

# Chapter 2 - Alkanes and Cycloalkanes: Introduction to Hydrocarbons (Test Bank) KEY

1. Alkanes are characterized by the general molecular formula:

- A.  $C_{nH2n-2}$
- B.  $C_{nH2n}$
- C.  $C_{nH2n+2}$**
- C.  $C_{nH2n+4}$

*Accessibility: Keyboard Navigation*  
*Bloom's Level: 1. Remember*  
*Chapter: 02*  
*Difficulty: Easy*  
*Gradable: automatic*  
*Section: 02.05*  
*Subtopic: Acyclic vs cyclic*  
*Subtopic: Alkanes*  
*Subtopic: Hydrocarbons*  
*Topic: Alkanes (Acyclic and Cyclic)*  
*Topic: Functional Groups*

2. Cycloalkanes are characterized by the general molecular formula:

- A.  $C_{nH2n-2}$
- B.  $C_{nH2n}$**
- C.  $C_{nH2n+2}$
- D.  $C_{nH2n+4}$

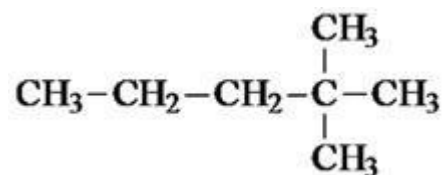
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*Bloom's Level: 1. Remember*  
*Chapter: 02*  
*Difficulty: Easy*  
*Gradable: automatic*  
*Section: 02.18*  
*Subtopic: Acyclic vs cyclic*  
*Subtopic: Alkanes*  
*Subtopic: Hydrocarbons*  
*Topic: Alkanes (Acyclic and Cyclic)*  
*Topic: Functional Groups*

**3. The carbon-carbon sigma bond in ethane is formed by overlap of which two orbitals?**

- A. 2p-2p
- B. sp-sp
- C.  $sp^2-sp^2$
- D.  $sp^3-sp^3$

*Accessibility: Keyboard Navigation*  
*Bloom's Level: 2. Understand*  
*Chapter: 02*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Section: 02.07*  
*Subtopic: Hybridization*  
*Topic: Molecular Shape*

4. What is the IUPAC name of the following compound?



- A. 4,4-dimethylpentane
- B. 1-tert-butylpropane
- C. 2,2-dimethylpentane
- D. 1,1,1-trimethylbutane

*Bloom's Level: 3. Apply*

*Chapter: 02*

*Difficulty: Medium*

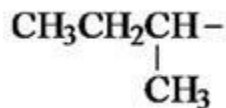
*Gradable: automatic*

*Section: 02.17*

*Subtopic: IUPAC Nomenclature of acyclic alkanes*

*Topic: Alkanes (Acyclic and Cyclic)*

5. The correct IUPAC name of the following compound is



- A. 2-ethyl-3,5-dimethylheptane.
- B. 6-ethyl-5,5-dimethylheptane.
- C. 3,4,4-trimethyloctane.**
- D. 5,5,6-trimethyloctane.

*Bloom's Level: 3. Apply*

*Chapter: 02*

*Difficulty: Medium*

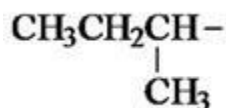
*Gradable: automatic*

*Section: 02.17*

*Subtopic: IUPAC Nomenclature of acyclic alkanes*

*Topic: Alkanes (Acyclic and Cyclic)*

6. The common name of the following group is



- A. *n*-butyl
- B. sec-butyl**
- C. isobutyl
- D. *tert*-butyl

*Bloom's Level: 1. Remember*

*Chapter: 02*

*Difficulty: Medium*

*Gradable: automatic*

*Section: 02.16*

*Subtopic: Alkyl groups*

*Topic: Alkanes (Acyclic and Cyclic)*

7. Which one of the following is 2,2,5-trimethylhexane?

- A.  $(\text{CH}_3)_2\text{CHCH}_2\text{C}(\text{CH}_3)_3$   
B.  $(\text{CH}_3)_2\text{CHCH}_2\text{CH}_2\text{C}(\text{CH}_3)_3$   
C.  $\text{CH}_3\text{CH}_2\text{CH}(\text{CH}_3)\text{C}(\text{CH}_3)_3$   
D.  $(\text{CH}_3)_2\text{CHCH}_2\text{CH}_2\text{CH}_2\text{C}(\text{CH}_3)_3$

