

JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF BIOLOGICAL AND PHYSICAL SCIENCES

UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE PUBLIC HEALTH

COURSE CODE : SCH 3112

COURSE TITLE: APPLIED CHEMISTRY

FIRST YEAR FIRST SEMESTER

INSTRUCTIONS

- 1. Answer question 1(Compulsory) in section A and ANY other 2 questions in section B
- 2. Candidates are advised not to write on the question paper
- 3. Candidates must hand in their answer booklets to the invigilator while in the examination room
- 4. Some important information/formula are found on the last page of the questions paper

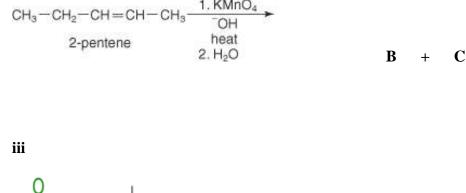
SECTION A

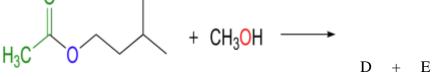
QUESTION 1 30 marks

a) Name and draw the structure of the main compounds A, B, C, D and E in the reactions below 5 mrks

i.

$$H_3C - CH - CH_2 - CH_3 KOH (alcoholic) - HBr + HBr$$





- b) The cations O_2^+ and N_2^+ are important components of the earth's upper atmosphere. Using Molecular orbital energy level diagram write the electronic configuration of O_2^+ and predict the bond order. 4 mrks
- c) Briefly discuss the following terms with the help of examples in each case;
 - i. Dipole-dipole interaction 2 mrks
 - ii. Ion-dipole interaction 2 mrks

d) Compare the THREE elements N,O and P

i.	Arrange the elements in order of increasing atomic radius. Justify your answer	3 mrks
ii.	Identify the element with the highest ionization energy. Explain your answer	3 mrks

- iii. Between N and P which one has the highest electron affinity? Explain 2 mrks
- iv. Explain why the Ionization energies of Si, P and S are in the order of Si< P>S 2 mrks

- i. A buffer solution was prepared by mixing 0.20 mol dm⁻³ ethanoic acid and 0.10 mol dm⁻³ sodium ethanoate. If the K_a for ethanoic acid is 1.74×10^{-5} mol dm⁻³, calculate the theoretical hydrogen ion concentration and pH of the buffer solution. 3 mrks
- ii. In what ratio should a 0.30 mol dm^{-3} of ethanoic acid be mixed with a 0.30 mol/dm³ solution of sodium ethanoate to give a buffer solution of pH 5.6? 4 marks

e)

SECTION B

Answer ANY TWO questions from Section B

QUESTION 2 20 MARKS

	Define the term line spectrum Explain how line spectrum can be used for the identification of elements			
c)	Hydrogen atom has one electron, however its spectrum contains so many lines. Explain. 2 mrk	5		
d)				
	i. the energy change (ΔE) for the electron in this jump	3 mrks		
	ii. the frequency (v) and wavelength (λ) of light emitted from this energy ch	ange		
		3 mrks		
	iii. the spectral region in which this this light will be formed	2 mrks		
e)	With the help of an example distinguish between Molarity and Molality	2 mrks		
f) In an experiment equal volumes of 0.025 mol dm ^{-3} potassium bromide (KBr) and 0.00				
dm^{-3} lead(II) nitrate (Pb(NO ₃) ₂) solutions were mixed (K _{sp(PbBr2)} = 7.9 x 10 ⁻⁵ mol ³ dr				
	a) Write down			
	(i) the K _{sp} expression for lead(II) bromide	1 mrk		
	(ii) the ionic equation for its precipitation.	1 mrk		
	b) Show by calculation if lead (II) bromide precipitates after mixing the solutions.	3 mrks		

QUESTION 3 20 MARKS

a)	State Le Chatelier's Principle	2 mrks
b)	Define the term limiting reagent	1 mrks
c)	Explain why elements of the same group have similar properties.	2 mrks

- d) A student is in possession of a weak acid solution of 0.2 M HF. He decided to add to his solution an equal amount 0.10 M HCl. $Ka = 6.8 \times 10^{-4}$
 - i. Determine the concentration of fluoride Ion and the pH of the solution before adding hydrochloric acid. 3 mrks
 - ii. Calculate the pH of the mixture and explain the effect of the common effect to the pH of the final solution.3 mrks
- e) Briefly explain the correlation between atomic size and ionization enthalpyf) Discuss any TWO relevant applications of radioactivity6 mrks

