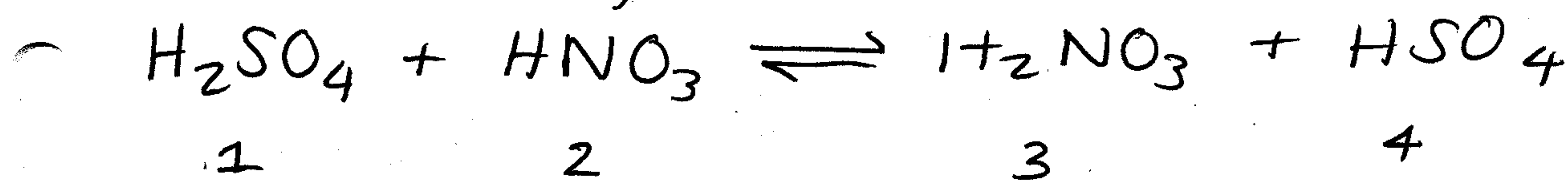


① Which of these species act as bases in the following rxn?



a) 1 & 2

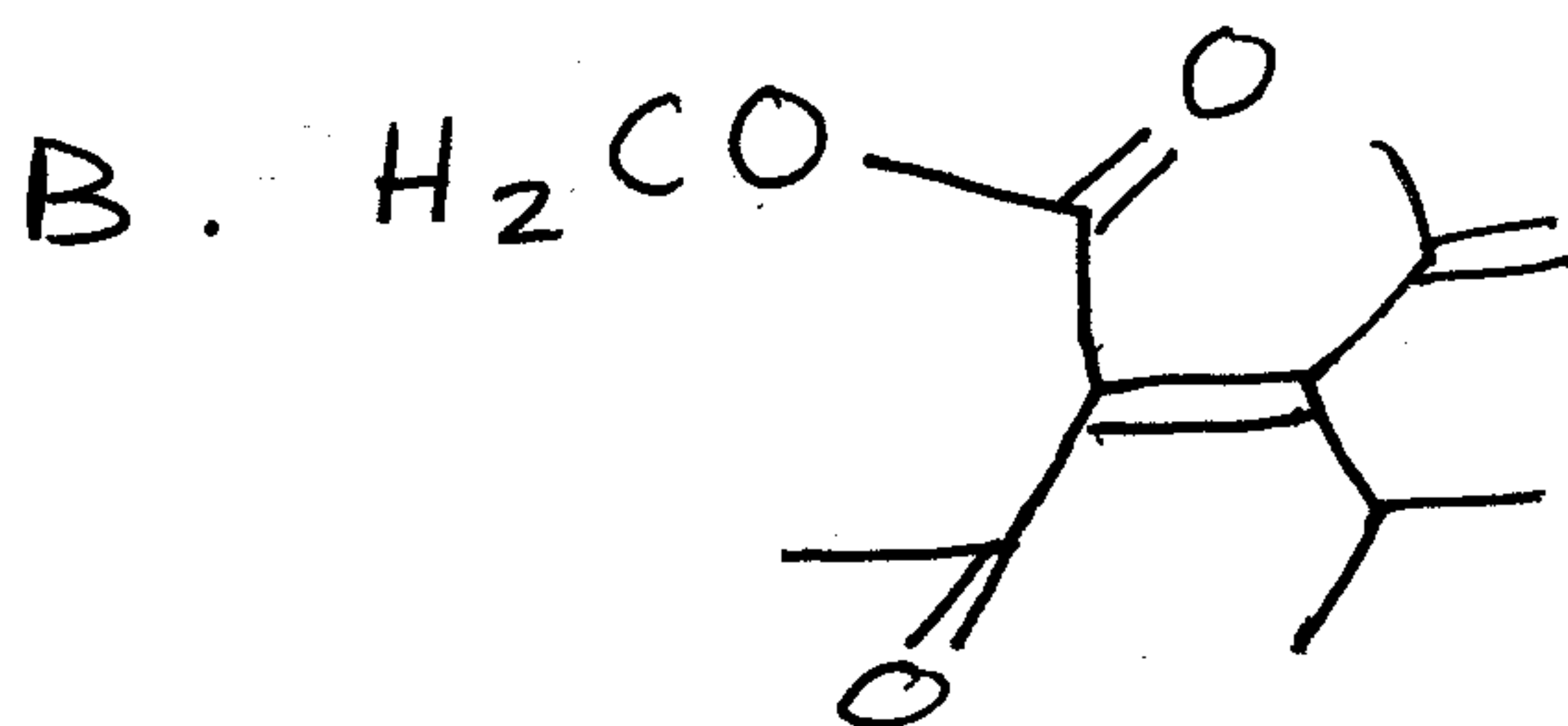
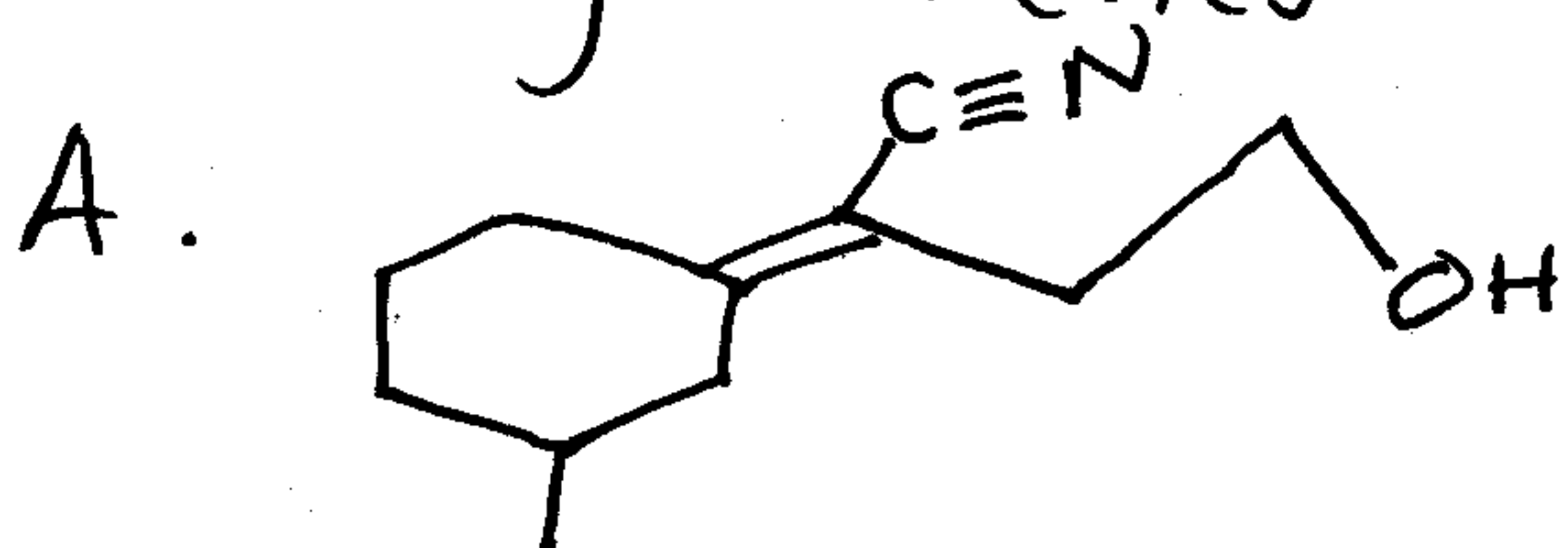
**c) 2 & 4**

