Name:_____ Class:_____ Date:_____

AP Physics 2 - Chapter 9 Test

Indicate the answer choice that best completes the statement or answers the question.

___ 1. A hole is poked through the metal side of a drum holding water. The hole is 19 cm below the water surface. What is the initial speed of outflow?

a. 1.9 m/s

b. 19.3 m/s

c. 0.6 m/s

d. 3.7 m/s

e. 1.4 m/s

___ 2. A blimp is filled with 400 m^3 of helium. How big a payload can the balloon lift? (The density of air is 1.29 kg/m^3; the density of helium is 0.18 kg/m^3.)

a. 360 kg

b. 516 kg

c. 72 kg

d. 444 kg

e. 588 kg

___ 3. Water (density = 1×10^3 kg/m^3) flows at 10 m/s through a pipe with radius 0.025 m. The pipe goes up to the second floor of the building, 2.5 m higher, and the pressure remains unchanged. What is the radius of the pipe on the second floor?

a. 0.011 m

b. 0.03 m

c. 0.001 m

d. 0.187 m

e. 0.023 m

___ 4. If the column of mercury in a barometer stands at 73.2 cm, what is the atmospheric pressure? (The density of mercury is 13.6×10^3 kg/m^3 and $g = 9.80$ m/s^2)

a. 0.976×10^5 N/m^2

b. 97.561×10^5 N/m^2

c. 1.176×10^5 N/m^2

d. 0.018×10^5 N/m^2

e. 1.016×10^5 N/m^2

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___ 5. The Greenland ice sheet can be one km thick. Estimate the pressure underneath the ice. (The density of ice is 918 kg/m^3.)

a. 9.0×10^5 Pa (9 atm)

b. 2.5×10^6 Pa (25 atm)

c. 4.5×10^6 Pa (45 atm)

d. 9.0×10^6 Pa (90 atm)

___ 6. A block of wood has specific gravity 0.70. When placed in water, what percent of the volume of the wood is above the surface?

a. 0, the block sinks.

b. 30%

c. 70%

d. 50%

e. 100%

___ 7. What is the total force on the bottom of a 2.0-m-diameter by 2.0-m-deep round wading pool due to the weight of the air and the weight of the water? (Note the pressure contribution from the atmosphere is 1.0×10^5 N/m^2, the density of water is 1 000 kg/m^3, and g = 9.8 m/s^2.)

a. 3.8×10^5 N

b. 15×10^6 N

c. 3.8×10^6 N

d. 5.3×10^6 N

e. 2.3×10^5 N

___ 8. A piece of aluminum has density 2.70 g/cm^3 and mass 751 g. The aluminum is submerged in a container of oil (oil's density = 0.650 g/cm^3). How much oil does the metal displace?

a. 278 cm^3

b. 181 cm^3

c. 428 cm^3

d. 2 027.7 cm^3

e. 3 120 cm^3

___ 9. The flow rate of a liquid through a 4.0-cm-radius pipe is 0.0070 m^3/s. The average fluid speed in the pipe is:

a. 0.04 m/s.

b. 0.005 m/s.

c. 0.14 m/s.

d. 1.4 m/s.

e. 14 m/s.

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___ 10. A solid object is made of two materials, one material having density of 2 000 kg/m^3 and the other having density of 5 000 kg/m^3. If the object contains equal volumes of the materials, what is its average density?

a. 2 857 kg/m^3

b. 3 500 kg/m^3

c. 4 500 kg/m^3

d. 7 000 kg/m^3

e. more information is needed

___ 11. An ideal fluid, of density 0.85×10^3 kg/m^3, flows at 0.27 kg/s through a pipe of radius 0.018 m. What is the fluid speed?

a. 3.09 m/s

b. 0.0028 m/s

c. 265.26 m/s

d. 0.31 m/s

e. 1.16 m/s

___ 12. Water is being sprayed from a nozzle at the end of a garden hose of diameter 2.5 cm. If the nozzle has an opening of diameter 1.0 cm, and if the water leaves the nozzle at a speed of 14 m/s, what is the speed of the water inside the hose?

