PHYSICS CLUB

STEM ASYUT

Grade 10

TEST BANK FOR PHYSICS LO.8

. Leader: Marven Waheed

. Co-Leader: Jomana Mohamed

LO.08 “Fluids as intro”

1. 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. 2πR2p
B. πR2p
C. 4πR2p
D. (4/3) πR2p
E. (4/3) πR3p

2. An airtight box, having a lid of area 80cm^2, is partially evacuated. Atmospheric pressure is 1.01×10^5 Pa. A force of 600N is required to pull the lid off the box.
The pressure in the box was:
A. 2.60×10^4 Pa
B. 6.35×10^4 Pa
C. 7.50×10^4 Pa
D. 1.38×10^5 Pa
E. 1.76×10^5 Pa

3. An object hangs from a spring balance. The balance indicates 30N in air and 20N 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. 20N
B. 25N
C. 30N
D. 35N
E. 40N

4. A rock, which weighs 1400N in air, has an apparent weight of 900N when submerged in fresh water (998kg/m3). The volume of the rock is:
A. 0.14m3
B. 0.60m3
C. 0.90m3
D. 5.1×10−2 m3
E. 9.2×10−2 m3

5 . A bucket resting on the floor of an elevator contains an incompressible fluid of density “ρ”. When the elevator has a downward 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
D. ρ(g−a)Δh
E. ρgaΔh

6. 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

7. A boat floating in fresh water displaces 16,000N of water. How many newtons of saltwater would it displace if it floats in saltwater of specific gravity 1.17?
A. 14,500
B. 17,600
C. 16,000

Team Leader:
Marwen Waheed

Team Leader:
Jomana Mohamed

8. A block of wood weighs 160N and has a specific gravity of 0.60. To sink it in fresh water requires an additional downward force of:
A. 54N
B. 64N
C. 96N
D. 110N
E. 240N

9- A certain object floats in fluids of density (0.9ρ0,1ρ0 , 1.1ρ0) Which of the following statements is true?
A. the buoyant force of fluid 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 displaces the same volume of all three fluids
E. none of these are true

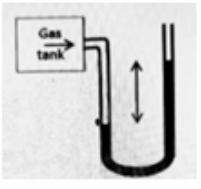
10- A body its volume is 60CM3 HALF IMMERSED IN WATER CALCULATE ITS DENSITY
A. 430
B. 170
C. 500
D. 234
E. 670

11-A diver dive to a certain depth in sea water, then he dives o the same depth in fresh water, given that the density of sea water is 1024 kg/m3, which of the following statement is true?
A - The pressure acts in a direction downward
B- The pressure acts in a direction upward
C- The pressure in sea water is greater than that at fresh water
D- The pressure in sea water is less than that at fresh water

12-In a tornado, the pressure is 15% below normal atmospheric pressure, suppose a tornado suddenly occurred outside your front door, which is 182 cm high and 91 cm wide. What net force would be exerted on the door?
A - 2.5 x 104 Newton (N)
B - 3.2 x 104 Newton (N)
C- 1.4 x 105 Newton (N)
D- 2.8 x 105 Newton (N)

13-The correct arrangement of the measuring units of the atmospheric pressure starting from the smallest unit is that labeled ...
a) Bar – Atmosphere – Pascal – Torr.
b) Torr – Pascal – Bar – Atmosphere.
c) Pascal– Atmosphere – Bar– Torr.
d) Pascal – Torr – Bar – Atmosphere.

14-A mercury manometer is connected to a gas tank. The difference between the mercury levels is 38 cm as shown. If the atmospheric pressure at that time = 1.013 bar. What is the absolute pressure of the gas inside the tank?
a) 0.5 atmosphere
b) 1 atmosphere
c) 1.5 atmosphere
d) 2 atmospheres



15-The gauge used to estimate the blood pressure is a type of .....
a) Manometers
b) Barometers
c) Hygrometers
d) Thermometers

16-How many kilopascals (Kpa) in 760-centimeter mercury (cm Hg)?
A- 1.013x102 Kpa
B- 1.013x103 Kpa
C- 1.013x104 Kpa
D- 1.013x105 Kpa

17-Water boils on Mount Saint Catherine at a temperature ...
a) Less than 100 0C since there is less atmospheric pressure there.
b) Higher than 100 0C since there is less atmospheric pressure there.
c) Water always boils at the same temperature no matter where it is on earth.
d) Less than 100 0C since Mount Saint Catherine is always cold.

