

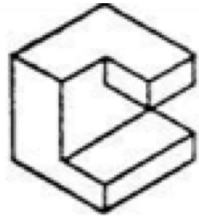
Spatial Reasoning:

- Chemistry is a very visual science
- Chemists frequently build models and make sketches to help them consider chemical behavior!
- All science, technology and engineering fields require spatial skill.
- Spatial skills are trainable, and we will be working on helping you to acquire these skills.
- Spatial ability has been shown to boost learning achievement

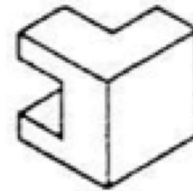
This Pre-test Includes

- First, some general questions from spatial visualization tests
- Second, specific chemistry questions that relate to 3-D understanding
- Last, a few general survey questions

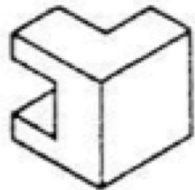
Purdue Spatial Visualization Test



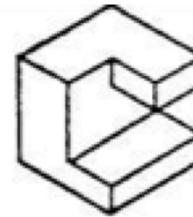
is to



AS



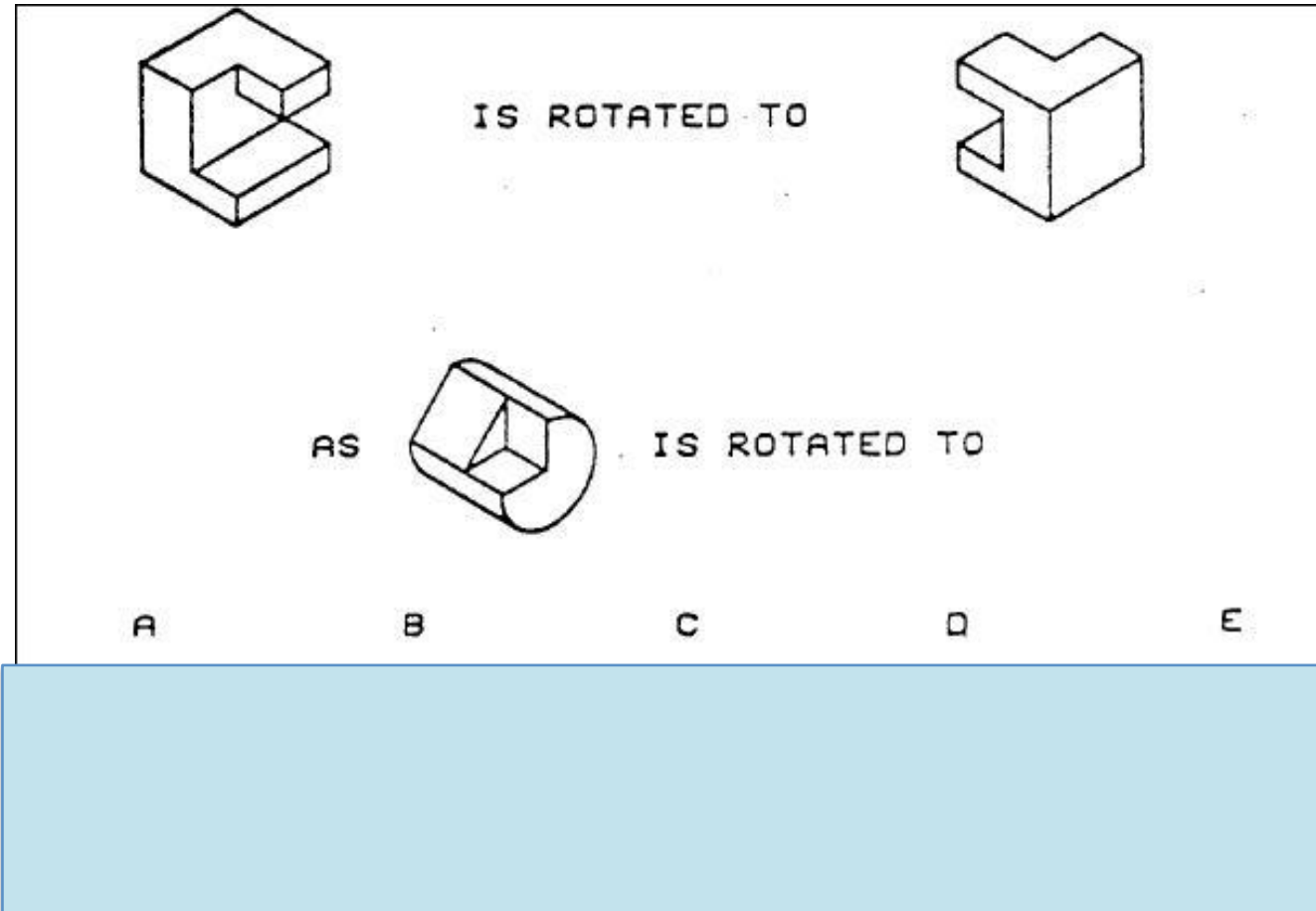
is to



How was the figure rotated?
In which Direction? AND
By how much?

