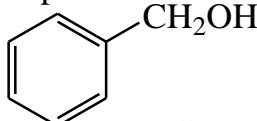
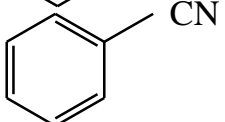


SECTION A (60 Marks)

Answer only **three** questions from this section.

1. Write equations to show how the following compounds can be synthesised.

- | | | | |
|---------------------------------------------------------------------------------------|------|--------------|------------|
| a). Propan-1-ol | from | Propyne | (04 marks) |
| b). 2,2-dibromopropane | from | Propan-1-ol | (04 marks) |
| c). Propanoneoxime | from | Benzene | (04 marks) |
| d).  | from | Phenol | (04 marks) |
| e).  | from | Benzoic acid | (04 marks) |

2. Define the following terms. (@01 mark)

i) **Colligative property**

ii) **Osmotic pressure**

b) i) Describe an experiment to determine the **molecular mass** of mannitol by osmotic pressure method. (07 marks)

ii) State three **limitations** of this method. (01½ marks)

c) The table below shows the osmotic pressure of a solution of mannitol of various concentrations at **25°C**.

Concentration of the solution (gdm ⁻³)	1.5	3.0	4.5	6.0	7.5	9.0	10.5
Osmotic pressure of the solution (atm)	0.20	0.40	0.60	0.81	1.05	1.20	1.40

i) Plot a graph of **osmotic pressure** against **concentration** of the solution. (03½ marks)

ii) Explain the **shape** of the graph. (03 marks)

iii) Use **your graph** to determine the **relative molecular mass** of mannitol. (03 marks)

3. Sodium, aluminium, silicon, phosphorus, sulphur and chlorine belong to period (III) elements of the periodic table.

(a) Predict and explain the differences in the melting points of the elements. (04 marks)

(b) Describe the reactions of:

(i) Aluminium, silicon and phosphorus with sodium hydroxide solution. (04 marks)

(ii) Hydride of sodium, silicon, and sulphur with water. (03 marks)

(iii) Chlorides of aluminium, silicon and phosphorus with water. (04 marks)

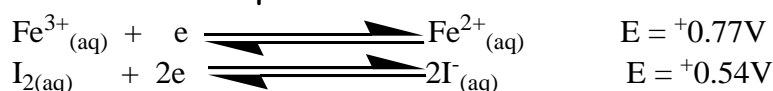
(c) The table below shows the melting points of oxides of period (III) elements.

Oxide	Na ₂ O	MgO	Al ₂ O ₃	SiO ₂	P ₂ O ₅	SO ₂	Cl ₂ O ₇
Melting point (K)	1,548	3,100	2,280	1,830	833	303	182

Explain the differences in melting points. (05 marks)

4.(a) Describe with the aid of a labelled diagram how the standard electrode potential of a copper electrode can be determined. (08 marks)

(b) The electrode potentials of some half-cells are shown below.



Write:

(i) The cell convention for the cell made by combining the electrodes of the half-cell reactions. (01½ marks)

(ii) The equation for the reaction. (01½ marks)

(c) (i) Determine the emf of the cell formed in (b) (i). (01½ marks)

(ii) State whether the reaction in (b) (i) above is possible or not and give a reason for your answer. (02 marks)

(d) Write a half equation to show how hydrogen peroxide act as:

(i) An oxidizing agent. (01½ marks)

(ii) A reducing agent. (01½ marks)

- (e) (i) State what would be observed if hydrogen peroxide is added to acidified solution of sodium iodide. (01 mark)
- (ii) Write equation for the reaction that took place in e (i). (01½ marks)

SECTION B (40 Marks)

Answer only **two** questions from this section.

5. (a). Describe the reaction of:
- (i) Ethanol with sulphuric acid. (07 marks)
 - (ii) Benzene with chlorine gas. (03 marks)
 - (iii) Propanoic acid and methanol. (05 marks)
- (b). Write the equation and indicate the mechanism for the reaction between:
- (i) Propanone and hydroxylamine. (03 marks)
 - (ii) Chloromethane and phenol in presence of sodium hydroxide solution. (02 marks)
6. (a) Define the term electron affinity. (01 mark)
- (b) The first affinities of group (VII) elements are shown below
- | Elements | Fluorine | Chlorine | Bromine | Iodine |
|----------------------------------|----------|----------|---------|--------|
| Atomic numbers | 9 | 17 | 35 | 54 |
| First electron affinity (kJ/mol) | -328 | -349 | -325 | -295 |
- (i) Plot a graph of first electron affinity against atomic numbers of group (VII) elements. (03 marks)
 - (ii) Explain the shape of the graph. (05 marks)
- (c) State three reasons why fluorine differs in some reactions from other group (VII) elements. (02 marks)
- (d) State four properties in which fluorine differs from other group (VII) elements. (02 marks)
- (e) Describe the reaction of:
- (i) Group (VII) elements with. (04 marks)

(ii)Hydrides of group (VII) elements with sulphuric acid.
(03½ marks)

7.(a) State **Raoult's law**. (02 marks)

- b) The vapour pressures of **n-heptane** and **n-hexane** at **50°C** are **20KNm⁻²** and **50KNm⁻²** respectively. If the mixture contains **20g** of **n-heptane** and **30g** of **n-hexane** at **50°C**, calculate the;
- i) **Vapour pressure** above the liquid mixture at **50°C**. (04 marks)
 - ii) **Mole fraction** of each component in the vapour. (03 marks)

c) Nitric acid [boiling point = 86°C] and water forms azeotropic mixture which boils at a temperature of 120°C and 68% nitric acid.

- i) Draw a well-labelled temperature-composition diagram of nitric acid-water mixture. (04 marks)
- ii) Explain the shape of the curve. (04 marks)
- iii) Use **the diagram**, to describe what happen when a mixture containing 30% nitric acid is distilled. (03 marks)

- 8.(a) Soap can be prepared from a vegetable oil or an animal fat. Briefly describe how an oil can be extracted from a natural source. (03 marks)
- (b) (i). Briefly describe how soap can be prepared. (03 marks)
(ii).Write the equation for the reaction leading to the formation of soap. (01 mark)
- (c) (i) State one advantage and one disadvantage of using soap. (01 mark)
(ii) Briefly explain the cleansing action of soap. (03 marks)
- (d) (i) Distinguish between soap and a non-soapy detergent.(01 mark)
(ii)Starting from duodecan-1-ol, write equations to show how you would prepare a soapless detergent. (03 marks)
- (e) Distinguish between addition and condensation polymerization. (01 mark)

(f) Write equations to show how the following polymers are formed.
(@01 mark)

(i) Perspex (ii) Terylene (iii) Nylon-6,6.

(g) State the difference between thermosetting and thermosoftening plastics.
(01 mark)

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

♥ ===END===

WELCOME TO SENIOR SIX, YEAR 2023
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