18-You have an iron block of dimensions 30 cm, 20 cm and 10 cm and an iron cube of side length 20cm. The two objects are placed on a horizontal surface. The iron block would ...
a) exert equal pressure to that the cube when its base is 30 cm and 20 cm.
b) exert equal pressure to that the cube when its base is 20 cm and 10 cm.
c) exert equal pressure to as that the cube when its base is 30 cm and 10 cm.
d) never exert equal pressure to that the cube.

19-Which change from the following leads to decreasing the height of mercury column inside the barometer?
A- Using a longer tube
B- Making the tube inclined
C. Increasing the temperature of the mercury
D- Carrying out the experiment at a higher place

20-If the density of ice is 920 kg/m3, what is the percentage of the floating part of an ice cube over water surface?
A- 8%
B- 29%
C- 38%
D- 92%

21.The pressure inside a commercial airliner is maintained at 1.00 atm (105 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

22- A stonecutter's chisel has an edge area of 0.50 $cm2$. If the chisel is struck with a force of 45 N, what is the pressure exerted on the stone?
A) 9 000 Pa
B) 90 000 Pa
C) 450 000 Pa
D) 900 000 Pa

23- A student wants to find the absolute pressure of water at a point below the surface of water. He has a barometer and a manometer pressure gauge. The barometer reads 1.3152 bar where as the manometer pressure gauge reads 0.3152 bar. What is the absolute pressure? (pressure at one end of the manometer is atmospheric.)
A) 1 bar
B) 1.6304 bar
C) 0.3152 bar
D) 1.3152 bar

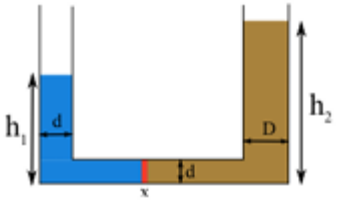
24.In a U-tube mercury manometer, one end is exposed to the atmosphere and the other end is connected to a pressurized gas. The gauge pressure of the gas is found to be 40 kPa. Now, we change the manometric fluid to water. The height difference changes by: (mercury = 13600 kg/m3, water = 1000 kg/m3).
A) 1260%
B) 92.64 %
C) Remains unchanged (0%)
D) 13.6%

25.A piece of aluminum has density 2.70 g/cm3 and mass 775 g. The aluminum is submerged in a container of oil of density 0.650 g/cm3. A spring balance is attached with string to the piece of aluminum. What reading will the balance register in grams (g) for the submerged metal?
A) 960 g
B) 775 g
C) 588 g
D) 190 g

26- A heavily loaded boat is floating in a pond. The boat sinks because of a leak. 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.

27- A block of wood has specific gravity 0.80. When placed in water, what percent of the volume of the wood is above the surface?
A) 0, the block sinks.
B) 20%
C) 25%
D) 80%

28- In a U-shaped tube, water and oil are separated by a movable membrane. What is the ratio of the heights $h1/h2$ (density of the oil = 0.92 g/$cm3$)?
A) 0.92
B) 1.3
C) 0.84
D) 1.5



29- A ping-pong ball has an average density of 0.0840 g/cm3 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

30- As ice floats in water, about 10% of the ice floats above the surface of the water. If we float some icein a glass of water, what will happen to the water level as the ice melts?
A) The water level will rise 10% of the volume of the ice that melts.
B) The water level will rise, but not as much as the 10% indicated in answer a.
C) The water level will remain unchanged.
D) The water level will become lower.

31- A cork has weight mg and density 25% of water's density. A string is tied around the cork and attached to the bottom of a water-filled container. The cork is totally immersed. Express the tension in the string in terms of the cork weight mg.
a- 0
b- Mg
c- 2mg
d- 3mg

32- A copper block is connected to a string and submerged in a container of water.
Position 1: The copper is completely submerged, but just under the surface of the water.
Position 2: The copper is completely submerged, mid-way between the water surface and the bottom of the container.
Position 3: The copper is completely submerged, but just above the bottom surface of the container.
Assume that the water is incompressible. What is the ranking of the buoyant forces (B) acting on the copper blocks for these positions, from least to greatest?
a. B1 < B2 < B3
b. B3 < B2 < B1
c. B1 = B2 = B3
d. B1 < B2 = B3

33- A block of mass m, density "ρB" , and volume V is completely submerged in a liquid of density "ρL". The density of the block is greater than the density of the liquid. The block
a- floats, because ρB > ρL
b- experiences a buoyant force equal to ρB gV.
c- experiences a buoyant force equal to ρL gV.
d- experiences a buoyant force equal to ρB g

34- A hydraulic lift is used to lift a car. The small piston has a radius of 5 cm and the large piston has a radius of 50 cm. If a driver applies a force of 88 N to the small piston, what is the weight of the car the large piston can support?
a. 880 N
b. 88 N
c. 8800 N
d. 8.8 N

35- Alcohol is used in manometer, because
a. It has low vapor pressure
b. It is clearly visible
c. It has low surface tension
d. It can provide longer column due to low density

36- In the open manometer shown, water occupies a part of the left arm, from a height of y1 to a height of y2. The remainder of the left arm, the bottom of the tube, and the right arm to a height of y are filled with mercury. Which of the following is correct? (Select two answers.)
a. the pressure at a height y3 is the same in both arms.
b. The pressure at a height y2 is the same in both arms.
c. the pressure at the bottom of the right arm is the same as at the bottom of the left arm.
d. the pressure at a height y3 is less in the left arm than in the right arm.

