

**UNIVERSITY OF FORT HARE**

**PAC 129**

**DEGREE EXAMINATIONS**

**NOVEMBER 2018**

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**Time: 3 HOURS**

**Subject: BASIC CHEMISTRY**

**Marks: 100**

**This paper consists of 6 pages including cover page**

**Internal Examiner**

**Prof OO Okoh**

**Instructions**

**Answer all questions**

### Question 1

(a) Define the following Gas Laws:

(i) Boyle's law

(ii) Charle's law

(iii) Avogadro's law

(iv) Gay- Lussac's law

(v) Daltons law of partial pressure

(10 marks)

(b) An aerosol can contain 400mL of compressed air at 5.20atm pressure. When all the gas is sprayed into a large plastic bag the bag inflates to a volume of 2.14L. What is the pressure of the gas inside the plastic bag? (Assume temperature is constant) (5 marks)

(c) Consider a 1.53L sample of gaseous sulphur dioxide at a pressure of  $5.6 \times 10^3$  Pa. If the pressure is changed to  $1.5 \times 10^4$  Pa at Constant temperature, what is the new volume of the gas? (5 marks)

(d) A compressed gas cylinder at 13.7MPa and  $23^\circ\text{C}$  is in a room where fire raises the temperature to  $450^\circ\text{C}$ . What is the new pressure in the Cylinder? (5 marks)

**(TOTAL= 25 MARKS)**

### Question 2

(a) Define the following (i) Molarity (ii) Mole (iii) Solution (iv) Solvent

(v) Solute (vi) Standard solution (vii) Strong electrolytes (viii) Weak electrolytes

(ix) Non-electrolytes (x) Concentration

(10 marks)

(b) The density of a 32 % by mass nitric acid solution is 1.19 g / mL. How many grams of pure  $\text{HNO}_3$  are present in 250 mL of solution:? How many moles of pure  $\text{HNO}_3$  are there in the volume of solution? (5 marks)

(c) Calculate the molarity of solution prepared by dissolving 11.5 g of solid NaOH in enough water to make 1.50 L of solution.

(5 marks)

(d) What is the volume percent of methanol,  $\text{CH}_3\text{OH}$ , in the solution formed when 2.0 L of methanol are mixed with 3.0 L of diethyl ether,  $(\text{C}_2\text{H}_5)_2\text{O}$ ? Assume that there is no change in the volume of either liquid when they are mixed. (5 marks)

**(TOTAL=25 MARKS)**

### Question 3

- (a) Briefly define the following : (i) Precipitation reaction  
(ii) Acid-Base reaction (iii) Oxidation-reduction (3marks)

(b) For each of the following reactions, write the molecular equation, the complete ionic equation, and the net ionic equation.

(i) Aqueous potassium chloride is added to aqueous silver nitrate to form a silver chloride precipitate plus aqueous potassium nitrate. (5marks)

(ii) Aqueous potassium hydroxide is mixed with the aqueous iron(III) nitrate to form a precipitate of iron(III) hydroxide and aqueous potassium nitrate. (5marks)

(c) Calculate the mass of solid NaCl that must be added to 1.50 L of a 0.100 M AgNO<sub>3</sub> solution to precipitate all the Ag<sup>+</sup> ions in the form of AgCl. (3marks)

(d) What volume of a 0.100 M HCl solution is needed to neutralize 25.0 mL of 0.350 M NaOH? (5marks)

(e) Sodium fluoride has a solubility of 4.22 g in 100 g of water at 18°C. Express the concentration in mass percent. (2 marks)

**(TOTAL=25 MARKS)**

### Question 4

- (a) Define the following: (i) Hydrocarbons (ii) Saturated hydrocarbons  
(iii) Unsaturated hydrocarbons (iv) Structural isomerism (4marks)

(b) Draw the structures of the following compounds

(i) 2-Methylpentane (2marks)