e) 2 & 3

b) 3 & 4

d) 1 & 3

② Assign the E or Z configuration in the following alkenes



**a) A = E, B = Z**

③ Which of the following is the strongest acids?

**a) CH<sub>3</sub>CH<sub>2</sub>OH**

b) CH<sub>3</sub>OCH<sub>3</sub>

c) CH<sub>3</sub>-C≡CH

d) CH<sub>3</sub>-CH=CH<sub>2</sub>

e) CH<sub>3</sub>NCH<sub>3</sub>

④ Which of the following structures (including formal charge) is correct for diazomethane, CH<sub>2</sub>N<sub>2</sub>?

a) H<sub>2</sub>C \ N=N:

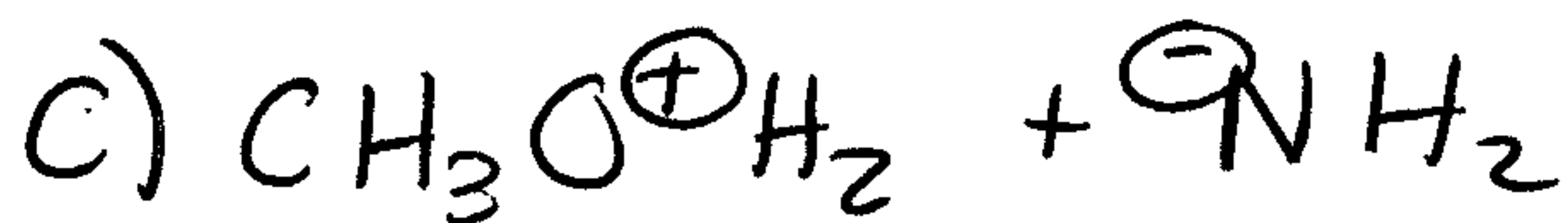
