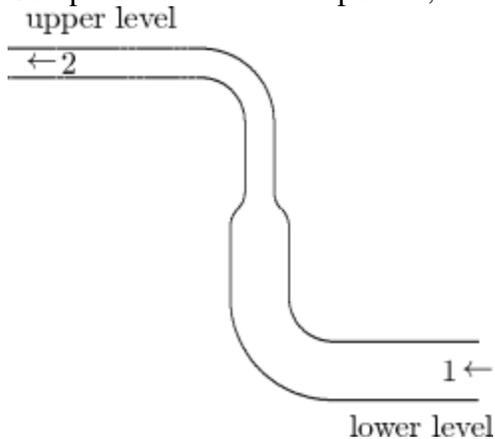


Name: _____ Date: _____

1. The principle of fluid pressure that is used in hydraulic brakes or lifts is that:
 - A) pressure is the same at all levels in a fluid
 - B) increases of pressure are transmitted equally to all parts of a fluid
 - C) the pressure at a point in a fluid is due to the weight of the fluid above it
 - D) increases of pressure can only be transmitted through fluids
 - E) the pressure at a given depth is proportional to the depth in the fluid

2. A fluid is undergoing “incompressible” flow. This means that:
 - A) the pressure at a given point cannot change with time
 - B) the velocity at a given point cannot change with time
 - C) the velocity must be the same everywhere
 - D) the pressure must be the same everywhere
 - E) the density cannot change with time or location

3. Water is pumped through the hose shown below, from a lower level to an upper level. Compared to the water at point 1, the water at point 2:



- A) has greater speed and greater pressure
- B) has greater speed and less pressure
- C) has less speed and less pressure
- D) has less speed and greater pressure
- E) has greater speed and the same pressure

Write the letter for the correct answer on the answer sheet. Write clearly.

4. A closed hemispherical shell of radius R is filled with fluid at uniform pressure P . The net force of the fluid on the curved portion of the shell is given by:
- A) $2\pi R^2 P$
 - B) $\pi R^2 P$
 - C) $4\pi R^2 P$
 - D) $(4/3)\pi R^2 P$
 - E) $(4/3)\pi R^3 P$
5. All fluids are:
- A) gases
 - B) liquids
 - C) gases or liquids
 - D) non-metallic
 - E) transparent
6. Water flows from a 6.0-cm diameter pipe into an 8.0-cm diameter pipe. The speed in the 6.0-cm pipe is 5.0 m/s. The speed in the 8.0-cm pipe is:
- A) 2.8 m/s
 - B) 3.7 m/s
 - C) 6.6 m/s
 - D) 8.8 m/s
 - E) 9.9 m/s
7. 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

8. A lawn sprinkler is made of a 1.0-cm diameter garden hose with one end closed and 25 holes, each with a diameter of 0.050 cm, cut near the closed end. If water flows at 2.0 m/s in the hose, the speed of the water leaving a hole is:
- A) 2.0 m/s
 - B) 32 m/s
 - C) 40 m/s
 - D) 600 m/s
 - E) 800 m/s
9. 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:
- A) 0.14 m^3
 - B) 0.60 m^3
 - C) 0.90 m^3
 - D) $5.1 \times 10^{-2} \text{ m}^3$
 - E) $9.2 \times 10^{-2} \text{ m}^3$
10. A person blows across the top of one arm of a U-tube partially filled with water. The water in that arm:
- A) rises slightly
 - B) drops slightly
 - C) remains at the same height
 - D) rises if the blowing is soft but drops if it is hard
 - E) rises if the blowing is hard but drops if it is soft
11. Barometers and open-tube manometers are two instruments that are used to measure pressure.
- A) Both measure gauge pressure
 - B) Both measure absolute pressure
 - C) Barometers measure gauge pressure and manometers measure absolute pressure
 - D) Barometers measure absolute pressure and manometers measure gauge pressure
 - E) Both measure an average of the absolute and gauge pressures

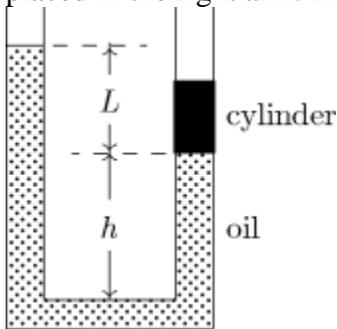
Write the letter for the correct answer on the answer sheet. Write clearly.

