Assignment 9

The due date for submitting this assignment is April 15.

A group of 3-4 people may work on the assignment.

1. It is required to prepare a solution of density 1.5 g/L by mixing two liquids in a ratio of 1:2 by mass. Calculate the concentration of each solution if the specific gravity of the two solutions is 1.00 and 1.04, respectively.

2. A filter has a volumetric flow rate of 30 L/min. Calculate the filtrate volume if the filtration time is 2 hours.

3. A batch reactor has a volume of 500 L and is filled with a solution of 50% alcohol by volume. Calculate the maximum amount of alcohol that can be added to the reactor without exceeding the solubility limit of alcohol in water.

4. A pump is required to deliver 100 L/min of water at a pressure of 120 kPa. Calculate the head required for the pump if the pipe length is 200 m and the pipe diameter is 50 mm.

5. A distillation column has 10 theoretical plates and a feed of 50 L/h at 100°C. Calculate the condenser temperature if the reflux ratio is 2.

6. A crystallizer is designed to produce 100 kg/h of crystals with a purity of 98%. Calculate the mass of slurry required if the solubility of the crystals in the slurry is 10 kg/L.

7. A reactor has a volume of 200 L and is filled with a solution of 50% reactant A and 25% reactant B by volume. Calculate the yield of product C if the concentration of reactant B is 0.1 M.

8. A tank contains 1000 kg of water at 50°C. Calculate the heat capacity of the tank if the specific heat capacity of water is 4.18 J/g°C.

9. A chemical reactor has a volume of 50 L and is filled with a solution of 40% reactant A and 60% reactant B by volume. Calculate the conversion of reactant A if the reactor is operated at a temperature of 30°C.

10. A filter press is required to filter 100 L/min of slurry at a filtration pressure of 100 kPa. Calculate the filtration area required if the cake thickness is 10 mm.

11. A distillation column has 10 theoretical plates and a feed of 50 L/h at 100°C. Calculate the reflux ratio if the condenser temperature is 80°C.

12. A chemical reactor has a volume of 50 L and is filled with a solution of 40% reactant A and 60% reactant B by volume. Calculate the conversion of reactant A if the reactor is operated at a temperature of 30°C.

13. A crystallizer is designed to produce 100 kg/h of crystals with a purity of 98%. Calculate the mass of slurry required if the solubility of the crystals in the slurry is 10 kg/L.

14. A filter press is required to filter 100 L/min of slurry at a filtration pressure of 100 kPa. Calculate the filtration area required if the cake thickness is 10 mm.

15. A batch reactor has a volume of 500 L and is filled with a solution of 50% reactant A and 25% reactant B by volume. Calculate the yield of product C if the concentration of reactant B is 0.1 M.

16. A distillation column has 10 theoretical plates and a feed of 50 L/h at 100°C. Calculate the reflux ratio if the condenser temperature is 80°C.

17. A chemical reactor has a volume of 50 L and is filled with a solution of 40% reactant A and 60% reactant B by volume. Calculate the conversion of reactant A if the reactor is operated at a temperature of 30°C.

18. A crystallizer is designed to produce 100 kg/h of crystals with a purity of 98%. Calculate the mass of slurry required if the solubility of the crystals in the slurry is 10 kg/L.

19. A filter press is required to filter 100 L/min of slurry at a filtration pressure of 100 kPa. Calculate the filtration area required if the cake thickness is 10 mm.

20. A distillation column has 10 theoretical plates and a feed of 50 L/h at 100°C. Calculate the reflux ratio if the condenser temperature is 80°C.

21. A chemical reactor has a volume of 50 L and is filled with a solution of 40% reactant A and 60% reactant B by volume. Calculate the conversion of reactant A if the reactor is operated at a temperature of 30°C.