

(I) Circle the letter of the correct answer. (5 pts each)

(1) Which of the following statements about the physical properties of organic molecules is false?

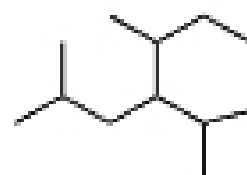
- (a) The substitution of a methyl group for a hydrogen at an alkane causes an increase in the boiling point of the molecule.
- (b) The boiling point of a linear alkane increases with increasing chain length.
- (c) The substitution of an HO- group for a hydrogen at an alkane causes an increase in the boiling point of the molecule.
- (d) The boiling point for alkanes of constant molecular weight increases with increasing branching.
- (e) The boiling point for alkanes of constant molecular weight decreases with increasing branching.

(2) Which of the following statements about valence bond resonance structures is true?

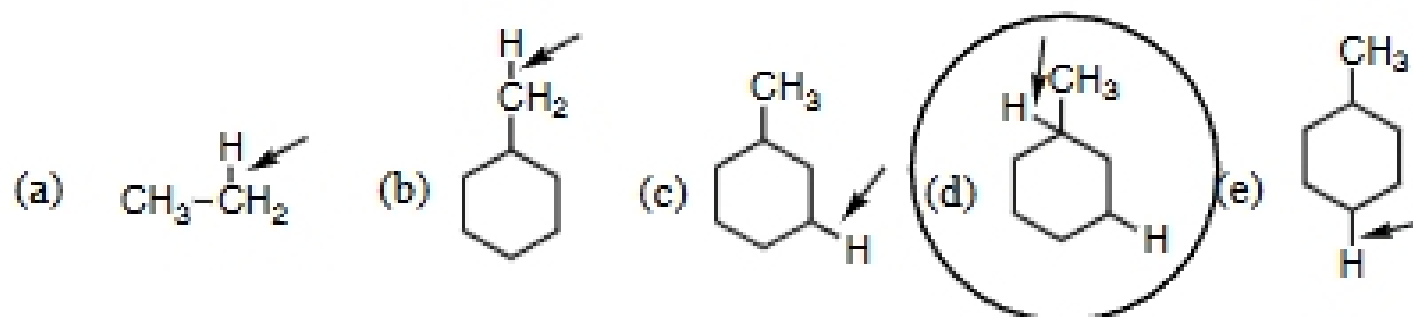
- (a) Contributing valence bond resonance structures with a minimum number of octets at the individual atom will make the largest contribution to the overall structure.
- (b) In cases where a positive charge is delocalized over two or more atoms, the charge will lie preferentially at the atom that is most electronegative.
- (c) Contributing valence bond resonance structures with a maximum formal charge at the individual atoms will make the largest contribution to the overall structure.
- (d) In cases where a negative charge is delocalized over two or more atoms, the charge will lie preferentially at the atom that is most electronegative.
- (e) All of the statements are true.

(3) What is the correct IUPAC name for the following compound?

