

CHEMISTRY IS NOT A MYSTERY

2021
CHEMISTRY
ZOOM SEMINAR FIVE
CHEMISTRY (P525/2)

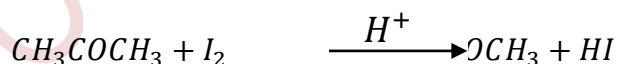
SCHEDULED FOR Sat 20th NOV 2021

Questions;

1. The table below shows the hydrides of group VII elements and their boiling points.

Period number	2	3	4	5
Hydride	HF	HCl	HBr	HI
Boiling point(°C)	+20	-85	-67	-35

- (a) (i) Plot a graph of boiling point against period number. (04 marks)
- (ii) Explain the shape of the graph. (05 marks)
- (b) Describe briefly how the following hydrides are prepared in the laboratory. (Illustrate your answers with equations) (2 1/2 marks)
- (i) hydrogen chloride (2 1/2 marks)
- (ii) hydrogen iodide (2 1/2 marks)
- (c) Discuss the reactions of the hydrides with:
- (i) sodium hydroxide
- (ii) sulphuric acid
- (iii) silicon dioxide (06 marks)
2. (a) Define the terms:
- (i) **order of reaction** (01 mark)
- (ii) **molecularity of a reaction** (01 mark)
- (iii) **rate constant** (01 mark)
- (iv) **rate equation** (01 mark)
- (b) Propanone reacts with iodine according to the equation:

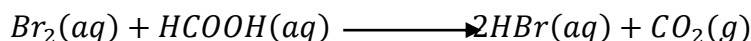


The reaction is first order with respect to propanone and zero order with respect to iodine.

Describe an experiment to show that the order of reaction with respect to iodine is zero.

(06 marks)

- (c) The table below shows the concentration of bromine at various intervals of time for the reaction:



Time (s)	0	30	60	90	120	180	240	360	480	600
$[\text{Br}_2] \times 10^{-3} (\text{mol dm}^{-3})$	10	9	8.1	7.3	6.6	5.3	4.4	2.8	2.0	1.3

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- (i) Plot a graph of concentration of bromine against time. (03 marks)
- (ii) Use the graph to find the order of reaction. Explain your answer. (02 marks)
- (iii) Calculate the rate constant. (01 mark)
- (d) The table below shows the results for the hydrolysis of a bromoalkane, C_4H_9Br with sodium hydroxide solution. The enthalpy of reaction is $-160kJmol^{-1}$

Experiment	$[C_4H_9Br](mol\ l^{-1})$	$[OH^-](mol\ l^{-1})$	Initial rate ($mol\ l^{-1}s^{-1}$)
1	0.05	0.10	1.00×10^{-5}
2	0.20	0.10	4.00×10^{-5}
3	0.20	0.05	4.00×10^{-5}

- (i) Determine the order of reaction and explain your answer. (02 marks)
- (ii) Identify the alkylhalide. ($\frac{1}{2}$ mark)
- (iii) Draw a well labelled energy diagram for the reaction. (1 $\frac{1}{2}$ marks)
3. When 7.5g of an organic compound **Q** was burnt completely in excess oxygen, $11.2dm^3$ of carbon dioxide and 4.5g of water were formed at s.t.p.
- (a) (i) Calculate the empirical formula of **Q**. (3 $\frac{1}{2}$ marks)
- (ii) Determine the molecular formula of **Q** (02 marks)
- (Density of **Q** is $5.357gdm^{-3}$ at s.t.p)
- (b) **Q** burns with a sooty flame and forms a yellow precipitate with 2,4-dinitrophenylhydrazine and also forms a pale yellow precipitate with iodine solution in sodium hydroxide solution. Identify **Q**. (0 $\frac{1}{2}$ mark)
- (c) Write equation and suggest a mechanism for the reaction between **Q** and
- (i) 2,4- dinitrophenylhydrazine in acidic medium. (4 $\frac{1}{2}$ marks)
- (ii) sodium hydrogen sulphite solution (03 marks)
- (d) Using equations only show how **Q**
- (i) can be synthesized from benzaldehyde (04 marks)
- (ii) can be converted to an alkene (2 $\frac{1}{2}$ marks)
4. Explain each of the following observations;
- (a) Lead (iv) oxide does not react with dilute hydrochloric acid but reacts with cold concentrated hydrochloric acid to form a bright yellow liquid. (04 marks)
- (b) Ethanol can be dehydrated by concentrated sulphuric acid at $170^\circ C$, whereas 2-methyl propan -2 -ol can be dehydrated at $100^\circ C$.

(03 marks)

- (c) 0.1M urea solution and 0.2M ethanoic acid have the same freezing point when benzene is used as a solvent. *(03 marks)*
- (d) A mixture of water and bromo benzene boils at 98.6°C whereas the boiling point of water and bromo benzene is 100°C and 150°C respectively. *(03 marks)*
- (e) When aqueous sodium hydroxide is added to aluminum nitrate solution, a white precipitate is formed which dissolves in excess alkali to form a colorless solution. When ammonia solution is used, a white precipitate is formed insoluble in excess. *(05 marks)*
- (f) Nitric acid is always kept in dark bottles. *(02 marks)*

END