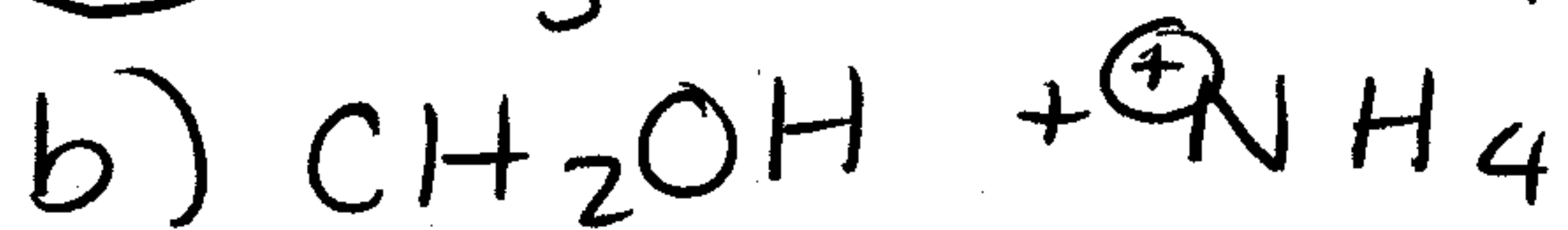
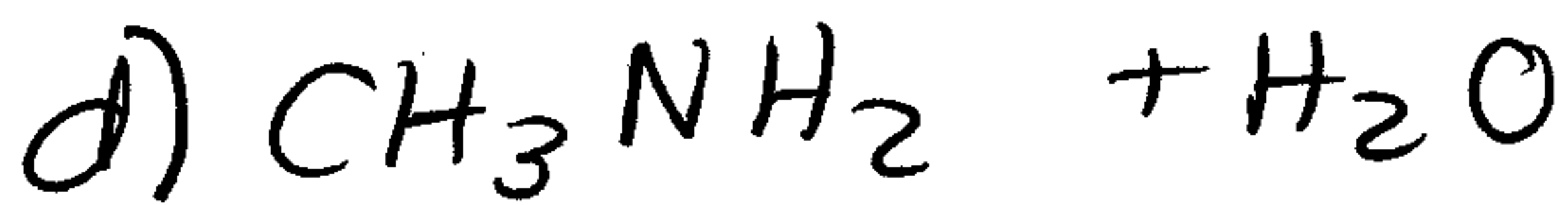
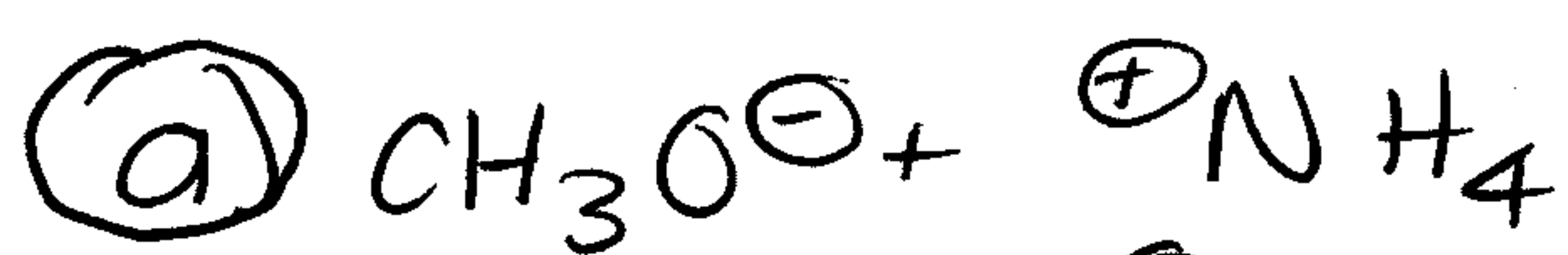
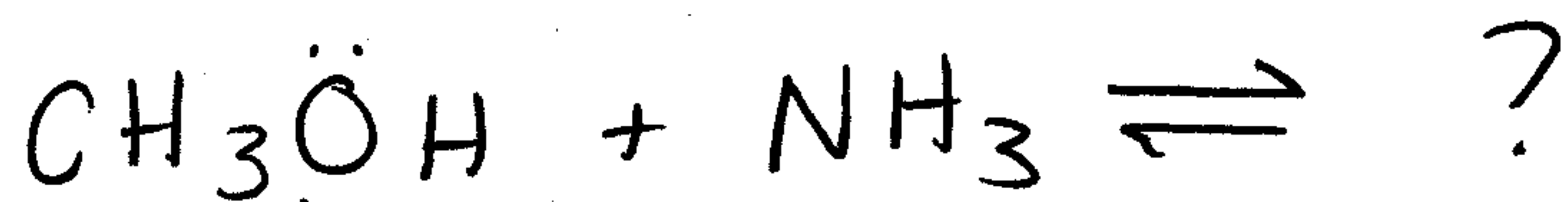
c) H<sub>2</sub>C = N<sup>+</sup> = N<sup>-</sup>:

b) H<sub>2</sub>C = N<sup>-</sup> = N<sup>+</sup>:

**d) H<sub>2</sub>C = N<sup>+</sup> = N<sup>-</sup>:**

e) H<sub>2</sub>C - N̄ - N̄:

What is the product of the following acid base rxn?



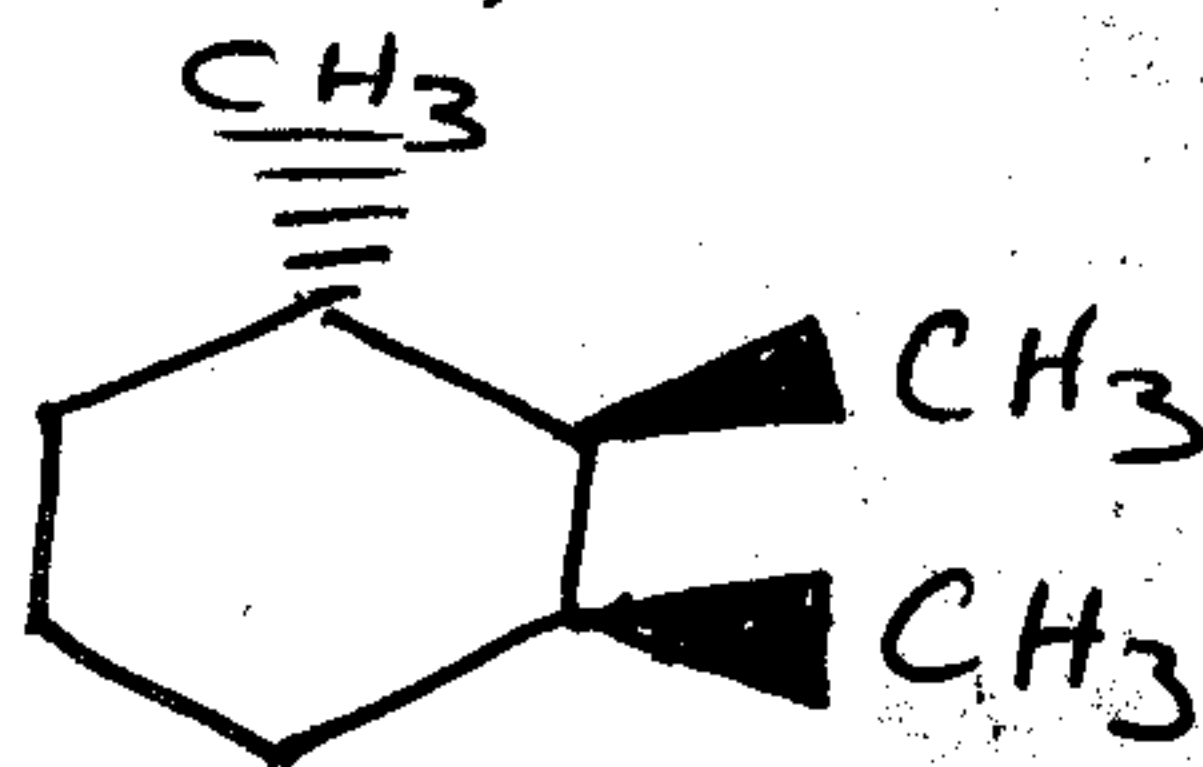
6) Calculate the energy of the following molecule in its most stable chair conformation.