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Bloom's Level: 3. Apply

Chapter: 02

Difficulty: Medium

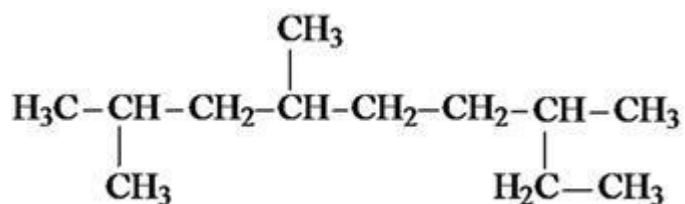
Gradable: automatic

Section: 02.17

Subtopic: IUPAC Nomenclature of acyclic alkanes

Topic: Alkanes (Acyclic and Cyclic)

8. The correct IUPAC name of the following is



- A. 2,4,7-trimethylnonane.  
B. 7-ethyl-2,4-dimethyloctane.  
C. 3,6,8-trimethylnonane.  
D. 2-ethyl-5,7-dimethyloctane.

Bloom's Level: 3. Apply

Chapter: 02

Difficulty: Medium

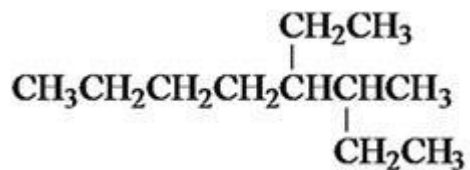
Gradable: automatic

Section: 02.17

Subtopic: IUPAC Nomenclature of acyclic alkanes

Topic: Alkanes (Acyclic and Cyclic)

9. What is the IUPAC name of the following?



- A. 5,6-diethylhexane
- B. 5-ethyl-6-methylheptane
- C. 2,3-diethylhexane
- D. 4-ethyl-3-methylheptane

*Bloom's Level: 3. Apply*

*Chapter: 02*

*Difficulty: Medium*

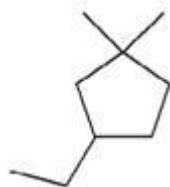
*Gradable: automatic*

*Section: 02.17*

*Subtopic: IUPAC Nomenclature of acyclic alkanes*

*Topic: Alkanes (Acyclic and Cyclic)*

10. What is the IUPAC name of the following?



- A. 1-ethyl-4,4-dimethylcyclopentane
- B. 1-ethyl-3,3-dimethylcyclopentane
- C. 3-ethyl-1,1-dimethylcyclopentane**
- D. 4-ethyl-1,1-dimethylcyclopentane

*Bloom's Level: 3. Apply*

*Chapter: 02*

*Difficulty: Medium*

*Gradable: automatic*

*Section: 02.18*

*Subtopic: IUPAC Nomenclature of cycloalkanes*

*Topic: Alkanes (Acyclic and Cyclic)*

## 11. Cyclohexane is composed of

- A. methine groups.
- B. methylene groups.**
- C. methyl groups.
- D. both methine and methylene groups.

*Accessibility: Keyboard Navigation*

*Bloom's Level: 2. Understand*

*Chapter: 02*

*Difficulty: Medium*

*Gradable: automatic*

*Section: 02.11*

*Subtopic: IUPAC Nomenclature of cycloalkanes*

*Topic: Alkanes (Acyclic and Cyclic)*

## 12. All the carbons in cyclopentane are

- A. primary carbons.
- B. secondary carbons.**
- C. tertiary carbons.
- D. quaternary carbons.

*Accessibility: Keyboard Navigation*

*Bloom's Level: 2. Understand*

*Chapter: 02*

*Difficulty: Medium*

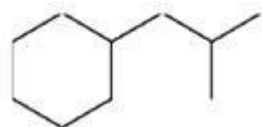
*Gradable: automatic*

*Section: 02.16*

*Subtopic: IUPAC Nomenclature of cycloalkanes*

*Topic: Alkanes (Acyclic and Cyclic)*

13. The correct name of the following compound is



- A. (1-methylpropyl)cyclohexane.
- B. (2,2-dimethylpropyl)cyclohexane.**
- C. (2,2-dimethylethyl)cyclohexane.
- D. (2,2-dimethylpropyl)cyclohexane.

