- Name: _____
 - 1. The correct name of the following molecule would be:



- A) 2-ethyl-3,3-dimethylheptane
- B) 6-ethyl-5,5-dimethylheptane
- C) 3,4,4-trimethyloctane
- D) 2-butyl-3-methylpentane
- E) 2-sec-butyl-2-methylhexane
- 2. What is the name given to the Newman projection of the butane conformation shown here?



- A) anti
- B) gauche
- C) staggered
- D) eclipsed
- E) skewed
- 3. At room temperature, the various conformations of butane
 - A) do not interconvert with only the *anti* form present.
 - B) do not interconvert, but all forms are present.
 - C) interconvert slowly.
 - D) interconvert rapidly.
 - E) There is no way to determine if interconversion occurs.

4. What statement is true of the following energy diagram?



- A) For irreversible reactions, product 1 will dominate.
- B) For reversible reactions, product 2 will dominate at equilibrium.
- C) For reversible reactions, equal amounts of 1 and 2 will be formed.
- D) For irreversible reactions, equal amounts of 1 and 2 will be formed.
- E) None of the above are true.
- 5. What would be the correct name of the following?

$$CH_3 - CH_2 - CH_2 - CH - CH_3$$

I
 $CH_3 - CH_2 - CH - CH_2 - CH_3$

- A) 3-(sec-pentyl)pentane
- B) 5-ethyl-4-methylheptane
- C) 3-(sec-butyl)hexane
- D) 3-ethyl-4-methylheptane
- E) 3-ethyl-4-propylpentane
- 6. The following Newman projection corresponds to which molecule?



- A) pentane
- B) butane
- C) 3-ethylbutane
- D) hexane
- E) 3-methylpentane

7. Rotation around the carbon-carbon bond of the molecule depicted by the following Newman projection requires how much energy?



- B) 3 kcal/mol
- C) 6 kcal/mol
- D) 9 kcal/mol
- E) 15 kcal/mol
- 8. What is the correct IUPAC name for the following molecule?



- A) 1,1,1,4-tetramethylhexane
- B) 4-ethyl-1,1,1-trimethylpentane
- C) 5-ethyl-2,2-dimethylhexane
- D) 3,6,6,6-tetramethylhexane
- E) 2,2,5-trimethylheptane
- 9. The following represents what functional group?



- A) ester
- B) ether
- C) alcohol
- D) thiol
- E) ketone

10. The following represents what functional group?



- A) alcohol
- B) aldehyde
- C) carboxylic acid
- D) amide
- E) ketone
- 11. The following represents what functional group?



- A) amide
- B) thiol
- C) ketone
- D) nitrile
- E) amine
- 12. What is the correct structure for *tert*-butyl bromide? A)





13. The following Newman projection represents which molecule?

14. Name the following functional group:

$$R \xrightarrow{O} Q \xrightarrow{O} R$$

A) ester

- B) ketone
- C) alcohol
- D) carboxylic acid
- E) anhydride
- 15. Which isomer of C_7H_{16} shown would have the highest boiling point?



- 16. Which of the following contains the isobutyl group?
 - A) (CH₃)₂CHCH₂Cl
 - B) (CH₃)₃CCl
 - C) CH₃CH₂CH(CH₃)Cl
 - D) CH₃CH₂CH₂CH₂CH₂Cl
 - E) None of the above.

- 17. Which of the following contains the sec-butyl group?
 - A) (CH₃)₂CHCH₂Cl
 - B) (CH₃)₃CCl
 - C) CH₃CH₂CH(CH₃)Cl
 - D) CH₃CH₂CH₂CH₂Cl
 - E) None of the above.
- 18. How would the following molecule be properly named?

$$\begin{array}{c} \mathsf{CH}_3\\ \mathsf{CH}_3-\mathsf{CH}\\ \mathsf{CH}_3\mathsf{CH}_2-\mathsf{CH}\\ \mathsf{HC}-\mathsf{CH}_2\mathsf{CH}_2\mathsf{CH}_2\\ \mathsf{HC}_2-\mathsf{CH}_2\\ \mathsf{CH}_2\\ \mathsf{CH}_3\end{array}$$

- A) 3-ethyl-2-methyl-4-propylhexane
- B) 3,4-diethyl-2-methylheptane
- C) 4-ethyl-3-isopropylheptane
- D) 3-isopropyl-4-propylhexane
- E) None of the above.