12. A block of ice at 0°C is floating on the surface of ice water in a beaker. The surface of the water just comes to the top of the beaker. When the ice melts the water level will:
- A) rise and overflow will occur
 - B) remain the same
 - C) fall
 - D) depend on the initial ratio of water to ice
 - E) depend on the shape of the block of ice
13. One end of a cylindrical pipe has a radius of 1.5 cm. Water (density = $1.0 \times 10^3\text{ kg/m}^3$) streams steadily out at 7.0 m/s. The rate at which mass is leaving the pipe is:
- A) 2.5 kg/s
 - B) 4.9 kg/s
 - C) 7.0 kg/s
 - D) 48 kg/s
 - E) $7.0 \times 10^3\text{ kg/s}$
14. Bernoulli's equation can be derived from the conservation of:
- A) energy
 - B) mass
 - C) rotational momentum
 - D) volume
 - E) pressure
15. 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

16. A non-viscous incompressible liquid is flowing through a horizontal pipe of constant cross section. Bernoulli's equation and the equation of continuity predict that the drop in pressure along the pipe:

A) is zero
 B) depends on the length of the pipe
 C) depends on the fluid velocity
 D) depends on the cross-sectional area of the pipe
 E) depends on the height of the pipe

17. 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:



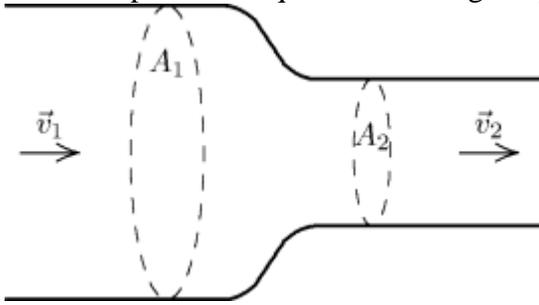
A) $AL\rho g$
 B) $L^3\rho g$
 C) $A\rho(L+h)g$
 D) $A\rho(L-h)g$
 E) none of these

18. If P is a pressure and ρ is a density then P/ρ has units of:

A) m^2
 B) m^2/s^2
 C) N/m^2
 D) kg/m^2
 E) m^3/kg

- 19.** Water (density = $1.0 \times 10^3 \text{ kg/m}^3$) flows through a horizontal tapered pipe. At the wide end its speed is 4.0 m/s. The difference in pressure between the two ends is $4.5 \times 10^3 \text{ Pa}$. The speed of the water at the narrow end is:
- A) 2.6 m/s
 - B) 3.4 m/s
 - C) 4.0 m/s
 - D) 4.5 m/s
 - E) 5.0 m/s
- 20.** 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?
- A) 20 N
 - B) 25 N
 - C) 30 N
 - D) 35 N
 - E) 40 N
- 21.** Mercury is a convenient liquid to use in a barometer because:
- A) it is a metal
 - B) it has a high boiling point
 - C) it expands little with temperature
 - D) it has a high density
 - E) it looks silvery

22. An incompressible liquid flows along the pipe as shown. The ratio of the speeds v_2/v_1 is:



- 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
23. Water is streaming downward from a faucet opening with an area of $3.0 \times 10^{-5} \text{ m}^2$. It leaves the faucet with a speed of 5.0 m/s . The cross-sectional area of the stream 0.50 m below the faucet is:
- A) $1.5 \times 10^{-5} \text{ m}^2$
 B) $2.0 \times 10^{-5} \text{ m}^2$
 C) $2.5 \times 10^{-5} \text{ m}^2$
 D) $3.0 \times 10^{-5} \text{ m}^2$
 E) $3.5 \times 10^{-5} \text{ m}^2$
24. Water is pumped into one end of a long pipe at the rate of 40 L/min . It emerges at the other end at 24 L/min . A possible reason for this decrease in flow is:
- A) the water is being pumped uphill
 B) the water is being pumped downhill
 C) the diameter of the pipe is not the same at the two ends
 D) friction in the pipe
 E) a leak in the pipe

- 25.** Two balls have the same shape and size but one is denser than the other. If frictional forces are negligible when they are dropped in air, which has the greater acceleration?
- A)** The heavier ball
 - B)** The lighter ball
 - C)** They have the same acceleration
 - D)** The heavier ball if atmospheric pressure is high, the lighter ball if it is low
 - E)** The lighter ball if atmospheric pressure is high, the heavier ball if it is low

Write the letter for the correct answer on the answer sheet. Write clearly.

Answer Key

1. B
2. E
3. B
4. B
5. C
6. A
7. E
8. B
9. D
10. A
11. D
12. B
13. B
14. A
15. C
16. A
17. A
18. B
19. E
20. B
21. D
22. A
23. C
24. E
25. A