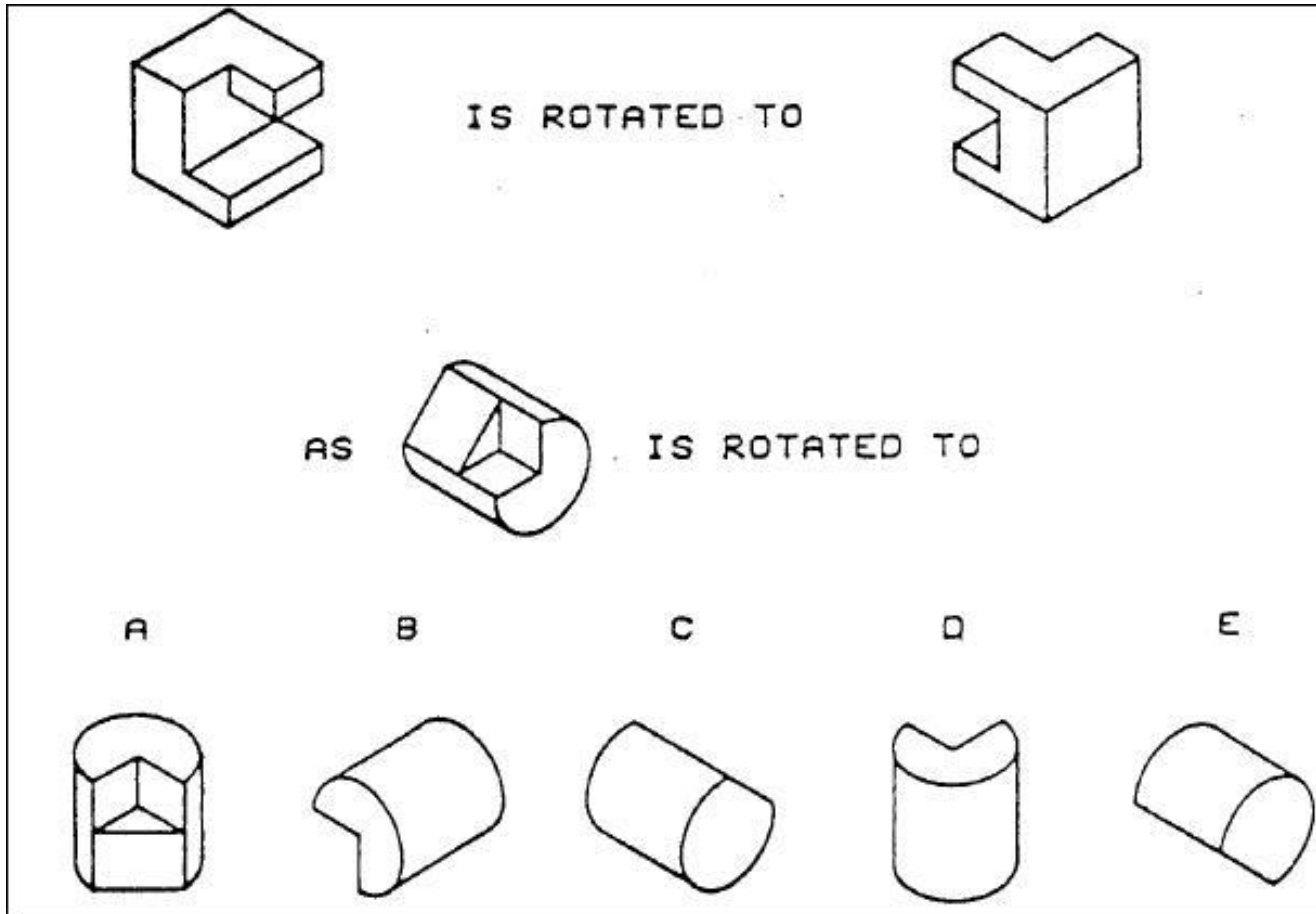
Purdue Spatial Visualization Test

Warm-up

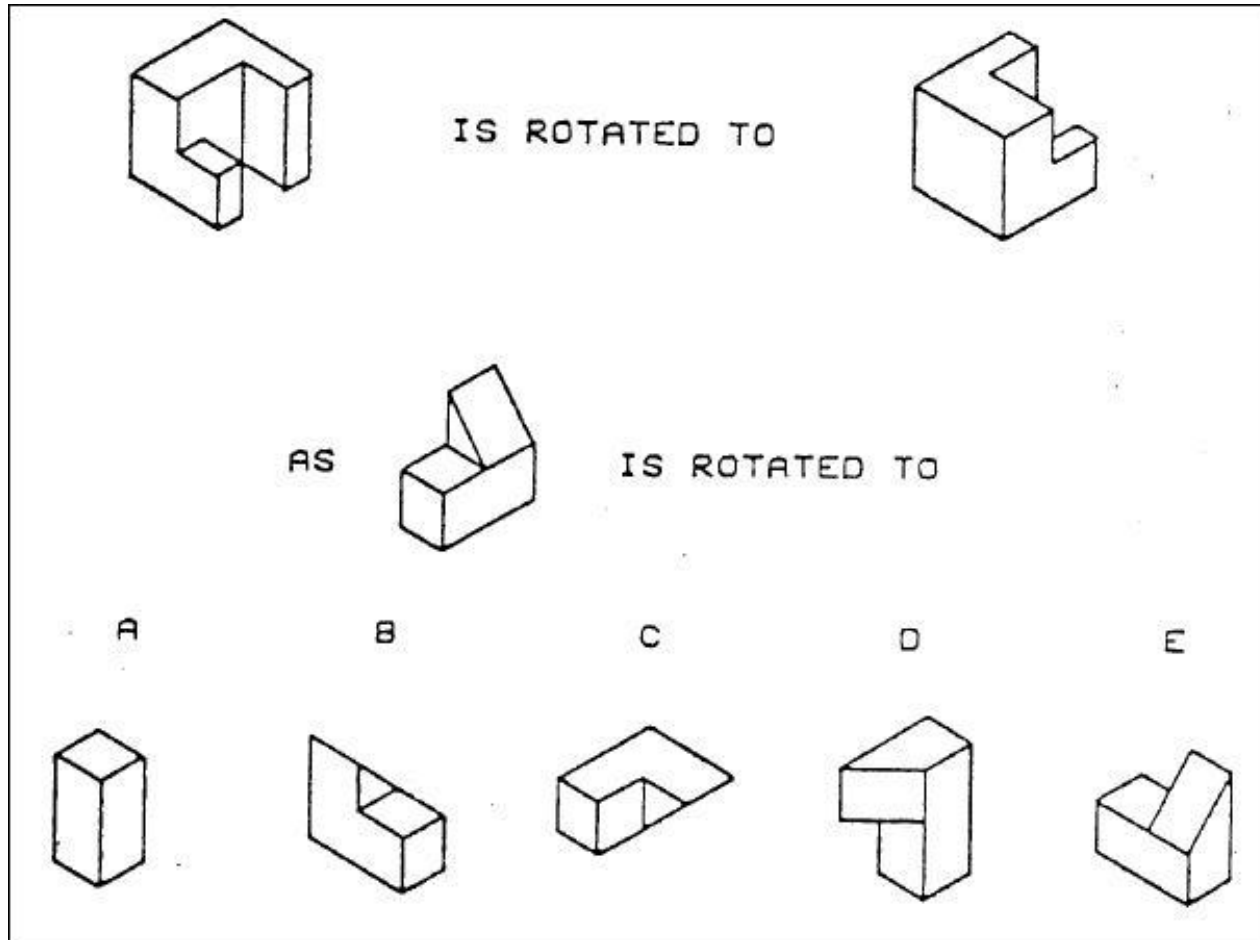


Select choice A, B, C, D, E shown above

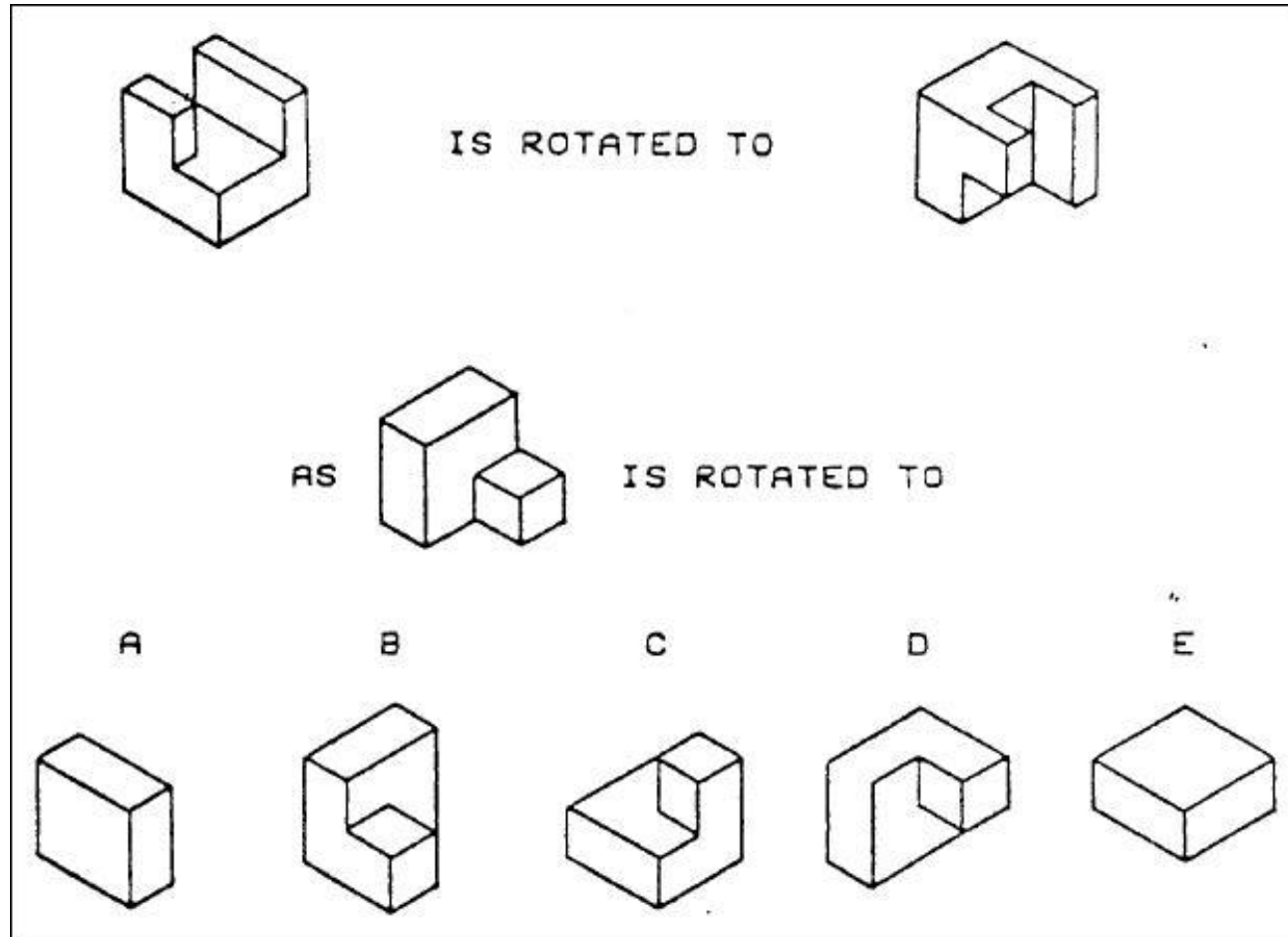
1.



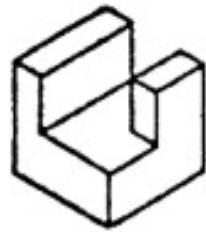
2.



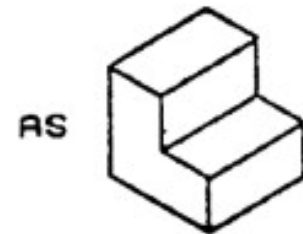
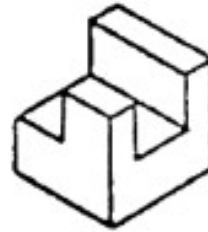
3.



4.



IS ROTATED TO



IS ROTATED TO

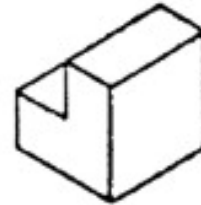
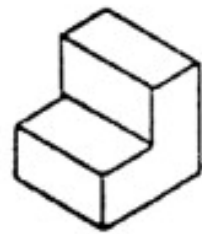
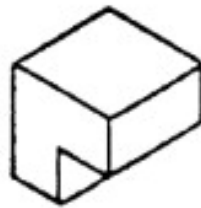
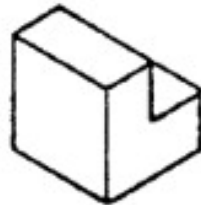
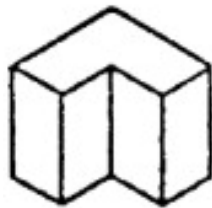
A