19. The IUPAC name for $[(CH_3)_3C]_2CHCH_3$ is:

- A) 1,1-di-*tert*-butylethane
- B) 3-*tert*-butyl-2,2-dimethylbutane
- C) 2,2,3,4,4-pentamethylpentane
- D) 2,4,4-trimethylheptane
- E) None of the above.
- 20. What is the smallest alkane that is liquid at room temperature?
 - A) propane
 - B) butane
 - C) pentane
 - D) hexane
 - E) All are liquids.

21. All steroids are derivatives of the ring system shown. How many **tertiary hydrogens** are in this ring system?



22. What is the correct IUPAC name for the following molecule:



- A) 2-ethyl-2,6-dimethylheptane
- B) 1,1,5,5-tetramethylhexane
- C) 1,1,5,5-tetramethylheptane
- D) 2,6,6-trimethyloctane
- E) 4,4-dimethyl-1-isopropylhexane
- 23. What is the name given to the Newman projection of the butane conformation shown here?



- A) eclipsed
- B) gauche
- C) staggered
- D) anti
- E) skewed

$CH_4 + Br_2 \longrightarrow CH_3Br + HBr$	Bond Ave Strength
	C-C 83 (kcal/mol) C-H 99 (kcal/mol) C-Br 68 (kcal/mol) H-Br 87 (kcal/mol) Br-Br 46 (kcal/mol)

24. Calculate ΔG° for the following reaction at 25 °C and $\Delta S=0$

- A) -10 kcal/mol
- B) 10 kcal/mol
- C) 34 kcal/mol
- D) -34 kcal/mol
- E) None of the above.
- 25. Which of the following has the highest pKa?
 - A) HI
 - B) NH₃
 - C) HNO₃
 - D) CH₃COOH
 - E) H_2SO_4
- 26. The common name for 1-methylpropyl is:
 - A) Isopropyl
 - B) Isobutyl
 - C) sec-Butyl
 - D) *tert*-Butyl
 - E) None of the above.

27. What is the correct Newman projection for the following molecule?



28. Which of the following molecules contain both an alcohol and an aldehyde functional group?A)



29. Consider the potential energy diagram for rotation about the C2–C3 bond in pentane. The position marked "A" most likely corresponds to which of the following Newman projections?





30. What is the correct IUPAC name for the following molecule?



- A) 6-propyl-5,7,8-trimethyldecane
- B) 5,7,8-trimethyl-6-propyldecane
- C) 3,4,6-trimethyl-5-propyldecane
- D) 5-propyl-3,4,6-trimethyldecane
- E) None of the above.
- 31. Which of the following is not considered a Lewis acid?

- B) CH₃OH
- C) AlCl₃



32. Which of the following is considered to be a nucleophile?





34. How many quaternary carbons are in the following molecule?



35. How many ester functional groups are in the potent anticancer compound Taxol?

HF

 NH_3



- B)
- 1 C) 2
- D) 3
- E) 4
- 36. Arrange these acids in the order of increasing acidity.
 - HCI HBr HI
 - A) HBr, HI, HF, HCl
 - B) HF, HCl, HBr, HI
 - C) HF, HBr, HCl, HI
 - D) HI, HCl, HBr, HF
 - E) HI, HBr, HCl, HF
- 37. Arrange these acids in the order of increasing acidity.

HF CH_4 H_2O A) CH₄, H₂O, HF, NH₃ B) HF, H₂O, CH₄, NH₃ C) HF, H₂O, NH₃, CH₄,

- D) CH₄, NH₃, H₂O, HF,
- E) NH₃, CH₄, H₂O, HF,

38. What is the correct IUPAC name for the following molecule?



- A) 1-ethyl-2-methylhexane
- B) 2-ethyl-1-methylcycloheptane
- C) 4-ethyl-5-methylcyclohexane
- D) 1-ethyl-2-methylcyclohexane
- E) 1-methyloctane
- 39. Guanacastepene is a natural product that was recently isolated and shown to be a potent antibiotic. How many **different** functional groups does this structure possess?



Guanacastepene

- A) 1
- B) 2
- C) 3
- D) 4
- E) 5

Answer Key

- 1. C
- 2. B
- D
 E
- 4. E 5. D
- 6. D
- 7. B
- 8. E
- 9. B
- 10. B
- 11. D 12. B
- 13. A
- 14. E
- 15. A
- 16. A 17. C
- 18. B
- 19. C
- 20. C 21. E
- 21. E 22. D
- 23. D
- 24. A
- 25. B 26. C
- 20. C 27. A
- 28. B
- 29. B
- 30. C
- 31. B
- 32. C
- 33. C
- 34. B 35. D
- 36. B
- 37. D
- 38. D
- 39. E