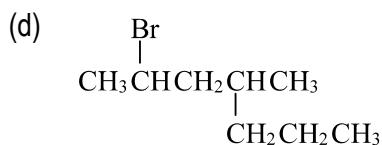
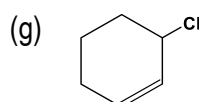
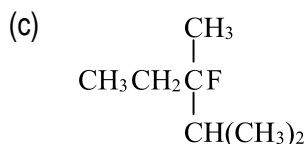
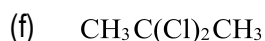
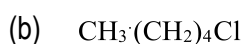
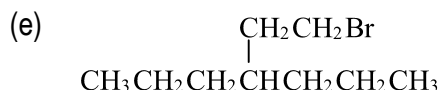
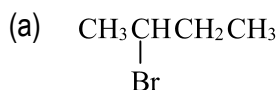


TOPIC	SUBTOPIC	LEARNING OUTCOMES	MAPPING COGNITIVE DOMAINS			
			C1	C2	C3	C4
Haloalkanes	7.1 Introduction to haloalkanes	a) Draw structures and classify primary, secondary and tertiary alkyl halides		√		
		b) Name the primary, secondary and tertiary haloalkanes according to the IUPAC nomenclature		√		
		c) Describe haloalkanes as compounds that contain polar bond and the carbon bearing the halogen is susceptible to nucleophilic attack		√		
	7.2 Chemical properties of haloalkanes	a) Explain nucleophilic substitution reaction of haloalkanes		√		
		b) Explain S _N 1 and S _N 2 mechanisms		√		
		c) Show S _N 1 and S _N 2 mechanisms of a given haloalkanes			√	
		d) Compare the relative reactivities of primary, secondary and tertiary haloalkanes toward hydrolysis or alcoholysis				√
		e) Explain elimination reaction of haloalkanes		√		
		f) Explain the use of haloalkanes in the synthesis of Grignard reagent, RMgX / ArMgX		√		
		g) Determine the structural formulae of alkanes, alcohols and carboxylic acids prepared using Grignard reagents			√	

1. Classify the following compounds as primary, secondary or tertiary haloalkanes and give their IUPAC names. [LO: 7.1(b)]



2. Draw the structural formulae of the following compounds:

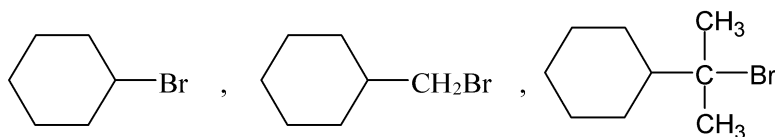
[LO: 7.1(b)]

- (a) *tert*-butylbromide
 (b) isopentylchloride

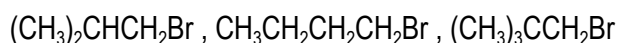
- (c) 1-bromo-1-isopropylcyclobutane
 (d) 4-bromo-3-methyl-2-pentene
 (e) 3-(iodomethyl)-3-phenyl-1-pentene

3. (a) What is meant by S_N1 and S_N2 ? [LO: 7.2(a)]
 (b) Give three differences between S_N1 and S_N2 reactions. [LO: 7.2(b)]

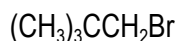
4. Arrange the following compounds in order of increasing reactivity towards S_N1 hydrolysis reaction. Explain your answer. [LO: 7.2(c)]



5. Arrange the following compounds in order of decreasing reactivity toward S_N2 reaction with aqueous solution of NaOH. [LO: 7.2(c)]

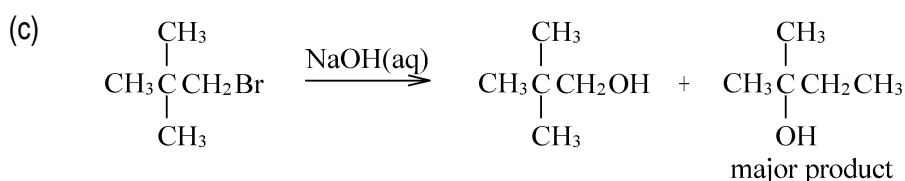
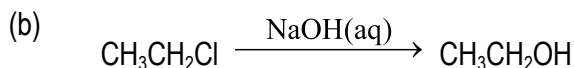
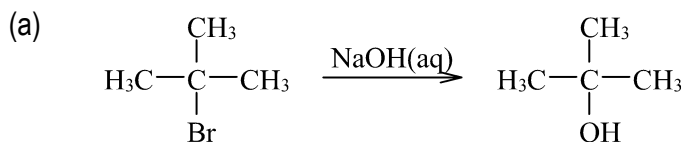


