

1. What fibers cannot make paper?
 - a) Asbestos
 - b) Cotton
 - c) Hemp
 - d) Wood
2. What is the approximate consistency in a modern headbox?
 - a) 0.025%
 - b) 0.25%
 - c) 0.5%
 - d) 1.0%
3. What is not considered a dewatering device on a fourdrinier table?
 - a) Dandy rolls
 - b) Flatboxes
 - c) Hydrofoils
 - d) Table rolls
4. What is the fourdrinier wire turning roll that is nearest to the headbox?
 - a) Breast
 - b) Couch
 - c) Guide
 - d) Holy
5. When a wet press nip becomes saturated the sheet defect that occurs is known as?
 - a) Crushing
 - b) Picking
 - c) Two-sidedness
 - d) Warping
6. What is the purpose of a flotation cell?
 - a) Collect condensate from dryer cylinders
 - b) Reclaim fibers after TMP refining
 - c) Remove ink particles
 - d) Wash pulp during bleaching
7. What coating process gives the most uniform thickness layer?
 - a) Air-knife
 - b) Blade
 - c) Gate-roll
 - d) Metered
8. What grade of paper can be produced at the fastest machine speeds?
 - a) Bleached Bristol
 - b) Bond
 - c) Newsprint
 - d) Tissue
9. What is an example of a physical paper property?
 - a) Grammage
 - b) Stretch
 - c) Tensile
 - d) Tensile energy absorption

10. What is an example of a wet-strength agent?
- AKD
 - Corn starch
 - Kymene
 - Polyacrylamide
11. What ingredient is not necessary for the formation of a foam?
- Gas
 - Film stabilizing agents
 - Surfactants
 - Liquid
12. When should alum be added before rosin in acidic papermaking?
- When pH is above 6
 - When pH is below 3
 - When there is high anionic trash
 - When water hardness is high
13. Electrophoresis measures what important parameter?
- Saponification
 - Sedimentation potential
 - Streaming potential
 - Zeta potential
14. A 1.0 m^2 blackbody cabinet wall has a temperature of 400 K. Compute the rate of heat transfer (W). The Stefan-Boltzmann constant is $5.67 \times 10^{-8} \text{ W/m}^2\text{-K}^4$.
- 1000
 - 1451
 - 2451
 - 252
15. A coin with an initial temperature of 100°C is plunged into a 20°C water bath. Assuming its thermal time constant is 1.0 minute, estimate its temperature ($^\circ\text{C}$) after 2 minutes.
- 21.5
 - 23.9
 - 30.8
 - 49.4
16. A 10.0 m^2 wall has a thickness of 0.1 m and a thermal conductivity of 0.1 W/m-K . Given a temperature differential of 10°C , how much heat does the wall transfer (W)?
- 50
 - 100
 - 150
 - 200
17. In an activated sludge process, a common MLSS level (in mg/l) would be:
- 2,000
 - 10,000
 - 20,000
 - 100,000

18. Water flows down through a porous pulp fiber mat. If Darcy's law or the Kozeny-Carman equation is obeyed, doubling the superficial approach velocity and tripling the thickness of the fiber mat increases of pressure drop by:
- $2/3$
 - $3/2$
 - 6
 - 12
19. Which of the variables listed below would influence the value of the specific resistance of a suspension of fiber fines and clay:
- Fluid viscosity
 - Dimensions of fiber fines and clay particles
 - Superficial velocity
 - All of the above
20. Which of the following is an intensive thermodynamic property:
- Mass (kg)
 - Volume (m^3)
 - Enthalpy (kJ)
 - Temperature (K)
21. The enthalpy of superheated steam entering a adiabatic turbine that is 75% efficient is 3,000 kJ/kg. The exhaust enthalpy is 2,500 kJ/kg. The work performed (kJ/kg) is:
- 125
 - 375
 - 500
 - 625
22. The enthalpy of superheated steam entering (at zero velocity) a converging-diverging adiabatic nozzle is 3,000 kJ/kg. The enthalpy at the nozzle exit is 2,500 kJ/kg. The steam velocity (m/s) at the nozzle exit is:
- 10
 - 100
 - 500
 - 1000
23. A reversible Carnot heat engine operates between a high temperature reservoir of 600 K and a low temperature reservoir of 300 K. Its efficiency is:
- 25%
 - 50%
 - 60%
 - 70 %
24. The flow of water in a pipe has a Reynolds number of 200. The velocity at the pipe center is how many times the mean velocity:
- one-half
 - the same
 - double
 - four times
25. The viscosity of gases, in general, is
- more sensitive to temperature than liquid viscosity
 - less sensitive to temperature than liquid viscosity
 - insensitive to temperature

