



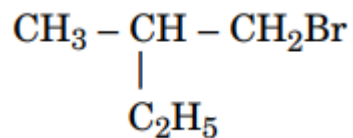
<b>Class: XII</b>	<b>DEPARTMENT: SCIENCE 2021-22</b> <b>SUBJECT: CHEMISTRY</b>	<b>Date of completion:</b> <b>06.05.2021</b>
<b>Worksheet No:01</b> <b>with answers</b>	<b>TOPIC: HALOALKANES AND HALOARENE</b>	<b>Note:</b> <b>A4 FILE FORMAT</b>
<b>NAME OF THE STUDENT</b>	<b>CLASS &amp; SEC:</b>	<b>ROLL NO.</b>

### MULTIPLE CHOICE QUESTIONS

1. Out of the following, the one which is most reactive towards nucleophilic substitution reaction is

- (i)  $\text{CH}_2 = \text{CH} - \text{Cl}$
- (ii)  $\text{C}_6\text{H}_5 - \text{Cl}$
- (iii)  $\text{CH}_3\text{CH} = \text{CH} - \text{Cl}$
- (iv)  $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{Cl}$

2. Which is the correct IUPAC name for



- (i) 1-Bromo-2-ethylpropane
- (ii) 2-Bromo-2-ethyl-2-methylethane
- (iii) 1-Bromo-2-methylbutane
- (iv) 3-Methyl-4-bromobutane

3. Toluene reacts with a halogen in the presence of iron (III) chloride giving ortho and para halo compounds. The reaction is

- (i) Electrophilic elimination reaction                      (iii) Free radical addition reaction  
(ii) Electrophilic substitution reaction                      (iv) Nucleophilic substitution reaction

4. A primary alkyl halide would prefer to undergo \_\_\_\_\_.

- (i)  $S_N1$  reaction    (iii)  $\alpha$ -Elimination  
(ii)  $S_N2$  reaction    (iv) Racemisation

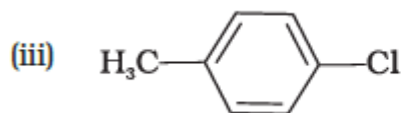
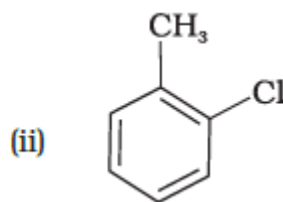
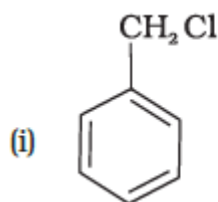
5. Which of the following alkyl halides will undergo  $S_N2$  reaction most readily?

- (i)  $CH_3F$     (iii)  $CH_3I$   
(ii)  $CH_3Cl$     (iv)  $CH_3Br$

6. Which is the correct IUPAC name for  $(CH_3)_3CCH_2Br$ ?

- (i) 2-Bromo-1,1-dimethylpropane                                      (iii) 1-Bromo-2-methylbutane  
(ii) 2-Methyl-1-bromobutane    (iv) 1-Bromo-2,2-dimethylpropane

7. The reaction of toluene with chlorine in the presence of iron and in the absence of light yields \_\_\_\_\_.



(iv) Mixture of (ii) and (iii)

8. Which of the following molecules is chiral in nature?

- (i) 2-Bromobutane    (iii) 2-Bromopropane  
(ii) 1-Bromobutane    (iv) 3-Bromopentane

9. The major organic compound formed when 2-Bromobutane is heated with alcoholic KOH is

- (i) Butan-2-ol    (iii) 2-Bromopropane  
(ii) But-2-ene    (iv) But-1-ene

10. Which is the correct increasing order of boiling points of the following compounds?

1-Iodobutane, 1-Bromobutane, 1-Chlorobutane, Butane

- (i) Butane < 1-Chlorobutane < 1-Bromobutane < 1-Iodobutane
- (ii) 1-Iodobutane < 1-Bromobutane < 1-Chlorobutane < Butane
- (iii) Butane < 1-Iodobutane < 1-Bromobutane < 1-Chlorobutane
- (iv) Butane < 1-Chlorobutane < 1-Iodobutane < 1-Bromobutane

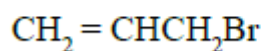
**Read the given passage and answer the questions that follow:**

One or more hydrogen atoms of alkanes can be replaced by halogens. Halogenation takes place either at higher temperature (573-773 K) or in the presence of diffused sunlight or ultraviolet light. Free radical chlorination or bromination of alkanes gives a complex mixture of isomeric mono- and polyhaloalkanes, which is difficult to separate as pure compounds. Consequently, the yield of any one compound is low.

