Test - 1

Properties of fluids, Fluid Statics, Kinematics

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A pressure gage submerged at the depth of the ocean (specific gravity = 1.025) reads an absolute pressure of 1.4 MPa. What is the depth at which the instrument is present?

- ○ 4 m
- ◉ 129 m
- ○ 133 m
- ○ 140 m
- ○ 2008 m
- ○ 3090 m

Ketchup is an example of a

- ◉ Shear thinning fluid
- ○ Newtonian fluid
- ○ Shear thickening fluid

A dimensionless group formed from velocity, V, body size, L, fluid density, rho, and surface tension, sigma is:

- ○ L rho sigma/ V
- ○ rho V L^2 / sigma
- ◉ rho L V^2/ sigma
- ○ rho sigma L^2/V
- ○ sigma L V^2/ rho

A vacuum of 25 kPa is measured at a location where the elevation is 3000 m. What is the absolute pressure in millimeters of mercury? The pressure altitude data is shown in the figure. g = 9.81 m/s^2, SG of mercury = 13.6, density of water = 1000 kg/m^3. Round your answer to one decimal place.

Altitude (m)	Temperature (K)	Pressure (kPa)	Density (kg/m^3)	Velocity of sound (m/s)
0	288.2	101.3	1.225	340
500	284.9	95.43	1.167	338
1000	281.7	89.85	1.112	336
2000	275.2	79.48	1.007	333
4000	262.2	61.64	0.8194	325
6000	249.2	47.21	0.6602	316
8000	236.2	35.65	0.5258	308
10 000	223.3	26.49	0.4136	300
12 000	216.7	19.40	0.3119	295
14 000	216.7	14.17	0.2278	295
16 000	216.7	10.35	0.1665	295
18 000	216.7	7.563	0.1216	295
20 000	216.7	5.528	0.0889	295
30 000	226.5	1.196	0.0184	302
40 000	250.4	0.287	4.00×10^{-3}	317
50 000	270.7	0.0798	1.03×10^{-3}	330
60 000	255.8	0.0225	3.06×10^{-4}	321
70 000	219.7	0.00551	8.75×10^{-5}	297
80 000	180.7	0.00103	2.00×10^{-5}	269

341.5

Consider a circular cylindrical block (specific gravity = 0.5) floating in water (specific gravity = 1) with its axis horizontal. The length of the cylinder is L and the radius is R. Which of the following statement exactly describes the condition for the body to be in stable equilibrium?

- ○ L/R > pi
- ○ L/R < 2*pi
- ◉ R/L < 2
- ○ R/L > 1

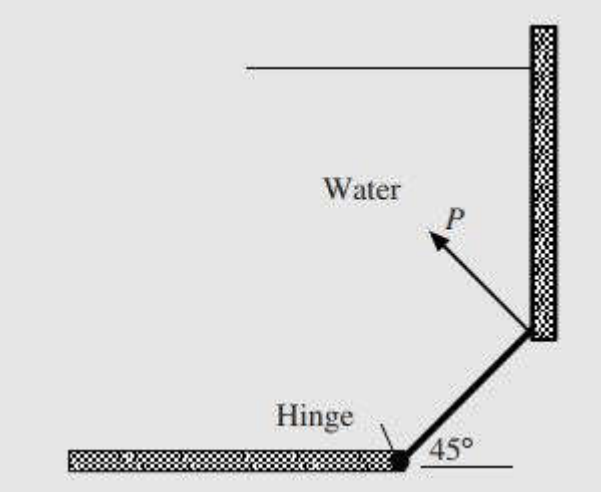
A floating body will always be in stable equilibrium when

- ○ Center of buoyancy is above center of gravity
- ○ Center of buoyancy is below the water
- ○ Center of buoyancy is above metacenter
- ◉ Metacenter is above the center of gravity

Your roll number: *

Your answer

A 60-cm square gate has its top edge 12 m below the water surface. It is on a 45– angle and its bottom edge is hinged as shown in the figure. What force P is needed to just open the gate?



