



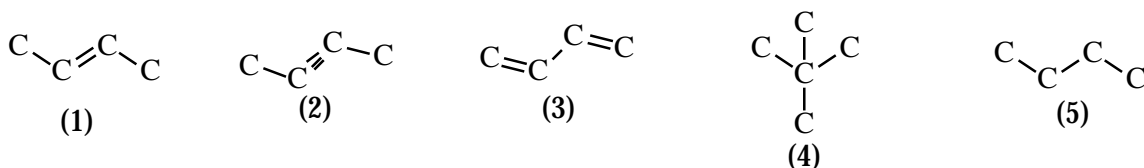
Unit VIII: Hydrocarbons test 3.1

Note: For clarity hydrogens have been omitted from most structures on this test. Whenever carbon does not appear to have the required number of bonds, it is understood that the “missing” bonds go to hydrogen atoms.

Multiple Choice

___ 1. A saturated compound is one that (1) contains only carbon-carbon sigma bonds; (2) contains at least one carbon-carbon pi bond; (3) contains at least one carbon-carbon double or triple bond; (4) both 1 and 3; (5) both 2 and 3; (1,2) is not described by any of the above answers.

___ 2. Which of the following structures best describes an unsaturated compound?



(1,2) both 2 and 5

(1,3) all but 2

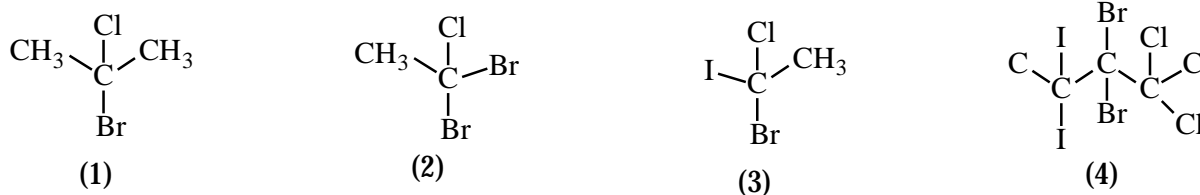
(1,4) all but 5

(1,5) all but 4 and 5

___ 3. The first three members of a homologous series are: CH_4O , $\text{C}_2\text{H}_6\text{O}_2$, $\text{C}_3\text{H}_8\text{O}_3$. The fourth member of this series would be (1) $\text{C}_4\text{H}_{10}\text{O}_4$; (2) $\text{C}_4\text{H}_{10}\text{O}$; (3) $\text{C}_{10}\text{H}_4\text{O}_4$; (4) $\text{C}_4\text{H}_{10}\text{O}_2$; (5) none of the above.

___ 4. The geometry associated with carbon-carbon triple bonds is (1) linear; (2) tetrahedral; (3) planar; (4) octahedral; (5) biplanar.

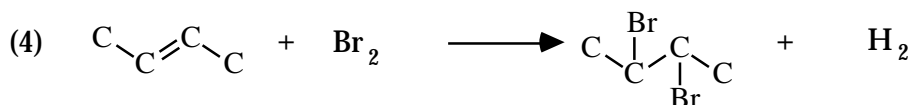
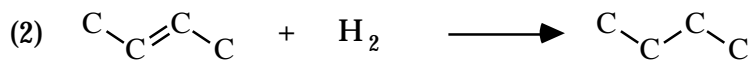
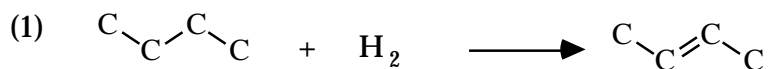
___ 5. Which of the following structures contain a chiral or asymmetric carbon atom?



___ 6. Isomers are compounds that (1) have the same number of carbon atoms but a different number of hydrogen atoms; (2) have the same number of hydrogen atoms but a different number of carbon atoms; (3) have the same number and kind of atoms in a molecule but differ in structure; (4) have the same kind of atoms in their molecular formulas but differ in the number of these atoms present; (5) none of the above.

___ 7. The two carbons joined by a triple bond in an alkyne are connected by (1) three sigma bonds; (2) one sigma bond and two pi bonds; (3) three pi bonds; (4) two identical sp^3 bonds; (5) two sigma and one pi bond.

___ 8 Which of the following illustrate the process of hydrogenation?



___ 9. In a certain laboratory exercise Snoopy mixed 5 drops of a solution of bromine water with one milliliter of each of the following substances: butane, 2-butene, 1-butene, benzene, and methyl benzene. The experiment was carried out at room temperature. Which of the substances should react rapidly with the bromine? (1) butane; (2) 1-butene and 2-butene; (3) benzene and methyl benzene; (4) 2-butene and benzene; (5) all but butane.

___ 10. Whenever two or more equally valid structures can be drawn for a molecule involving only the relative positions of double and single bonds, _____ is said to occur? (1) resonance; (2) geometric isomerism; (3) stereoisomerism; (4) cis configuration; (5) trans configuration.

___ 11. Which of the following best explain why there are so many carbon compounds? (1) concatenation; (2) isomerism; (3) multiple oxidation states are possible for carbon; (4) both 1 and 2; (5) both 2 and 3.

