socrative by MasteryConnect

Name: _____ Date: _____

Quiz name: Chapter 13 Test Review - Fluids

1. All fluids are
   - A gases
   - B liquids
   - C gasses or liquids
   - D non-metallic
   - E transparent

2. 1 Pa is
   - A 1 N/m
   - B 1 m/N
   - C 1 kg/(m·s)
   - D 1 kg/(m·s^2)
   - E 1 N/m·s

$P = \frac{F}{A} \rightarrow \frac{N}{m^2} = \frac{kg \cdot m/s^2}{m^2} = \frac{kg}{m \cdot s^2}$

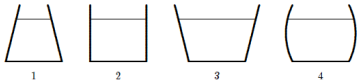
3. To obtain the absolute pressure from a guage pressure:
   - A subtract atmospheric pressure
   - B add atmospheric pressure
   - C subtract 273
   - D add 273
   - E convert to N/m^3

4. The pressure exerted on the ground by a man is greatest when
   - A he stands with both feet flat on the ground
   - B he stands flat on one foot
   - C he stands on the toes of one foot
   - D he lies down on the ground
   - E all of the above yield the same pressure

$P = \frac{F}{A}$ So when A is small, P is large

5. The vessels shown below all contain water to the same height. Rank them according to the pressure exerted by the water at a point located at the bottom of each vessel, least to greatest.
   - A 1, 2, 3, 4
   - B 3, 4, 2, 1
   - C 4, 3, 2, 1
   - D 2, 3, 4, 1
   - E All pressures are the same

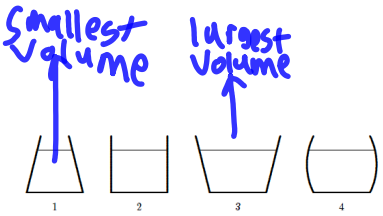
Same depth means same pressure



6. The vessels shown below all contain water to the same height. Rank them according to the contacting force for each flask has with the ground, greatest to least.

(A) 1, 2, 3, 4
(B) 3, 4, 2, 1
(C) 4, 3, 2, 1
(D) 2, 3, 4, 1
(E) All pressures are the same

we are simply seeing which container weighs the most so the one with the most water is the heaviest.



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7. In a stationary homogeneous liquid

(A) pressure is the same at all points
(B) pressure depends on the direction
(C) pressure is independent of any atmospheric pressure on the upper surface of the liquid
(D) pressure is the same at all points at the same level
(E) none of the above

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8. Several cans of different sizes and shapes are all filled with the same liquid to the same depth. Which statement is true?

(A) the weight of the liquid is the same for all cans
(B) the force of the liquid on the bottom of each can is the same
(C) the least pressure is at the bottom of the can with the largest bottom area
(D) the greatest pressure is at the bottom of the can with the largest bottom area
(E) the pressure on the bottom of each can is the same

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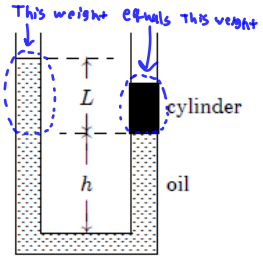
9. The diagram shows a U-tube with cross-sectional area A and partially filled with oil of density ρ. A solid cylinder, which fits the tube tightly but can slide without friction, is placed in the right arm. The system is in equilibrium. The weight of the cylinder is:

(A) ALρg
(B) $L^3\rho g$
(C) Aρ(L+h)g
(D) Aρ(L-h)g
(E) none of these

$F_g = mg$, $\rho = \frac{m}{V} \rightarrow m = \rho V$, $V = AL$, $m = \rho AL$, $F_g = \rho ALg$



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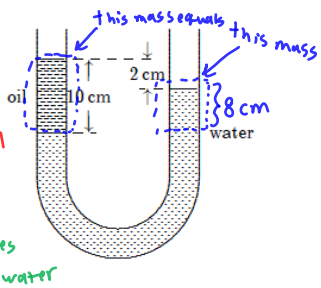
10. The density of water is 1.0g/cm3. The density of the oil in the left column of the U-tube shown below is:

