

***Answer all questions***

1.(a) Describe how in a mass spectrometer the positive ions are:  
(@02 marks)

(i) formed

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(ii) accelerated

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(iii) separated

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(iv) detected

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- b) State two advantages and one disadvantage of using mass spectrometer. (@0½ mark)

**Advantages**

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**Disadvantage**

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2. 10.0cm<sup>3</sup> of a hydrocarbon P (C<sub>x</sub>H<sub>y</sub>) was exploded in 90.0cm<sup>3</sup> of oxygen gas. On cooling to room temperature, the residual gases occupied 70.0cm<sup>3</sup>, when the residual gases were passed through potassium hydroxide solution, the volume reduced to 40.0cm<sup>3</sup>.

- a) Write the equation for the reaction between hydrocarbon P and oxygen gas. (01 mark)

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- b) Determine the **molecular formula** of hydrocarbon P. (03 marks)

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c) Complete the following equations and write the suggested mechanism with hydrocarbon, P. (@02½ marks)

(i) Hydrocarbon, P with concentrated nitric acid /400°C.

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(ii) Hydrocarbon,P with concentrated sulphuric acid/400°C.

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3.(a) Bromine has two isotopes  $^{79}\text{Br}$  and  $^{81}\text{Br}$  and the mass spectrum of bromine shows peaks at  $m/e$  of 158, 160 and 162. Write the formula(e) of the ion(s) corresponding to the peak(s). (@0½ mark)

Peak at m/e of value	Formula of the ion
158	
160	
162	

b) By calculation, deduce which of the isotopes in (b) above is most abundant if the relative atomic mass of bromine is 79.9.  
(02 marks)

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4.(a) State Graham's law of diffusion. (01 mark)

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- b) A certain volume of oxygen diffused through a porous membrane in **120s**. Under the same conditions, the same volume of a gas **X** diffused in **112s**. Calculate the **formula mass** of **X**.

(03 marks)

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5. The combustion of a hydrocarbon **T** gave **8.8g** of carbon dioxide and **4.5g** of water, if the molecular mass of **T** is **58**. Determine the

- a) Empirical formula of **hydrocarbon, T**. (03½ marks)

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- b) Molecular formula of hydrocarbon, **T**. (02 marks)

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c) Write the possible isomers and IUPAC names for the hydrocarbon, T. (02 marks)

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6.(a) Complete the following nuclear equations. (@01 mark)



b) In an experiment, the radioactive decay of bromine decreased by **25%** in **96 minutes**. Determine the **half-life** of bromine. (02 marks)

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7.(a) Explain what is meant by the term first electron affinity? (02 marks)

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- b) The table below shows the first electron affinity of period 2 elements of the Periodic Table.

Elements	${}_3\text{Li}$	${}_4\text{Be}$	${}_5\text{B}$	${}_6\text{C}$	${}_7\text{N}$	${}_8\text{O}$	${}_9\text{F}$
1 <sup>st</sup> E.A (kJ/mol)	-52	+50	-29	-120	+7	-142	-348

- (i) Plot a graph of 1<sup>st</sup> electron affinity against atomic numbers for period 2 elements. (03 marks)  
[Graph papers are provided]
- (ii) Explain the shape of the graph. (06 marks)

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- 8.(a) Define what is meant by the term diagonal relationship. (02 marks)

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b) State reasons as to why lithium resembles magnesium.  
(02 marks)

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c) State any two properties why boron resembles silicon.  
(05 marks)

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9.(a) Write the IUPAC names of the following compounds.  
(@0½ mark)

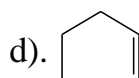
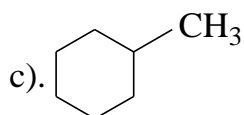
a).  $\text{CH}_3(\text{CH}_2)_8\text{CH}_3$

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b).  $\text{CH}_3\text{CH}_2\text{CH}=\text{CHCH}_2\text{CH}_2\text{CH}_3$

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b) Write the structural formula of the following compounds.

(@0½ mark)

(i) Butane

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(ii) Cyclopentane

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(iii) Methylcyclohexane

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(iv) But-2-ene

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c) An organic compound, **Q** has the structure;  $CH_3CH=CHC\equiv CH$ .  
Name the functional groups present in compound, **Q**. (01 mark)

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10.(a) Discuss the reactions of:

(i) Na, Mg & P with oxygen gas.

(05 marks)

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(ii) Si, Cl<sub>2</sub> & Be with water. (06 marks)

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c) Define the term "Disproportionation". (01 mark)

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# 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 Lw 103



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