AP Physics 2 Unit – 1 -: Fluids Algebra Based Practice Test

Question 1

Two spherical objects are placed in a bucket of water. One object has mass $m_2 = 1.5\,kg$, while the other has mass $m_1 = 2\,kg$. Both objects have the same diameter. The buoyant force acting on m_1 is _____ the buoyant force on m_2.

A. Equal to
B. Greater than
C. Less than
D. In opposite direction

Question 2

Determine the volume of water that needs to be displaced in order for a 90kg man to be able to float.

A. 180 L
B. 120 L
C. 90 L
D. 45 L

Question 3

At what depth within a salt water solution will the gauge pressure be equal to three times the atmospheric pressure?

Use $\rho_{salt\,water} = 1100\frac{kg}{m^3}$; $P_{atm} = 101235\,Pa$

A. 28.20 m
B. 37.6 m
C. 18.8 m
D. 9.4 m

Question 4

Suppose that two different balls of equal volume are submerged and held in a container of water. Ball A has a density of 0.4 $\frac{g}{cm^3}$ and Ball B has a density of 0.6 $\frac{g}{cm^3}$. After the two balls are released, both of them begin to accelerate up towards the surface. Which ball is expected to accelerate faster?

A. Neither ball will accelerate
B. Ball B will have greater acceleration
C. Ball A will have greater acceleration
D. Ball A and ball B will have the same acceleration

Question 5

A ball with radius r = 0.22m is submerged in syrup at a depth of 4m. What is the total force from pressure acting on the ball?

Use: $g=10\frac{m}{s^2}$; $\rho_s=1370\frac{kg}{m^3}$; $P_{atm}=100\,kPa$

A. 33 kN
B. 78 kN
C. 64 kN
D. 49 kN

Question 6

A U-shaped tube is filled with water, however the openings on either ends have different cross-sectional areas of $5\,m^2$ and $10\,m^2$. If a force of 100N is applied to the opening that is $5\,m^2$ in area, how much force will be exerted on the other end of the tube?

A. 25 N
B. 50 N
C. 75 N
D. 100 N

Question 7

Calculate the difference in pressure, ΔP, between the surface of a lake and a depth of 15m below the surface.

A. 248 kPa
B. 73.6 kPa
C. 15.8 kPa
D. 147 kPa

Question 8

Water is flowing through a horizontal pipe. Water enters the left side of the pipe at a pressure P=100kPa and a velocity of $v=9.5\frac{m}{s}$. It leaves the pipe at a pressure of P=85kPa. What is the velocity of the water when it leaves the pipe? Use: $\rho_{water}=1000\frac{kg}{m^3}$

A. $v_2=5.48\frac{m}{s}$
B. $v_2=3.66\frac{m}{s}$
C. $v_2=8.32\frac{m}{s}$
D. $v_2=10.37\frac{m}{s}$

Question 9

As the velocity of a fluid increases, what happens to the pressure? Assume both states of the fluid are at the same height and the pipe has a constant diameter.

A. Velocity has no effect of pressure
B. As velocity increases, the pressure stays the same
C. As velocity increases, the pressure increases
D. As velocity increases, the pressure decreases

Question 10

An object with mass 10 kg and volume 4L and reference area of $0.05\,m^2$ is sinking in water with a constant velocity of $2\frac{m}{s}$. What is the drag coefficient of the object?

Use: ¿ $10\frac{m}{s^2}$; $\rho_{water} = 1000\frac{kg}{m^3}$

A. 0.30
B. 0.60
C. 0.75
D. 0.45

Question 11

Paul weighs 100N. What must be the surface area of his shoe if he uses it to try to kill an ant? Assume the shoe applies uniform force, he can only apply as much force as his weight, and his other foot is not in contact with the ground. The ant cannot withstand any pressure greater than 80kPa.

A. 1.25 m^2
B. 0.125 m^2
C. 0.00125 m^2
D. 12.5 m^2

Question 12

Suppose that a cube composed of a mysterious substance is hanging from a string while also submerged in water. If the cube is not moving and has a side length of 8cm and the tension in the string is equal to 15N, what is the specific gravity of this mysterious substance?

Use: $\rho_{water} = 1\frac{g}{cm^3}$

A. 3.939
B. 7.976
C. 10.24
D. 5.123

Question 13

By what factor does the Reynolds's number change for water flowing through a circular tube as the cross-sectional area of the tube gradually triples?

A. 0.58
B. 0.77
C. 1.0
D. 1.3

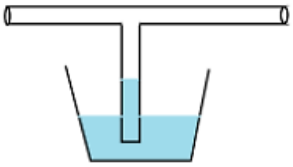
Question 14

Suppose that water flows from a pipe with a diameter of 1m into another pipe of diameter 0.5m. If the speed of water in the first pipe is 5 $\frac{m}{s}$, what is the speed in the second pipe?

A. 10 $\frac{m}{s}$
B. 5 $\frac{m}{s}$
C. 2.5 $\frac{m}{s}$
D. 20 $\frac{m}{s}$

Question 15

A venturi is a T-shaped tube in which the vertical tube is in water. A high-speed stream of air is forced through the horizontal tube. As a result, water rises in the vertical tube, as shown in the given figure. If air is forced through the horizontal tube at v=7 $\frac{m}{s}$, how high will the water rise in the vertical tube?



A. The water in the vertical tube will not change its height
B. The water in the vertical tube will be pulled down
C. h = 3.22 cm
D. h = 4.52 cm

Question 16

Water is flowing through a hose. It comes out of the tap at a pressure of P=120kPa, velocity of v=7 $\frac{m}{s}$, and height of h=0m. It leaves the nozzle at a velocity of v=4 $\frac{m}{s}$ and a height of h=2m. What is the pressure of the water when it leaves the hose?

Use: $\rho_{water} = 1000 \frac{kg}{m^3}$

A. $P_2 = 136.7\, kPa$

B. $P_2 = 116.9\,kPa$
C. $P_2 = 150.24\,kPa$
D. $P_2 = 125.89\,kPa$

Question 17

Fluid enters a pipe at 24 $\frac{m}{s}$ and exits the pipe at 48 $\frac{m}{s}$. What is the diameter of the pipe exit if the entrance has a 26m diameter?

A. $d_{out} = 18.38\,m$
B. $d_{out} = 20.11\,m$
C. $d_{out} = 10.55\,m$
D. $d_{out} = 9.19\,m$

Question 18

What is the Reynold's number of water flowing through a fully filled rectangle duct that is 50x30cm at a velocity v=2.5 $\frac{m}{s}$? Use: $\rho_{water} = 1000\frac{kg}{m^3}$:

$\mu_w = 1.002\,x\,10^{-3}\,Pa \cdot s$

A. 9,400
B. 1,000,000
C. 10,000
D. 940,000

Question 19

How much of an iceberg is submerged below the water if the density of ice is 917 $\frac{kg}{m^3}$ and the density of water is 1000 $\frac{kg}{m^3}$?

A. 80.3 %
B. 9.3 %
C. 91.7 %
D. 109 %

Answer Key

1. A
2. C
3. A
4. C
5. B
6. B
7. D
8. A
9. D
10. B
11. C
12. A
13. A
14. D
15. C
16. B
17. A
18. D
19. C