a) 3.8

b) 7.8

c) 11.4

d) 15.2



7) How many lone pairs of electrons will be present in  $\text{CH}_3-\text{N}=\text{N}=\text{N}$

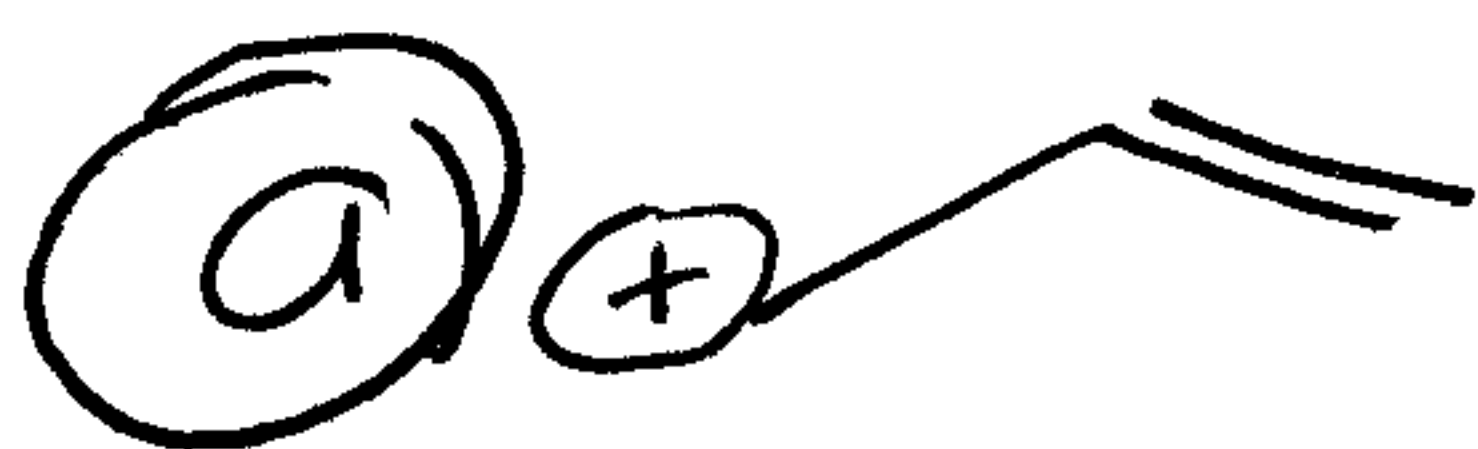
a) 1

c) 0

b) 2

d) 3

8) Which of the following has all carbon  $\text{sp}^2$  hybridized?



etc....

9) How many orbitals are present in the valence shell of Carbon when it is  $\text{sp}$  hybridized