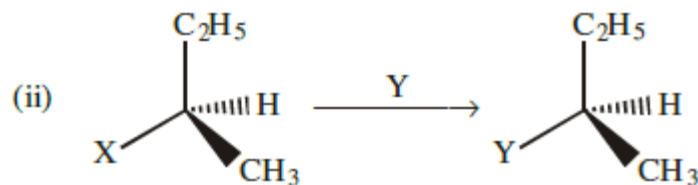
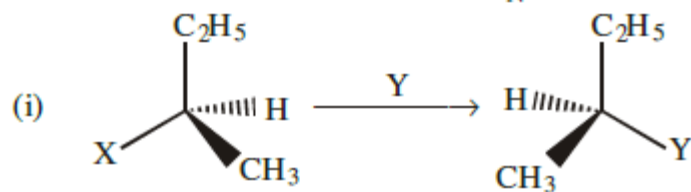
- 11. Among the isomeric cyclic alkanes of molecular formula  $C_4H_8$ , identify the one that on photochemical chlorination yields a single monochloride.
- 12. Is halogenation of alkane in presence of UV an addition or substitution reaction?
- 13. Identify the final organic product if methane is treated with excess chlorine in UV.
- 14. How many monochlorides are formed when Butane undergoes halogenation in presence of UV?
- 15. Name the catalyst used when aryl chlorides are prepared by electrophilic substitution of arenes with chlorine.

**Question – Answer Type:**

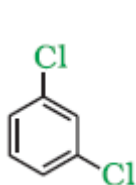
- 16. Why is it necessary to avoid even traces of moisture during the use of a Grignard reagent? 1
- 17. Write the IUPAC name of the following compound: 1



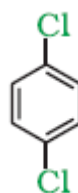
18. Which of the following reactions is  $S_N1$  type ? 1



19. Which of the compounds will have higher melting point and why? 1



OR



20. Why is chloroform kept in dark coloured bottles? 1

21. Which compound in the following couples will react faster in  $S_N1$  displacement and why? 2

i) 1-Bromopentane or 2-bromopentane

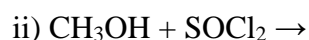
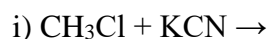
ii) 1-Bromo-2-methylbutane or 2-bromo-2-methylbutane.

22. (i) Write the product formed when p-nitrochlorobenzene is heated with aqueous NaOH at 443 K followed by acidification. 2

(ii) Why dextro and laevo rotatory isomers of Butan-2-ol are difficult to separate by fractional distillation?

23. Out of Chlorobenzene and Cyclohexyl chloride, which one is more reactive towards nucleophilic substitution reaction and why? 2

24. Complete the following reaction: 2

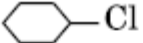
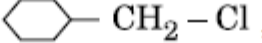


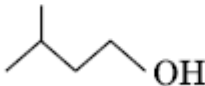
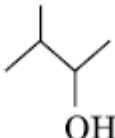




25. Give reasons: 2

(a) Grignard reagent should be prepared under anhydrous conditions

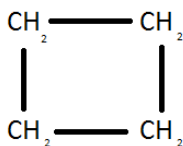
(b) Alkyl halides are immiscible with water although they are polar.

26. Among all the isomers of molecular formula  $\text{C}_4\text{H}_9\text{Br}$ , identify 3

- (a) the one isomer which is optically active.
- (b) the one isomer which is highly reactive towards  $S_N1$ .
- (c) the two isomers which give same product on dehydrohalogenation with alcoholic KOH.
- 27.** (a) Why are alkyl halides insoluble in water? 3
- (b) Why is Butan-1-ol optically inactive but Butan-2-ol is optically active?
- (c) Although chlorine is an electron withdrawing group, yet it is *ortho*-, *para*- directing in electrophilic aromatic substitution reactions. Why?
- 28.** (a) Out of -Cl and , which one is more reactive towards  $S_N2$  reaction and why? 3
- (b) Out of -Cl and  $O_2N$ -, which one is more reactive towards nucleophilic substitution reaction and why?
- (c) Out of  and , which one is optically active and why?
- 29.** Convert the following: 3
- i) Aniline to Chlorobenzene
- ii) Bromomethane to Fluoromethane
- iii) Chlorobenzene to Phenol
- 30.** Draw the structures of the major monohalo product for each of the following reactions: 3
- a)  $2$   + Na  $\xrightarrow{\text{Ether}}$
- b)  + Mg  $\xrightarrow{\text{dry ether}}$
- c)  $2CHCl_3 + O_2 \xrightarrow{\text{light}}$

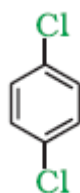
## ANSWERS

1. (iv)
2. (iii)
3. (ii)
4. (ii)
5. (iii)
6. (iv)
7. (iv)
8. (i)
9. (ii)
10. (i)
- 11.



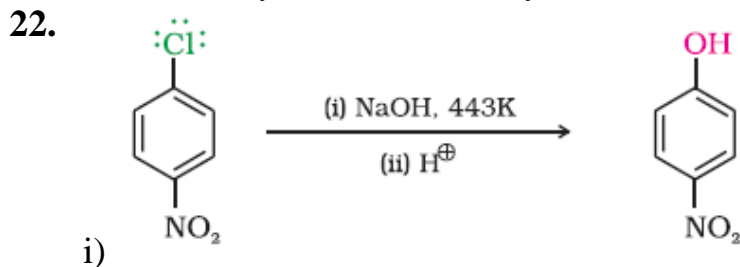
Cyclobutane

12. Substitution reaction
13. CCl<sub>4</sub>
14. Two.
15. Iron or iron(III) chloride
16. Grignard reagents are highly reactive and react with any source of proton to give hydrocarbons. Even water, alcohols, amines are sufficiently acidic to convert them to corresponding hydrocarbons.
17. 3-Bromoprop-1-ene
18. (ii)
- 19.



