Petrochemicals lab (CHE 471) related questions MCQs and short answer questions

1. **How do you calculate swelling factor?**
   Answer: Calculating the percentage change in height from the wet soil to the dry will give you a measure of the swell factor of the soil. For example, if the dry soil was 1 inch high and the wet soil is 1.54 inches high, divide 1 by 1.54 and multiply by 100 to get a 65 percent swell factor.
2. **Why do we calculate swelling index?**

   Answer: The swell index test procedure is used to determine the general swelling characteristics of bentonite clay. The Swell Index test has not been demonstrated to have a proportional correlation to hydraulic properties, a high swell is considered by most to be a good indicator of bentonite quality.

3. **What is the procedure to obtained swelling index of bentonite?**

   Answer: Test method ASTM- D5890 is used to determine the swell index. A 2g sample of dried and finely ground bentonite clay is dispersed into a 100 ml graduated cylinder in 0.1g increments. A minimum of 10 minutes must pass between additions to allow for full hydration and settlement of the clay to the bottom of the cylinder.

4. **What is the swelling power of bentonite?**

   Answer: Sodium Bentonite clay is widely known for its high swelling characteristics. A typical sodium bentonite clay has the ability to absorb 4-5 times its own weight in water and can swell 5 – 15 times its dry volume at full-unconfined saturation.

5. **What is swelling bentonite?**

   Answer: Bentonite clays generally have a high swelling capacity in low electrolyte water solutions, i.e. the bentonite swell in water to a volume several times the original dry clay volume. This swelling ability is one of the basic reasons for using bentonite clay as buffer material in a repository for spent nuclear fuel

6. **Which of the following clay is known for better swelling?**
   a. Ca-Bentonite
   b. Na-Bentonite
   c. Both
   d. None of the above
7. **A sodium bentonite clay can absorb its own weight in water upto-**
   a. Can not absorb at all
   b. Absorb a little only
   c. 2 times only
   d. 4-5 times

8. **What is the use of bentonite in *petrochemical engineering*?**
   a. Helps in drilling in a oil or gas field
   b. Used for protect skin
   c. To absorb water
   d. All of the above
9. What is bentonite
   a. A clay
   b. A stone
   c. An alloy of iron
   d. All of the above
10. **Swelling index was obtained in one experiment (Experiment no.1) for Khulais bentonite, Saudi Arabia, (a local Ca-bentonite clay) after adding some amount of Sodium carbonate (Na_2CO_3). How much amount was added in the experiment?**
    a. 2wt%
    b. 5wt%
    c. 7wt%
    d. 10wt%

Table 1: Density of some important petrochemicals-

S.no.	Petrochemicals	Density (Kg/m^3)
1	ethylene	1.18 kg/m^3
2	Propylene (propene)	1.74 kg/m^3
3	Benzene	876 kg/m^3
4	hexane	655 kg/m^3
5	xylene	864.2 kg/m^3
6	toluene	867 kg/m^3
7	ethanol	789 kg/m^3
8	methanol	792 kg/m^3

11. Which one of the following unit is the SI unit for density?
    a. g/ml
    b. g/cm^3
    c. kg/m^3
    d. lb/ft^3

12. Which one of the following is not the unit of density?
    a. g/cm^3
    b. kg/m^3
    c. lb/ft^3

d. m/s^2

13. Is the density of alcohol is less than water
    a. True
    b. False
14. Which one of the following is different from the rest -
    a. g/ml
    b. g/cm^3
    c. kg/m^3
    d. lb/ft^3
15. Which one of the following is true-
    a. Methanol and ethanol (792 kg/m^3 and 789 kg/m^3)
    b. Xylene and toluene (864.2 kg/m^3 and 867 kg/m^3)
    c. Benzene and hexane (876 kg/m^3 and 655 kg/m^3)
    d. Ethylene and propylene (750 kg/m^3 and 666 kg/m^3)

16. What is combustion reaction?

Answer: When a hydrocarbon burns in the presence of oxygen it produces CO_2 gas and liquid water. For example:

$C_4H_{10} + {}_{6.5}O_2 \longrightarrow 4CO_2 + 5H_2O$

$C_2H_5OH + {}_3O_2 \longrightarrow 2CO_2 + 3H_2O$

$CH_3OH + {}_{1.5}O_2 \longrightarrow CO_2 + 2H_2O$

$C_6H_6 + {}_{7.5}O_2 \longrightarrow 6CO_2 + 3H_2O$

17. What is enthalpy of combustion?

Answer: The enthalpy of combustion of a substance is defined as the heat energy given out when one mole of a substance burns completely in oxygen.

Combustion reactions are exothermic so the value for the enthalpy change (ΔH) is always negative.

18. How the enthalpy of combustion is measured?

Answer: Fuel is burned and the temperature increase measured. The mass of fuel corresponding to the temperature increase can be used to calculate the enthalpy change of the reaction, which in turn can be used to calculate the enthalpy of combustion of that fuel. The formula is used to calculate heat is given below-

$Q=mcp\Delta T$

Where q=heat given out, m=mass of water in kg, cp=specific heat of water in KJ and T is the difference in temperature in K.

19. The specific heat of water is-

a. 4.184 KJ/Kg °C

b. 4184 J /Kg °C

c. 1 calorie/gram °C

d. All above is correct

20. **The quantity of heat required to raise the temperature of one gram of a substance by one Celsius degree. This is the definition of one of the following-**

a. Specific gravity

b. Specific density

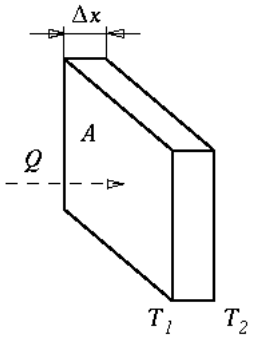
c. **Specific heat**

d. Specific volume

21. What is the thermal conductivity?

Answer: Thermal conductivity can be defined as the rate at which heat is transferred by conduction through a unit cross-section area of a material, when a temperature gradient exits perpendicular to the area.

$$k = \frac{Q\Delta x}{A(T_2 - T_1)}$$



22. What is the significance of thermal conductivity?

Answer: **Its a measure of the ability of a material to transfer heat**. Thermal conductivity is a bulk property that describes the ability of a material to transfer heat.

23. Which one of the following is unit of thermal conductivity coefficient?

a. W/(m.K)

b. Joule

c. Joule/second

d. All of the above

24. Thermal conductivity of air is less than water

a. **True**

b. False

25. Which of the following is true-

a. **0.026 W/m.K, 0.10 W/m.K, 0.60 W/m.K (air, mineral oil, water)**

b. 0.026 W/m.K, 0.10 W/m.K, 0.60 W/m.K (water, mineral oil, Air)

c. 0.026 W/m.K, 0.10 W/m.K, 0.60 W/m.K (air, water, mineral oil)

d. None of the above