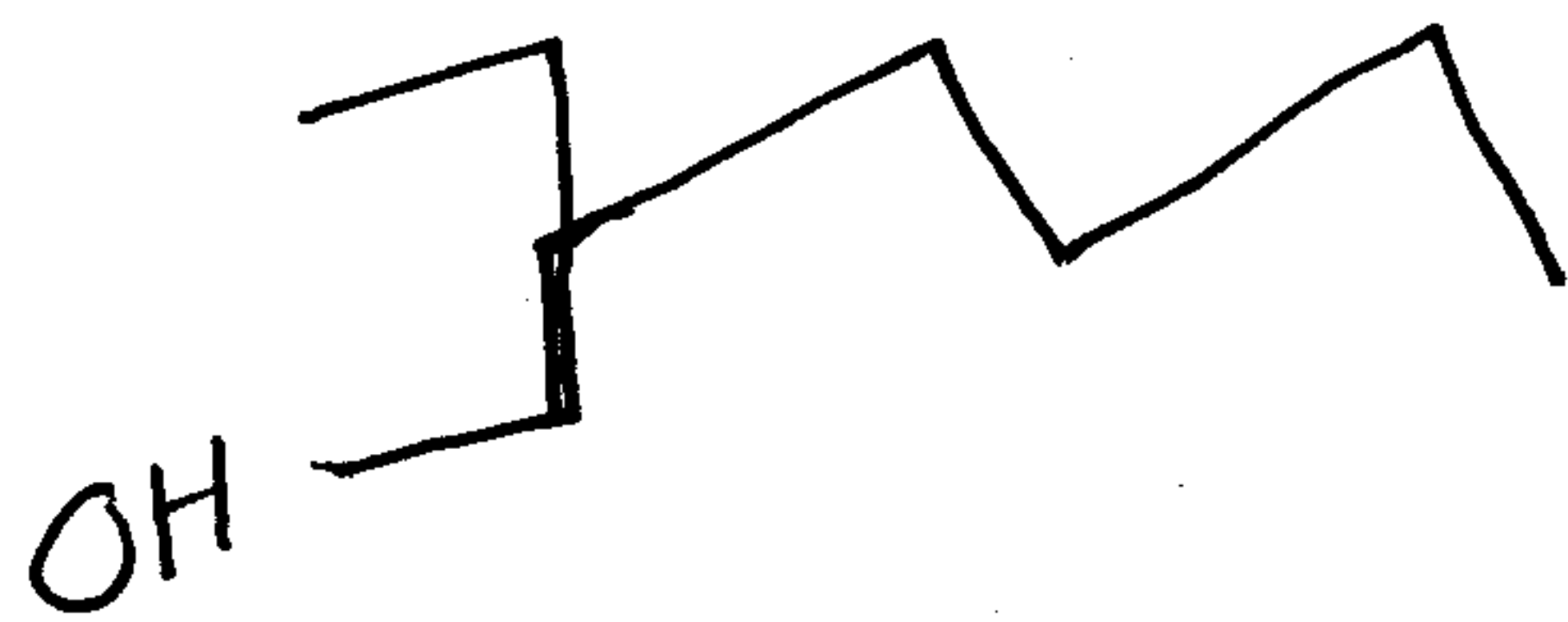
a) 1

b) 2

c) 3

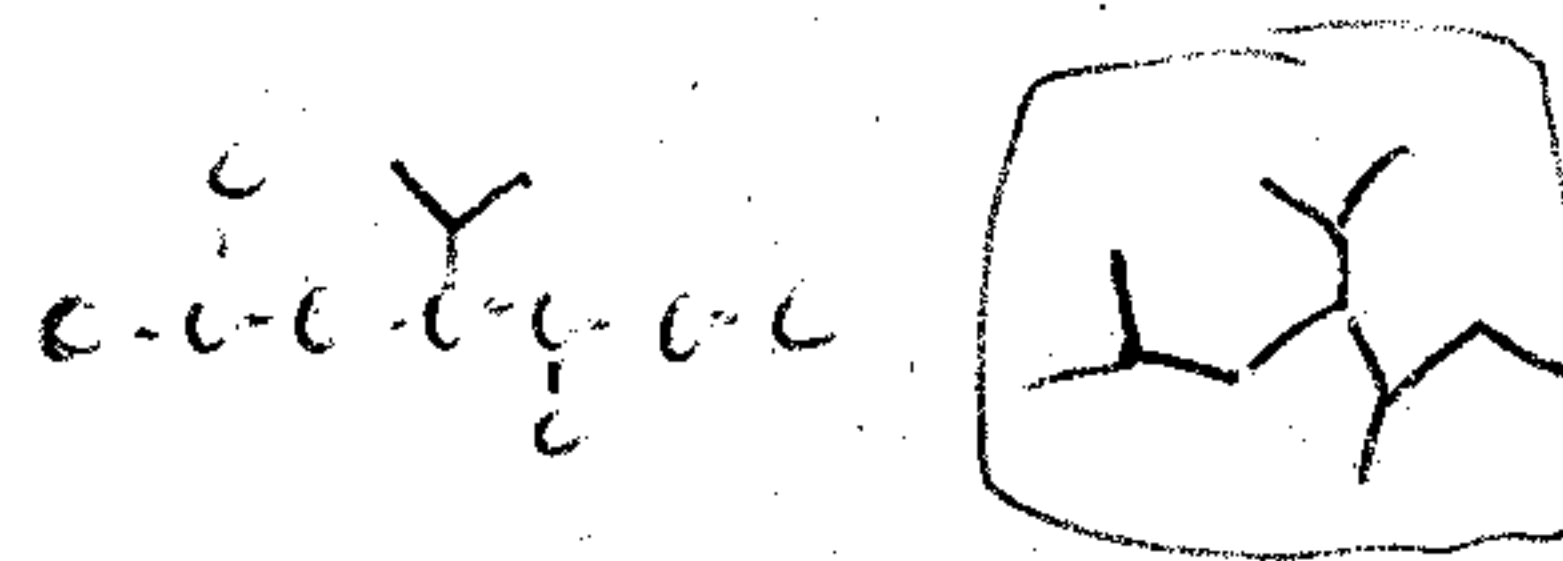
d) 4

Which is the correct IUPAC name for the following compound?