B

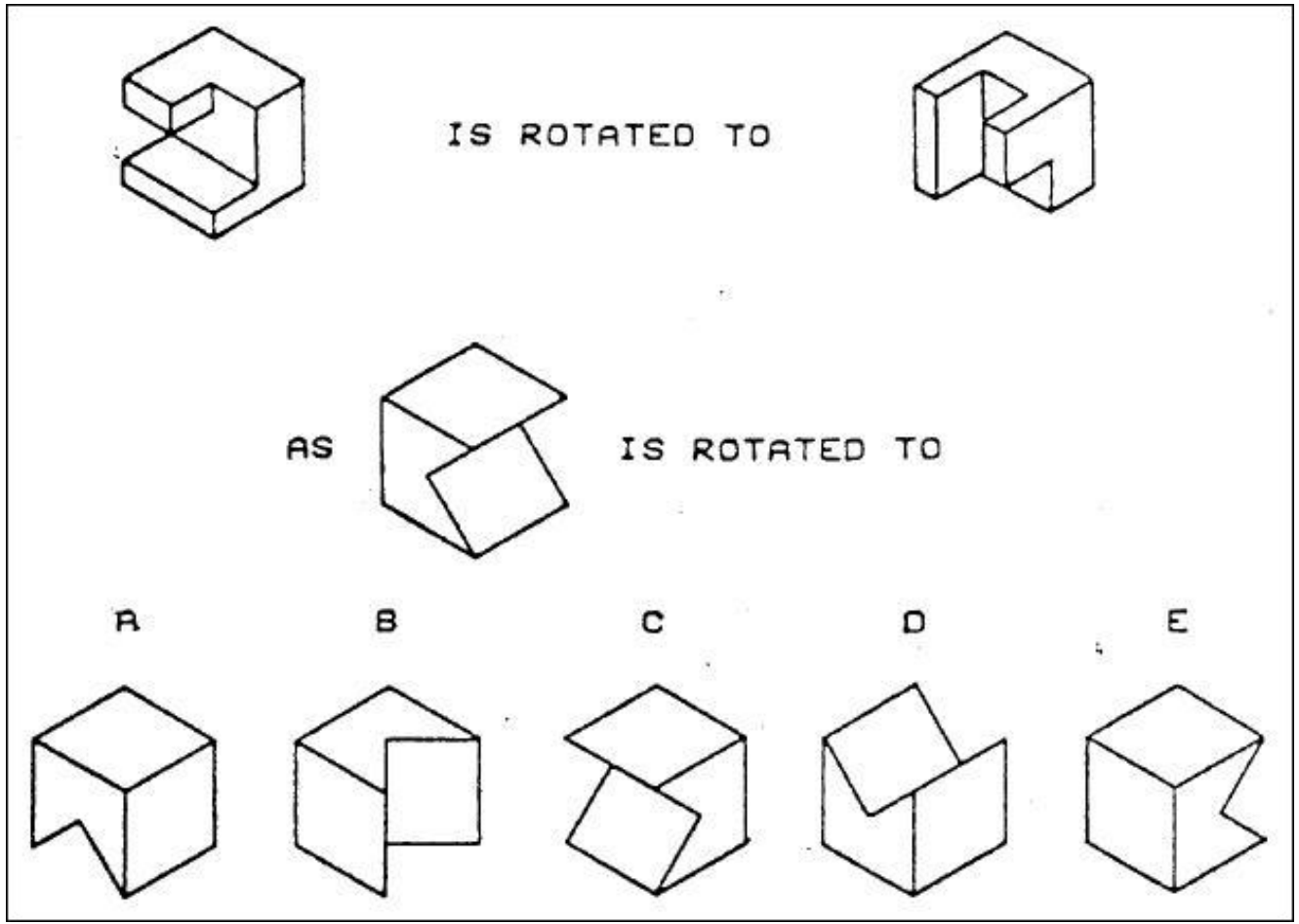
C

D

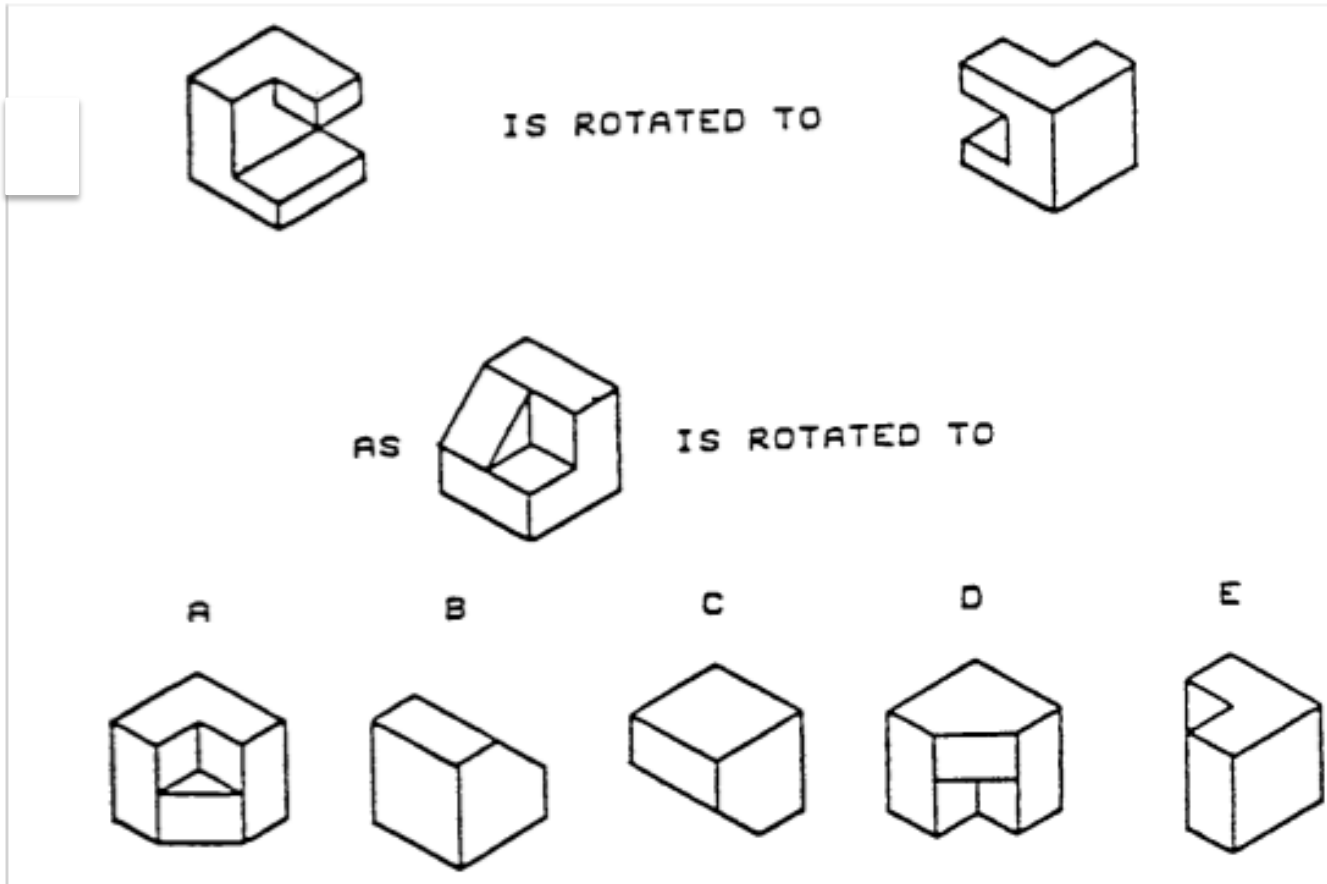
