Uka Tarsadia University(Diwaliba Polytechnic)
Diploma in Chemical Engineering
Objective Type Questions (Industrial Stoichiometry)

UNIT 1

Unit system and basic chemical calculation

1. What are the process in which physical changes are involved?
    a. Unit operation
    b. Unit process
    c. Both of above
    d. None of above
2. What are the process in which chemical changes are involved?
    a. Unit operation
    b. Unit process
    c. Both of above
    d. None of above
3. What are the process in which physical and chemical changes are involved?
    a. Unit operation
    b. Unit process
    c. Both of above
    d. None of above
4. What are the process in which only physical changes are involved?
    a. Unit operation
    b. Unit process
    c. Both of above
    d. None of above
5. Under which process does fluid flow come?
    a. Unit operation
    b. Unit process
    c. Both of above
    d. None of above
6. Under which process does heat and mass transfer come?
    a. Unit operation
    b. Unit process
    c. Both of above
    d. None of above
7. Under which process does adsorption and absorption come?
    a. Unit operation

b. Unit process
c. Both of above
d. None of above

8. Under which process does extraction and leaching come?
    a. Unit operation
    b. Unit process
    c. Both of above
    d. None of above
9. Under which process does oxidation and reduction come?
    a. Unit operation
    b. Unit process
    c. Both of above
    d. None of above
10. Under which process does nitrogenation and halogenation come?
    a. Unit operation
    b. Unit process
    c. Both of above
    d. None of above
11. Under which process does hydrolysis and pyrolysis come?
    a. Unit operation
    b. Unit process
    c. Both of above
    d. None of above
12. What is the measure or amount used as standard for measurement called?
    a. Unit
    b. Dimension
    c. Both of above
    d. None of above

13. What is the measurable extent of physical quantity called?
    a. Unit
    b. Dimension
    c. Both of above
    d. None of above
14. Distance comes under which category?
    a. Primary dimension
    b. Derived dimension
    c. Both of above
    d. None of above
15. Density comes under which category?

a. Primary dimension
b. Derived dimension
c. Both of above
d. None of above

16. Can we say that derived dimension quantities are formed from primary dimension?
    a. Yes
    b. No
    c. Maybe
    d. Can't predict
17. What are MKS, CGS, FPS called?
    a. System of unit
    b. System of dimensions
    c. Systems
    d. None of above
18. What does P in FPS stand for?
    a. Per (each)
    b. Para
    c. Pound
    d. None of above
19. What is the SI unit for length?
    a. Foot
    b. Centimetre
    c. Metre
    d. None of above
20. What is the SI unit of temperature?
    a. Celsius
    b. Fahrenheit
    c. Kelvin
    d. None of above
21. What is the unit of Force?
    a. Kg/s
    b. Kg/m.s
    c. N
    d. None of above
22. What is the unit of pressure?
    a. N.m
    b. N/m
    c. N/m^2

d. None of above

23. What is the unit of power?
   a. Watt
   b. J/s
   c. Both of above
   d. None of above

24. What is the dimension of volume?
   a. L^3
   b. L^3T
   c. ML^3
   d. None of above

25. What is the dimension of volumetric flow rate?
   a. M^2L^3
   b. $L^3\ T^{-1}$
   c. L^3T^2
   d. None of above

26. What is the dimension of energy?
   a. ML^2T^{-2}
   b. $M^2L^3T^3$
   c. $M^2L^{-5}T^2$
   d. None of above

27. What is the dimension of density?
   a. ML^{-3}
   b. M^2L^3
   c. L^3T^3
   d. None of above

28. 1 ft = ____ m
   a. 0.3
   b. 0.2048
   c. 0.3048
   d. None of above

29. 1 in = ___ m
   a. 0.204
   b. 0.0254
   c. 0.325
   d. None of above

30. 1 lb = ____ kg
   a. 0.750
   b. 0.250
   c. 0.45

d. None of above

31.1 ton = ____ kg

a. 10
b. 100
c. 1000
d. None of above

32.1 quintal = ___ kg

a. 10
b. 100
c. 1000
d. None of above

33.1 N/m^2 = ____ Pa

a. 1
b. 10
c. 100
d. None of above

34.1 atm = ____ kPa

a. 1
b. 101.325
c. 101325
d. None of above

35.1 bar = ____ Pa

a. 10^2
b. 10^5
c. 10^7
d. None of above

36.1 mm Hg =_____ Pa

a. 100
b. 133
c. 150
d. None of above

37.1 cal = ____ J

a. 9
b. 7
c. 4
d. None of above

38.1 bar = ____ torr

a. 250
b. 500
c. 750

d. 1000

39.1 kgf = ___ N

a. 2
b. 5
c. 10
d. None of above

40.1 dyne = ____ N

a. 10^{-2}
b. 10^{-5}
c. 10^{-10}
d. None of above

41.What is the density of water in kg/m^3?

a. 10
b. 100
c. 1000
d. None of above

42. 1000 kg/m^3 = ____ g/cc.

a. 1
b. 10
c. 100
d. None of above

43.1 poundal = _____ N

a. 0.1283
b. 0.1383
c. 0.1483
d. None of above

44. Are empirical equations always dimensionless?

a. Yes
b. No
c. Maybe
d. Can't predict

45.Is it necessary that empirical equations should be used with the same unit it was developed?

a. Yes
b. No
c. Maybe
d. Can't predict

46.What is the unit of heat capacity (C_p)?

a. BTU/(lb mol. °F)

b. lbmol/(BTU. °F)
c. °F /(lbmol.BTU)
d. None of above

47. Which of the following is a unit of heat capacity?
a. BTU/(lbmol.°F)
b. kJ/(kmol K)
c. Both of above
d. None of above