*Bloom's Level: 3. Apply*

*Chapter: 02*

*Difficulty: Medium*

*Gradable: automatic*

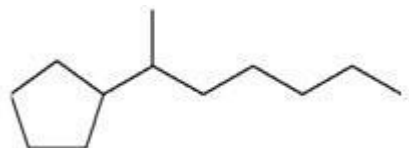
*Section: 02.18*

*Subtopic: IUPAC Nomenclature of cycloalkanes*

*Topic: Alkanes (Acyclic and Cyclic)*



14. The correct IUPAC name of the following compound is



- A. (1-methylhexyl)cyclopentane.
- B. (1-pentylethyl)cyclopentane.
- C. 2-cyclopentylheptane.**
- D. 1-cyclopentyl-2-heptane.

*Bloom's Level: 3. Apply*

*Chapter: 02*

*Difficulty: Medium*

*Gradable: automatic*

*Section: 02.18*

*Subtopic: IUPAC Nomenclature of cycloalkanes*

*Topic: Alkanes (Acyclic and Cyclic)*

15. The C-C sigma bond in acetylene is formed by the overlap of which two orbitals?



- A. 2p-2p
- B. sp-sp**
- C.  $\text{sp}^2\text{-sp}^2$
- D.  $\text{sp}^3\text{-sp}^3$

*Bloom's Level: 2. Understand*

*Chapter: 02*

*Difficulty: Medium*

*Gradable: automatic*

*Section: 02.09*

*Subtopic: Hybridization*

*Topic: Molecular Shape*

16. The boiling point of isobutane ( $-10.2^{\circ}\text{C}$ ) is lower than n-butane ( $-0.4^{\circ}\text{C}$ ) because isobutane has

- A. weaker intermolecular van der Waals forces.
- B. stronger intermolecular van der Waals forces.
- C. weaker dipole-dipole attractive forces.
- D. stronger dipole-dipole attractive forces.

*Accessibility: Keyboard Navigation*

*Bloom's Level: 2. Understand*

*Chapter: 02*

*Difficulty: Medium*

*Gradable: automatic*

*Section: 02.21*

*Subtopic: Intermolecular forces*

*Topic: Functional Groups*

17. Which of the following describes an atom or group of atoms that has similar chemical properties when it occurs in different compounds?

- A. hydrocarbon
- B. functional group**
- C. paraffin
- D. isomer

*Accessibility: Keyboard Navigation*

*Bloom's Level: 1. Remember*

*Chapter: 02*

*Difficulty: Easy*

*Gradable: automatic*

*Section: 02.19*

*Subtopic: C-Z functional groups (Z = N, O, S, halogen)*

*Subtopic: Hydrocarbons*

*Topic: Functional Groups*

18. Arrange the following isomeric alkanes in order of increasing boiling point.

I. n-heptane

II. 2,3-dimethylpentane

III. 2,2,3-trimethylbutane

- A. I < II < III
- B. II < III < I
- C. III < I < II
- D. III < II < I

*Accessibility: Keyboard Navigation*  
*Bloom's Level: 4. Analyze*  
*Chapter: 02*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Section: 02.21*  
*Subtopic: Intermolecular forces*  
*Topic: Functional Groups*

19. The oxidation states of carbon range from

- A. 0 to +2.
- B. 0 to +4.
- C. -4 to 0.
- D. -4 to +4.

*Accessibility: Keyboard Navigation*  
*Bloom's Level: 1. Remember*  
*Chapter: 02*  
*Difficulty: Easy*  
*Gradable: automatic*  
*Section: 02.23*  
*Subtopic: Acyclic vs cyclic*  
*Topic: Alkanes (Acyclic and Cyclic)*

20. Which of the following has (have) a higher oxidation state of carbon than the carbon in formaldehyde,  $\text{H}_2\text{C}=\text{O}$ ?

I.  $\text{CH}_3\text{OH}$

II.  $\text{HCO}_2\text{H}$

III.  $\text{H}_2\text{CO}_3$

- A. I
- B. III
- C. II and III
- D. I, II, and III

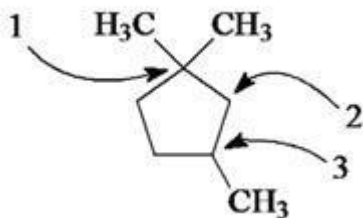
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*Bloom's Level: 4. Analyze*  
*Chapter: 02*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Section: 02.23*  
*Subtopic: Acyclic vs cyclic*  
*Topic: Alkanes (Acyclic and Cyclic)*

21. The tert-butyl group can also be called

- A. 1,1-dimethylpropyl.
- B. 1,1-dimethylethyl.**
- C. 2,2-dimethylpropyl.
- D. 2,2-dimethylethyl.

