Unit 8 - Week 6

Assignment 6

The due date for submitting this assignment has passed. Due on 2019-09-11, 23:59 IST.
As per our records you have not submitted this assignment.

1) Deoxidation of liquid steel with ferrosilicon produces spherical silica particles. A particle of 10 μm takes 6000 minutes to float up through a 5 m height liquid steel. Assuming stokes law, for a particle of 100 μm to float up through the same height, the time required in minutes is *1 point*

- 600
- 60
- 6000
- 1920

No, the answer is incorrect.
Score: 0
Accepted Answers:
60

2) Given that Density of liquid steel = $7900\ kg\ m^{-3}$ Viscosity of liquid steel = $5 \times 10^{-3}\ kg\ m^{-1} s^{-1}$;Density of the inclusion = $2500\ kg\ m^{-3}$; Acceleration due to gravity = $9.81\ m\ s^{-2}$ .What can be the maximum size of the inclusion (in μm) that can float up from the bottom of a liquid steel bath of 1 m height in 10 minutes. Assume that stokes law is valid. *1 point*

- 266.06
- 26.606
- 53.213
- 532.126

No, the answer is incorrect.
Score: 0
Accepted Answers:
26.606

3) A spherical bubble of radius *r* is rising upward with constant velocity U, in quiescent water of dynamic viscosity μ density of air and water is denoted by ρ_a and ρ_w respectively and g is acceleration due to gravity. Bubble motion is such that R_e << 1.The density of air can be neglected in comparison of water density ($\rho_a << \rho_w$). Which one of the following expression is true for the density of water? *1 point*

- $\rho_w = \frac{2}{9}\frac{\mu U}{r^2 g}$
- $\rho_w = \frac{9}{2}\frac{\mu U}{r^2 g}$
- $\rho_w = \frac{9}{4}\frac{\mu U}{r^2 g}$
- $\rho_w = \frac{4}{9}\frac{\mu U}{r^2 g}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\rho_w = \frac{9}{2}\frac{\mu U}{r^2 g}$

4) For analytical solution applicable for laminar flow over a sphere (creeping flow regime) the range of Reynold's number is *1 point*

- $R_e > 100$
- $R_e < 0.1$
- $R_e > 2000$
- $100 < R_e < 2000$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$R_e < 0.1$

5) The drag force exerted by a fluid on a body immersed in the fluid is due to *1 point*

- Pressure and Lorentz forces
- Pressure and viscous forces
- Pressure and surface tension forces
- Viscous and Marangoni forces

No, the answer is incorrect.
Score: 0
Accepted Answers:
Pressure and viscous forces

6) In fully turbulent flow regime, the friction factor *1 point*

- Increases with Reynold's number
- Decreases with Reynold's number
- Depends only upon the velocity of the fluid and increases with the velocity of the fluid
- Independent of Reynolds number

No, the answer is incorrect.
Score: 0
Accepted Answers:
Independent of Reynolds number

7) Consider the following statements *1 point*
1. The friction factor in laminar flow through a pipe is dependent on relative roughness of the pipe.
2. The friction factor for laminar flow through a pipe is directly proportional to Reynolds number.
3. In fully turbulent flow, through a pipe, friction factor is independent of Reynolds number.
Which of the statements given above are correct?

- 1, 2 and 3
- 1 and 3 only
- 2 and 3 only
- 1 and 2 only

No, the answer is incorrect.
Score: 0
Accepted Answers:
1 and 3 only

8) For laminar flow over a sphere if the friction factor is doubled, how will the Reynold's number change for the given flow? *1 point*

- Re will be doubled
- Re will be halved
- Re need not change
- Re will be quadrupled

No, the answer is incorrect.
Score: 0
Accepted Answers:
Re will be halved

9) For an external flow, which of the following is considered for computing the friction factor? *1 point*

- Total Surface Area
- Projected Area
- Wetted Area
- Lateral Surface Area

No, the answer is incorrect.
Score: 0
Accepted Answers:
Projected Area

10) A parachutist has a mass of 90 kg and a projected frontal area of $0.30\ m^2$ in free fall. The drag coefficient based on frontal area is found to be 0.75. If the air density is $1.28\ kg/m^3$, the terminal velocity of the parachutist will be *1 point*