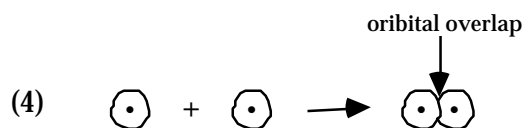
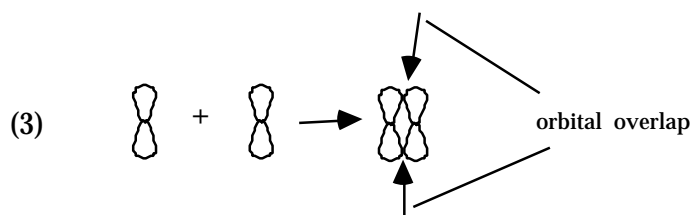
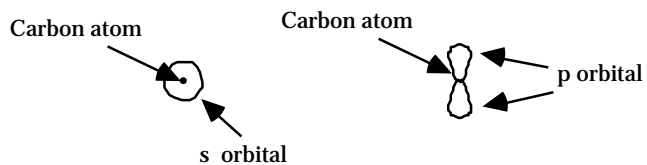
___ 12. Hydrogenation is the process of (1) adding hydrogen to unsaturated compounds; (2) adding hydrogen to saturated compounds; (3) removing hydrogen from saturated compounds; (4) removing hydrogen from unsaturated compounds.

___ 13. The formula for 2-nonacontene, an 90 carbon alkyne, would be
(1) $\text{C}_{90}\text{H}_{182}$; (2) $\text{C}_{90}\text{H}_{180}$; (3) $\text{C}_{90}\text{H}_{178}$; (4) $\text{C}_{90}\text{H}_{176}$.

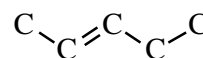
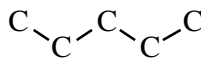
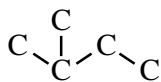
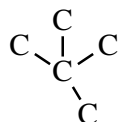
___ 14. In order to explain the geometry of organic compounds, among other properties, hybrid orbitals are postulated to exist. What type of hybridization exists for the carbon atom in order to explain the geometry associated with a carbon-carbon single bond?
(1) sp^3 ; (2) s^3p ; (3) s^2p ; (4) sp^2 ; (5) sp .

___ 15. As explained in class, resonance structures occur when a (1) sigma bond attempts to form in two places at the same time; (2) pi bond attempts to form in two places at the same time; (3) two pi bonds attempt to form between adjacent hydrogen atoms; (4) two pi bonds attempt to form an arene without carbon atoms; (5) a hybrid warp orbital orientates perpendicular to the axis of a sigma-pi intercept vector involving six carbon atoms.

___ 16. Which of the following illustrates the formation of a pi bond? (Note: The following legend applies to the various figures used in all answers.)



___ 17. Which of the structures below is not an isomer of pentane?



(1)

(2)

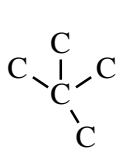
(3)

(4)

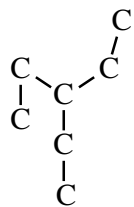
___ 18. The process of breaking up large hydrocarbon molecules into smaller molecules is known as (1) resonance; (2) hydrogenation; (3) dehydrogenation; (4) cracking.

Matching

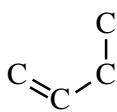
Questions 19-29 pertain to the structures below and to the right. Match up the IUC name with a corresponding structure, if a structure exists.



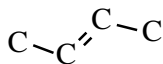
(1)



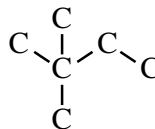
(2)



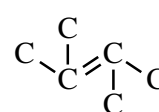
(3)



(4)



(5)



(1,2)

___ 19. 2,3 dimethyl 1-butene

___ 20. 2,3 dimethyl 1-butyne

___ 21. 1, 3 dimethyl benzene

___ 22. 1, 4 dimethyl benzene

___ 23. anthracene

___ 24. 3 methyl heptane

___ 25. 2 pentene

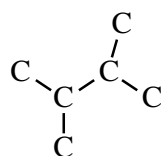
___ 26. hexane

___ 27. 3 ethyl pentane

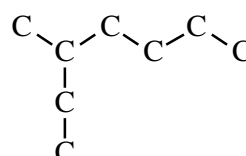
___ 28. an isomer of heptane

___ 29. 2,3 dimethyl butane

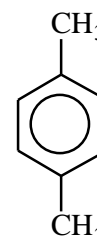
___ 30. Which of the following is in favor of hurt?



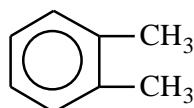
(1,3)



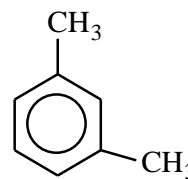
(1,4)



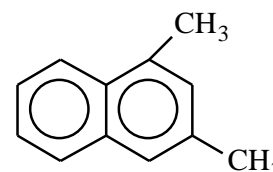
(1,5)



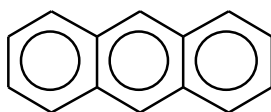
(2,3)



(2,4)



(2,5)

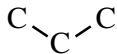


(3,4)

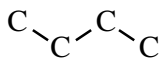
(3,5) no structure matches.



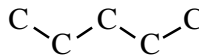
(1)



(2)



(3)

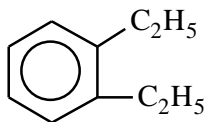


(4)

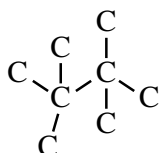
Short Answer

1. Name each of the six structures below. (Note: If you feel a structure cannot exist, for whatever reason, you must answer with "impossible".)

a)



b)



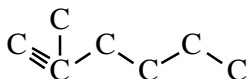
c)



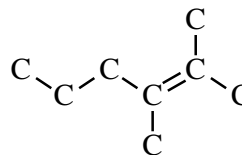
d)



e)



f)



a) _____

b) _____

c) _____

d) _____

e) _____

f) _____

2. Draw a structure for benzene, showing all hydrogen atoms.