48. 1 bar = ____ kgf/cm^2
a. 1
b. 10
c. 100
d. None of above

49. 1 bar = ___ psi
a. 10
b. 15
c. 20
d. None of above

50. 5 lbmol = ___ kmol
a. 1.558
b. 2.268
c. 3.125
d. 4.485

UNIT 2
Ideal gas law

1. At constant temperature the pressure of an ideal gas is doubled its density becomes
   a) Half
   b) **Double**
   c) Same
   d) None
2. For an ideal gas, incorrect statement is
   a) Molecules do not occupy any space
   b) No attractive force exist between the molecules
   c) The gas molecules move in random, straight line motion
   d) **None of the mentioned**

3. Correct statement is
   a) **Gases at low pressure or high temperature behave as an ideal gas**
   b) Gases at high pressure or low temperature behave as an ideal gas
   c) Gases at high density behave as an ideal gas
   d) None of the mentioned
4. What is the volume of 20 gms of Oxygen in Litre at standard conditions?
   a) 10
   b) 12
   c) **14**
   d) 16
5. What is the density of Carbon-di-oxide in kg/m^3 at 27 degree celcius and 100 KPa?
   a**) 1.76**
   b) 2.76
   c) 3.76
   d) 4.76
6. The expression which represents the pressure exerted by a gas is
   a) nVRT
   b**) nRT/V**
   c) V/nRT
   d) 1/nVRT
7. According to the Dalton's law of partial pressures, the total pressure of a mixture of ideal gases is equal to the
   a) difference of the highest and lowest pressure
   b) product of the partial pressures
   c) **sum of the partial pressures**
   d) none of the mentioned
8. The gas constant of the mixture is the ____ of the gas constants of the components.
   a) average
   b) **weighted mean**
   c) sum
   d) difference of the highest and the lowest
9. 1 atm pressure and 0°C' condition is known as
   a) Room temperature and pressure
   b) **Standard temperature and pressure**
   c) Atmospheric temperature and pressure
   d) None of the mentioned
10. At standard conditions, what is the volume of 1 kg mole of ideal gas?
    a) **22.4 m^3**

b) 2240 m^3
c) 224000 m^3
d) None of the mentioned

11. How many molecules are present in 691 g of K_2CO_3?
3
4
5
6

12. What is the volume occupied by 1 mole of gas at given set of temperature and pressure called?
Standard volume
Atomic volume
Molar volume
None of above

13. What is the standard temperature defined by STP?
273.15 K
283.15K
293.15K
None of above

14. What is the standard volume defined by STP in m^3/kmol?
22.4
23.4
24.4
25.4

15. What is the standard pressure defined by STP?
1 atm
1 bar
1 pascal
1 mm Hg

16. What is the unit of density?
Kg/m^3
g/cm^3
lb/ft^3
All of above

17. Density of liquid is a function of?
Pressure
Temperature
Both of above
None of above

18. Density of liquid is independent of?

Pressure
Temperature
Both of above
None of above

19. Density of gas is dependent of?
Pressure
Temperature
Both of above
None of above

20. What is specific gravity?
Density ratio at different pressure
Density ratio at different volume
Density ratio at different temperature
None of above

21. What does specific gravity refer to?
Relative pressure
Relative density
Relative mass
None of above

22. What is the unit of specific gravity?
g/cc
kg
K
Dimensionless

23. What is the specific gravity of gas dependent on?
Density of moist air
Density of dry air
Density of water
None of above

24. What is mass fraction?
Total volume of mixture to total mass of mixture
Total mass of mixture to mass of component
Mass of component to total mass of mixture
None of above

25. What is mass ratio?
Ratio of volume of components in a mixture
Ratio of weight of components in a mixture
Ratio of pressure of components in a mixture
None of above

26. What is mole fraction?

Total volume of mixture to total mass of mixture
Total mass of mixture to mass of component
Moleof component to total mole of mixture
None of above

27. 300 kg of wet ammonia sulphate containing 50kg moisture is sent to dryer in order to remove 90% moisture in feed. Calculate weight fraction of water.
0.14
0.16
0.18
0.2

28. 300 kg of wet ammonia sulphate containing 50kg moisture is sent to dryer in order to remove 90% moisture in feed. Calculate weight ratio of water.
0.15
0.2
0.25
0.3

29. 300 kg of wet ammonia sulphate containing 50kg moisture is sent to dryer in order to remove 90% moisture in feed. Calculate weight percentage of water on wet basis.
14%
16%
18%
20%

30. 300 kg of wet ammonia sulphate containing 50kg moisture is sent to dryer in order to remove 90% moisture in feed. Calculate weight percentage of water on dry basis.
15%
20%
25%
30%

31. What does ppm stand for?
Parts per many
Parts per million
Parts per multivalue
None of above

32. What is ppm equivalent to?
g/L
mg/L

µg/L
none of above

33. What is ppm generally used to represent?
High amount of solute
Small amount of solute
Extremely small amount of solute
None of above

34. What is hardness of water measured in?
mg
ppm
ppb
none of above

35. What is BOD of effluent measured in?
mg
ppm
ppb
none of above

36. What is molarity measured in reference to?
1 L of solution
1 kg of solvent
1 Pa pressure of solution
None of above

37. What is molality measured in reference to?
1 L of solution
1 kg of solvent
1 Pa pressure of solution
None of above

38. What is normality measured in reference to?
1 L of solution
1 kg of solvent
1 Pa pressure of solution
None of above

39. What is the product of normality and valency?
Molarity
Molality
Normavalicity
None of above

40. Solubility of NaCl in water at 290 K is 35.8 kg/100 kg of water. What is the solubility as the mass fraction of NaCl.
0.25