QUESTION 4 20 MARKS

a)	Distinguish between artificial and natural Transmutation	2 mrks	
b)) With the help of curly arrows explain the Electrophilic Aromatic Substitution me		
	using benzene and a compound EY	3 mrks	
c)	Explain why aromatic compounds are stable?	1 mrk	
4)	Discuss the relevance of electromagnetic radiation in the Global Warming phenor		
u)	Discuss the relevance of electromagnetic radiation in the Global warning phenol	3 mrks	
,	Identify the missing product in the radioactive equation below		

- f) State Pauli exclusion principle
- g) Write the electronic configuration of the following Cr, Ti, Sn 4 mrks
- h) Calculate the lattice enthalpy for lithium fluoride, given the following information 4 mrks

2 mrks

- Enthalpy of sublimation for solid lithium = 161 kJ/mol
- First ionization energy for lithium = 520 kJ/mol
- F-F bond dissociation energy = 154 kJ/mol
- Enthalpy of formation for F(g) = 77 kJ/mol
- Electron affinity for fluorine = -328 kJ/mol
- Enthalpy of formation for solid lithium fluoride = -617 kJ/mol

End

Support information

h = planck's constant =	e
C= speed of light =	3
R= Rhyberg's constant =	1

6.626 x 10⁻³⁴ J.S 3.0x10⁸ m/s 1.0973731 x 10⁷ m/s

18 2 He	10 Ne 20.18 18 39.95	36 Kr 83.80	54 Xe	86 Rn 222		Î	71 Lu 74.97	103 262
17		35 Br 79.91					70 Yb 173.04	
16		34 Se 78.96		84 Po 210			69 Tm 168.93	101 Md 258.10
5	7 14.01 15 30.97	33 As 74.92	51 5 b 121.75	83 Bi 208.98			68 Er 167.26	100 Fm 257.10
14	6 C 12.01 14 Si 28.09	32 Ge 72.59	50 Sn 118.71	82 Pb 207.19			67 Ho 164.93	99 Es 252.09
ŧ	5 B 10.81 13 13 13 26.98	31 Ga 69.72	49 In 114.82	81 11 204.37			66 Dy 162.50	1
	12	30 Zn 65,41	48 Cd 112.40	80 Hg 200.59	112 Uub [285]		65 Tb 158.92	97 Bk 249.08
r hass, A _r	٦	82 BS	47 Ag 107.87	79 Au 196.97	111 Rg [272]			96 Cm 244.07
 Atomic number, Z Element symbol Relative atomic mass, A_r 	1	28 Ni 58.69	46 Pd 106.42	78 Pt 195.08	110 DS [271]		63 Eu 151.96	95 Am 241.06
Atomic number Element symbol Relative atomic	م	27 58,93	45 Rh 102.91	77 Ir 192.22	109 Mt [268]		62 5m 150.35	94 Pu 239.05
$\downarrow \downarrow \downarrow \downarrow$		26 Fe 55.85	44 Ru 101.07	76 OS 190.23	108 Hs [277]		61 Pm 146.92	93 Np 237.05
008 T -	~	25 Mn 54.94	43 7 98.91	75 Re 186.21	107 Bh [264]		60 Nd 144.24	92 U 238.03
	و	24 G 52.01	42 Mo 95,94	74 W 183.85	106 Sg [266]		59 Pr 140.91	91 Pa 231.04
	S	23 × 23	41 Nb 92.91	73 Ta 180.95	105 Db [262]		58 Ce 140.12	90 Th 232.04
	4	22 TI 47.90	40 Zr 91.22	72 Hf 178.49	104 Rf [261]		57 La 138.91	89 Ac 227.03
	m	21 Sc 44.96	39 ★ 88.91	la-Lu	Ac-Lr			
~	4 Be 9.01 12 12 24,31 24,31	20 Ca 40.08	38 Sr 87.62	56 Ba 137,34	88 Ra 226.03		Lanthanoids	loids
H	3 Li 6.94 11 Na 22.99	19 K 39,10	37 Rb 85.47	55 CS 132.91	87 Fr 223		Lant	Actinoids

Periodic table