

Supporting information

Teaching and assessing systems thinking in first-year chemistry

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Prior knowledge Quiz 1

Description The purpose of this quiz is to assess your prior knowledge of core chemistry concepts that will be important for practicals 4 and 5.

Instructions Ensure that quiz 1 is opened on your ClickUP page as you enter your home group. The group presenter will now share quiz 1 on their screens and as you collaborate in your group, you must submit your answers on your ClickUP.

Submit the quiz after 30 minutes and work through the feedback to learn from your mistakes

Total 4

Questions

Total Points 12

Question 1 (Jumbled Sentence- 5 marks)

Water contains two hydrogen atoms centered around an oxygen atom. The Oxygen atom has **[a]** lone pair(s) of electrons, which gives water a **[b]** geometry. Due to the differences in electronegativity, the electrons are unevenly distributed between the H and O atoms, resulting in **[c]** water molecules. Water is a good **[d]** as the uneven charges on water molecules can easily dissociate **[e]** salts from a crystal lattice, which contains a positively charged **[f]** and a negatively charged **[g]**. The water molecules surround the released ions with strong attractive forces. The water molecules are held together by **[h]** forces and strong hydrogen bonds, which are types of **[i]** forces. In bulk water, these strong bonds collectively form strong **[j]** forces at the surface, which creates a high surface tension that allows light objects to float on water.

Drop-down List of Answers

none

one

two

linear

trigonal planar

bent

polar

non-polar

solute

solvent

solution

covalent

ionic

cation

anion

london dispersion

dipole-dipole

intramolecular

intermolecular

adhesive

cohesive

Question 2 (Jumbled sentence-5 marks)

Oil molecules are all hydrocarbons as they contain hydrogen and carbon atoms bonded together. The long-chain hydrocarbons, especially in crude oil, can either be [a] if it has single bonds forming part of the [b] functional group or [c] if double bonds are present, forming part of the [d] functional group. Other fractions of useful hydrocarbons can be obtained through a process known as fractional [e]. The fractions are collected at different temperatures depending on the boiling points of the different hydrocarbons. [f] chain alkanes have [g] boiling points than [h] chain alkanes, as a result of heavier molecular weight and stronger intermolecular forces. These long-chain carbons ensure that electrons are [i] spread, resulting in no net dipole, making oil [j].

Drop-down List of Answers

saturated
unsaturated
alkene
alkane
distillation
condensation
short
long
higher
lower
unevenly
evenly
polar
non-polar

Question 3 (Jumbled sentence- 5 marks)

Physically water and oil are [a] because oil has a [b] density than water, which allows oil to float on water, hence mixing does not occur. On a molecular level, water and oil won't mix due to the differences in polarity. Water is [c] and oil is [d] and thus constant motion between the molecules allows the water to separate from the oil due to attractive forces.

Drop-down List of Answer

miscible
immiscible
lower
higher
non-polar
polar

Question 4 (Essay- 0 marks)

If oil and water don't mix, what can we add to remove oil from clothes that are submerged in water? Use your chemistry knowledge to explain on a molecular level how this is possible.