E



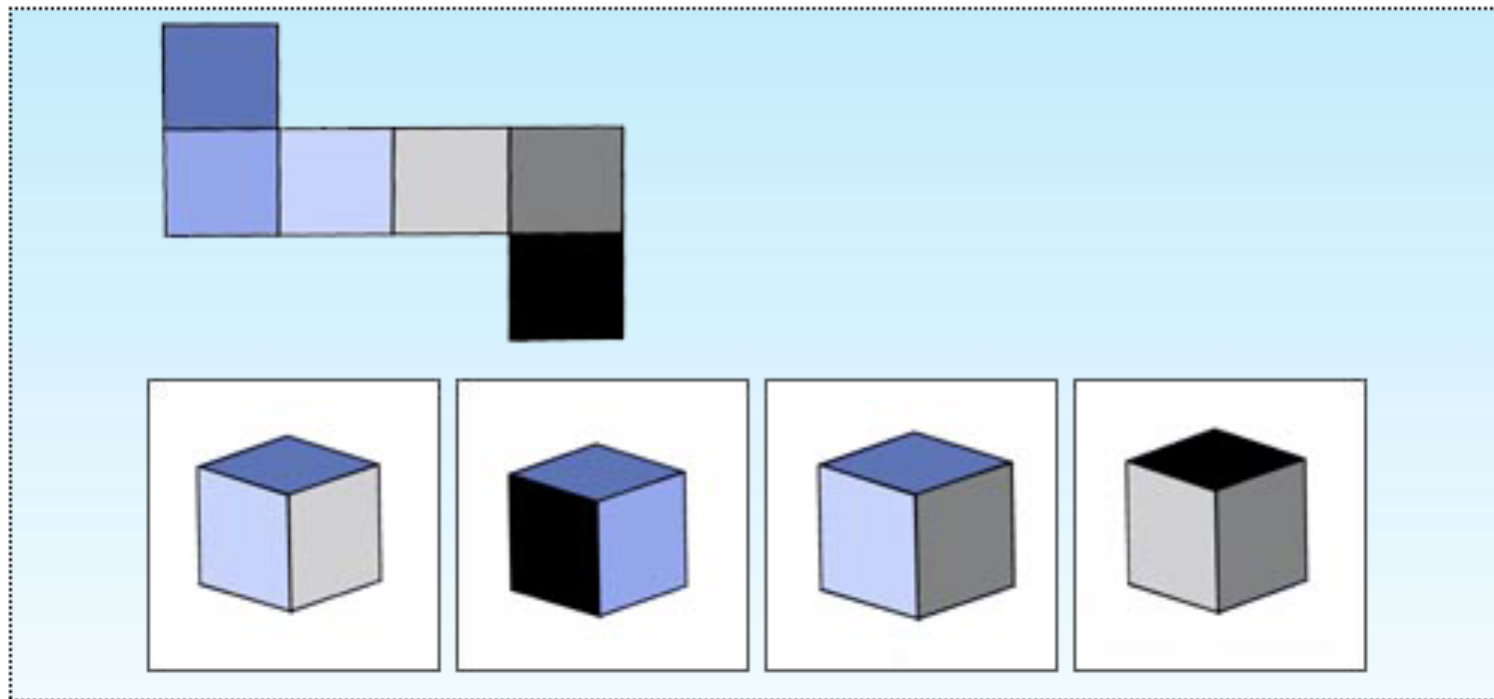
5.



6.