(A) 0.20 g/cm^3
(B) 0.80 g/cm^3
(C) 1.0 g/cm^3
(D) 1.3 g/cm^3
(E) 5.0 g/cm^3

oil water
$m_o = m_w$
$\rho_o V_o = \rho_w V_w$
$\frac{V_o}{V_w} = \frac{\rho_w}{\rho_o}$ inversely proportional
So if $\frac{V_o}{V_w} = \frac{10}{8}$
then $\frac{\rho_o}{\rho_w} = \frac{8}{10} = 0.8$ times that of water



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11. A bucket resting on the floor of an elevator contains an incompressible fluid of density ρ. When the elevator has an upward acceleration of magnitude a the pressure difference between two points in a fluid separated by a vertical distance Δh, is given by:

(A) ρaΔh
(B) ρgΔh
(C) ρ(g + a)Δh

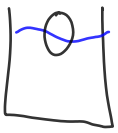
Accelerating upwards makes you feel heavier, so simply add the upward acceleration to the existing gravitational acceleration.

D ρ(g − a)Δh

E ρgaΔh

A certain object floats in fluids of density

1. 0.9 ρ_o
2. ρ_o
3. 1.1 ρ_o



In order to float, the F_B must be equal to F_g. So the buoyant force will always be F_g

12.

Which of the statements is true?

A the buoyant force of fluid i is greater than the buoyant forces of the other two fluids

B the buoyant force of fluid 3 is greater than the buoyant forces of the other two fluids

C the three fluids exert the same buoyant force

D the object displace the same volume of all three fluids

E none of these are true

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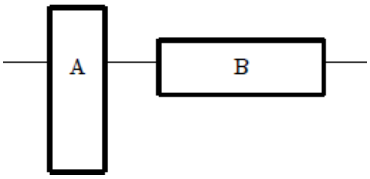
13. Two identical blocks of ice float in water as shown. Then



A block A displaces a greater volume of water since the pressure acts on a smaller bottom area

B block B displaces a greater volume of water since the pressure is less on its bottom

C the two blocks displace equal volumes of water since they have the same weight

D block A displaces a greater volume of water since its submerged end is lower in the water

E block B displaces a greater volume of water since its submerged end has a greater area

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14. A block of ice at 0 C containing a piece of cork is floating on the surface of ice water in a beaker. When the ice has melted the water level:

No mass is added to the system, so the pressure will not change either.

A is higher

B is lower

C is the same

D depends on the initial ratio of water to ice

E depends on the shape of the ice block

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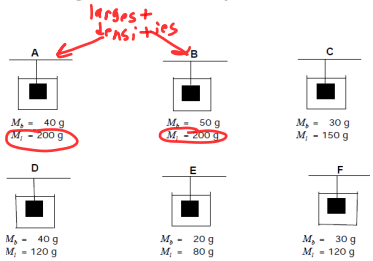
15. Consider the diagram shown. 6 different masses are suspended in 6 different fluids. Each fluid has the same volume and each mass has the same volume. Which of the following masses experiences the largest buoyant force? If there is a tie, select all that apply.

$F_B = \rho_f V_f g$ ← doesn't change.

ρ_f: different per fluid

V_f: same for all fluids



A

B

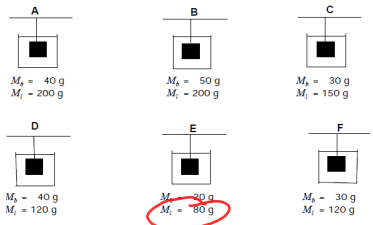
C

D

E

F

16. Consider the diagram shown. 6 different masses are suspended in 6 different fluids. Each fluid has the same volume and each mass has the same volume. Which of the following masses experiences the smallest buoyant force? If there is a tie, select all that apply.



Smallest densities

- (A) A
- (B) B
- (C) C
- (D) D
- (E) E
- (F) F

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17. An object hangs from a spring balance. The balance indicates 30 N in air and 20 N when the object is submerged in water. What does the balance indicate when the object is submersed in a liquid with a density that is half that of water?

$F_B = 10\,N$ in water

So it will be $F_B = 5$ in a fluid half as dense.