6. (a) Name the alkyl halide below and classify as 1° , 2° or 3° . [LO: 7.1(b)]

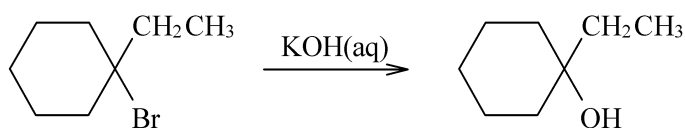


- (b) The S_N2 hydrolysis of $(CH_3)_3CCH_2Br$ with aqueous solution of NaOH is 10^5 times slower than the hydrolysis of CH_3CH_2Br . Explain this observation. [LO: 7.2(c)]

7. State and write the reaction mechanism for each of the following reactions: [LO: 7.2(b)]



(d)



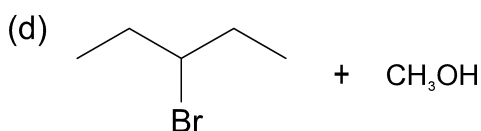
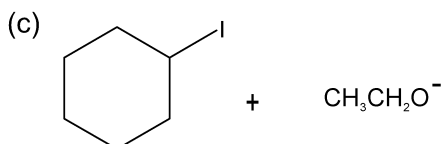
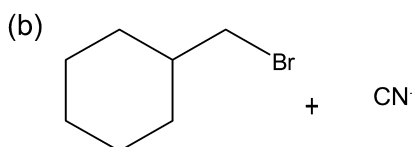
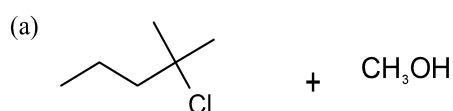
8. For each alkyl halide and nucleophile:

(i) Draw the product of nucleophilic substitution

[LO: 7.2(a)]

(ii) Determine the likely mechanism ($\text{S}_{\text{N}}1$ or $\text{S}_{\text{N}}2$) for each reaction.

[LO: 7.2(b)]



9. Draw all structural isomers of $\text{C}_4\text{H}_9\text{Br}$.

[LO: 7.1(b)]

(a) Which of the isomers react most rapidly with aqueous NaOH through $\text{S}_{\text{N}}1$ reaction?

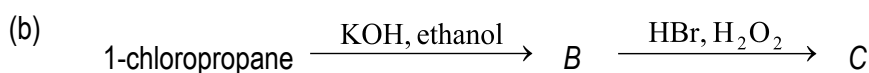
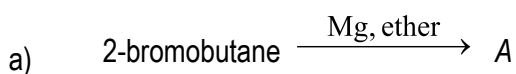
[LO: 7.2(b)]

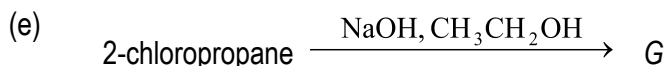
(b) Choose two isomers which can react with KOH in ethanol to produce the same alkene.

[LO: 7.2(d)]

10. Draw the structural formulae of **A** to **N**.

[LO: 7.2]





11. Grignard reagent is an example of organometallic compound which is very useful in the synthesis of many organic compounds.

(a) Show the preparation of a Grignard reagent from bromoethane. **[LO: 7.2(e)]**

(b) Use the above Grignard reagent to prepare the corresponding: **[LO: 7.2(f)]**

- i. alkane
- ii. 1°, 2° and 3° alcohols
- iii. carboxylic acid

12. Outline the synthesis of the following compounds:

(a) 2,3-dibromobutane from 2-butene **[LO: 7.2(h)ii]**

(b) bromocyclohexane from cyclohexene **[LO: 7.2(h)iv]**

13. Compound *M* can be prepared from the reaction between propene and HBr. Treatment of *M* with Mg in dry ether followed by 2-butanone produces *N*. Hydrolysis of *N* gives *P*. Draw the structures of *M*, *N*, *P*. Name the type of reaction for the formation of *M* and write the mechanism.

[LO: 7.2(h)iv, 7.2(e) & (f)]