Answer the following by choose the correct:

1. Ideal fluid is one has __d_____.
   (a) No viscosity (b) No surface tension (c) No compressibility <u>(d)</u> All of the above

2. This shear stress is proportional to the rate of change of velocity with respect to y. It is denoted as τ and mathematically ____a____.
   <u>(a)</u> $\tau = \mu \frac{du}{dy}$ (b) $\tau = \frac{1}{\mu}\frac{du}{dy}$ (c) $\tau = \frac{1}{\mu}\frac{dy}{du}$ (d) $\tau = \mu \frac{dy}{du}$
3. Reynolds number is defined as ___c_____for a flow on flat plate.
   (a) $Re_L = \frac{\rho u L^2}{\mu}$ (b) $Re_L = \frac{u L^2}{\mu}$ <u>(c)</u> $Re_L = \frac{\rho u L}{\mu}$ (d) $Re_L = \frac{\rho u}{\mu}$
4. For laminar flow over a flat plate, the Reynolds number becomes less than ___d___
   (a) $2x10^4$ (b) $7x10^7$ (c) $10x10^5$ <u>(d)</u> $5x10^5$
5. For turbulent flow in the pipe Re_d be greater than___c____
   (a) 1000 (b) 2000 <u>(c)</u> 2300 (d) 10000
6. Prandtl number (Pr) is the ratio of kinematic viscosity to thermal diffusivity and mathematically denoted as ___d____.
   (a) $Pr = \frac{\mu Cp}{k}$ (b) $Pr = \frac{\rho \nu Cp}{k}$ (c) $Pr = \frac{\nu}{\alpha}$ <u>(d)</u> All of the abov
7. Nusselt Number for flow in tube is denoted mathematically as_______.
   (a) $Nu_d = \frac{d.k}{h}$ <u>(b)</u> $Nu_d = \frac{h.d}{k}$ (c) $Nu_d = \frac{k}{h.d}$ (d) $Nu_d = \frac{h}{k.d}$
8. Air at atmospheric pressure and 200°C flows over a plate with velocity of 5m/s. The plate is 15mm wide and is maintained at a temperature of 120°C. Calculate the Reynold's Number at distance of 0.5 meter and the local and average heat transfer coefficient ____a____. The properties at film-

temperature are ρ=0.815kg/m^3, μ=24.5x10^{-6}N.s/m^2, Pr=0.7, k=0.0364W/m.K.

(a) <u>0.831×10^5, $6.188 W/m^2$.K, $12.376 W/m^2$.K</u>
(b) 6.188, $0.831 \times 10^5 W$/m^2.K, $12.376 W/m^2$.K
(c) 0.831×10^5, $12.376 W/m^2$.K, $6.188 W/m^2$.K
(d) 0.831×10^5, $74.256 W$/m^2.K, $12.376 W/m^2$.K

9. The hydraulic diameter is defined as___c___.

(a) $d_h = \frac{4P}{A}$ (b) $d_h = \frac{A}{4P}$ <u>(c)</u> $d_h = \frac{4A}{P}$ (d) $d_h = \frac{2A}{P}$

10. For turbulent flow in tube the Nusselt Number is calculated by Following relation___a____.

(a) $\underline{\overline{Nu} = 0.023\,(Re_d)^{0.8}(Pr)^{1/3}}$

(b) $\overline{Nu} = 0.023\,(Re_L)^{0.8}(Pr)^{1/3}$

(c) $\overline{Nu} = 0.023\,(Re_d)^{0.4}(Pr)^{1/3}$

(d) $\overline{Nu} = 0.023\,(Re_d)^{0.8}(Pe)^{1/2}$

11. The convective heat transfer coefficient in laminar flow over a flat plate _c__

(a) increases if a lighter fluid is used

(b) increases if a higher viscosity fluid is used

<u>(c) increases if higher velocities are used</u>

(d) increases with distance.

12. Reynolds number for flow in pipe is ___c_____

(a) $Re = \frac{Ldu}{\mu}$

(b) $Re = \frac{\rho ud}{\nu}$

<u>(c)</u> $\underline{Re = \frac{\rho du}{\mu}}$

(d) $Re = \frac{d.u}{\mu}$

13. The friction factor in the laminar region is proportional to ___d__

(a) $Re^{0.5}$ (b) $Re^{0.2}$ (c) $Re^{-0.2}$ <u>(d)</u> $\underline{Re^{-0.5}}$

14. In pipe flow, the average convection coefficient

<u>(a) will be higher in rough pipes</u>

(b) will be higher in smooth pipes

(c) Roughness affects only pressure drop and not the convection coefficient

(d) Only Reynolds and Prandtl numbers influence the convection coefficient and not the roughness.

15. Air at 20°C flows over a 4-m-long and 3-m-wide surface of a plate whose temperature is 80°C with a velocity of 5 m/s. The rate of heat transfer from the laminar flow region of the surface is___c____.(For air, use k= 0.02735 W/m.K, Pr= 0.7228, ν=1.798 x 10^{-5} m^2 /s)

(a) 950 W (b) 1037 W (c) 2074 W (d) 2640 W

16. The normal automobile radiator is a heat exchanger of the type __d___.

(a) Direct contact

(b) Parallel flow

(c) Counter flow

(d) Cross flow

17. The requirement of transfer of a large heat is usually met by __d___.

(a) Increase the length of the tube

(b) Decreasing the diameter of the tube

(c) Increase the number of tubes

(d) Having multiple tube of shell passes

18. In a heat exchanger with one fluid evaporating or condensing, the surface area required is least in ___b_____.

(a) Parallel flow

(b) Counter flow

(c) Cross flow

(d) Same in parallel, counter and cross flow arrangements

19. In a counter- flow heat exchanger, cold fluid enters at 30°C and leaves at 50°C, whereas the hot fluid enters at 150°C and leaves at 130°C. The mean temperature difference for this case is ___c____.