*Accessibility: Keyboard Navigation*  
*Bloom's Level: 2. Understand*  
*Chapter: 02*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Section: 02.16*  
*Subtopic: Alkyl groups*  
*Topic: Alkanes (Acyclic and Cyclic)*

22. Carbon atoms 1, 2, and 3 in the following structure are classified, respectively, as



- A. tertiary, primary, secondary.
- B. quaternary, secondary, secondary.
- C. quaternary, primary, tertiary.
- D. quaternary, secondary, tertiary.

*Bloom's Level: 2. Understand*

*Chapter: 02*

*Difficulty: Medium*

*Gradable: automatic*

*Section: 02.16*

*Subtopic: Alkyl groups*

*Topic: Alkanes (Acyclic and Cyclic)*

23. Identify the isomer of C<sub>6</sub>H<sub>14</sub> that only has primary and tertiary carbons.

- A. hexane
- B. 2,2-dimethylbutane
- C. 3-methylpentane
- D. 2,3-dimethylbutane

*Accessibility: Keyboard Navigation*

*Bloom's Level: 3. Apply*

*Chapter: 02*

*Difficulty: Hard*

*Gradable: automatic*

*Section: 02.16*

*Subtopic: IUPAC Nomenclature of acyclic alkanes*

*Topic: Alkanes (Acyclic and Cyclic)*

**24. Why can heats of combustion of constitutional isomers of hydrocarbons be used to measure their stabilities?**

- I. Combustion of constitutional isomers gives different final states.**
- II. Combustion of constitutional isomers gives the same final states.**
- III. Constitutional isomers of hydrocarbons have the same potential energies.**
- IV. Constitutional isomers of hydrocarbons have different potential energies.**

- A. only I
- B. only II
- C. I and III
- D. II and IV

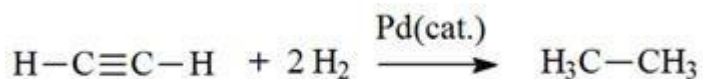
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*Bloom's Level: 2. Understand*  
*Chapter: 02*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Section: 02.22*  
*Subtopic: Reactions of alkanes*  
*Topic: Alkanes (Acyclic and Cyclic)*

**25. The heats of combustion ( $-\Delta H^\circ$ ) of heptane and 3,3-dimethylpentane are 4,817 and 4,809 kJ/mol, respectively. Which statement is true?**

- A. Heptane is 8 kJ/mol more stable than 3,3-dimethylpentane.
- B. 3,3-Dimethylpentane is 8 kJ/mol more stable than heptane.
- C. Stabilities cannot be compared since they are not isomers.
- D. Stabilities cannot be compared since they give different combustion products.

*Accessibility: Keyboard Navigation*  
*Bloom's Level: 2. Understand*  
*Chapter: 02*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Section: 02.22*  
*Subtopic: Reactions of alkanes*  
*Topic: Alkanes (Acyclic and Cyclic)*

26. The reaction of acetylene with hydrogen gas is shown below. Which statements are true concerning the reaction?



- I. Acetylene is oxidized to ethane.
- II. Acetylene is reduced to ethane.
- III. Carbon changes oxidation state from -1 to -3.
- IV. Hydrogen (from H<sub>2</sub>) changes oxidation state from 0 to +1.

- A. I and III
- B. II and IV
- C. I, III, and IV
- D. II, III, and IV

*Bloom's Level: 2. Understand*  
*Chapter: 02*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Section: 02.23*  
*Subtopic: Reactions of alkanes*  
*Topic: Alkanes (Acyclic and Cyclic)*

27. How many methine groups are there in isopropylcyclopentane?

- A. one
- B. two
- C. three
- D. four

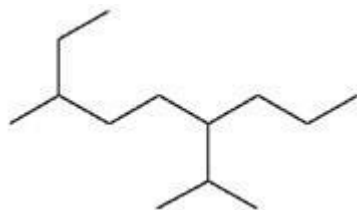
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*Bloom's Level: 2. Understand*  
*Chapter: 02*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Section: 02.11*  
*Subtopic: IUPAC Nomenclature of acyclic alkanes*  
*Topic: Alkanes (Acyclic and Cyclic)*

