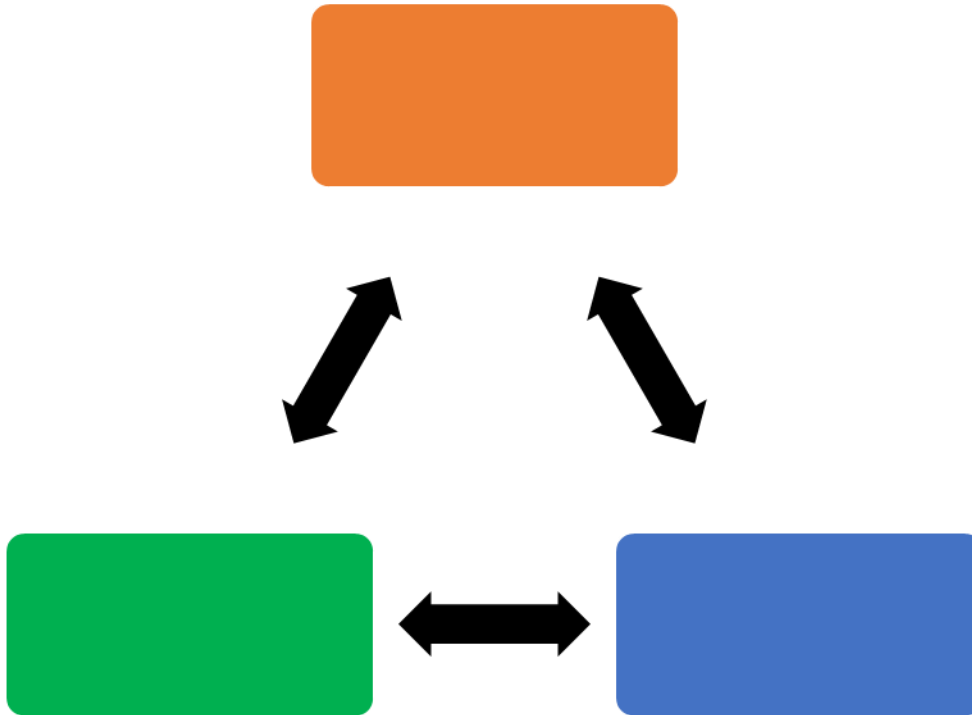


1. (3 points) In the course, what were the three factors about concentration that begin with the letter "S"?



2. (1 points) If your only concern with the selectivity and were using ethanol as the solvent, what would be the order of most selectivity (least number of compounds extracted) to least selectivity (most number of compounds extracted)?

- a. Plus 25 C (77 F) ethanol
- b. Minus 10 C (14 F) ethanol
- c. Minus 40 C (minus 40F) ethanol

c, a, b

b, c, a

c, b, a

a, b, c

3. (1 point) If your only concern is just the extraction itself, not any other part of the process, circle the fastest with ethanol?

- a. Plus 25 C (77 F) ethanol
- b. Minus 10 C (14 F) ethanol
- c. Minus 40 C (minus 40F) ethanol

