Exercises

Master's degree in environmental science and engineering

Occupational and environmental health

2.1 Chemical pollutants - properties

1) Quiz question

a) Calculate the composition of the vapor phase in equilibrium with a mixture of 10% benzene and 90% xylene by volume

Benzene:	Xylene
ρ20°C = 0.879 kg/l	ρ20°C = 0.864 kg/l
$P°_{benzene}$ (20° C) = 10.0 kPa,	$P°_{xylene}$ (20°C) = 0.80 kPa
MW = 78.1 g/mol	MW = 106.2 g/mol

2) Blood concentration

The partition coefficient between blood and air at 37°C for benzene is 7.1. Calculate the concentration of benzene remaining in 1 ml of blood containing initially 5 mg/l, after equilibration with 10 ml of air at 37°C.

3) Surprise fridge

I am storing a mixture of 30% hexane and 70% non-flammable chlorinated solvent in a refrigerator at 4°C. Is there a risk of fire/explosion if there is a source of ignition (such as an electrical spark from the thermostat)?

The properties of hexane are as follows

Boiling point:	69°C
Melting point:	-95°C
Flash point:	-23°C
LEL:	1.2 %
UEL:	7.7 %
Vapor pressure (25°C):	256 mmHg
Vapor pressure (0°C):	~46 mmHg

A. Yes, because the vapor pressure of the mixture exceeds the LEL at this temperature

B. Yes, because the refrigerator temperature exceeds the flash point of hexane

C. No, because the UEL is exceeded

D. No, because the flash point of the mixture is higher than the refrigerator temperature