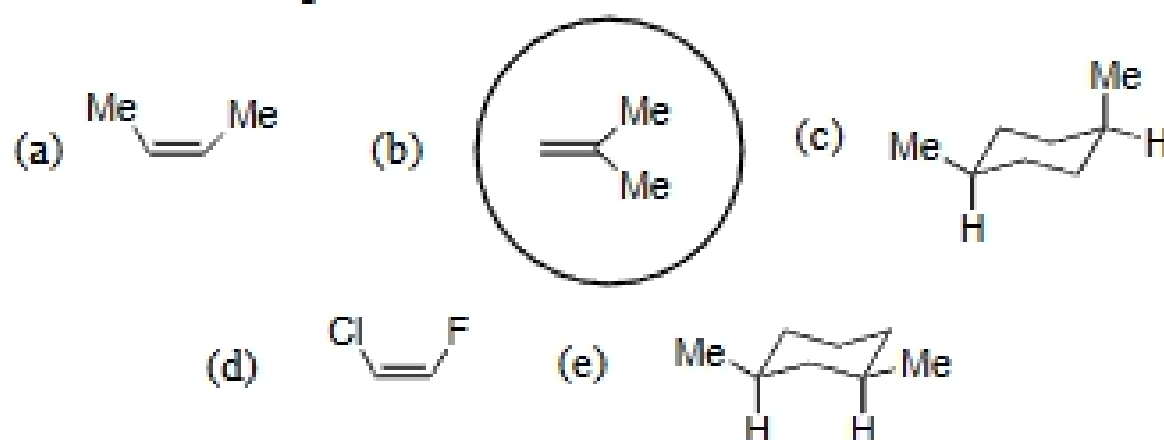
- (a) 2,5-dimethyl-4-(isopropyl)hexane
- (b) 2,6-dimethyl-4-(isopropyl)heptane
- (c) 2,5-dimethyl-4-(isopropyl)heptane
- (d) 2,4-dimethyl-3-(1-methylpropyl)hexane
- (e) None of the answers are correct



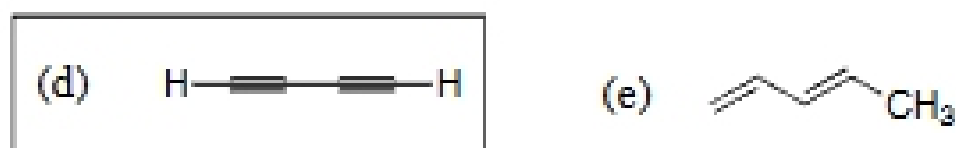
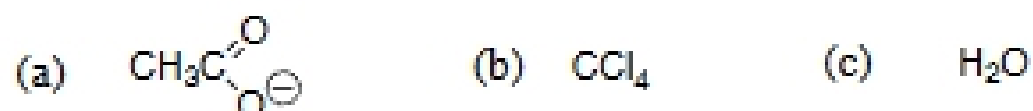
(4) Which of the following bonds has the smallest bond dissociation energy?



(5) Which of the following molecules has no trans isomer?



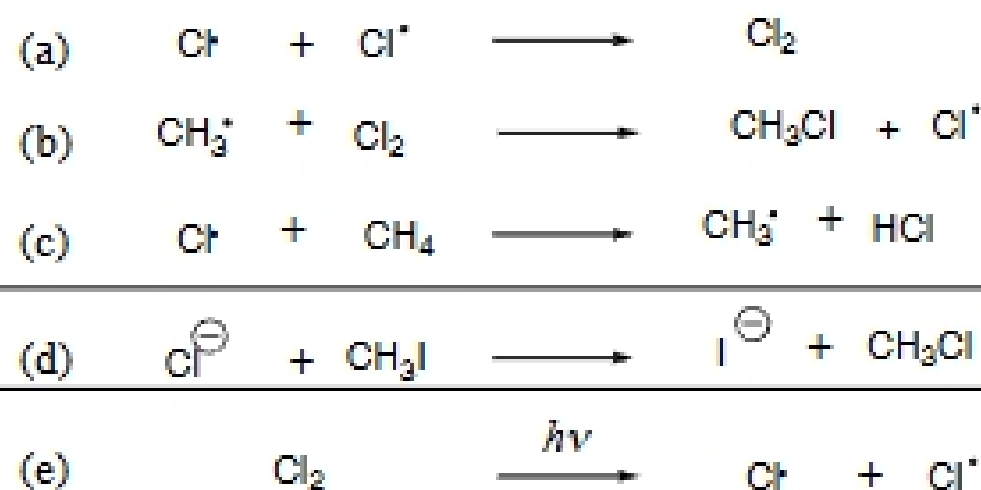
(6) Which of the following molecules contains no sp^3 -hybrid orbitals?