0.35
0.45
0.55

41. Solubility of NaCl in water at 290 K is 35.8 kg/100 kg of water. What is the solubility as the mole fraction of NaCl.
    0.1
    0.2
    0.3
    0.4
42. Solubility of NaCl in water at 290 K is 35.8 kg/100 kg of water. What is the solubility as the kmolNaCl per 1000 kg of water.
    2
    4
    6
    8
43. Solubility of NaCl in water at 290 K is 35.8 kg/100 kg of water. What is the solubility as the mole percentage of NaCl.
    5
    10
    15
    20
44. An aqueous solution of K_2CO_3 containing 50% salt and specific gravity of the solution is 1.53 . Determine the mole % of salt in solution.
    10
    12
    14
    16
45. An aqueous solution of K_2CO_3 containing 50% salt and specific gravity of the solution is 1.53 . Determine the volume % of water.
    25
    50
    75
    100
46. An aqueous solution of K_2CO_3 containing 50% salt and specific gravity of the solution is 1.53 . Determine the molality of solution.
    0.0062
    0.0072
    0.0082
    0.0092

47. An aqueous solution of K_2CO_3 containing 50% salt and specific gravity of the solution is 1.53 . Determine the molarity of solution.
    5
    10
    15
    20
48. An aqueous solution of K_2CO_3 containing 50% salt and specific gravity of the solution is 1.53 . Determine the normality of solution.
    0.011
    0.022
    0.033
    0.044
49. What is the volume(m^3)occupied by 20 kg of Cl_2gas at a pressure of 100 kPa and 298 K?
    5
    7
    9
    11
50. What is the weight(kg) of 1 $m^3$of chlorine gas at a temperature of 298 K and a pressure of 101.325 kPa?
    1
    3
    5
    7

UNIT 3
Material balance without chemical reaction

1. Block diagram is a _____ form of process flowsheet.
   Complex
   Simplified
   Justified
   None of above
2. When is block diagram used for assessment?
   Early stage
   Final stage
   Intermediate stage
   None of above

3. Is block diagram useful to estimate the feed and product stream alongwith its utilities?
   Yes
   No
   Maybe
   Can’t predict
4. Which is comparatively more efficient?
   Block diagram
   Process flowsheet
   Both of above
   None of above
5. Does process flowsheet include flowrate and composition of input and output stream?
   Yes
   No
   Maybe
   Can’t predict
6. Does process flowsheet include temperature and pressure of input and output stream?
   Yes
   No
   Maybe
   Can’t predict
7. Does process flowsheet include the datas of heat addition or removed in particular equipment?
   Yes
   No
   Maybe
   Can’t predict
8. How many classification of material balance are there when concerned with plant design by chemical engineer?
   1
   2
   3
   4
9. While dealing with material balance, which state do we usually consider?
   Steady state
   Unsteady state
   Both of above
   None of above

10. What are the materials that do not change during the particular operation called?
    Tie material
    Inerts
    Both of above
    None of above
11. What are the materials that do not take part in the reaction called?
    Tie material
    Inerts
    Both of above
    None of above

12. In the process of concentration of a solution in evaporator involving dissolved solids, which is the tie material?
    Dissolved solids
    Undissolved solids
    Solution
    None of above
13. In the process of combustion of air, which is the inert material?
    Oxygen
    Nitrogen
    Carbon dioxide
    Carbon monoxide
14. The processes like adsorption, absorption, distillation are _____.
    Heat transfer operations
    Mass transfer operations
    Fluid flow operations
    None of above
15. Heat transfer, mass transfer , fluid flow are basically _____.
    Unit operations
    Unit process
    Both of above
    None of above
16. Which process is used to concentrate aqueous solution by removing solvent water?
    Evaporation
    Crystallization
    Extraction
    None of above
17. Concentration of sugarcane juice in sugar factory is an example of?

Evaporation
Crystallization
Extraction
None of above

18. Concentration of ammonium sulphate in fertilizer industry is an example of?
Evaporation
Crystallization
Extraction
None of above

19. Evaporators can be used with _____.
Direct fire
Heating medium in jackets
Steam heated tube
All of above

20. What is the concentrated solution drawn as product from evaporator known as?
Mother liquor
Thick liquor
Waste liquor
None of above

21. What is the major cost of operation in evaporator?
Feed
Product
Steam
None of above

22. What is the process in which solid particles form by evaporating liquid saturated solution called?
Evaporation
Crystallization
Extraction
None of above

23. How many types of typical crystallizers used in industry?
3
4
5
6

24. The mother liquor that leaves the crystalllizer at final temperature is a _____.
Saturated solution

Unsaturated solution
Both of above
None of above

25. Which parameter is used to calculate the yield of crystals?
Initial concentration of solute
Final temperature
Solubility
All of above

26. What are the material balance usually preferred in crstallizzation operation?
Water balance
Solute balance
Both of above
None of above

27. What is the process of separation of solid mixture by dissolving soluble components of solids in liquid solvent called?
Distillation
Leaching
Absorption
None of above

28. Recovering oil from oilseeds is an example of?
Distillation
Leaching
Absorption
None of above

29. What is used to extract oil from oilseeds?
Bollman extractor
Whatman extractor
Fendlich extractor
None of above

30. What is the clear solution at the end of leaching operation called?
Underflow
Overflow
Both of above
None of above

31. What is the slurry of leached solids suspended in solution called?
Underflow
Overflow
Both of above
None of above

32. What type of adsorption occur due to intermolecular force?
    Physical adsorption
    Chemical adsorption
    Both of above
    None of above
33. What type of adsorption occur due to chemical interaction between solid and fluid?
    Physical adsorption
    Chemical adsorption
    Both of above
    None of above
34. The solid used for adsorption is called?
    Adsorbent
    Adsorbate
    Both of above
    None of above
35. The fluid adsorbed on the solid is called?
    Adsorbent
    Adsorbate
    Both of above
    None of above
36. Concentration of solute in fluid and quantity adsorbed per unit weight of adsorbent is explained by?
    Frendlich isotherm
    Langmuir isotherm
    Adsorption isotherm
    None of above
37. Which operation is the least ore last preferred operation in industry?
    Extraction
    Leaching
    Drying
    Distillation
38. Which industry prefers drying operation?
    Paper
    Wood
    Sugar
    None of above
39. When the vapour pressure exerted by moisture in solids equals the partial pressure of water in gas exposed to solid, the solid is said to have attained _____.