28. What is the total number of constitutional isomers with the formula C<sub>5</sub>H<sub>12</sub>?

- A. two
- B. three
- C. four
- D. five

*Accessibility: Keyboard Navigation*  
*Bloom's Level: 3. Apply*  
*Chapter: 02*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Section: 02.13*  
*Subtopic: Constitutional isomers*  
*Topic: Drawing Organic Molecules*

29. What is the IUPAC name of the following?



- A. 6-isopropyl-3-methylnonane
- B. 2-ethyl-5-isopropyloctane
- C. 6-propyl-3-methylnonane
- D. 2-ethyl-5-propyloctane

*Bloom's Level: 3. Apply*  
*Chapter: 02*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Section: 02.17*  
*Subtopic: IUPAC Nomenclature of acyclic alkanes*  
*Topic: Alkanes (Acyclic and Cyclic)*

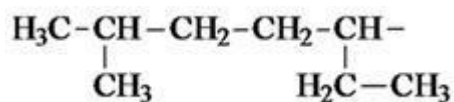


30. How many moles of O<sub>2</sub> gas would be consumed in the complete combustion of 0.100 mole of C<sub>5</sub>H<sub>12</sub>?

- A. 0.100 mole O<sub>2</sub>
- B. 0.400 mole O<sub>2</sub>
- C. 0.800 mole O<sub>2</sub>
- D. 1.60 mole O<sub>2</sub>

*Accessibility: Keyboard Navigation*  
*Bloom's Level: 4. Analyze*  
*Chapter: 02*  
*Difficulty: Hard*  
*Gradable: automatic*  
*Section: 02.22*  
*Subtopic: Reactions of alkanes*  
*Topic: Alkanes (Acyclic and Cyclic)*

31. The systematic name of the following group is



- A. 5-ethyl-2-methylpentyl.
- B.** 1-ethyl-4-methylpentyl.
- C. 6-methyl-3-heptyl.
- D. 2-methyl-5-heptyl.

*Bloom's Level: 3. Apply*  
*Chapter: 02*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Section: 02.16*  
*Subtopic: Alkyl groups*  
*Topic: Alkanes (Acyclic and Cyclic)*

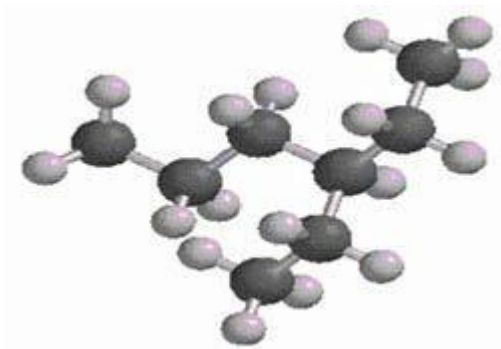
32. What is the relationship between the two structures below?



- A. identical structures
- B. resonance forms
- C. constitutional isomers
- D. different compounds with different compositions

*Bloom's Level: 2. Understand*  
*Chapter: 02*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Section: 02.11*  
*Subtopic: Constitutional isomers*  
*Topic: Drawing Organic Molecules*

33. What is the IUPAC name of the following structure?



- A. 3-propylpentane
- B. 3-ethylhexane**
- C. 2-ethylheptane
- D. 4-ethylpentane

*Bloom's Level: 3. Apply*

*Chapter: 02*

*Difficulty: Medium*

*Gradable: automatic*

*Section: 02.17*

*Subtopic: IUPAC Nomenclature of acyclic alkanes*

*Topic: Alkanes (Acyclic and Cyclic)*

34. Which of the following are constitutional isomers?

- I. 2,3,3-dimethylhexane
- II. 2,2-diethylpentane
- III. 3-ethyl-2-methylheptane

- A. I and II
- B. I and III
- C. II and III
- D. they are all constitutional isomers