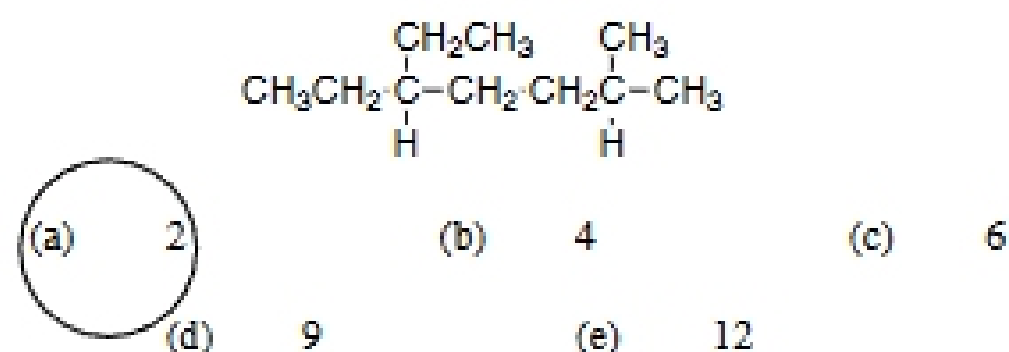
(7) How many equatorial hydrogens are there at the most stable chair form of *cis*-1,4-dimethylcyclohexane?

- (a) 2 (b) 3 (c) 4
 (d) 5 (e) 6

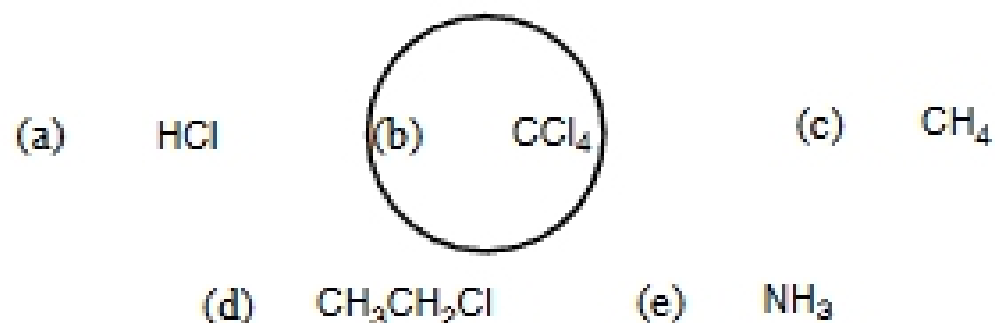
(8) Which of the following reactions is not part of a free radical halogenation reaction mechanism?



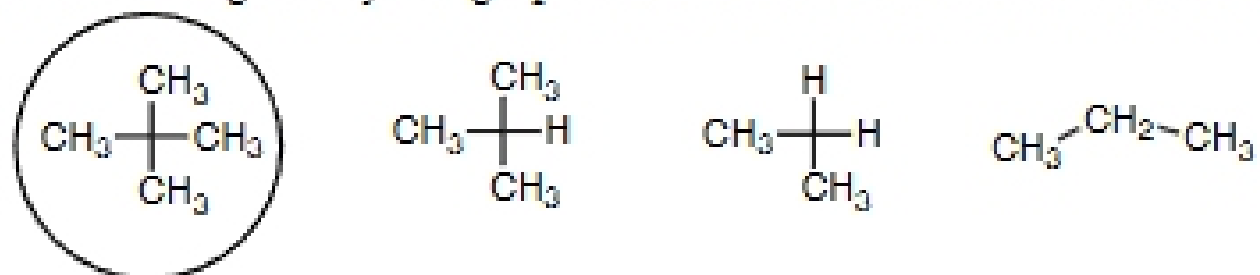
(9) How many tertiary-type hydrogens are there in the following molecule?



(10) Which of the following molecules has polar covalent bonds but no net dipole moment?



(11) Circle the alkane that will give only a single product from a free radical monobromination reaction.



(12) Circle the cycloalkane that has the highest heat of combustion per $-\text{CH}_2-$ group.

