Shapes of Carbon Compounds: sp^3, sp^2, sp

Methane, ethene and ethyne all contain carbon but have different shapes. Hybridisation, and a quick way to find it.

Name: Date: Score: ____ / 19

A. Fill in the blanks

1. sp^3 carbon is ____ in shape.

2. sp^2 carbon has a bond angle of ____ degrees.

3. sp carbon is ____ in shape.

4. A carbon with 3 groups around it is ____ hybridised.

5. sp has ____ percent s character.

B. True or False

6. Methane's carbon is sp^3. True / False

7. Ethyne's carbon is sp^2. True / False

8. More s character gives a shorter bond. True / False

9. A double bond counts as 2 groups. True / False

C. Assertion and reason

10. Assertion (A): The C–H bond in ethyne is shorter than in ethane.
Reason (R): sp carbon has more s character.

(a) Both A and R are true, and R explains A
(b) Both A and R are true, but R does not explain A
(c) A is true, R is false
(d) A is false, R is true

Answer: _____

11. Assertion (A): Ethene's carbons are trigonal planar.
Reason (R): Each carbon has 3 groups around it.

(a) Both A and R are true, and R explains A
(b) Both A and R are true, but R does not explain A
(c) A is true, R is false
(d) A is false, R is true

Answer: _____

D. Choose the correct option

12. The carbon in ethene is:

(a) sp
(b) sp^2
(c) sp^3
(d) sp^3d

Answer: _____

13. The bond angle in methane is about:

(a) 90°
(b) 109.5°
(c) 120°
(d) 180°

Answer: _____

14. The shape around sp carbon is:

(a) tetrahedral
(b) bent
(c) trigonal planar
(d) linear

Answer: _____

15. Which has the least s character?

(a) sp
(b) sp^2
(c) sp^3
(d) all equal

Answer: _____

E. Numerical problems

16. How many groups surround each carbon in ethyne?

17. How many sp^3 carbons are in propene, $CH_3CH=CH_2$?

F. Short answer questions

18. State the shortcut to find hybridisation.

G. Match the columns

19. Match each item in Column A with the correct item in Column B.

Column A	Column B	Your answer
1. sp^3	(a) 109.5°	1 → ____
2. sp^2	(b) 180°	2 → ____
3. sp	(c) sp	3 → ____
4. 50% s character	(d) 120°	4 → ____

Detailed solutions

1. tetrahedral

2. 120

3. linear

4. sp^2

5. 50

6. True. Four single bonds.

7. False. It is sp.

8. True. s orbitals lie closer to the nucleus.

9. False. It counts as one group.

10. (a) R explains A.

11. (a) R explains A.

12. (b) sp^2. 3 groups.

13. (b) 109.5°. Tetrahedral.

14. (d) linear. 180°.

15. (c) sp^3. 25%.

16. One H and the triple bond. **Answer: 2**

17. Only the CH_3 carbon. **Answer: 1**

18. Count the groups around carbon: 4 is sp^3, 3 is sp^2, 2 is sp. A multiple bond counts as one group.

19. 1 → (a), 2 → (d), 3 → (b), 4 → (c). Each item matches its partner.