*Accessibility: Keyboard Navigation*

*Bloom's Level: 3. Apply*

*Chapter: 02*

*Difficulty: Medium*

*Gradable: automatic*

*Section: 02.11*

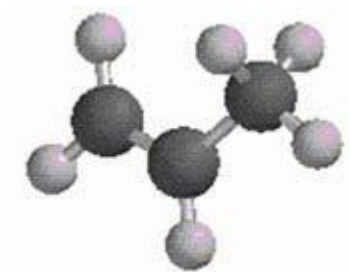
*Subtopic: Constitutional isomers*

*Subtopic: IUPAC Nomenclature of acyclic alkanes*

*Topic: Alkanes (Acyclic and Cyclic)*

*Topic: Drawing Organic Molecules*

35. What is the estimated C-C-C bond angle in the following model?



- A.  $90^\circ$
- B.  $109.5^\circ$
- C.  $120^\circ$
- D.  $180^\circ$

*Bloom's Level: 2. Understand*

*Chapter: 02*

*Difficulty: Medium*

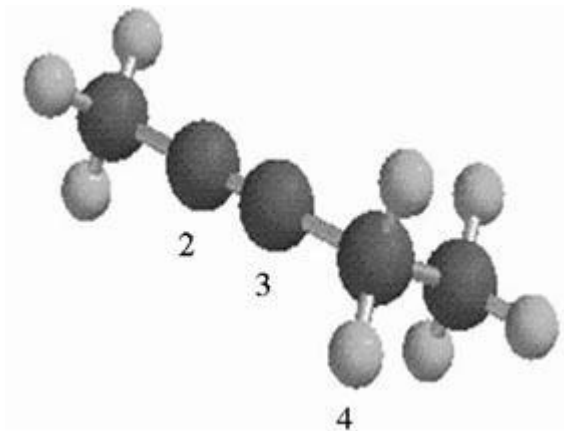
*Gradable: automatic*

*Section: 02.08*

*Subtopic: Hybridization*

*Topic: Molecular Shape*

36. What are the hybridizations of carbon atoms 2, 3, and 4 shown in the model below?



- A.  $sp$ ,  $sp^2$ ,  $sp^2$
- B.  $sp$ ,  $sp^2$ ,  $sp^3$
- C.  $sp$ ,  $sp$ ,  $sp^2$
- D.  $sp$ ,  $sp$ ,  $sp^3$

*Bloom's Level: 2. Understand*  
*Chapter: 02*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Section: 02.09*  
*Subtopic: Hybridization*  
*Topic: Molecular Shape*

37. Arrange the following hydrocarbons in order of increasing boiling point.

I. pentane

II. 2,2-dimethylpropane

III. 2-methylbutane

- A. I < II < III
- B. I < III < II
- C. II < I < III
- D. II < III < I

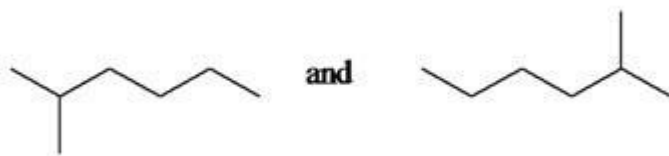
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*Chapter: 02*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Section: 02.21*  
*Subtopic: Intermolecular forces*  
*Topic: Functional Groups*

38. The 1,1-dimethylethyl group,  $-\text{C}(\text{CH}_3)_3$ , can also be called

- A. butyl.
- B. isobutyl.
- C. *sec*-butyl.
- D. *tert*-butyl.

*Accessibility: Keyboard Navigation*  
*Bloom's Level: 2. Understand*  
*Chapter: 02*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Section: 02.16*  
*Subtopic: Alkyl groups*  
*Topic: Alkanes (Acyclic and Cyclic)*

39. What is the relationship between the following two structures?



- A. identical structures
- B. resonance forms
- C. constitutional isomers
- D. different compounds with different compositions

*Bloom's Level: 2. Understand*

*Chapter: 02*

*Difficulty: Easy*

*Gradable: automatic*

*Section: 02.11*

*Subtopic: Skeletal/bond-line structures*

*Topic: Drawing Organic Molecules*

40. The  $sp^3$  orbitals of carbon in  $CH_4$  are formed from the

- A. three 2p orbitals.
- B. 2s and two of the 2p orbitals.
- C. 2s and one of the 2p orbitals.
- D. 2s and the three 2p orbitals.

*Accessibility: Keyboard Navigation*

*Bloom's Level: 2. Understand*

*Chapter: 02*

*Difficulty: Medium*

*Gradable: automatic*

*Section: 02.06*

*Subtopic: Hybridization*

*Topic: Molecular Shape*

**41. The geometry of  $sp^3$  hybrid orbitals can be described as pointing towards the corners of a**

- A. triangle.
- B. square.
- C. tetrahedron.**
- D. square pyramid.