Equilibrium dry content
Equilibrium moisture content
Equilibrium solid content
None of above

40. For pasty materials and lumpy solids, what type of dryers do we use?
Tray driers
Rotary driers
Freeze driers
Spray driers

41. For granular and free flowing solids, what type of dryers do we use?
Tray driers
Rotary driers
Freeze driers
Spray driers

42. For food stuffs and pharmaceuticals, what type of dryers do we use?
Tray driers
Rotary driers
Freeze driers
Spray driers

43. For slurries and paste, what type of dryers do we use?
Tray driers
Rotary driers
Freeze driers
Spray driers

44. The removal of certain constituents of liquid mixture by contacting with gas phase is called?
Absorption
Desorption
Adsorption
None of above

45. What is desorption process otherwise known as?
Rectification
Stripping
Extraction
None of above

46. Which process is used to separate liquid mixtures by into component parts by boiling?
Extraction
Drying
Distillation

Crystallization

47. 2000 kg of wet solid containing 70% solid by wt% are fed to a tray dryer where it is dried by hot air. The product finally obtained is found to contain 1% moisture by wt. Calculate the kg of water removed from wet solid.
    585
    1000
    1414
    2000
48. 2000 kg of wet solid containing 70% solid by wt% are fed to a tray dryer where it is dried by hot air. The product finally obtained is found to contain 1% moisture by wt. Calculate the kg of product obtained.
    585
    1000
    1414
    2000
49. An aqueous solution of pyridine containing 27% by weight of pyridine and 73% by weight of water is to be extracted with chlorobenzene. The feed and solvent are mixed well in a batch extractor and the mixture is then allowed to stand for phase separation. The extract phase contains 11% pyridine, 88.1% chlorobenzene and 0.9% water by weight. The raffinate phase contains 5% pyridine and 95% water by weight. Calculate the quality of two phase.
    211, 74
    180, 25
    250, 85
    149, 65
50. An aqueous solution of pyridine containing 27% by weight of pyridine and 73% by weight of water is to be extracted with chlorobenzene. The feed and solvent are mixed well in a batch extractor and the mixture is then allowed to stand for phase separation. The extract phase contains 11% pyridine, 88.1% chlorobenzene and 0.9% water by weight. The raffinate phase contains 5% pyridine and 95% water by weight. Calculate the weight ratio of solvent to feed based on 100 kg feed.
    1.5
    1.8
    2.1
    2.5

UNIT 4
Material balance with chemical reaction

1. Which reactant disappears first when the reaction goes to completion?
   Excess reactant
   Limiting reactant
   Intermediate reactant
   None of above

2. What is the reactant that is in excess of the theoretical requirement as decided by the reaction called?
   Excess reactant
   Limiting reactant
   Intermediate reactant
   None of above
3. Which reactant decide the extent to which a reaction should proceed?
   Excess reactant
   Limiting reactant
   Intermediate reactant
   None of above
4. What is the reactant that is present in less quantity than that of the theoretical requirement as decided by the reaction called?
   Excess reactant
   Limiting reactant
   Intermediate reactant
   None of above
5. Where is the excess reactant found after the reaction completes?
   Feed stream
   Product stream
   Both of above
   None of above
6. How can we increase % conversion?
   By increasing the limiting reactant reacted
   By decreasing the limiting reactant reacted

By maintaining constant the limiting reactant reacted
None of above

7. How can we increase % conversion?
   By increasing the limiting reactant charged
   By decreasing the limiting reactant charged
   By maintaining constant the limiting reactant charged
   None of above
8. How can we increase selectivity?
   By increasing the quantity of limiting reactant forming desired product
   By decreasing the quantity of limiting reactant forming desired product
   By maintaining constant the quantity of limiting reactant forming desired product
   None of above
9. How can we increase selectivity?
   By increasing the quantity of reactant getting converted
   By decreasing the quantity of reactant getting converted
   By maintaining constant the quantity of reactant getting converted
   None of above
10. CO combines with $Cl_2$to form phosgene ($COCl_2$). After reaction, the product contains 12 moles of phosgene, 3 moles of chlorine and 8 moles of CO. Assuming the original reactant mixture is free of phosgene, which is the limiting reactant?
    CO
    Cl_2
    $COCl_2$
    None of above
11. CO combines with $Cl_2$to form phosgene ($COCl_2$). After reaction, the product contains 12 moles of phosgene, 3 moles of chlorine and 8 moles of CO. Assuming the original reactant mixture is free of phosgene, which is the excess reactant?
    CO
    Cl_2
    $COCl_2$
    None of above
12. CO combines with $Cl_2$to form phosgene ($COCl_2$). After reaction, the product contains 12 moles of phosgene, 3 moles of chlorine and 8 moles

of CO. Assuming the original reactant mixture is free of phosgene, calculate the percentage excess reactant.