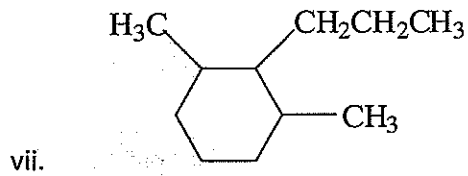
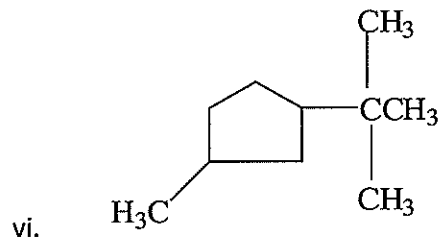
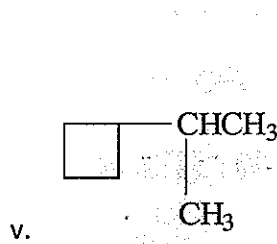
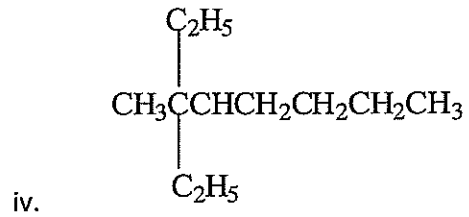
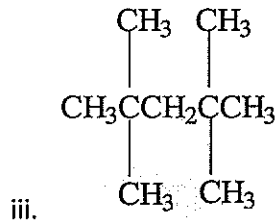
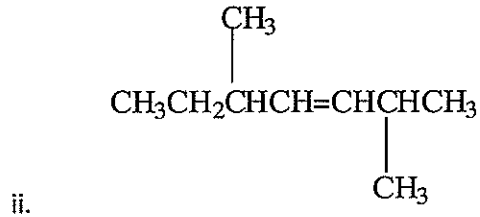
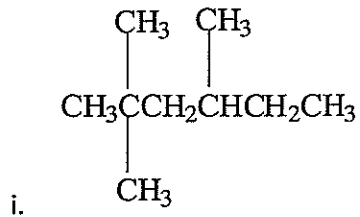
(ii) 2, 2, 4- Trimethyl pentane (2marks)

(iii) 4-Methylhexane (2marks)

(iv) 4-methyl-1-pentyne (2marks)

(v) 2, 3, 3-trimethyl -1-hexene (2marks)

(b) Name each of the following



(14marks)

(TOTAL =25 MARKS)

# PERIODIC TABLE OF ELEMENTS

Alkali metals												Noble gases					
1 Alkali metals												↓					
1A												Halogens					
2 Alkaline earth metals												↓					
2A												18 8A					
1 H 1.008	2 He 4.003											13 3A	14 4A	15 5A	16 6A	17 7A	18 8A
3 Li 6.941	4 Be 9.012											5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18
11 Na 22.99	12 Mg 24.31	3	4	5	6	7	8	9	10	11	12	13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95
Transition metals																	
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.88	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 72.59	33 As 74.92	34 Se 78.96	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 95.94	43 Tc (98)	44 Ru 101.1	45 Rh 102.9	46 Pd 106.4	47 Ag 107.9	48 Cd 112.4	49 In 114.8	50 Sn 118.7	51 Sb 121.8	52 Te 127.6	53 I 126.9	54 Xe 131.3
55 Cs 132.9	56 Ba 137.3	57 La 138.9	72 Hf 178.5	73 Ta 180.9	74 W 183.9	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197.0	80 Hg 200.6	81 Tl 204.4	82 Pb 207.2	83 Bi 209.0	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra 226	89 Ac (227)	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Uun	111 Uuu	112 Uub	metals ← → nonmetals					

\* Lanthanides

58 Ce 140.1	59 Pr 140.9	60 Nd 144.2	61 Pm (145)	62 Sm 150.4	63 Eu 152.0	64 Gd 157.3	65 Tb 158.9	66 Dy 162.5	67 Ho 164.9	68 Er 167.3	69 Tm 168.9	70 Yb 173.0	71 Lu 175.0
90 Th 232.0	91 Pa (231)	92 U 238.0	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (260)

\*\* Actinides