7. Fold the paper cut out in your mind and choose the correct representation.



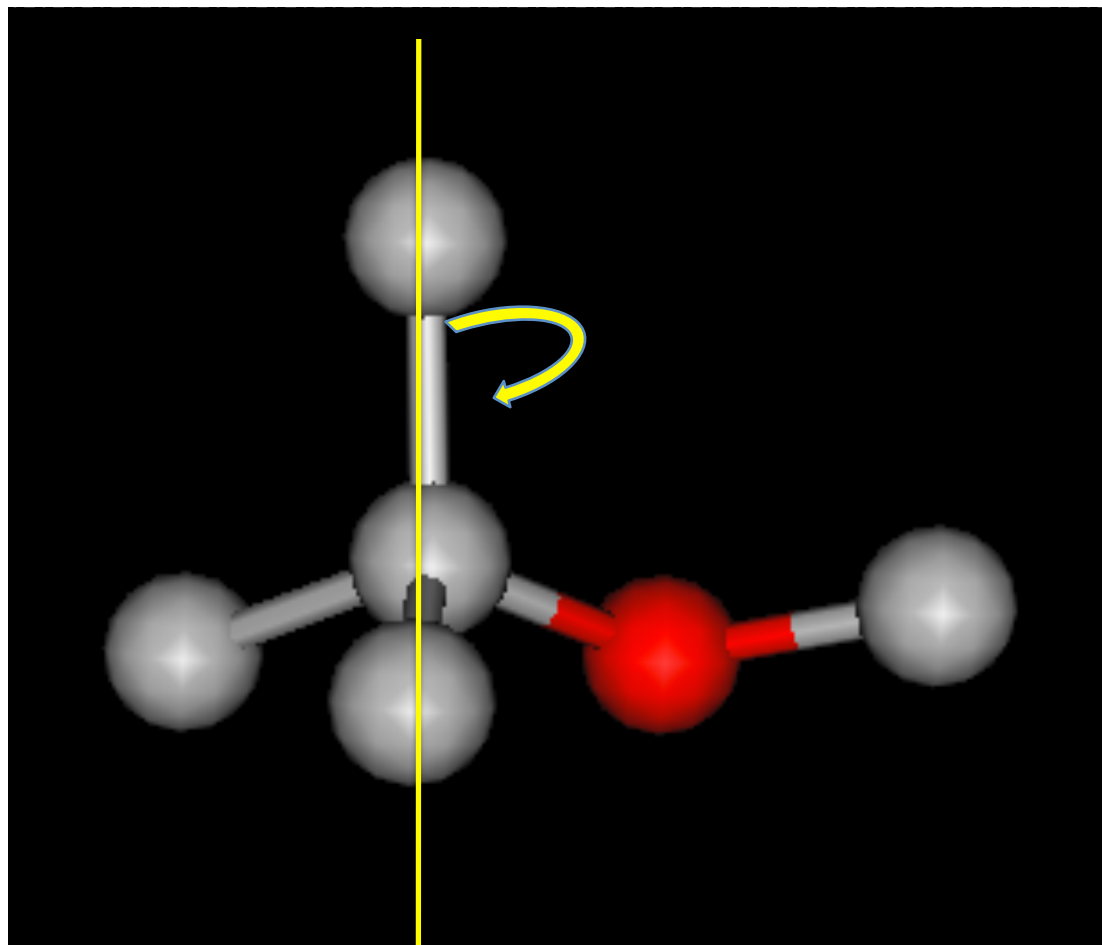
a)

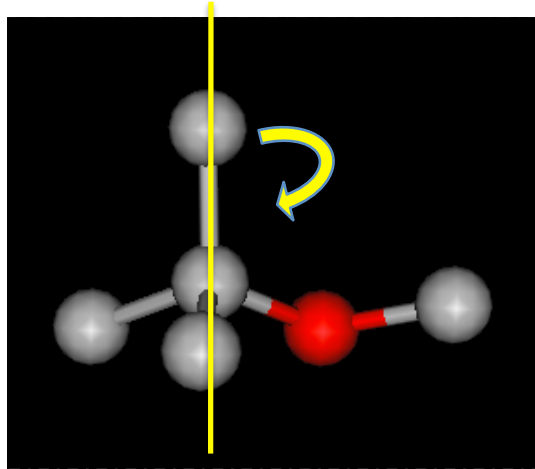
b)

c)

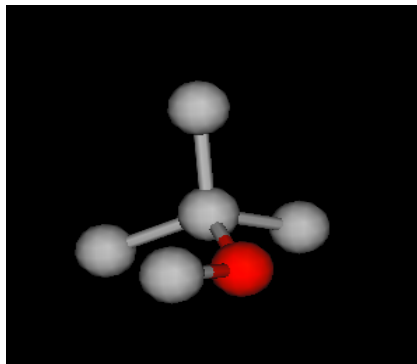
d)

Rotate the Molecule 180° around the Y- axis

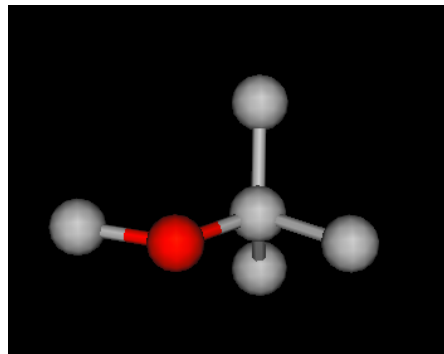




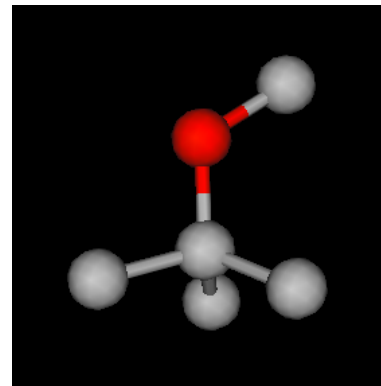
8. Rotate the molecule 180° in the clockwise direction around the Y- axis (shown in Yellow). Which image matches what the molecule would look like after the rotation?