$30 - 5 = 25\,N$

- (A) 20 N
- (B) 25 N
- (C) 30 N
- (D) 35 N
- (E) 40 N

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18. A fir wood board floats in fresh water with 60% of its volume under water. The density of the wood in g/cm^3 is:

- (A) 0.4
- (B) 0.5
- (C) 0.6
- (D) less than 0.4
- (E) more than 0.6

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19. A boat floating in fresh water displaces 16,000 N of water. How many Newtons of saltwater would it displace if it floats in saltwater with density of 1.17 g/cm^3?

The boat is still floating so F_B still is 16,000 N

- (A) 14,500
- (B) 17,600
- (C) 16,000
- (D) 284
- (E) 234

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20. A rock, which weighs 1400 N in air, has an apparent weight of 900 N when submerged in fresh water (998 kg/m^3). The volume of the rock is:

$F_B = 500\,N = \rho_f V_s g$

$500 = (998)\,V_s\,(9.8)$

$V_s = 0.051\ m^3$

- (A) 0.14 m^3
- (B) 0.60 m^3
- (C) 0.90 m^3
- (D) 5.1 x 10^{-2} m^3
- (E) 9.2 x 10^{-2} m^3

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21. A loaded ship passes from a lake (fresh water) to the ocean (saltwater). Saltwater is more dense than fresh water and as a result the ship will:

- (A) ride higher in the water

It does not have to displace as much fluid.

(B) settle lower in the water
(C) ride at the same level in the water
(D) experience an increase in buoyant force
(E) experience a decrease in buoyant force

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22. A student standardizes the concentration of a saltwater solution by slowly adding salt until an egg will just float. The procedure is based on the assumption that:

(A) all eggs have the same volume
(B) all eggs have the same weight
(C) all eggs have the same density
(D) all eggs have the same shape
(E) the salt tends to neutralize the cholesterol in the egg

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23. The apparent weight of a steel sphere immersed in various liquids is measured using a spring scale. The greatest reading is obtained for that liquid:

(A) having the smallest density → this will minimize the buoyant force
(B) having the largest density
(C) subject to the greatest atmospheric pressure
(D) having the greatest volume
(E) in which the sphere was submerged deepest

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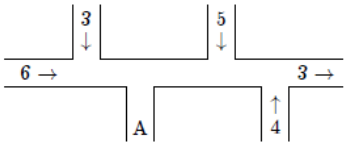
24. The diagram shows a pipe of uniform cross section in which water is flowing. The directions of flow and the volume flow rates (in cm^3/s) are shown for various portions of the pipe. The direction of flow and the volume flow rate in the portion marked A are:

Hint: Recall from circuits that the amount of current coming into a node is the same as the current coming out of the node!



(A) Down @ 3 cm^3/s
(B) Up @ 7 cm^3/s
(C) Down @ 9 cm^3/s
(D) Up @ 11 cm^3/s
(E) Down @ 15 cm^3/s

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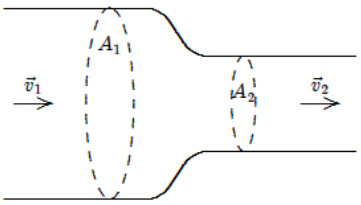
25. An in-compressible liquid flows along the pipe as shown. The ratio of the speeds v_2/v_1 is:

$A_1 v_1 = A_2 v_2$

$\frac{v_2}{v_1} = \frac{A_1}{A_2}$



(A) A_1/A_2
(B) A_2/A_1
(C) sqrt(A_1/A_2)
(D) sqrt(A_2/A_1)
(E) v_1/v_2

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26. Bernoulli's equation can be derived from the conservation of:

(A) energy
(B) mass
(C) angular momentum
(D) volume
(E) pressure

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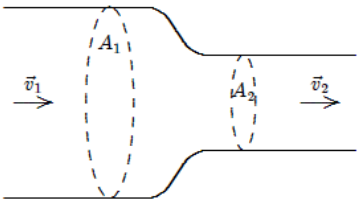
27. Water flows through a constriction in a horizontal pipe. As it enters the constriction, the water's:



(A) speed increases and pressure decreases
(B) speed increases and pressure remains constant
(C) speed increases and pressure increases
(D) speed decreases and pressure increases
(E) speed decreases and pressure decreases

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28. A large tank filled with water has two holes in the bottom, one with twice the radius of the other. In steady flow the speed of water leaving the larger hole is the speed of the water leaving the smaller.

