 77	195 Pt 78	197 Au 79	201 Hg 80	204 Tl 81	207 Pb 82	209 Bi 83	209 Po 84	210 At 85	222 Rn 86
223 Fr 87	226 Ra 88	227 Ac 89															

139 La 57	140 Ce 58	141 Pr 59	144 Nd 60	147 Pm 61	150 Sm 62	152 Eu 63	157 Gd 64	159 Tb 65	162 Dy 66	165 Ho 67	167 Er 68	169 Tm 69	173 Yb 70	175 Lu 71
227 Ac 89	232 Th 90	231 Pa 91	238 U 92	237 Np 93	244 Pu 94	243 Am 95	247 Cm 96	247 Bk 97	251 Cf 98	254 Es 99	257 Fm 100	256 Md 101	254 No 102	260 Lr 103

END