Double and Triple Bonds

New Regents original practice • Name: _____ Date: _____
Show your work for written answers.

Count one shared electron pair for each line in a structural formula. A neutral carbon atom in the examples below forms four shared pairs in total.

1 How many shared electron pairs are between the atoms in C≡C?

(1) 1

(2) 2

(3) 3

(4) 6

2 In O=C=O, count the shared electron pairs around carbon and the shared electrons in those pairs. [1]

Answer and work

3 Which symbol represents the carbon–carbon bond in $H_2C{=}CH_2$?

(1) A single line

(2) Two lines

(3) Three lines

(4) Four lines

4 A draft of a neutral two-carbon molecule shows a C≡C bond and two single bonds from each carbon to hydrogen. Explain why this model needs a correction. [1]

Answer and work

Three Hydrocarbon Models

Use the information below to answer the questions.

A model kit shows ethane, ethene, and ethyne. The H subscript next to each carbon counts the hydrogen atoms attached to that carbon by single bonds.

Hydrocarbon	**Structural formula**
Ethane	$H_3C–CH_3$
Ethene	$H_2C=CH_2$
Ethyne	$HC\equiv CH$

5 Which molecular formula matches the ethyne model?

(1) C_2H_2

(2) C_2H_4

(3) C_2H_6

(4) CH_4

6 Describe how the total number of hydrogen atoms changes from ethane to ethene to ethyne. Relate this change to the C–C bond order. [1]

Answer and work

7 How many shared electron pairs are in the entire ethene molecule? Count the C–C and C–H bonds separately. [1]

Answer and work

8 Which change converts the ethyne model to the ethene model?

(1) Replace the C≡C bond with C=C and add one H to each C.

(2) Replace the C≡C bond with C–C and remove one H from each C.

(3) Keep the C≡C bond and add two H atoms to one C.

(4) Remove both H atoms and keep the C≡C bond.