Practice Test Questions - Halogeno -Alkanes

1. Halogen alkanes are used as starting reagents for many synthesis reactions. The percent composition of one such halogeno-alkane is given below:

- C 29.30 %
- H 5.70 %
- Br 65.00 %

The molar mass, M_r, of the halogeno-alkane is 123 $gmol^{-1}$

a) What is the molecular formula of the halogeno-alkane?

b) Bromomoethanes have different reactions with NaOH depending on the conditions.

I. Explain the mechanism, using curly arrows, the reaction of bromoethane with cold, dilute, aqueous NaOH.

II. Explain what you understand by optical activity.

III. State and explain if the product from b. (I) above will be optically active.

c) Under different conditions, a different product is obtained.

I. What will be formed? State the name, and the structural formula of compound formed.

II. What are the conditions?

III. What type of reaction is this?

IV. State the name of the mechanism, and explain the mechanism, using curly arrows, the reaction of bromoethane under these different conditions.

V. State and explain if the product from (c) above will exhibit geometrical isomerism.

d) The product from (c) is tested with bromine solution, state what is observed and give the name and structural formula of the product with bromine. State the name of the mechanism of the reaction of the product of (c) with bromine and show the mechanism for this reaction.

2. A student placed small separate samples of: 1-chlorobutane, 1-bromobutane, and 1-iodobutane, in separate test tubes. To each test tube 1 cm^3 of alkali, NaOH(aq), and then 1 cm^3 of $AgNO_3$ were added. They were shaken and placed in a test-tube rack, and observed for 30 minutes. A precipitate was formed but not at the **same time**, the fastest taking about 2 minutes to become opaque and the slowest about 20 minutes.

a. What is the identity of the precipitate formed when 1-chlorobutane is used?

b. What will be its color?

c. Which of the three halogenoalkanes will produce a precipitate in 2 minutes

d. Use the Data Table 11 in the Data Book to explain why the reaction takes place most quickly of the three test tubes.

e.

i. Explain using curly arrows the mechanism of 1-bromobutane in this reaction.

ii. State and explain why you have chosen this mechanism.

iii. State the rate law for this mechanism.

iv. Explain what would happen to the rate of this reaction if the concentration of both the bromobutane and the alkali were doubled.

v. State and explain if the product will be optically active.

f. Explain if you would expect bromobenzene to react faster or slower than 1-bromobutane.

g. Explain how you would synthesize pentamine form 1-bromobutane