- 104.4 m/s
- 78.3 m/s
- 25 m/s
- 18.5 m/s

No, the answer is incorrect.
Score: 0
Accepted Answers:
78.3 m/s

11) For solid spheres falling vertically downwards under gravity in a viscous fluid, the terminal velocity, V_{st} varies with diameter 'D' of the sphere as *1 point*

- $V_{st} \propto D^{1/2}$ for large diameters
- $V_{st} \propto D^2$ for small diameters
- $V_{st} \propto D$ for any diameter
- $V_{st} \propto D^{1/2}$ for small diameters

No, the answer is incorrect.
Score: 0
Accepted Answers:
$V_{st} \propto D^{1/2}$ *for small diameters*

12) A fluid flows past a solid cube with length a. What is the relevant area to be used to compute the friction factor for this situation? *1 point*

- $6a^2$
- a^2
- $4a^2$
- $2a^2$

No, the answer is incorrect.
Score: 0
Accepted Answers:
a^2

13) Friction factor for laminar flow through porous body is found to be 3. What is the Reynold's number (redefined as Re_s) *1 point*

- 0.07
- 0.14
- 0.7
- 1.4

No, the answer is incorrect.
Score: 0
Accepted Answers:
1.4

14) Flow takes place and Reynolds Number of 10^1 in two different pipes with relative roughness of 0.01 and 0.0001. The friction factor ... *1 point*

- will be higher in the case of pipe with relative roughness of 0.0001
- will be higher in the case of pipe having relative roughness of 0.01
- cannot be related to relative roughnes
- will be equal for both the pipes

No, the answer is incorrect.
Score: 0
Accepted Answers:
will be higher in the case of pipe having relative roughness of 0.01

15) A pipe friction test shows that, over the range of speeds used for the test,the log-log plot of non-dimensional friction factor 'f' with Reynolds Number is a straight line with a negative slope. From this, one can conclude that the *1 point*

- Fluid must be compressible
- Flow must be laminar
- Fluid must be supersonic
- Pipe must be rough

No, the answer is incorrect.
Score: 0
Accepted Answers:
Flow must be laminar

16) Two spherical particles have the same outer diameter but are made of different materials. The first one (with material density ρ_1) is solid, whereas the second (with material density ρ_2) is a hol-low sphere with the inner shell diameter equal to half the outer diameter. If both the spheres have the same terminal velocity in a fluid that has negligible density, then the ratio of their material densities, ρ_2/ρ_1 is *1 point*

- 1
- 8/7
- 2
- 8

No, the answer is incorrect.
Score: 0
Accepted Answers:
8/7

17) What is the terminal velocity in cm/s, calculated from Stokes law for a particle of diameter 0.1×10^{-3} m , density $2800\ kg/m^3$ settling in water of density $1000\ kg/m^3$ and viscosity 10^{-3} *kg/ms*? (Assume $g = 10\ m/s^2$) *1 point*

- 2
- 0.4
- 1
- 0.8

No, the answer is incorrect.
Score: 0
Accepted Answers:
1

18) For a particle settling in water at its terminal settling velocity, which of the following is true ? *1 point*

- Buoyancy = Weight + Drag
- Weight = Buoyancy + Drag
- Drag = Buoyancy + Weight
- Drag = Weight

No, the answer is incorrect.
Score: 0
Accepted Answers:
Weight = Buoyancy + Drag

19) Consider creeping flow over sphere of uniform size.What will be the value of friction drag if the value of form drag is 0.02, using the same units of force? *1 point*

- 0.01
- 0.04
- 0.1
- 0.4

No, the answer is incorrect.
Score: 0
Accepted Answers:
0.04

20) For an internal laminar flow through a pipe, the friction factor is found to 0.25. What will be the Reynold's number for the given flow using the convention for friction factor as given in this course? *1 point*

- 8
- 16
- 64
- 256

No, the answer is incorrect.
Score: 0
Accepted Answers:
64