(a) 20°C

(b) 80°C

(c) 100°C

(d) Indeterminate

20. In a heat exchanger, the hot liquid enters with a temperature of 180°C and leaves at 160°C. The cooling fluid enters at 30°C and leaves at 110°C. The capacity ratio of the heat exchanger is ___a____.

(a) 0.25

(b) 1.5

(c) 0.33

(d) 0.2

21. The overall heat transfer coefficient for a shell and tube heat exchanger for clean surfaces is U_o=400W/m^2.K. The fouling after one year of operation is found to be h_o=2000W/m^2.K. The overall heat transfer coefficient at this time is ___c___.

(a) 1200W/m^2.K (b) 894W/m^2.K (c) 333W/m^2.K (d)287W/m^2.K

22. A correction of LMTD is necessary in case of __a____ heat exchanger.

(a) Cross flow

(b) Parallel flow

(c) Counter current

(d) All of theses

23. Fouling factor is used ___d____

(a) In heat exchanger design as a safety factor

(b) In case of Newtonian fluids

(c) When a liquid exchanges heat with a gas

(d) None of theses

24. In a shell and tube heat exchanger, baffles are provided on the shell side to ____d____.

(a) Improve heat transfer.

(b) Provide support for tubes

(c) Prevent stagnation of shell side fluid

(d) All of these

25. In a two-fluid heat exchanger, the inlet and outlet temperature of the hot fluid are 65°C and 40°C respectively. For the cold fluid these are 15°C and 42°C. The heat exchanger is a ___b____.

(a) Cross-flow heat exchanger

(b) Counter-flow heat exchanger

(c) Parallel-flow heat exchanger

(d) None of theses

26. In case of heat exchanger, the value of LMTD should be ___b___.

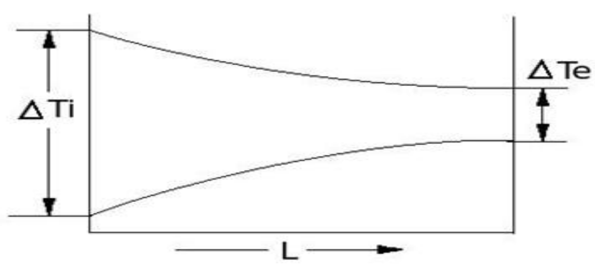
(a) As small as possible

(b) As large as possible

(c) Constant

(d) Has a specific level of temperature which depends on the size of the heat exchanger

27. Which type of flow in heat exchanger is represented in below diagram? ___a____.



Temperature Profile of Fluids in Heat Exchanger

(a) Parallel flow heat exchanger

(b) Counter flow heat exchanger

(c) Cross flow heat exchanger

(d) None of the above

28. For the same inlet and exit temperatures of two fluids, the LMTD for counter flow is always ___b_____.

(a) Smaller than LMTD for parallel flow

(b) Greater than LMTD for parallel flow

(c) Same as LMTD for parallel flow

(d) Unpredictable

29. For the same heat transfer Q and same overall heat transfer coefficient U_o, surface area required for parallel flow heat operation is always ___b_____.

(a) Less than that for counter flow

(b) More than that for counter flow

(c) Same as that for counter flow

(d) Unpredictable

30. For the same heat transfer Q and same overall heat transfer coefficient U_o, surface area required for cross flow operation is always ____a____.

(a) Less than LMTD for parallel flow

(b) More than LMTD for parallel flow

(c) Same as LMTD for parallel flow

(d) Unpredictable

31. In a direct contact heat exchanger, there is ___c____

(a) Mass transfer

(b) Heat transfer

(c) Heat & mass transfer

(d) None

32. In a condenser, the temperature of the hot fluid is __c___.

(a) Decreasing

(b) Increasing

(c) Remains constant (d) None

33. The sequence of the modes of heat transfer in case of a heat exchanger are ____c_____.

(a) Cond. + conv. + rad.

(b) Conv. +rad. + conv.

(c) Conv. + cond. + conv.

(d) None

34. a correction factor 'F' to calculate the rate of heat transfer in case of a ___c____.

(a) Parallel flow heat exchanger

(b) Counter flow heat exchanger

(c) Cross flow heat exchanger

(d) None

35. The equation of LMTD is ___c___.

(a) $(\Delta T_a + \Delta T_b)/ln(\Delta T_a/\Delta T_b)$

(b) $(\Delta T_a \Delta T_b)/ln(\Delta T_a/\Delta T_b)$

(c) $(\Delta T_a - \Delta T_b)/ln(\Delta T_a/\Delta T_b)$

(d) $None$

36. The general equation for heat transfer rate $\dot{Q}$, is expressed as:___c___

(a) $A\Delta T/U$ (b) $U/A\Delta T$ (c) $AU\Delta T$ (d) $UA/\Delta T$