*Accessibility: Keyboard Navigation*  
*Bloom's Level: 2. Understand*  
*Chapter: 02*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Section: 02.06*  
*Subtopic: Hybridization*  
*Topic: Molecular Shape*

**42. What is the Cl-C-Cl bond angle in  $CCl_4$ ?**

- A.  $60^\circ$
- B.  $90^\circ$
- C.  $109.5^\circ$**
- D.  $120^\circ$

*Accessibility: Keyboard Navigation*  
*Bloom's Level: 3. Apply*  
*Chapter: 02*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Section: 02.08*  
*Subtopic: Hybridization*  
*Topic: Molecular Shape*

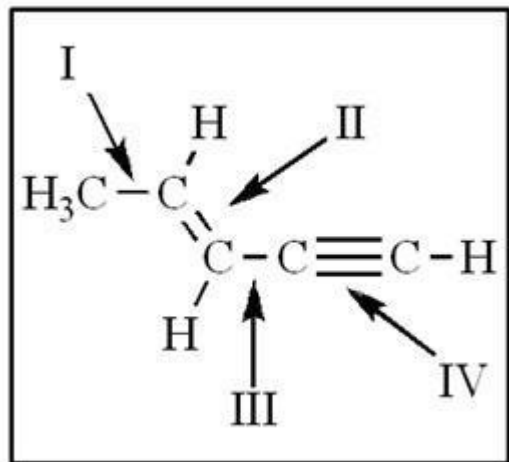
**43. Which of the following has the lowest boiling point?**

- A. pentane
- B. 2,2-dimethylpropane**
- C. 2-methylbutane
- D. hexane

*Accessibility: Keyboard Navigation*  
*Bloom's Level: 2. Understand*  
*Chapter: 02*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Section: 02.21*  
*Subtopic: Intermolecular forces*  
*Topic: Functional Groups*



44. The shortest and longest carbon-carbon bonds, respectively, in this molecule are:



- A. II and III
- B. IV and III
- C. I and IV
- D. IV and I

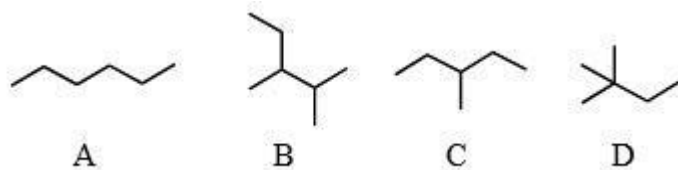
*Bloom's Level: 2. Understand*  
*Chapter: 02*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Section: 02.08*  
*Subtopic: Bond properties*  
*Subtopic: Types of bonds*  
*Topic: Structure and Bonding*

45. How many isomers of  $\text{C}_6\text{H}_{14}$  are possible?

- A. four
- B. five
- C. six
- D. seven

*Accessibility: Keyboard Navigation*  
*Bloom's Level: 3. Apply*  
*Chapter: 02*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Section: 02.15*  
*Subtopic: Constitutional isomers*  
*Topic: Drawing Organic Molecules*

46. Which of the molecules below is NOT an isomer of formula  $C_6H_{14}$ ?



- A. A
- B. B**
- C. C
- D. D

*Bloom's Level: 3. Apply*  
*Chapter: 02*  
*Difficulty: Easy*  
*Gradable: automatic*  
*Section: 02.18*  
*Subtopic: Constitutional isomers*  
*Subtopic: Skeletal/bond-line structures*  
*Topic: Drawing Organic Molecules*

47. Which of the following statements is not true concerning hydrocarbons?

- A. Hydrocarbons are compounds that carbon, hydrogen, and oxygen atoms.**
- B. Alkanes, alkenes, and alkynes are examples of aliphatic hydrocarbons.
- C. Aromatic hydrocarbons are also referred to as arenes.
- D. Hydrocarbons may contain sigma bonds and/or pi bonds.

*Accessibility: Keyboard Navigation*  
*Bloom's Level: 2. Understand*  
*Chapter: 02*  
*Difficulty: Easy*  
*Gradable: automatic*  
*Section: 02.01*  
*Subtopic: Alkanes*  
*Subtopic: Alkenes*  
*Subtopic: Alkynes*  
*Subtopic: Arenes (Aromatics)*  
*Subtopic: Hydrocarbons*  
*Topic: Functional Groups*

**48. How many isomers of C<sub>4</sub>H<sub>9</sub>Cl are possible?**

- A. two
- B. three
- C. four**
- D. five

*Accessibility: Keyboard Navigation*  
*Bloom's Level: 3. Apply*  
*Chapter: 02*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Section: 02.11*  
*Subtopic: Constitutional isomers*  
*Topic: Drawing Organic Molecules*

**49. The smallest straight-chain alkane that is liquid at room temperature and atmospheric pressure is**

- A. propane.
- B. butane.
- C. pentane.**
- D. hexane.