11%

22%

33%

40%

13. CO combines with Cl_2 to form phosgene ($COCl_2$). After reaction, the product contains 12 moles of phosgene, 3 moles of chlorine and 8 moles of CO. Assuming the original reactant mixture is free of phosgene, calculate the percentage conversion of limiting reactant.

70%

80%

85%

90%

14. CO combines with Cl_2 to form phosgene ($COCl_2$). After reaction, the product contains 12 moles of phosgene, 3 moles of chlorine and 8 moles of CO. Assuming the original reactant mixture is free of phosgene, calculate the moles of total product per mole of reactant mixture fed to the reactor.

0.55

0.65

0.70

0.75

15. CO combines with Cl_2 to form phosgene ($COCl_2$). After reaction, the product contains 12 moles of phosgene, 3 moles of chlorine and 8 moles of CO. Assuming the original reactant mixture is free of phosgene, calculate the total moles of reactant.

23

32

35

40

16. CO combines with Cl_2 to form phosgene ($COCl_2$). After reaction, the product contains 12 moles of phosgene, 3 moles of chlorine and 8 moles of CO. Assuming the original reactant mixture is free of phosgene, calculate the total moles of product.

23

32

35
40

17. A feed mixture containing 60%, 3% inerts and 37% water are sent to reactor. The products contain 53.89% ethylene, 14.37% ethanol, 1.80% ether, 26.35% water and 3.59% inerts. Calculate the moles of product formed.
    80.87
    83.56
    86.35
    90.54
18. A feed mixture containing 60%, 3% inerts and 37% water are sent to reactor. The products contain 53.89% ethylene, 14.37% ethanol, 1.80% ether, 26.35% water and 3.59% inerts. Calculate the conversion of ethylene.
    15%
    25%
    30%
    35%
19. A feed mixture containing 60%, 3% inerts and 37% water are sent to reactor. The products contain 53.89% ethylene, 14.37% ethanol, 1.80% ether, 26.35% water and 3.59% inerts. Calculate the yield of ethanol.
    70%
    75%
    80%
    85%
20. A feed mixture containing 60%, 3% inerts and 37% water are sent to reactor. The products contain 53.89% ethylene, 14.37% ethanol, 1.80% ether, 26.35% water and 3.59% inerts. Calculate the yield of ether based on ethylene.
    10%
    15%
    20%
    25%
21. Carbon monoxide is reacted with hydrogen to produce methanol.Calculate from the reaction, the stoichiometric ratio of hydrogen to carbon monoxide.
    1:2

2:1
1:3
3:1

22. Carbon monoxide is reacted with hydrogen to produce methanol.Calculate from the reactionkmol of methanol produced per kmol of CO reacted.
    1
    2
    3
    4
23. Carbon monoxide is reacted with hydrogen to produce methanol.Calculate from the reaction the weight ratio of CO to H_2 if both are fed to reactor in stoichiometric proportion.
    1:7
    7:1
    1:14
    14:1
24. Carbon monoxide is reacted with hydrogen to produce methanol.Calculate from the reaction the quantity of CO required to produce 1000 kg of methanol.
    825
    850
    875
    900
25. In the production of sulphur trioxide, 100 kmol of SO_2 and 200 kmol of O_2 are fed to a reactor. The product stream is found to contain 80 kmol SO_3. Find the percent conversion of SO_2.
    70%
    75%
    80%
    85%
26. Ammonia produced by the following reaction
    $N_2 + 3H_2 = 2NH_3$ .Calculatethe kg of ammonia produced per hour if percentageconversion is 25 and nitrogen feed rate is 25 kmol/h.
    200
    212
    220

235

27. Ammonia produced by the following reaction $N_2 + 3H_2 = 2NH_3$ .Calculate the molal flow rate (kmol/h) of hydrogen corresponding to nitrogen feed rate of 25kmol/h if they are fed in the stoichiometric proportion.
    25
    50
    75
    100
28. A combustion chamber is feed with 50 kmol/h of butane and 2000kmol/h of air. Calculate the % excess air used and composition of the gases leaving combustion reactor assuming completecombustion of butane.
    25%
    30%
    35%
    40%
29. How much % of oxygen by volume does air contain?
    21
    42
    79
    90
30. A feed containing 60 mole % A, 30 mole % B and 10 mole % inerts enters a reactor. 80 % of the original A reacts as per following equation: 2A+B=C. Find the composition of A unreacted.
    6
    12
    24
    30
31. A feed containing 60 mole % A, 30 mole % B and 10 mole % inerts enters a reactor. 80 % of the original A reacts as per following equation: 2A+B=C. Find the composition of B unreacted.
    6
    12
    24
    30

32. A feed containing 60 mole % A, 30 mole % B and 10 mole % inerts enters a reactor. 80 % of the original A reacts as per following equation: 2A+B=C. Find the composition of inert in product stream.
    6
    8
    10
    12
33. The rate at which gaseous constituent of a mixture is absorbed in liquid depends upon _____ of gas.
    Equilibrium solubility
    Inquilibrium solubility
    Both of above
    None of above
34. Absorption process is a gas-liquid contact operation like _____.
    Extraction
    Drying
    Distillation
    Crystallization
35. Packed columns are usually mounted in which position?
    Vertical
    Horizontal
    Hanging
    None of above
36. What are the packing materials usually used in absorption column?
    Raschig rings
    Saddles
    Both of above
    None of above
37. In liquid-liquid extraction, solvent rich phase is called_____.
    Extract
    Raffinate
    Both of above
    None of above
38. IN liquid liquid extraction, the residual solution from which the solute is extracted is called _____.
    Extract
    Raffinate

Both of above
None of above

39. Which of the following are extraction equipment?
Gravity settlers
Sieve tray columns
Spray towers
All of above

40. What does high speed rotating disc in rotating disc contactors provide?
Mechanical agitation
Manual power
Chemical agitation
None of above

