ENVH 557, Winter 2008

NAME

MIDTERM EXAM Take home exam: Due in class on Thursday 2/21/08 Please show your work.

1. (20 pts) In your own words describe the following terms and indicate how they apply to exposure controls: a. Risk assessment matrix, b. Hierarchy of controls, c. Control chart and control banding, d. Capture velocity

2. (15 pts) Identify and describe the two principal mechanisms that contribute to hood entry losses. How are these losses characterized in terms of measurements and tabulated values?

3. (15 pts) Describe in words and symbols why a hood with less than 100% efficiency will result in a volumetric flow rate less than the ideal flow rate.

4. (15 pts) A person working in a small room of volume V=640 Cuft uses a solvent containing 1 part benzene in 19 parts hexane at a rate of 2 pints/day. The room is ventilated at a rate of 3 air changes per hour. (Part A) If the solvent evaporates slowly and evenly during the day, estimate the air concentration for each solvent component in both ppm and mg/m3. (Part B) What would be the maximum concentration if he spilled half of the day's usage and it evaporated all at once?

5. (15 pts) You have been asked by a large Northwest manufacturer to evaluate the ventilation in a fabrication facility and make recommendations for improvements. The facility uses a combination of dilution ventilation and local exhaust ventilation. You decide to make some tracer gas measurements to evaluate the overall ventilation effectiveness in one room. You release a known mass of tracer gas into the room, use a fan to mix the tracer with the room air, and then make measurements of the concentration over the next several hours.

a. Draw a sketch of what the concentration measurements look like over time. What equation is convenient and appropriate for these test conditions?

b. If C_{tracer} (at t = 0) = 896 ppm, and C_{tracer} (at t = 95 min) = 321 ppm, how many room air changes per hour are occuring? If the room volume is 12,000 ft³, what is the effective ventilation rate?

c. If the contaminant of concern has a TLV of 100ppm, is of moderate toxicity, and is generated at rate of 0.1 cfm, is the ventilation rate measured above sufficient to maintain the steady-state concentration at or below the TLV? Indicate what action must be taken, if any.

6. (20 pts) Complete the following table.

Location	TP	SP	VP
1		-3.2	1.2
2			
3	11.1		1.2
4		9.2	

Duct is constant diameter, and Fe = 2.17(Pv) per 100 ft If Q=862 CFM for this system, what diameter is the duct?