c, a, b

b, c, a

c, b, a

a, b, c

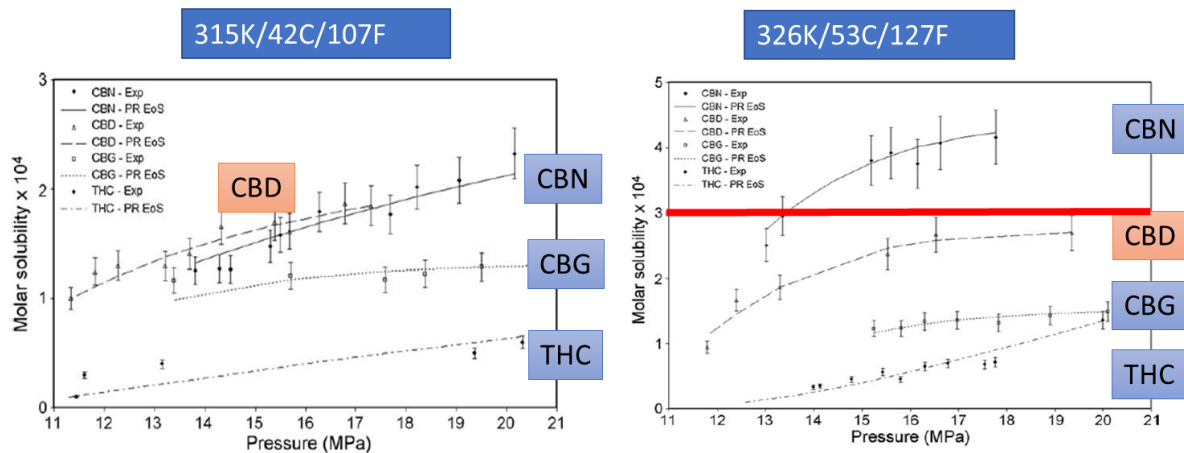
4. (1 point) Give a general definition of a “formulation-centric” concentration strategy based on how it can determine the types of concentration you would be using in your business?

5. (1 points) Circle the example(s) of extraction?

- a. Pressing the biomass with a flat iron?
- b. Grinding with coffee grinding
- c. Adding ethanol to hemp at room temperature
- d. Using ice to knock off the trichomes

6. (1 point) What is the general definition of mass balance as it pertains to the extraction or separation?

Based on the two diagrams below of the pure cannabinoids are various pressure and solubility at two different temperatures,



H. Perrotin-Brunel et al. / J. of Supercritical Fluids 55 (2010) 603–608

7. (1 point) If you increased the temperature of CO₂ from 42C to 53C, would you have more or less CBD extracted per unit time assuming the flow rate of the CO₂ is the same

8. (1 point) Would you have faster THC or CBD extraction if started with equal amounts initially?

9. (3 points) Circle the example of concentration (solventless)?

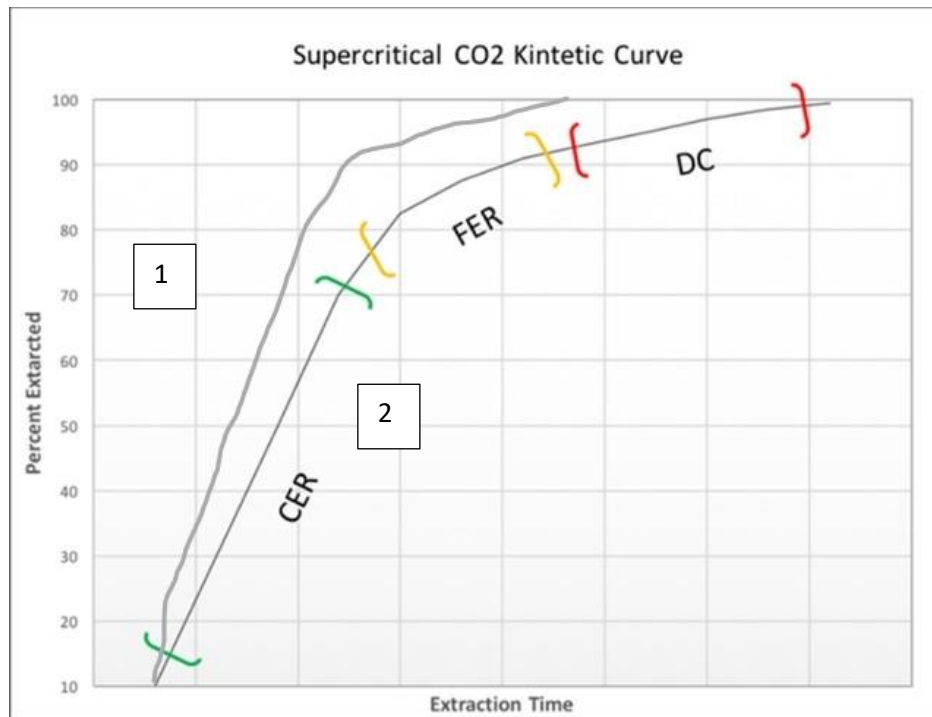
Shaking the hemp buds over a set of mesh screens