41. Removal of color by activated carbon is an example of which process?
Absorption
Adsorption
Extraction
None of above

42. Silica gel is an example of?
Absorbent
Adsorbent
Extract
None of above

43. Activated charcoal is an example of?
Absorbent
Adsorbent
Extract
None of above

44. Bone char is an example of?
Absorbent
Adsorbent
Extract
None of above

45. Silica gel is an example of?
Absorbent
Adsorbent
Extract
None of above

46. Dilute acid containing 25% H_2SO_4 is concentrated by commercial grade H_2SO_4 containing 98% H_2SO_4 to obtain desired acid containing 65% H_2SO_4. Find the quantities (kg) of acid required to make 1000 kg of desired acid.
    300
    350
    400
    450
47. Soyabean seeds are extracted with hexane in batch extractors. The flaked seeds are found to contain 18.6% oil, 69% solid and 12.4% moisture (by weight). At the end of the extraction process, cake (meal) is separated from hexane-oil mixture. The cake is analysed to contain 0.8% oil, 87.7% solids and 11.5% moisture (by weight). Find the % recovery of oil.
    80
    85
    90
    95
48. Soyabean seeds are extracted with hexane in batch extractors. The flaked seeds are found to contain 18.6% oil, 69% solid and 12.4% moisture (by weight). At the end of the extraction process, cake (meal) is separated from hexane-oil mixture. The cake is analysed to contain 0.8% oil, 87.7% solids and 11.5% moisture (by weight). Find the oil in cake in kg.
    0.43
    0.53
    0.63
    0.73
49. Soyabean seeds are extracted with hexane in batch extractors. The flaked seeds are found to contain 18.6% oil, 69% solid and 12.4% moisture (by weight). At the end of the extraction process, cake (meal) is separated from hexane-oil mixture. The cake is analysed to contain 0.8% oil, 87.7% solids and 11.5% moisture (by weight). Find the oil recovered in kg.
    12
    18
    24

30

50. Soyabean seeds are extracted with hexane in batch extractors. The flaked seeds are found to contain 18.6% oil, 69% solid and 12.4% moisture (by weight). At the end of the extraction process, cake (meal) is separated from hexane-oil mixture. The cake is analysed to contain 0.8% oil, 87.7% solids and 11.5% moisture (by weight). Find theamount of cake in kg.
    75
    80
    85
    90

UNIT 5
Energy balance

1. How many forms of energy are there?
    1
    2
    3
    4
2. Kinetic and potential energy comes under which form of energy?
    System
    Process
    Both of above
    None of above
3. Pressure and internal energy comes under which form of energy?
    System
    Process
    Both of above
    None of above
4. Magnetic energy comes under which form of energy?
    System
    Process
    Both of above
    None of above
5. Heat comes under which form of energy?
    System

Process
Both of above
None of above

6. Work comes under which form of energy?
   System
   Process
   Both of above
   None of above
7. Energy possessed by a substance due to its relative motion is called?
   Kinetic energy
   Potential energy
   Internal energy
   Pressure energy
8. Energy possessed by a substance due to its relative position is called?
   Kinetic energy
   Potential energy
   Internal energy
   Pressure energy
9. Energy possessed by a substance due to the space occupied by it is called?
   Kinetic energy
   Potential energy
   Internal energy
   Pressure energy
10. Energy possessed by a substance due to its relative motion and position is called?
    Kinetic energy
    Potential energy
    Internal energy
    Pressure energy
11. What is the energy in transit between a hot source and cold reservoir called?
    Heat
    Work
    Both of above
    None of above
12. What difference causes the flow of heat?

Pressure
Volume
Temperature
None of above

13. What is the product of force and the distance moved in the direction of applied force ?
Heat
Work
Both of above
None of above

14. Quantity of heat required to raise the temperature of 1 gm of water by 1°C in the surrounding of 15°C is called?
Standard heat
Fat
Calories
None of above

15. Which law of thermodynamics accounts for law of conservation of energy?
First
Second
Third
Zero

16. Does the total energy of the system remain constant as per law of conservation of energy?
Yes
No
Maybe
Can’t predict

17. In which process does the streams of material continuously enter or leave the system?
Flow
Non flow
Batch
None of above

18. In which process does no stream of material enter or leave the system?
Flow
Non flow

Batch
None of above

19. What is non flow process also called as?
Batch
Continuous
Both of above
None of above

20. In which system does mass not crosses the boundary of the system?
Open
Closed
Both of above
None of above

21. In which system is the input energy and output energy equal?
Open
Closed
Both of above
None of above

22. What is the heat that must be transferred to raise or lower the temperature of a substance called?
Latent heat
Sensible heat
Specific heat
None of above

23. What is the ratio of heat capacity of a substance to that of water called?
Latent heat
Sensible heat
Specific heat
None of above

24. What is the amount of heat required to raise the temperature of 1 kg substance by 1 K called?
Latent heat
Heat capacity
Specific heat
None of above

25. Can heat capacity be calculated at constant pressure?
Yes
No

Maybe
Can’t predict

26. Can heat capacity be calculated at constant volume?
    Yes
    No
    Maybe
    Can’t predict
27. As per ideal gas law, what is R equal to?
    C_p- C_v
    C_p+ C_v
    C_v– C_p
    None of above
28. For deriving the relationship between $C_p$and C_v, what is the value of n that we assume?
    1
    2
    3
    4
29. What is the enthalpy change resulting due to chemical reaction called?
    Heat of reaction
    Standard heat of reaction
    Heat of formation
    Standard heat of formation
30. What is the enthalpy change resulting due to chemical reaction with reactants and products in standard state called?
    Heat of reaction
    Standard heat of reaction
    Heat of formation
    Standard heat of formation
31. What is the enthalpy change accompanying the formation of 1 mole of compound from its element called?
    Heat of reaction
    Standard heat of reaction
    Heat of formation
    Standard heat of formation
32. What is the enthalpy change accompanying the formation of 1 mole of compound from its element beginning and ending at 298.15K called?