*Accessibility: Keyboard Navigation*  
*Bloom's Level: 2. Understand*  
*Chapter: 02*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Section: 02.21*  
*Subtopic: Intermolecular forces*  
*Topic: Functional Groups*

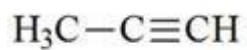
50. The lowest-boiling isomer of C<sub>7</sub>H<sub>16</sub> would be



- A. A.
- B. B.
- C. C.
- D. D.

*Bloom's Level: 2. Understand*  
*Chapter: 02*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Section: 02.21*  
*Subtopic: Intermolecular forces*  
*Topic: Functional Groups*

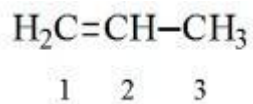
51. The C-C-C bond angle in propyne, shown below, is



- A. 90°.
- B. 109.5°.
- C. 120°.
- D. 180°.

*Bloom's Level: 3. Apply*  
*Chapter: 02*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Section: 02.09*  
*Subtopic: Hybridization*  
*Topic: Molecular Shape*

52. The hybridization of carbon atoms 1, 2, and 3 in the following are respectively,



- A. sp, sp, and  $\text{sp}^2$ .
- B. sp, sp, and  $\text{sp}^3$ .
- C.**  $\text{sp}^2$ ,  $\text{sp}^2$ , and  $\text{sp}^3$ .
- D.  $\text{sp}^2$ ,  $\text{sp}^3$ , and  $\text{sp}^3$ .

*Bloom's Level: 3. Apply*  
*Chapter: 02*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Section: 02.08*  
*Subtopic: Hybridization*  
*Topic: Molecular Shape*

53. How many pi bonds are present in the following structure?



- A. one
- B. two
- C.** three
- D. four

*Bloom's Level: 2. Understand*  
*Chapter: 02*  
*Difficulty: Easy*  
*Gradable: automatic*  
*Section: 02.09*  
*Subtopic: Hybridization*  
*Topic: Molecular Shape*

54. The carbon-carbon single bond in the following is formed by the overlap of which two orbitals?



- A. sp-sp
- B. sp<sup>2</sup>-sp**
- C. sp<sup>2</sup>-sp<sup>2</sup>
- D. sp<sup>2</sup>-sp<sup>3</sup>

*Bloom's Level: 2. Understand*  
*Chapter: 02*  
*Difficulty: Medium*  
*Gradable: automatic*  
*Section: 02.09*  
*Subtopic: Hybridization*  
*Topic: Molecular Shape*

# Chapter 2 - Alkanes and Cycloalkanes: Introduction to Hydrocarbons (Test Bank) Summary

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Bloom's Level: 2. Understand	25
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Bloom's Level: 4. Analyze	4
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Difficulty: Easy	8
Difficulty: Hard	2
Difficulty: Medium	44
Gradable: automatic	54
Section: 02.01	1
Section: 02.05	1
Section: 02.06	2
Section: 02.07	1
Section: 02.08	4
Section: 02.09	5
Section: 02.11	6
Section: 02.13	1
Section: 02.15	1
Section: 02.16	7
Section: 02.17	7
Section: 02.18	5
Section: 02.19	1
Section: 02.21	6
Section: 02.22	3
Section: 02.23	3
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Subtopic: Alkanes	3
Subtopic: Alkenes	1
Subtopic: Alkyl groups	5
Subtopic: Alkynes	1
Subtopic: Arenes (Aromatics)	1
Subtopic: Bond properties	1

Subtopic: C-Z functional groups (Z = N, O, S, halogen)	1
Subtopic: Constitutional isomers	6
Subtopic: Hybridization	11



Subtopic: Hydrocarbons	4
Subtopic: Intermolecular forces	6
Subtopic: IUPAC Nomenclature of acyclic alkanes	10
Subtopic: IUPAC Nomenclature of cycloalkanes	5
Subtopic: Reactions of alkanes	4
Subtopic: Skeletal/bond-line structures	2
Subtopic: Types of bonds	1
Topic: Alkanes (Acyclic and Cyclic)	28
Topic: Drawing Organic Molecules	7
Topic: Functional Groups	10
Topic: Molecular Shape	11
Topic: Structure and Bonding	1