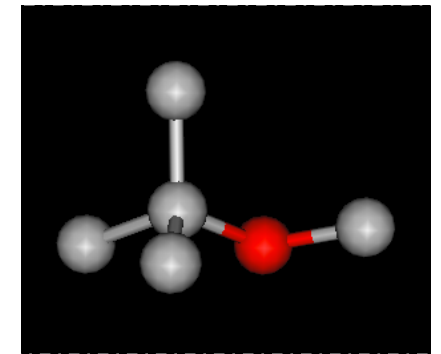
A



B

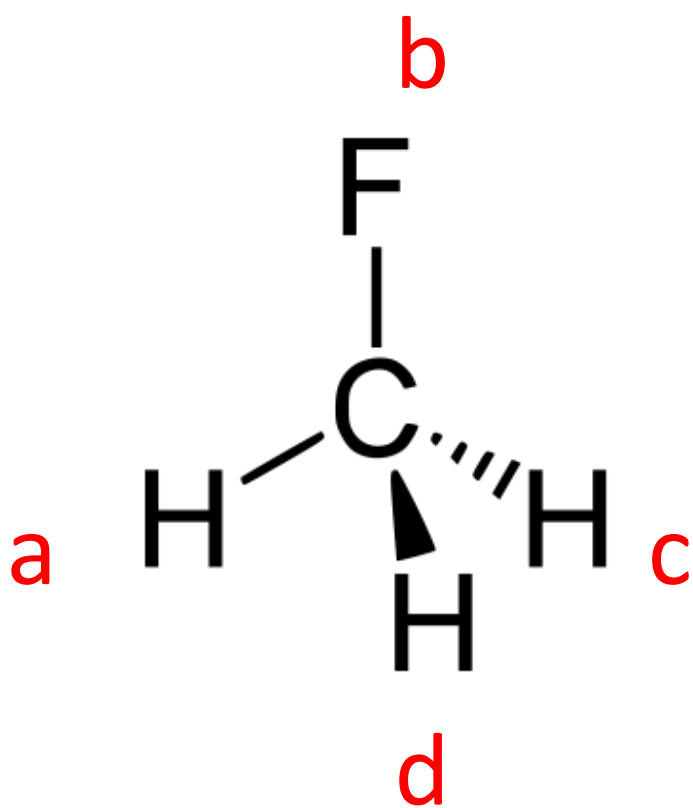


C



D

9. Which atom lies behind the plane of the screen?



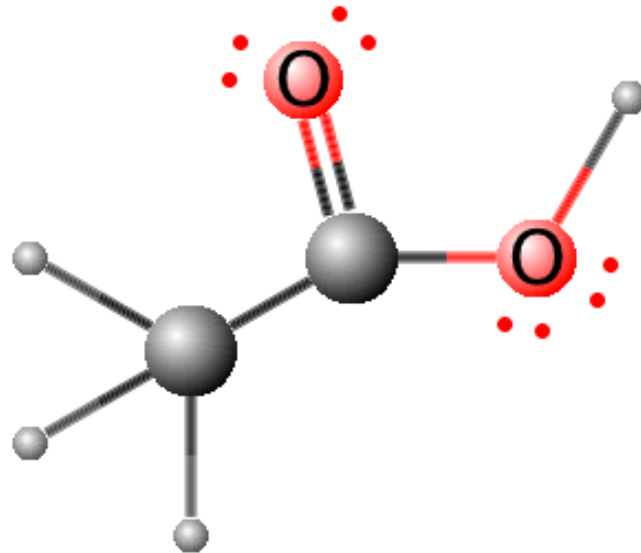
A) a

B) b

C) c

D) d

10. How many water molecules could hydrogen bond to **one** molecule of acetic acid (shown below) ?



a) 1

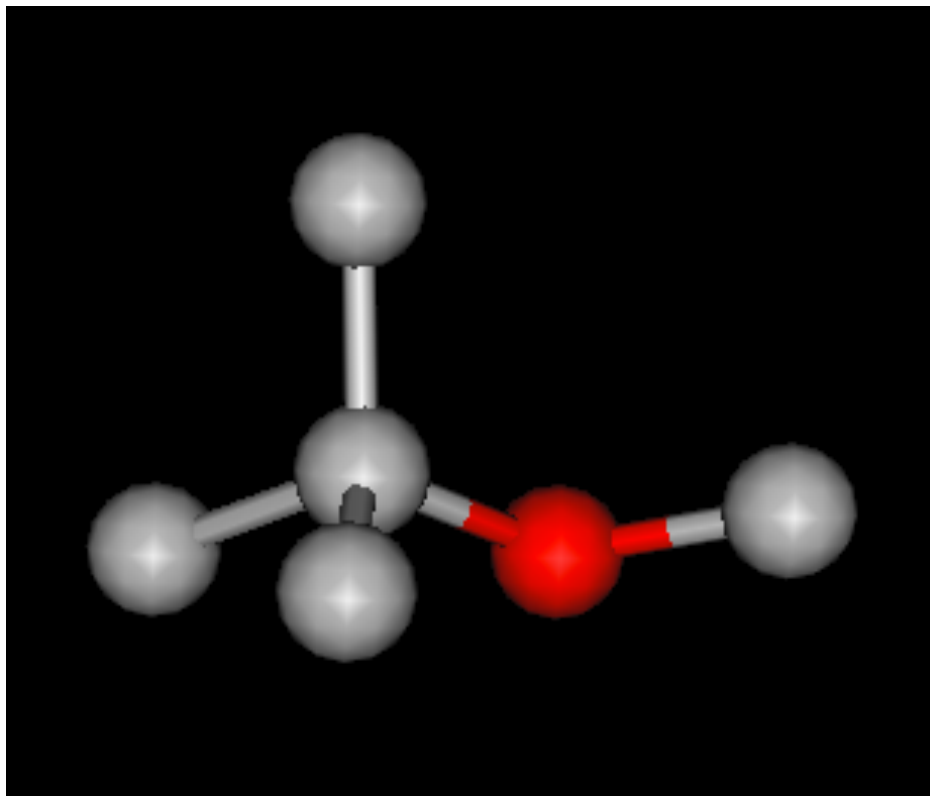
b) 2

c) 3

d) 4

e) 5

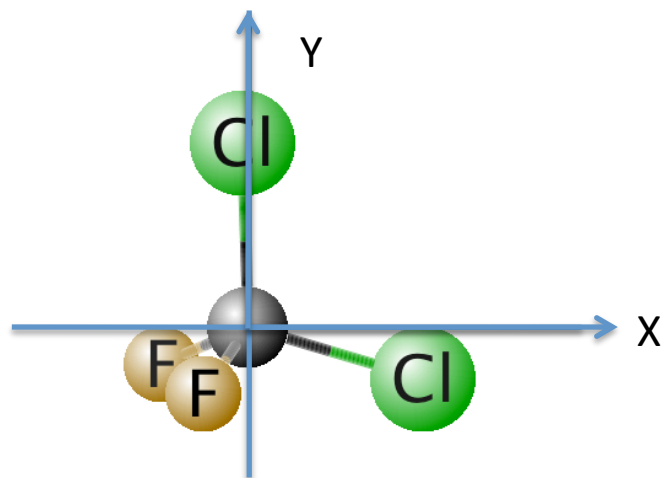
11. Does this molecule possess a plane of symmetry?



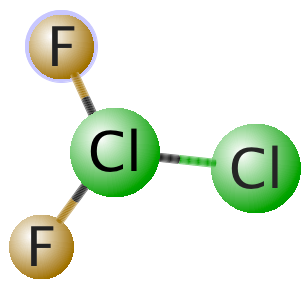
a) Yes

b) No

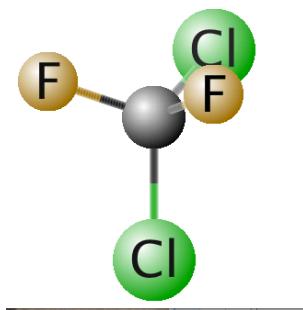
12.