Heat of reaction
Standard heat of reaction
Heat of formation
Standard heat of formation

33. Is it necessary for the reaction to start and end at 298.15K for standard heat of formation?
Yes
No
Maybe
Can’t predict

34. What is the pressure maintained for standard heat of formation?
0.1 Pa
0.1 kPa
0.1 MPa
None of above

35. What is the heat reaction of one mole of substance with molecular oxygen called?
Heat of formation
Standard heat of formation
Heat of combustion
Standard heat of combustion

36. What is the heat reaction of one mole of substance with molecular oxygen with reactants at 298.15 K called?
Heat of formation
Standard heat of formation
Heat of combustion
Standard heat of combustion

37. What is the sign of heat of combustion?
Positive
Negative
Not defined
None of above

38. What is the pressure maintained for standard heat of combustion?
0.1 Pa
0.1 kPa
0.1 MPa
None of above

39. As per the assumption for standard heat of combustion, all carbon must be converted to?
    CO
    CO_2
    CH_4
    None of above
40. As per the assumption for standard heat of combustion, all hydrogen must be converted to?
    HO_2
    H_2O
    H_2SO_4
    None of above
41. As per the assumption for standard heat of combustion, all sulphur must be converted to?
    SO
    SO_2
    SO_3
    H_2SO_4
42. As per the assumption for standard heat of combustion, all nitrogen must be converted to?
    N_2
    N_2O
    NO
    NO_2
43. Which law states that the enthalpy changes remains the same irrespective of the number of steps it takes?
    Newtons law
    Einstein law
    Hess law
    None of above
44. The total change in enthalpy depends upon?
    Temperature
    Pressure
    Both of above
    None of above
45. Does the total change in enthalpy depend upon its state of aggregation?
    Yes

No
Maybe
Can't predict

46. Does the total change in enthalpy depend upon no. of intermediate reaction?
Yes
No
Maybe
Can't predict

47. Can heat of reaction be added or substracted?
Yes
No
Maybe
Can't predict

48. 1000 kg/h of a thermic fluid is being indirectly heated from 380K to 550K. Calculate the heat load on heater in kW. Heat capacity equation of thermic fluid is $C_P = 1.436 + 2.18 * 10^{-3} T$ where C_P is kJ/kg K and T in K.
11.5
115
11500
115000

49. 1000 kg/h of a thermic fluid is being indirectly heated from 380K to 550K. Calculate the heat load on heater in kJ/s. Heat capacity equation of thermic fluid is $C_P = 1.436 + 2.18 * 10^{-3} T$ where C_P is kJ/kg K and T in K.
11.5
115
11500
115000

50. The heat capacity of CO_2 is given by $C_P = 26.540 + 42.454 * 10^{-3} T - 14.298 * 10^{-6} T^2$ where C_P is kJ/kg K and T in K. Calculate the heat (kJ) required to raise 1kg of CO_2 from 300K to 1000K.
700
750
800
850

UNIT 6

combustion

1. What is a substance that produces heat or energy on undergoing a process called?
   Fat
   Calorie
   Fuel
   None of above
2. How many types of fuels are there?
   1
   2
   3
   4
3. What is coal an example of?
   Solid fuel
   Liquid fuel
   Gaseous fuel
   None of above
4. What is petrol an example of?
   Solid fuel
   Liquid fuel
   Gaseous fuel
   None of above
5. What is natural gas an example of?
   Solid fuel
   Liquid fuel
   Gaseous fuel
   None of above
6. Are liquid fuel obtained by distillation of crude oil?
   Yes
   No
   Maybe
   Can’t predict
7. How much percentage of methane does natural gas contain?

50-65
60-75
70-85
80-95

8. Does combustion occur in presence of oxygen?
   Yes
   No
   Maybe
   Can't predict
9. Combustion process can be termed complete combustion only if carbon is converted to?
   CO
   CO_2
   CH_4
   None of above

10. Combustion process can be termed complete combustion only if hydrogen is converted to?
    HO_2
    H_2O
    H_2SO_4
    None of above
11. Combustion process can be termed complete combustion only if sulphur is converted to?
    SO
    SO_2
    SO_3
    H_2SO_4
12. After combustion process, if CO is formed can it be called complete combustion?
    Yes
    No
    Maybe
    Can't predict
13. What is the process of combustion called if CO is formed?
    Full combustion
    Complete combustion

Half combustion
Partial combustion

14. What is the source of oxygen for combustion process?
Water
Carbon dioxide
Air
Sulphur dioxide

15. What are the product gases that leaves combustion chamber called?
Stack gases
Flue gases
Both of above
None of above

16. What is calorific value of fuel otherwise known as?
Burning value of fuel
Heating value of fuel
Both of above
None of above

17. When water is present in combustion products in vapour form, what is it called?
Net calorific value of fuel
Gross calorific value of fuel
Calorific value of fuel
None of above

18. When water is present in combustion products in liquid form, what is it called?
Net calorific value of fuel
Gross calorific value of fuel
Calorific value of fuel
None of above

19. What is the difference of GCV and NCV?
$m\nu$
$m\lambda$
Δm
$m\beta$

20. What is the minimum amount of oxygen required for complete combustion of all fuel fed to combustion chamber called?
Theoretical air

