

Ferrofluid Assessment

Name _____

Date _____ Hour _____

Matching

Match the word with the best definition.

- | | |
|--------------------------------|--|
| _____ 1. stoichiometry | a. weak forces of attraction between molecules |
| _____ 2. spikes | b. a 3-D parallelepiped that, when shifted along each edge by the length of the edge creates the entire structure of atoms in a crystal |
| _____ 3. ferromagnetism | c. regions where unpaired electrons strongly interact with one another and align, even in the absence of a magnetic field |
| _____ 4. colloid | d. a pattern of uplifted suspended particles that results from placing a magnet near a ferrofluid |
| _____ 5. hole | e. a word describing that part of chemistry that deals with the relative amounts of substances involved in chemical reactions |
| _____ 6. ferrimagnetism | f. a dispersion of particles from ~ 1 nm to 1000 nm |
| _____ 7. magnetic domain | g. a phenomenon in which the internal magnetic moments of multiple spin sets of unpaired electrons within the magnetite domain of a solid partially cancel and thus leave a net spin |
| _____ 8. Unit cell | h. a phenomenon in which the internal magnetic moments of unpaired electrons within a domain of the solid are aligned and act cooperatively |
| _____ 9. Nanoparticle | i. an empty site in a crystalline solid |
| _____ 10. empirical formula | j. a very small particle on a scale of nanometers (10^{-9} m) |
| _____ 11. surfactant | k. the name for Fe_3O_4 |
| _____ 12. ferrofluid | l. information that gives the simplest ratio between the atoms of the elements present in a compound |
| _____ 13. magnetite | m. a molecule that surrounds particles and isolates them from the attractive forces of their neighbors |
| _____ 14. Van der Waals forces | n. a suspension of a magnetic solid in a liquid that responds to an external magnetic field |

Multiple Choice

Choose the best answer.

- _____ 15. Ferrofluids exhibit magnetic properties because
- they consist of a magnetic solid suspended in a liquid medium.
 - they become magnetic under the influence of the earth's magnetic field.
 - they consist of positively and negatively charged ions.
 - none of the above.
- _____ 16. The potential advantage of using a ferrofluid to administer medication is
- that it is cheaper.
 - that it also acts as an iron supplement.
 - that it tastes better.
 - that it can be directed to specific sites in the body.
- _____ 17. In the production of a ferrofluid, the van der Waals attractions can be overcome by
- shielding the reaction vessel from the earth's magnetic field.
 - adding a substance called a surfactant.
 - adding a substance called a catalyst.
 - adding a coagulating agent.

Problems

18. a. Not all of the atoms occupying each site in a unit cell belong to that unit cell. What fraction of each of the following belong to a given unit cell?

Edge _____ Face _____
Corner _____ Inside _____

- b. Based on your answers in part *a*, sodium thallide was constructed and contained the following

Sodium Atoms	Sites in the Unit Cell	Atoms in the Unit Cell From that Site
8	Corners	
0	Edges	
4	Faces	
4	Inside	
	Total in Cell	

Thallium Atoms	Sites in the Unit Cell	Atoms in the Unit Cell From that Site
0	Corners	
12	Edges	
0	Faces	
4	Inside	
	Total in Cell	

- c. What is the total number of each type of atom in this compound? _____

- d. What is the empirical formula for this compound? _____
19. Determine the percent composition of each element in magnetite.

20. The mole ratio of NH_4OH to NH_4Cl was experimentally determined to be 4 : 2; balance the equation below.