(a) 2-ethyl-1-hexanol

11) IUPAC name for the following molecule



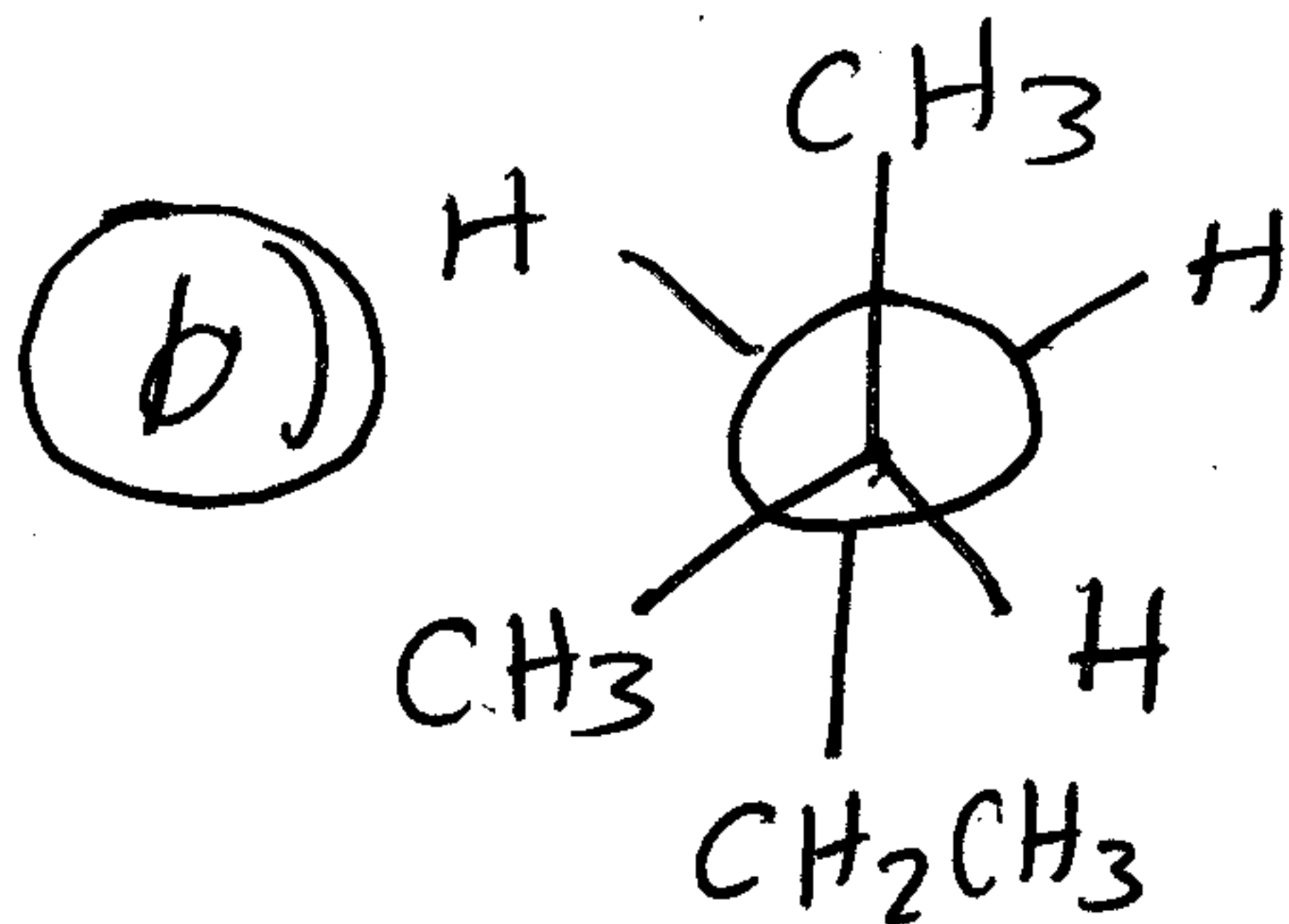
(a) 4-isopropyl-2,5-dimethylheptane

12) Which of the following species have tetrahedral bond angles

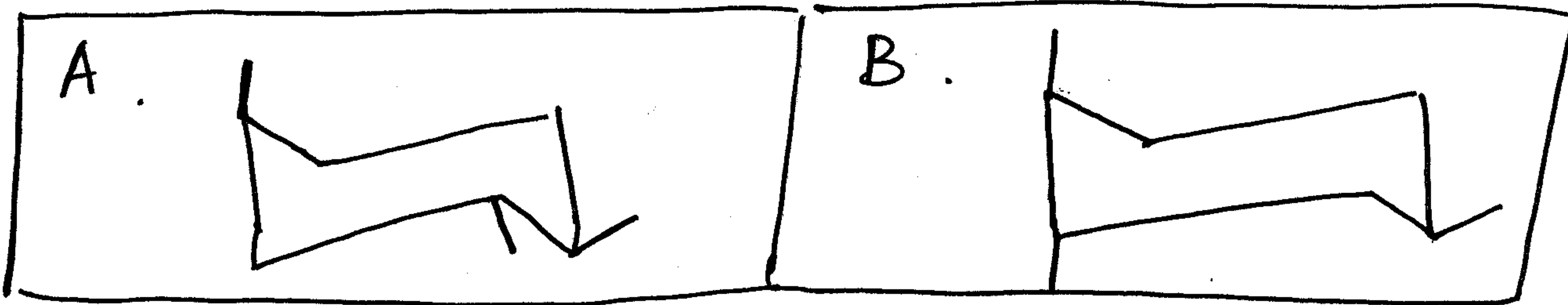
- |                    |                             |
|--------------------|-----------------------------|
| → A) $\text{NH}_3$ | → d) $\text{CH}_3^-$        |
| b) $\text{BF}_3$   | → e) $\text{H}_3\text{O}^+$ |
| c) $\text{CH}_3^+$ | → f) $\text{H}_2\text{O}$   |

