IB Chemistry HL - R3.4

Electron-pair sharing reactions

Exercises + Practice questions

Official answers appended at the end

this is a **coordination bond** which is introduced in Structure 2.2.

Exercise

Q1. What is the essential feature of a nucleophile?

A a lone pair of electrons

B a negative charge

C a pi bond

D a positive charge

Q2. Which of the following species can act as a nucleophile?

I. NH_3 II. CH_4 III. H_2O

A I, II and III

B II and III

C I and III

D I and II

Overall Equation: $H_2O + RX \rightarrow ROH + HX$

Exercise

Q3. In the reaction $R–X + OH^- \rightarrow R\text{-}OH + X^-$

X^- acts as a:

A nucleophile **B** electrophile

C reducing agent **D** leaving group

Q4. Explain what is meant by nucleophilic substitution, using the reaction between NaOH and chloroethane to illustrate your answer.

Q5. Use curly arrows to show how hydroxide ions react with bromomethane to form methanol.

Q6. Use Section 12 in the data booklet to predict which halide ion will be the best leaving group in a nucleophilic substitution reaction.

Exercise

Q7. Which of the following reactions best represents heterolytic fission?

A $C + O_2 \rightarrow CO_2$

B $HF \rightarrow H^+ + F^-$

C $BF_3 + F^- \rightarrow BF_4^-$

D $Br_2 \rightarrow Br\bullet + Br\bullet$

Q8. Use curly arrows to explain the difference between the homolytic and heterolytic fission of a H–Br bond.

Exercise

Q9. What is the essential feature of an electrophile?

A It has a lone pair of electrons.

B It can accept a pair of electrons.

C It has a negative charge.

D It has a positive charge.

Q10. Which of the following species can act as an electrophile?

I. HBr II. Br_2 III. NH_3

A I, II and III

B II and III

C I and III

D I and II

Exercise

Q11. In the reaction between ethene and hydrogen chloride, $CH_2CH_2 + HCl$, the product is:

A CH_2ClCH_2Cl

B CH_3CH_3

C no reaction occurs

D CH_3CH_2Cl

Q12. Give the condensed formulas and names of the products for the following reactions:

(a) $CH_3CH{=}CHCH_3 + HBr$

(b) $CH_2{=}CH_2 +$ conc. H_2SO_4

(c) $CH_3CH{=}CH_2 + Br_2$

Q13. Explain how bromine water, $Br_2(aq)$, can be used to distinguish between an alkane and an alkene.