Pre-test questions

1. Most biomolecules, for example, proteins (made of amino acids) and carbohydrates (made of sugars) have non-superimposable mirror image.

- o   Yes
- o   No

2. Who formulated the theory of the tetrahedral carbon atom and laid the foundations of stereochemistry?

- o   Svante August Arrhenius (1859 – 1972)
- o   Jacobus Henricus van 't Hoff (1852 – 1911)
- o   August Wilhelm von Hofmann (1818 – 1892)
- o   Friedrich August Kekule von Stradonitz (1829 – 1896)
- o   Adolph Wilhelm Hermann Kolbe (1818 – 1884)
- o   Gilbert Newton Lewis (1875 – 1946)

3. The molecular structure on the left is represented by the picture on the right.
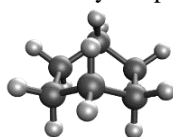
- o   Yes
- o   No

4. Rate your familiarity with a VR headset.

- o   I have never heard of it.
- o   I have heard of it but never tried it at all.
- o   I have tried it at least once in the past.
- o   I regularly use it at least a few times per month.
- o   I own it and/or I use it a few times per week.

5. What is your expectation for the use of VR headset for **this class**?
[There is no correct answer. Please feel free to pick the one that is closest to your expectation.]

- o   It helps visualizes molecules in 3D – users view molecules the same way as seeing movies in the 3D cinema.
- o   It helps visualizes molecules in 3D – users view molecules the same way as visiting museums.
- o   It helps visualizes molecules in 3D – users can interact to manipulate the size and orientation of molecules – both users and the molecules can move in space
- o   It uses artificial intelligence to show interactions between molecules and use can use voice commands to manipulate molecules in 3D.
- o   It predicts interactions between molecules and can screen candidate compounds for drug development using antigen-antibody binding in 3D.

6. Feel free to write any comments, suggestions or concerns that you may have. (if any)

Post-test questions

1. Prior to this class, I have used 3D and/or augmented reality tools in a classroom setting.

- o Yes
- o No

2. Who proposed the structure of benzene contained a six-membered ring of carbon atoms with alternating single and double bonds?

- o Svante August Arrhenius (1859 – 1972)
- o Jacobus Henricus van 't Hoff (1852 – 1911)
- o August Wilhelm von Hofmann (1818 – 1892)
- o Friedrich August Kekule von Stradonitz (1829 – 1896)
- o Adolph Wilhelm Hermann Kolbe (1818 – 1884)
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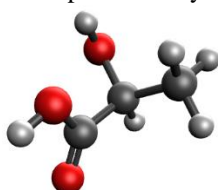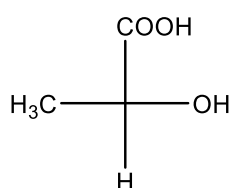
- o Yes
- o No

4. Rate your agreement with the following statements.

statement	strongly agree	agree	disagree	strongly disagree
a. The cost of the VR headset used in **this class** today ($\leq$ USD325 or 11,990THB including shipping to Thailand) is cheaper than or comparable to my mobile devices (phone or tablet).				
b. I already have or I will buy a VR headset in the next one year.				
c. A VR headset is useful for educational purposes.				
d. A VR headset is useful for entertainment purposes.				
e. I have difficulties in using VR (motion sickness or other types of discomfort).				
f. I still prefer having **this class** delivered in a traditional way (e.g. use plastic or plasticine models). The application of VR to this class is a distraction.				
g. Overall, the application of VR in **this class** is appropriate for teaching molecular models.				
h. I wish to see more VR application used in future classes				

5. If your institution has a limited budget and competing priorities to provide different educational technologies to students. Please rank what should the institution provides to you:
[Put 1 to 5 in front of the items below. 1 is for the highest priority]

___ VR headset   ___ 3D printer/scanner   ___ Laptop computer/tablet devices

___ Netflix subscription (MUIC library has the subscription but it is fully booked at least a week in advance.)

___ 1TB cloud storage subscription (MU current plan is 100GB for Microsoft and 20GB for Google.)

The first three are physical devices and the last two are online subscriptions.

6. Feel free to write any comments, suggestions or concerns that you may have at back. (if any)

For example, comment if you want to post your video of VR interactions on social media.

Olfactory test

1. Do you think the smells of the two compounds are the same?

- o   Yes [skip to question 3]
- o   No [go to question 2]

2. If no, let's do a test if you can identify them correctly. This is a double-blind test. You will be given four bottles to identify. One bottle at a time, please give your best guess within 30 seconds per bottle.

Attempt #	1	2	3	4
Your identification				
Compound				
Correct/Incorrect				

Before moving on to the next question, we will see the correct answer together. As this is a double-blind test, we do not know the enantiomer given to you beforehand. There are eight bottles (four each) in total in the basket. The is a small probability (1/16) that all of the four attempts will be the same enantiomer.

3. Rate your agreement with the following statements.

statement	strongly agree	agree	disagree	strongly disagree
a. The smelling activity in **this class** helps me learn stereochemistry				