(a) A, D, E, F

13) Which of the following represents 2-methylpentane



Identify the ~~total~~ relationship between the 2 following structures A & B

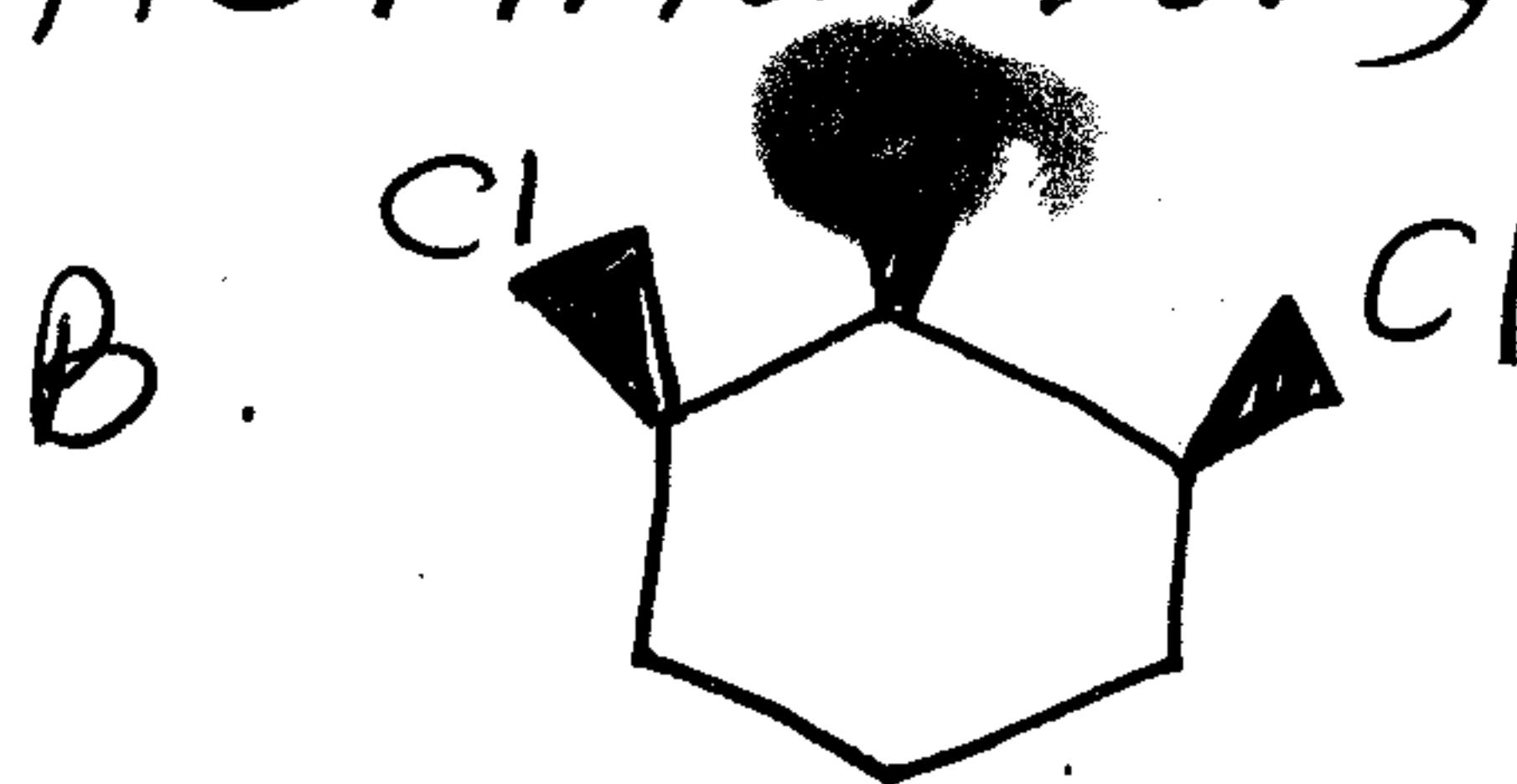
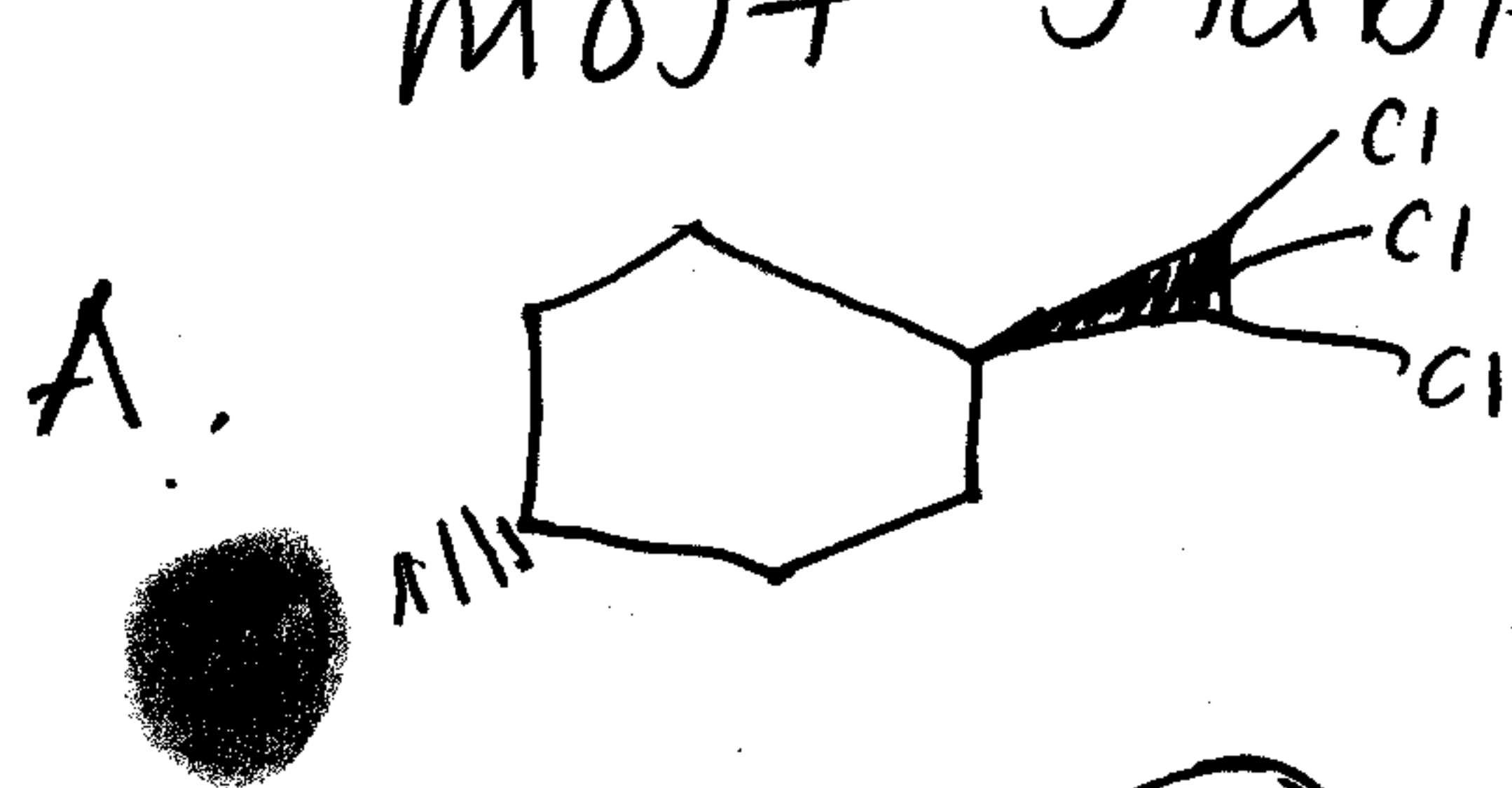