(A) twice
(B) four times
(C) half
(D) one-fourth
(E) the same as

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29. Water flows through a cylindrical pipe of varying cross section. The velocity is 3.0 m/s at a point where the pipe diameter is 1.0 cm. At a point where the pipe diameter is 3.0 cm, the velocity is:

Area gets increased by X9
So velocity gets decreased by $X\frac{1}{9}$
$3 X \frac{1}{9} = \left(\frac{1}{3}\right)$

(A) 9 m/s
(B) 3 m/s
(C) 1 m/s
(D) 0.33 m/s
(E) 0.11 m/s

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30. The equation of continuity for fluid flow can be derived from the conservation of:

(A) energy
(B) flow rate
(C) angular momentum
(D) volume
(E) pressure

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31. Imagine holding two bricks under water. Brick A is just beneath the surface of the water, while brick B is at a greater depth. The force needed to hold brick B in place is _____ the force required to hold brick A in place

(A) larger than
(B) the same as
(C) smaller than

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32. A 200-ton ship enters the lock of a canal. The fit between the sides of the lock and the ship is tight so that the weight of the water left in the lock after it closes is much less than 200 tons. Can the ship still float if the quantity of water left in the lock is much less than the ship's weight?

(A) Yes, as long as the water gets up to the ship's waterline.
(B) No, the ship touches bottom because it weighs more than the water in the lock.

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33. When a hole is made in the side of a container holding water, water flows out and follows a parabolic trajectory. If the container is dropped in free fall, the water flow

(A) diminishes

This essentially turns $g = 0$, so no pressure exists

B stops altogether

C goes out in a straight line

D curves upward

A container is filled with oil and fitted on both ends with pistons. The area of the left piston is 10 mm^2; that of the right piston 10,000 mm^2. What force must be exerted on the left piston to keep the 10,000-N car on the right at the same height?

34. HINT: The pressure must be the same on both sides.

A 10 N

B 100 N

C 10,000 N

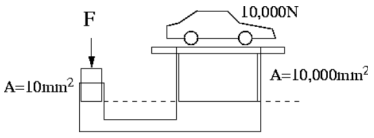
D 106 N

E 108 N

$P_1 = P_2$

$\frac{F_1}{A_1} = \frac{F_2}{A_2}$

$\frac{F_1}{10} = \frac{10,000}{10,000}$ $F_1 = 10$



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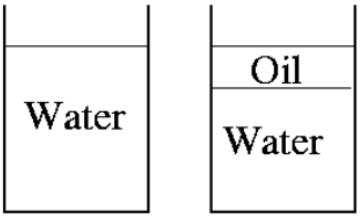
35. Two beakers are filled with fluid. One is filled with water. The other is filled with a mixture of oil (less dense than water) and water to the same level. Which beaker has the greatest pressure at a point on the bottom of the beaker?

A The Water Beaker

B The Oil/Water Beaker

C Both the Same



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36. Consider two identical glasses. One contains water. One contains a combination of ice and water. The water level is the same in both glasses. Which weighs more?

A The glass without ice cubes

B The glass with ice cubes

A The two weight the same

Same depth means same pressure.

Since glasses are identical, this would mean same weight.

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37. An in-compressible fluid is flowing through a pipe. At which point is the fluid traveling the fastest?

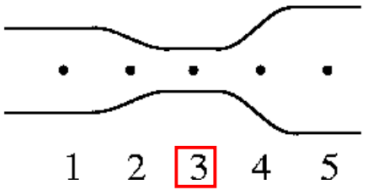
A 1

B 2

B 3

D 4

E 5



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38. An in-compressible fluid flows through a pipe. Compare the pressure at points 1 and 2.

A Greater at 1

B Greater at 2

C Both the same

D Not enough info

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39. Consider a small, horizontal artery in which there is a constriction due to plaque. This constriction reduces the cross sectional area of the artery. The pressure in the constricted region is _____ the pressure in the unconstricted region.

A greater than

B less than

faster speeds → smaller pressure

C the same as

40. In a laboratory experiment, the amount of significant figures recorded for a measurement should be based on

A Having at least 3 significant figures

B Knowing what the exact value should be

C The precision of the instrument used to make the measurement

D Lying