- (●) 21940 N
- ( ) 13150 N
- ( ) 37240 N
- ( ) 26250 N

Find out the speed of a particle at (2, 1, -3) when t = 2 if the velocity field is given by (2xy, y^2 t, yz) m/s

5.385

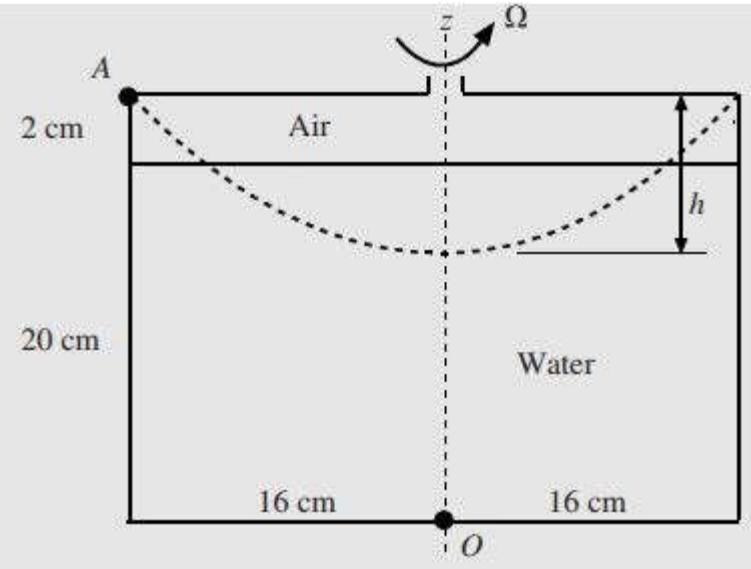
For the velocity field v = (2xy, 4tz^2, -yz). Determine the acceleration, angular velocity about the z axis, and vorticity vector at (2, -1, 1) at t = 2

(40, 20,-7); 2; -17i -4k

A steady incompressible flow is moving through a contraction of length L. The one dimensional velocity distribution is given by u = U0 * (1+2x/L). WHat is the advective component of acceleration at x = L?

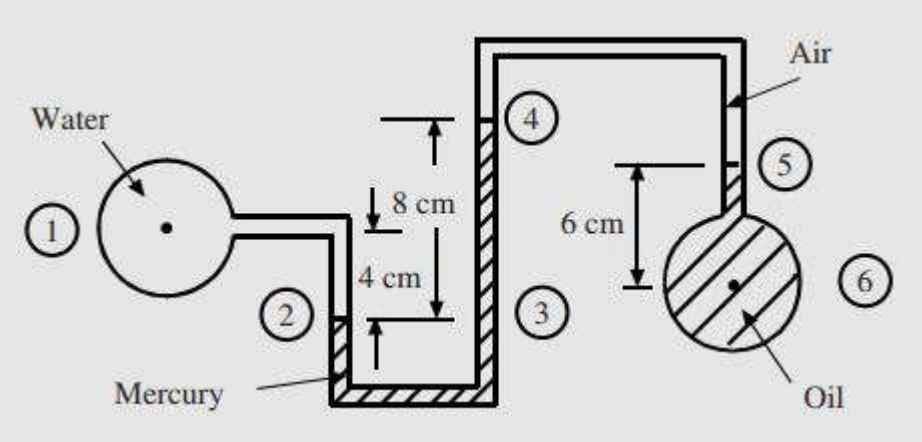
- ○ U0^2/L
- ○ 3U0^2/L
- ○ 4U0^2/L
- ◉ 6U0^2/L

The cylinder in the figure is rotated about the center axis as shown. What rotational speed is required so that the water just touches point A. Also, find the force on the bottom of the cylinder.



- ◉ 5.5 rad/s; 142 N
- ○ 5 rad/s; 120 N
- ○ 4.5 rad/s; 130 N
- ○ 6.5 rad/s; 120 N

A manometer connects an oil pipeline and a water pipeline as shown in figure. Determine the difference in pressure between the two pipelines using the readings on the manometer. Use SG oil = 0.86 and SG Hg = 13.6



- [ ] 9800 Pa
- [ ] 10560 Pa
- [ ] 10250 Pa
- [ ] 11500 Pa
- [x] 10780 Pa

A 1 m diameter sphere floats at the interface of mercury and water (SG = 13.6 and SG = 1) respectively so that 40 percent of it is below water. What is the specific gravity of the sphere?

- [ ] 6.1
- [ ] 7.28
- [ ] 7.78
- [x] 8.54
- [ ] 12.56

As the temperature increases, what happens to the viscosity of liquids and gases?

- (●) μ of gas increases and liquid decreases
- ( ) Viscosity does not change
- ( ) μ of gas decreases and liquid increases

A velocity field in a plane flow is given by V = 2yt i + x j. Find the equation of the streamline passing through (4, 2) at t = 2.

x^2 = 4 y^2

Find out the acceleration of a particle at (2, 1, -3) when t = 2 if the velocity field is given by (2xy, y^2 t, yz) m/s. Answer in terms of vector triplet (a,b,c). Put down the numbers inside round brackets with no space in between.

(10,9,-3)

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