Theoretical oxygen
Excess air
Actual air

21. What is the minimum amount of air required for complete combustion of all fuel fed to combustion chamber called?
Theoretical air
Theoretical oxygen
Excess air
Actual air

22. What is the surplus amount of airsupplied for complete combustion of all fuel fed to combustion chamber called?
Theoretical air
Theoretical oxygen
Excess air
Actual air

23. Do we supply air more than the theoretical air requirement in actual practice?
Yes
No
Maybe
Can’t predict

24. What is % excess oxygen equal to in terms of % excess air?
Equal to % excess air
%excess air/21
%excess air/79
None of above

25. Does the theoretical air value required to burn given quantity of fuel depend upon how much fuel is there to burn?
Yes
No
Maybe
Can’t predict

26. Does the excess air requirement depend upon the type of fuel to be burned?
Yes
No
Maybe

Can’t predict

27. How much excess air does gaseous fuel require?
    Less
    High
    Very high
    None of above
28. How much excess air does liquid fuel require?
    Less
    High
    Very high
    None of above
29. How much excess air does solid fuel require?
    Less
    High
    Very high
    None of above
30. What percent of excess air are gaseous fuels burned with?
    5 to 15
    5 to 20
    10 to 40
    10 to 50
31. What percent of excess air are solid fuels burned with?
    5 to 15
    5 to 20
    10 to 40
    10 to 50
32. What percent of excess air are liquid fuels burned with?
    5 to 15
    5 to 20
    10 to 40
    10 to 50
33. Crude oil is analyzed to contain 87% carbon, 12.5% hydrogen and 0.5% sulphur (by weight). Calculate the net calorific value (kJ) of crude oilat 298 K.
    Data: GCV of crude oil at 298 K is at 298 K is 45071KJ/kg Oil.
    41200
    42300

42900
43500

34. What is the significance of combustion process?
    Tremendous amount of heat absorbed during process
    Tremendous amount of heat released during process
    No amount of heat absorbed during process
    None of above
35. At what temperature(K) are NCV values reported?
    273.15
    298.15
    303.15
    None of above
36. At what temperature(K) are NCV values reported?
    273.15
    298.15
    303.15
    None of above
37. What is the unit of GCV and NCV?
    kJ/mole
    kJ/kg
    kJ/m^3
    All of above
38. What do we calculate first to find GCV of fuel from NCV value of fuel?
    Moles of carbon dioxide produced in unit mass of fuel
    Moles of water produced in unit mass of fuel
    Moles of sulphur dioxide produced in unit mass of fuel
    None of above
39. What is the latent heat of water vapour(kJ/kg) at standard temperature?
    2432
    2442
    2452
    2462
40. How is theoretical air requirement in moles calculated?
    Theoretical O_2 in moles/0.21
    Theoretical O_2 in moles/0.79
    Theoretical N_2 in moles/0.21
    None of above

41. Calculate the NCV(kJ/kg) at 298K of a sample fuel oil having C/H ratio 9.33 (by weight) and containing sulphur to the extent of 1.3% by weight. Data: GCV of fuel at = 41785 kj/kg, latent heat of water= 2442.5 kj/kg.
    38600
    39600
    40600
    41600
42. The net heating value of gaseous propane at 298 K is 2219.71KJ/mol. Calculate the gross heating value(kJ/mol) of propane.
    2000
    2200
    2400
    2600
43. The Orsat analysis of the flue gases from a boiler house chimney, by volume, is as given below: CO_2: 11.4% , O_2 : 4.2% and N_2 : 84.4% , Assuming complete combustion, calculate the % excess air.
    20
    23
    27
    30
44. The Orsat analysis of the flue gases from a boiler house chimney, by volume, is as given below: CO_2: 11.4% , O_2 : 4.2% and N_2 : 84.4% , Assuming complete combustion, find the C:H ratio in the fuel.
    1:5
    5:1
    1:10
    10:1
45. The ultimate analysis of a residual fuel oil (RFO) sample is: C : 88.4%, H: 9.4% , and S: 2.2% (by weight). The residual fuel oil is used as a fuel in a power generating boiler with 25% excess air. Calculatethe theoretical dry air (kmole) requirement.
    40
    45
    50
    55
46. The ultimate analysis of a residual fuel oil (RFO) sample is: C : 88.4%, H: 9.4% , and S: 2.2% (by weight). The residual fuel oil is

used as a fuel in a power generating boiler with 25% excess air. Calculate the actual dry air (kmol) supplied.

55
58
61
64

47. The ultimate analysis of a residual fuel oil (RFO) sample is: C : 88.4%, H: 9.4% , and S: 2.2% (by weight). The residual fuel oil is used as a fuel in a power generating boiler with 25% excess air. Calculate the theoretical oxygen(kmol) supplied.

7.82
8.54
9.78
11.58

48. The ultimate analysis of a residual fuel oil (RFO) sample is: C : 88.4%, H: 9.4% , and S: 2.2% (by weight). The residual fuel oil is used as a fuel in a power generating boiler with 25% excess air. Calculate the weight of dry air(kg) supplied.

1150
1250
1350
1450

49. The ultimate analysis of a residual fuel oil (RFO) sample is: C : 88.4%, H: 9.4% , and S: 2.2% (by weight). The residual fuel oil is used as a fuel in a power generating boiler with 25% excess air. Calculate the actual dry air (kg) supplied.

1590
1690
1790
1890

50. The ultimate analysis of a residual fuel oil (RFO) sample is: C : 88.4%, H: 9.4% , and S: 2.2% (by weight). The residual fuel oil is used as a fuel in a power generating boiler with 25% excess air. Calculate kmole of SO_2 produced.

0.02
0.04
0.06

0.08