- a) constitutional isomers
- b) stereoisomers
- c) different conformations of the same compound
- d) identical

15) According to molecular orbital theory in the case of a C-C double bond the C-C bonding electrons of higher energy occupy which molecular orbital

- a)  $\sigma$  bonding MO
- b)  $\pi$  bonding MO
- c)  $\sigma^*$  antibonding MO
- d)  $\pi^*$  antibonding MO
- e)  $\pi^*$  bonding MO

16) Are highlighted substituents axial or equatorial? (Assume molecules are in most stable conformation)



- d) A = equatorial B = axial

17) Which of the following molecules & ions are nucleophilic

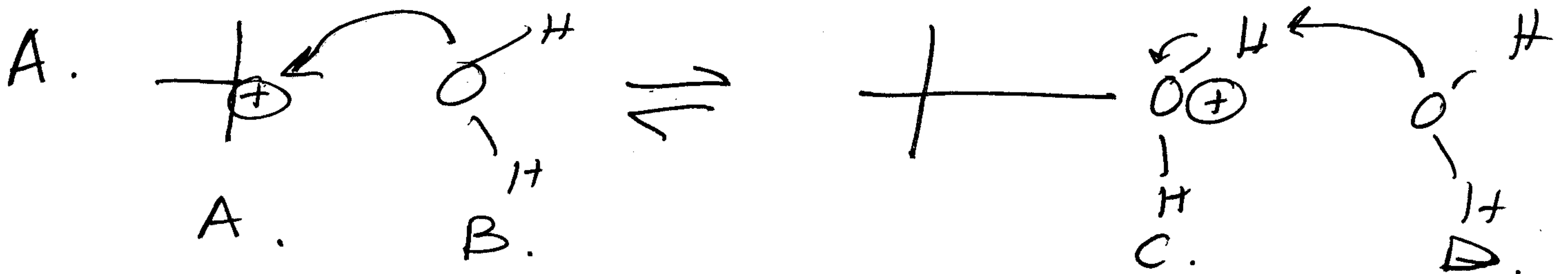
A. $\text{CH}_4$	B. $\text{H}_2\text{O}$	C. $\text{BH}_3$	D. $\text{CH}_2=\text{CH}_2$
E. $\text{OH}^-$	F. $\text{Br}^+$	G. $\text{NH}_3$	H. $\text{Br}^-$

(a) B, D, E, G and H

18) The pKa of methanol is 16 which of the following bases will deprotonate methanol completely

only  $\rightarrow$   $\text{NaNH}_2$  (pKa of  $\text{NH}_3 = 35$ )  
 $\text{NaOH}$  (pKa of ..  $\approx 16$ )  
 $\text{NH}_3$  (pKa of ...  $\approx 10$ )  
 $\text{NaOAc} = \text{OCH}_3$  (pKa of ...  $\approx 5$ )

19) Identify Nucleophile & electrophile



c) A = elec. B = Nuc. C = Nuc. D = elec.

(d) A = elec. B = Nuc. C = elec. d = Nuc.

20 WHICH of the following statements is false about the  $\text{He}_2^+$  molecule

SKIP

- a) There are 2 electrons in the antibonding orbital
- b) There are 2 electrons in the bonding orbital
- c)  $\text{He}_2^+$  has a weaker bond than  $\text{H}_2$
- d)  $\text{He}_2^+$  has a stronger bond than  $\text{H}_2$

21 What is the relative energy cost of the least stable conformer of 2-3 dimethyl butane (about  $\text{C}_2-\text{C}_3$ )

- a) 26 kJ/mol
- b) 21 kJ/mol
- c) 7.6 kJ/mol
- d) 3.8 kJ/mol