It is due to symmetry of *para*-isomer that fits in crystal lattice better as compared to *ortho*- and *meta*-isomers.

20. Chloroform in the presence of light forms phosgene gas ( $\text{COCl}_2$ ) which is poisonous in nature.
21. i) 2-bromopentane.  
It's a secondary haloalkane. Secondary carbocation is more stable than primary.
- ii) 2-bromo-2-methylbutane.  
It's a tertiary haloalkane. Tertiary carbocation is more stable than primary.



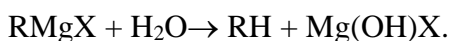
ii) Enantiomers have same boiling points.

23. Cyclohexyl chloride.

Due to partial double bond character of C-Cl bond in Chlorobenzene / Resonance effect /  $\text{sp}^3$  hybridised carbon in cyclohexyl chloride whereas  $\text{sp}^2$  carbon in chlorobenzene.

24. i)  $\text{CH}_3\text{Cl} + \text{KCN} \rightarrow \text{CH}_3\text{CN} + \text{KCl}$   
ii)  $\text{CH}_3\text{OH} + \text{SOCl}_2 \rightarrow \text{CH}_3\text{Cl} + \text{SO}_2 + \text{HCl}$

25. a) It reacts with moisture readily



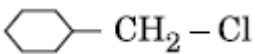
b) They can't form hydrogen bonds with water. Less energy is released when alkyl halide and water are mixed.

26. (a) 2-Bromobutane  
(b) 2-Bromo-2-methylpropane  
(c) 2-Bromo-2-methylpropane and 1-Bromo-2-methylpropane

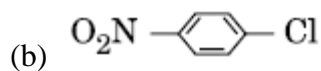
27. a) Haloalkanes are unable to form H-bonds with water molecules. Less energy is released when new attractions are set up between the haloalkane and the water molecules as these are not as strong as the original hydrogen bonds in water.

b) Due to the presence of chiral carbon in butan-2-ol.

c) Due to dominating +R effect (over -I effect)

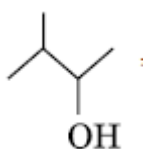
28. (a) 

It's a primary haloalkane.



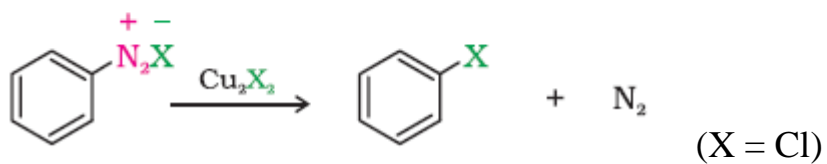
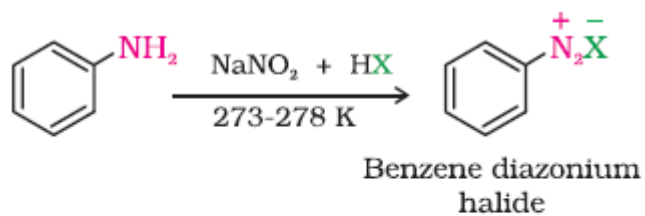
The presence of an electron withdrawing group ( $-\text{NO}_2$ ) at *ortho*- and *para*-positions increases the reactivity of haloarenes.

(c)



It contains a chiral carbon.

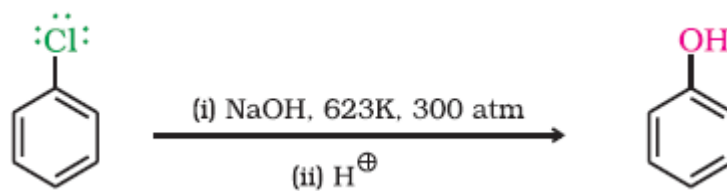
29. i)



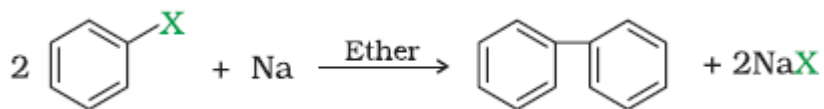
ii)



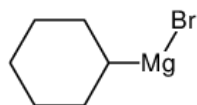
iii)



30. a)

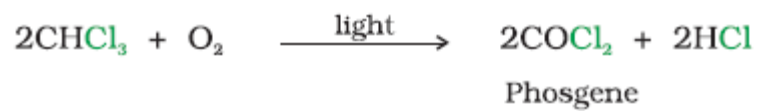


b)



c)





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