a. 2.24 m/s

b. 87.5 m/s

c. 0.01 m/s

d. 3.24 m/s

e. also 14 m/s

___ 13. A fountain sends water to a height of 100 m. What must be the pressurization (above atmospheric) of the underground water system? (1 atm = 10^5 N/m^2)

a. 1 atm

b. 44.3 atm

c. 10.8 atm

d. 9.8 atm

e. 0.1 atm

___ 14. Dams at two different locations are needed to form a lake. When the lake is filled, the water level will be at the top of both dams. The Dam #2 is twice as high and twice as wide as Dam #1. How much greater is the force of the water on Dam #2 than the force on Dam #1? (Ignore atmospheric pressure; it is pushing on both sides of the dams.)

a. 2

b. 4

c. 8

d. 16

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___ 15. Water is sent from a fire hose at 25 m/s at an angle of 30° above the horizontal. What is the maximum height reached by the water?

a. 4 m

b. 8 m

c. 16 m

d. 156 m

e. 32 m

___ 16. A stonecutter's chisel has an edge area of 0.45 cm^2. If the chisel is struck with a force of 46 N, what is the pressure exerted on the stone?

a. 1 022 Pa

b. 10 220 Pa

c. 102 200 Pa

d. 1 022 000 Pa

e. 511 000 Pa

___ 17. The Garfield Thomas water tunnel at Pennsylvania State University has a circular cross-section that constricts from a diameter of 3.6 m to the test section, which is 1.2 m in diameter. If the speed of flow is 4.0 m/s in the large-diameter pipe, determine the speed of flow in the test section.

a. 0.4 m/s

b. 4 m/s

c. 36 m/s

d. 5 m/s

e. 38 m/s

___ 18. In a large tank of liquid, the hydrostatic pressure at a given depth is a function of:

a. depth.

b. surface area.

c. liquid density.

d. Choices a and c are both valid.

___ 19. A large stone is resting on the bottom of the swimming pool. The normal force of the bottom of the pool on the stone is equal to the:

a. weight of the stone.

b. weight of the water displaced.

c. sum of the weight of the stone and the weight of the displaced water.

d. difference between the weight of the stone and the weight of the displaced water.

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___ 20. A ping-pong ball has an average density of 0.0840 g/cm^3 and a diameter of 3.80 cm. What force would be required to keep the ball completely submerged under water?
a. 1.000 N
b. 0.788 N
c. 0.516 N
d. 0.258 N

___ 21. An ice cube with a small solid steel sphere frozen inside floats in a glass of water filled to the brim. What happens to the level of water in the glass as a result of the ice melting?
a. It goes up, overflowing.
b. It stays the same.
c. It goes down.
d. It depends on air pressure, thus the answer is indeterminate.

___ 22. The pressure inside a commercial airliner is maintained at 1.00 atm (10^5 Pa). What is the net outward force exerted on a 1.0 m × 2.0 m cabin door if the outside pressure is 0.30 atm?
a. 140 N
b. 1 400 N
c. 14 000 N
d. 140 000 N

___ 23. By what factor is the total pressure greater at a depth of 890 m in water than at the surface where pressure is one atmosphere? (water density = 1.0×10^3 kg/m^3, 1 atmosphere pressure = 1.01×10^5 N/m^2, and $g = 9.8$ m/s^2)
a. 9
b. 86
c. 96
d. 76
e. 8 722

___ 24. A heavily loaded boat is floating in a pond. The boat starts to sink because of a leak but quick action plugging the leak stops the boat from going under although it is now deeper in the water. What happens to the surface level of the pond?
a. It stays the same.
b. It goes up.
c. It goes down.
d. More information is needed to reach a conclusion.

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Answer Key

1. a
2. d
3. b
4. a
5. d
6. b
7. a
8. a
9. d
10. b
11. d
12. a
13. d
14. c
15. b
16. d
17. c
18. d
19. d
20. d
21. c
22. d
23. b
24. a