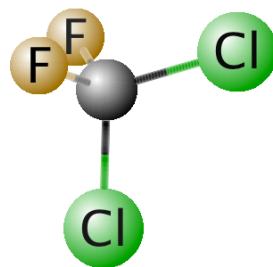
Which picture best represents what this molecule would look like after being rotated 180° on the X - axis?



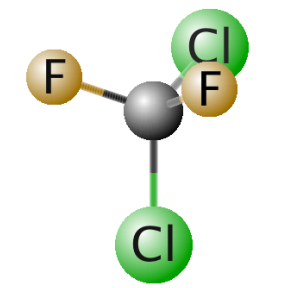
A



B



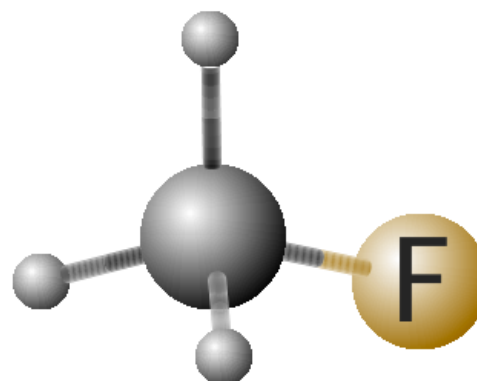
C



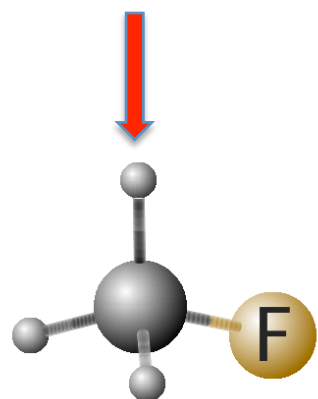
D

13.

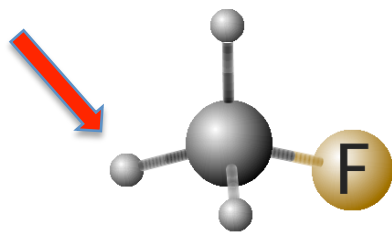
Assume *a collection of many* of these CH_3F molecules.



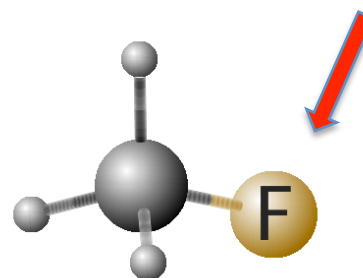
Based on what you know about polarity, predict which region of the molecule, CH_3F , will experience the greatest attraction to fluorine, F on an adjacent molecule.



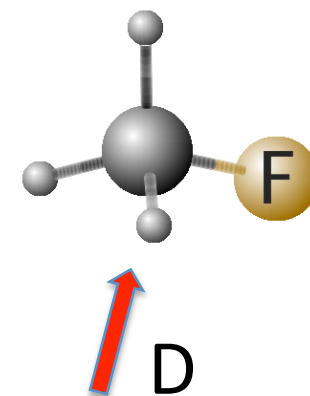
A



B



C

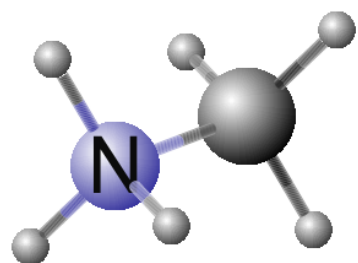


D

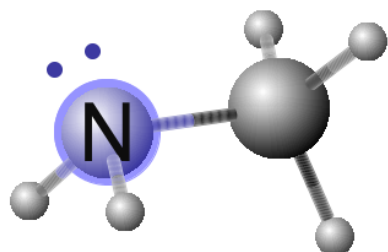
14.



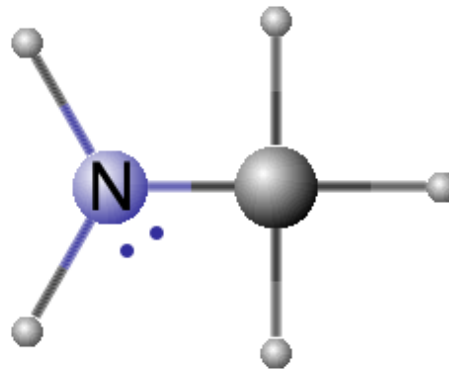
Select the 3-D shape that best corresponds to the Lewis formula above.



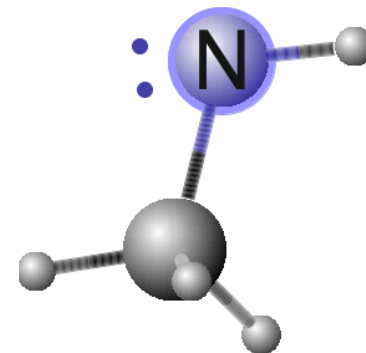
A



B



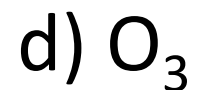
C



D

15. VSEPR Theory

Which of these molecules, if any, is not flat?



16. VSEPR Theory

Imagine a molecule of ammonia, NH_3 . If you carefully inspected it, what is the maximum number of atoms that would lie within one plane?

- a) 0 b) 1 c) 2 d) 3 e) 4

17. At the molecular level, are you able to imagine how a collection of water molecules, in the liquid state, would interact with each other?

- a) Yes, easily
- b) Vaguely, but not sure
- c) No, I cannot

18. I have a good understanding of how 3-D molecular shape and orientation affect a molecules reactivity.

- a) Yes
- b) Some idea
- c) Vague idea
- d) Not sure at all

Survey Questions:

19. Do you feel it is important to be able to imagine molecules in 3-D?

- a) No b) Sometimes c) Often d) Always

Survey Questions (continued):

20. Have you ever built molecules with hand-held molecular models sets?

a) No b) Little c) Some d) Frequently

21. Have you used computer imaging programs for visualizing 3-D molecules?

a) No b) Little c) Some d) Frequently