26. If the compressibility factor for a real gas is less than one, the predicted density of the gas will be _____ the density predicted by the ideal gas law.
- lower than
 - higher than
 - the same as
27. For an adiabatic system with no moving parts, which terms may be neglected in the open system energy balance?
- enthalpy change and flow work
 - shaft work and heat
 - shaft and flow work
 - heat and flow work
28. Which of the following is not a contributor to the odor from a Kraft mill?
- Methylmercaptans
 - dimethyldisulfide
 - methanol
 - dimethylsulfide
29. The commonly accepted meaning of ECF
- elemental chlorine free
 - entirely chlorine free
 - especially chlorine free
 - expensive chlorine free
30. The operation which separates particles primarily on the basis of density
- cleaning
 - screening
 - cooking
 - washing
31. Reaction wood
- protects trees from parasites
 - is highly beneficial for pulping
 - keeps the tree vertical
 - grows only in the crown of the tree
32. The chemical reaction primarily responsible for strength loss during pulping
- delignification
 - cellulose chain cleavage
 - peeling
 - aromatic substitution
33. The R^2 value for a regression analysis indicates
- the fraction of the variability in y that comes from changing x
 - the total variability in the data set
 - how linear the relationship between x and y is
 - how good your data collection plan was
34. Increasing the number of terms in your regression equation
- increases R^2
 - decreases R^2
 - does not change R^2
 - eliminates R^2

35. The variance of a set of data is the _____ of the standard deviation
- square
 - square root
 - sine
 - negative
36. Chlorine dioxide solubility in water is _____ at lower temperatures.
- the same
 - higher
 - lower
37. The reduced temperature of a material is the ratio of the system temperature to the
- boiling temperature
 - melting temperature
 - glass transition temperature
 - critical temperature
38. On an open head box machine, doubling the wire speed will require _____ the level of stock in the headbox.
- not changing
 - doubling
 - tripling
 - quadrupling
39. An investment of \$1000 made today at 8% per annum, compounded annually will be worth _____ ten years from now.
- \$1562
 - \$2159
 - \$2647
 - \$2984
40. Increasing refining will move the dry line on a Fourdrinier table
- toward the headbox
 - toward the couch
 - not at all
 - under the dandy roll
41. Saturated steam at a pressure of 75 psig will have a temperature of approximately
- 187 °F
 - 221 °F
 - 293 °F
 - 347 °F
42. Primary control of basis weight on a paper machine is made by adjusting the
- slice opening
 - slide adjusting screws or thermal rods
 - the thick stock valve
 - the fan pump speed
43. On most paper machines, basis weight profile is controlled by adjusting the
- thick stock valve
 - shape of the slice opening
 - press roll crown
 - thick stock consistency

44. In an evaporator system, the total pounds of water evaporated per pound of boiler house steam used is called
- steam efficiency
 - steam economy
 - steam use
 - steam effectiveness
45. For process control purposes, many pulp and paper processes can be modeled as _____ processes.
- first order
 - first order plus dead time
 - dead time
 - second order
46. A first order process will achieve _____ of its ultimate response in a period of time equal to one time constant.
- approximately 50%
 - approximately 60%
 - approximately 70%
 - approximately 80%
47. The integral mode of feedback control eliminates _____.
- error
 - offset
 - oscillation
 - slow response
48. When the tending end of a felt guide roll in the felt return run is moved toward the couch the felt will
- move to the tending side
 - move to the back side
 - tighten
 - stay where it is
49. Most forming fabrics are made of
- nylon
 - brass
 - polyester
 - kevlar
50. The appropriate units for thermal conductivity might be
- Btu/hr-ft- °F
 - Btu/hr-sq. ft- °F
 - cal/gm- °C
 - Btu/lb.- °F