Names _____ *Section*_____
Chem 226/ Fall 2009 *Dr. Rusay*

Part II: Turn in one report for your group. Each member of your group is responsible for all of the information in the segments. One of the group will read the summary from **Segment I** to the class. Each of you is expected to be able to answer and explain any questions from the class or Dr. R. if asked to do so.

Segment I: Provide a short written summary of the topic assigned to your group by Dr. R. from the following possibilities: *1.* ***Entry and Fate of Chemicals in Humans,*** *2.* ***Bioaccumulation,*** *3.* ***Carcinogenicity,*** *4.* ***Dose Response Relationships,*** *5.* ***Ecological Effects*** and *6.* ***Risk Assessment***.. The written summary is to be no more than 1 page typed using a word processor that is to be turned in to Dr. R.. The write-up can be in outline form. Information on these topics can be found on the Web site: ***http://extoxnet.orst.edu/*** under *Toxicology Information Briefs*.

Segment 2: This exercise involves information that was actually developed for an academic institution by the ***IT Corporation.*** It has been modified for this exercise. The data are air sampling results for 4 common organic solvents: acetone, ethyl acetate, methylene chloride and toluene, which are included in TABLE 1 for four locations: S-1 to S-4. You are to answer the following questions from information found in an MSDS for each compound. Use "technical grade" or 95% or higher purity for the purity of the chemicals in your search. Details of the NFPA hazard/placard numbers can be found in pdf at:

http://chemconnections.org/organic/chem226/Labs/NFPA Ratings-08.pdf

MSDS information can be located by using various databases. Refer to:

http://chemconnections.org/organic/chem226/226web-08.html

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1. What are OSHA's current PEL time weighted average (TWA) exposure limits for the materials?

   Acetone _____ *Ethyl acetate* _____

   Methylene Chloride _____ *Toluene* _____

2. Write the sample locations (S-1, etc.) from the ***IT*** report for those compounds/locations that are equal to or above the allowable OSHA PEL limits.

   Acetone _____ *Ethyl acetate* _____

   Methylene Chloride _____ *Toluene* _____

Acetone:

3. What are the NFPA ratings for acetone?

   Health ___ *Flammability* ___ *Reactivity* ___ *Special* ____

4. What is the color storage code for acetone and what does it signify?

5. What should be done if acetone is splashed into your eyes?

6. What can be used to fight an acetone fire?

***Ethyl acetate**:*

7. What are the NFPA ratings for ethyl acetate?

   Health ___ *Flammability* ___ *Reactivity* ___ *Special* ____

8. What can be used to fight an ethyl acetate fire?

9. List three materials that react violently with ethyl acetate and should be avoided.

10. What are the possible effects of chronic overexposure to ethyl acetate?

***Methylene chloride**: (dichloromethane)*

11. What are the NFPA ratings for methylene chloride?

    Health ___ *Flammability* ___ *Reactivity* ___ *Special* ____

12. Is methylene chloride thought to cause cancer in humans? Briefly explain your answer.

13. How would you dispose of 100 mL of methylene chloride? What are the government regulations governing disposal of this chemical?

14. Should a pregnant student consider methylene chloride exposure a high health risk? Briefly explain your answer.

***Toluene**:*

15. What are the NFPA ratings for methylene chloride?

    Health ___ *Flammability* ___ *Reactivity* ___ *Special* ____

16. How would you clean up a small spill of toluene?

17. What is the reported odor of toluene?

18. Is it OK to use water to put out a toluene fire? Why or why not?

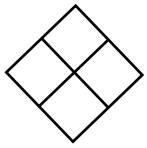
19. What is methylene chloride's LD_{50}-oral-rat? How much methylene chloride would the smallest member of your group need to ingest to be equivalent to this amount, i.e., what would be the LD_{50}-oral-human based on the smallest group member? (Show your calculation.)

20. Rank the 4 chemicals in what you think their order of increasing health & safety risk would be in common laboratory use in Chem 226. Briefly cite the criteria used in your appraisal.

_____ < _____ < _____ < _____

Appraisal criteria:

21. a) Go to see the four panel diamond safety placard that is on the Physical Sciences classroom building, which houses PS 275. (It faces south towards the parking lot.) b) Draw the numbers and symbols from the placard in the diamond below and indicate the respective colors of each diamond, and what the colors, numbers and symbols mean.



b) How much chemical material (either mass or volume) is in the building based on the classification for each of the following categories?

Health _____ *Flammability* _____ *Reactivity* _____

c) Do you think that the placard is properly placed? If so, explain why, and if not, explain where you would put it and why.