Shaking buds in ice water

Adding ethanol to hemp at room temperature

Using ice to knock off the trichomes

Answer the question based on the following diagrams

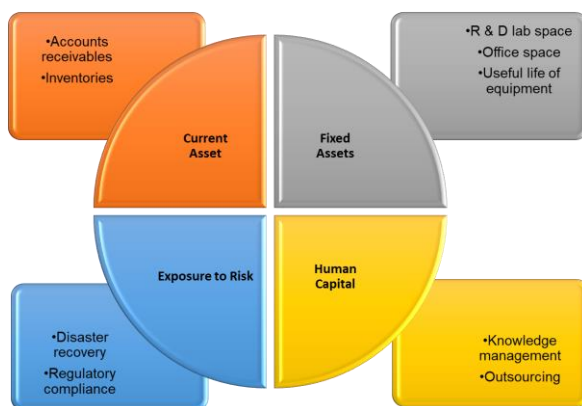
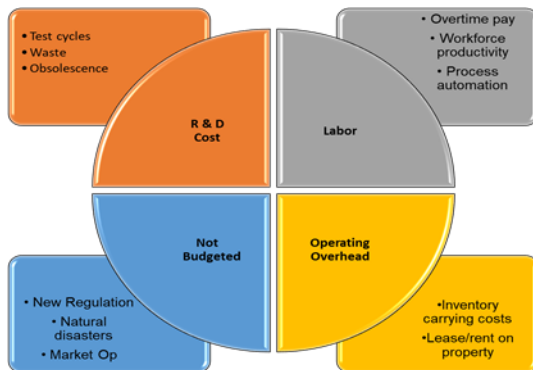


10. (1 point) Which of the two extractions were completed first? Figure 1 or 2

11. (1 point) Name one way to increase the first stage of the extraction? (mechanical influenced)

12. (1 point) How can you increase the speed of the last stage of the extraction? (solubility influenced)

13 (3 points) Identify the three ways to make money from below: (increase sales, decrease costs, optimize asset utilization), how would a business plan of extraction of hemp into crude oil be part of each of these?



14. (1 point) How do separations differ from extraction (based on solvent)

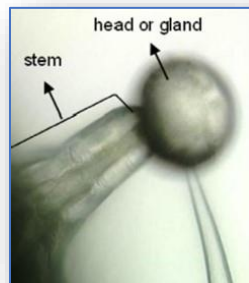
15. (1 point) Why is the final step in extraction so much slower than the first two steps?

16. (3 points) What are the three types of trichomes in the cannabis plant? Label them under pictures

Bulbous trichomes

Capitate-sessile trichomes

Capitate-stalked trichomes (glandular trichomes)



17. (1 point) Which has the most cannabinoids per trichome.

18. (1 point) Why is the mass balancing of extraction and separations necessary to your business?

Based on the drawing below.



	Top			
Pressure Vessel	MARBLES			Empty Headspace
	10.2%	13.2%	11.4%	BELOW MARBLES
	1.8%	3.0%	10.5%	MIDDLE
	0.0%	0.0%	0.0%	6" FROM BOTTOM
	Bottom			

Color Key	
	less than 1%
	1.0% to 1.9%
	2.0% to 3.9%
	4.0% to 5.9%
	Greater than 6%

19. (2 points) What two ways do you know that the extraction has not gone to completion? Visual and numerical?

20. (2 points) What two suggestions would have to complete the extraction?

21. (4 points) Based on the course, what is the BEST concentration for a selective formulation?

B	
E	
S	
T	