Why Carbon Forms Millions of Compounds

Over 100 elements, yet most known compounds contain carbon. Four reasons, and why silicon can't do the same.

Name: Date: Score: ____ / 19

A. Fill in the blanks

1. A carbon atom forms ____ covalent bonds.

2. C_5H_{12} has ____ structural isomers.

3. $C_{10}H_{22}$ has ____ structural isomers.

4. Si–Si bonds are ____ than C–C bonds.

5. Compounds with the same atoms in a different arrangement are ____.

B. True or False

6. Carbon can form single, double and triple bonds. True / False

7. Long silicon chains are as stable as carbon chains. True / False

8. Carbon bonds easily to oxygen and nitrogen. True / False

9. Isomers have different molecular formulas. True / False

C. Assertion and reason

10. Assertion (A): Carbon forms long stable chains.
Reason (R): C–C bonds are strong.

(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): Silicon forms far fewer chain compounds than carbon.
Reason (R): Si–Si bonds are weak.

(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. Carbon compounds are so many mainly because of:

(a) tetravalency and catenation
(b) high density
(c) metallic bonding
(d) low melting point

Answer: _____

13. C_4H_{10} has how many structural isomers?

(a) 1 (b) 2

(c) 3 (d) 4

Answer: _____

14. The C–C bond energy is about:

(a) 100 kJ/mol (b) 225 kJ/mol

(c) 350 kJ/mol (d) 900 kJ/mol

Answer: _____

15. Which is NOT a reason for many carbon compounds?

(a) 4 bonds (b) strong C–C bonds

(c) metallic lustre (d) isomerism

Answer: _____

E. Numerical problems

16. How many C–H bonds are in C_4H_{10}?

17. How many C–C bonds are in a straight chain of 5 carbons?

F. Short answer questions

18. Give the four reasons why carbon forms so many compounds.

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. C_4H_{10}	(a) 366,319 isomers	1 → ____
2. C_5H_{12}	(b) 2 isomers	2 → ____
3. $C_{10}H_{22}$	(c) 3 isomers	3 → ____
4. $C_{20}H_{42}$	(d) 75 isomers	4 → ____

Detailed solutions

1. 4

2. 3

3. 75

4. weaker

5. isomers

6. True. Bond variety is one reason.

7. False. Si–Si bonds are weaker.

8. True. That adds even more compounds.

9. False. Same formula, different arrangement.

10. (a) R explains A.

11. (a) R explains A.

12. (a) tetravalency and catenation. 4 bonds and strong chains.

13. (b) 2. Butane and 2-methylpropane.

14. (c) 350 kJ/mol. Stronger than Si–Si.

15. (c) metallic lustre. Carbon is a non-metal.

16. One per H atom. **Answer: 10**

17. n − 1. **Answer: 4**

18. Four bonds, strong C–C bonds, single, double and triple bonds with many partners, and isomerism.

19. 1 → (b), 2 → (c), 3 → (d), 4 → (a). Each formula matches its isomer count.