TABLE 1

SOLVENT VAPOR AIR SAMPLING RESULTS
PHYSICAL SCIENCES: Organic Laboratory
Wattsamatta U.
August 18, 2008

Sample No.	Location	Time ON	Time OFF	Flow Rate (Lpm)	Vol. (L)	Analyte	Conc. (ppm) TWA
S-1	Directly across from hood	08:33	11:53	0.050	10.1	acetone	1000.0
						ethyl acetate	ND(<1.0)
						methylene chloride	600.0
						toluene	ND(<0.47)
S-2	Work-station next to hood	08:37	11:57	0.055	11.0	acetone	ND(<1.5)
						ethyl acetate	515.0
						methylene chloride	ND(<0.71)
						toluene	8.5
S-3	S-1 site with open bottles	11:54	15:14	0.050	10.1	acetone	685.0
						ethyl acetate	450.0
						methylene chloride	ND(<0.77)
						toluene	550.0
S-4	S-2 site with open bottles	11:59	15:19	0.055	11.0	acetone	250.0
						ethyl acetate	450.0
						methylene chloride	155
						toluene	ND(<0.43)

All samples analyzed by gas chromatography
Lpm • Liters per minute
L • Liters
ppm • parts per million by volume
ND • none detected at detection limit stated
TWA • Time Weighted Average

Special Hazards

Hazard Category	Rating Number	Description
Health (Blue)	4	Materials that under emergency conditions can be lethal
	3	Materials that under emergency conditions can cause serious injury
	2	Materials that under emergency conditions can cause temporary incapacitation or residual injury
	1	Materials that under emergency conditions can cause significant irritation
	0	Materials that offer no hazard beyond that of ordinary cumbustible material
Flammability (Red)	4	All liquids and gasee with a flash point below 73F and a boiling point below 100F
	3	All liquids and gasee with flash points at or below 73F and a boiling point at or above 100F and those liquids having flash point at or above 73F and below 100F
	2	All liquids with a flash at or above 100F and below 200F or solids that readily give off vapors
	1	All liquids, solids, and semi solids with flash points at or above 200F
	0	Materials that will not burn, including any material that will not burn in air when exposed to a temperature of 1500 for a period of 5 minutes
Reactivity (Yellow)	4	Materials readily capable of detonation or explosive reaction at normal temperatures and pressures. Includes materials that are very sensitive to heat, shock, or light. Examples would include explosives A & B and organic peroxides
	3	Materials which when heated and under confinement are capable of detonation and which may react violently with water. A "W" should appear as a special hazard if an explosive reaction with water can be expected. Examples would include blasting agents, fireworks, and ammonium nitrate fertilizer
	2	Materials which will undergo a violent chemical change at elevated temperatures and pressures but do not detonate. A "W" should appear as a special hazard if contact with water may cause a violent reaction or may cause potentially explosive mixtures to be formed. Examples would include combustible metals and water reactive corrosive materials
	1	Materials which are normally stable but may become unstable in combination with other materials or at elevated temperatures and pressures. A "W" should appear as a special hazard if a vigorous but not violent reaction with water may take place. Examples would include most common corrosive and oxidizing materials
	0	Materials that in themselves are normally stable, even under fire conditions
Special Hazards (White)		Note: Refer to the MSDS for the NFPA symbol for each hazard category. Special hazard symbols, such as W (water reactive), OXY (oxidizing material), CRY (cryogenic material), COR (corrosive material), POI (poisonous material), or the radiation warning symbol, must be added to the white bottom section of the placard when available information indicates that one of these special hazards exist. When multiple special hazards exist, add white panels below the placard to list the additional special hazards that apply.

Building/Facility Placards

Facility and building placards identify the highest hazard rating in each category based on the combined materials in a category rating exceeding threshold quantities. Placards will be required when the following amounts of materials are stored or used at a facility:

Hazard Category	Rating Number	Amount Requiring Placarding on a Building or within a Facility (Aggregate Totals of Weight or Volume)
Health (Blue)	4	> 100 lbs or 10 gals or 50 cu ft
	3	> 100 lbs or 10 gals or 50 cu ft
	2	> 500 lbs or 55 gals or 1000 cu ft
	1	> 1000 lbs or 110 gals or 200 cu ft
Flammability (Red)	4	> 500 lbs or 55 gals or 1000 cu ft
	3	> 500 lbs or 55 gals or 1000 cu ft
	2	> 1000 lbs or 110 gals or 2000 cu ft
	1	> 2000 lbs or 220 gals or 4000 cu ft
Reactivity (Yellow)	4	> 100 lbs or 10 gals or 50 cu ft
	3	> 100 lbs or 10 gals or 50 cu ft
	2	> 500 lbs or 55 gals or 1000 cu ft
	1	> 500 lbs or 55 gals or 1000 cu ft