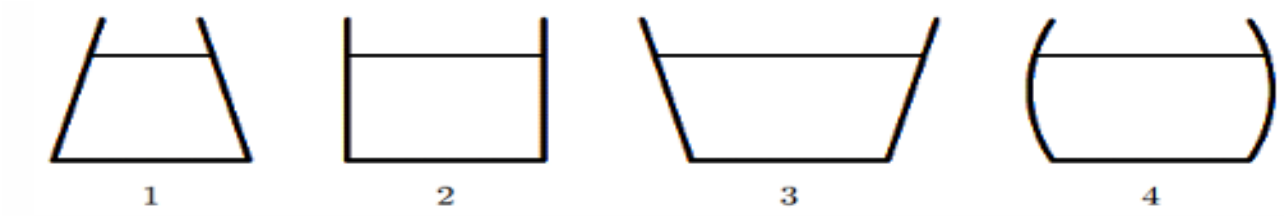
37- The liquid will boil at low temperature when we have low
a. External pressure
b. Volume
c. Viscosity
d. Polarization

38- A ball of mass 10kg is held under the surface of a pool. The instant it is released, it has an instantaneous acceleration of 4ms^2 toward the bottom of the pool. What is the volume of the ball?
a. 0.01m^3
b. More information is needed to solve
c. 0.08m^3
d. 0.7m^3

39- Suppose that a hollow cylindrical object is floating on the surface of water. This object has a mass of 300g and is floating such that 4cm of its height is submerged under the surface of water, while 6cm of its height is above the water. How much mercury would need to be poured into this cylindrical object in order for it to sink? (ρ Hg = 13.6 g/cm3)
a- 47mL
b- Addition of mercury will not cause the cylinder to sink
c- 33mL
d- 50mL
e- 24mL

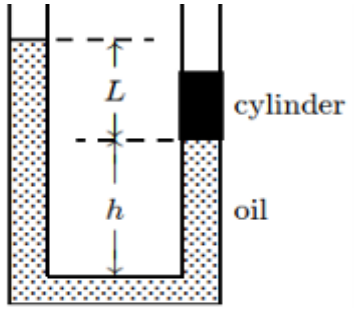
40- Suppose that three different balls with equal volumes are submerged in water. Ball A has a density of 1.2 g/cm3, ball B has a density of 0.8 g/cm3, and ball C has a density of 0.6 g/cm3. What is true regarding the rate at which balls A, B, and C will float to the top?
a- Ball C will rise to the top first, followed by ball B, and lastly by ball A.
b- Ball B will rise to the top first, followed by ball C, and ball A will sink.
c- Ball C will rise to the top first, followed by ball B, and lastly by ball A.
d- Ball A will rise to the top first, followed by ball B, and lastly by ball C.

41- The vessels shown below all contain water to the same height. Rank them according to the pressure exerted by the water on the vessel bottoms, 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

42- 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. L3ρg
C. Aρ(L + h)g
D. Aρ(L − h)g

43- A small steel ball floats in a half-full container of mercury. When water is added:
A. the ball will float on the water
B. the ball will rise slightly
C. the mercury will float on the water
D. the ball will sink to the bottom of the container

44- A fire wood board floats in fresh water with 60% of its volume under water. The density of the wood in g/cm3 is
A. 0.4
B. 0.5
C. 0.6
D. less than
E. more than 0.6

45- A long U-tube contains mercury (density = 14 × 103 kg/m 3). When 10 cm of water (density = 1.0 × 103 kg/m 3) is poured into the left arm, the mercury in the right arm rises above its original level by
A. 0.36 cm
B. 0.72 cm
C. 14 cm
D. 35 cm
E. 70 cm

46- When water freezes, it expands about 9%. What will be the pressure increase inside your automobile engine block if the water in there froze? (The bulk modules of ice is 2*10^9 pa) 1 atm = 1*10^5 pa
A:1800
B:1900
D:1700
E: None of them

47- "An object completely submerged in a fluid displaces its own volume of fluid". This is:
A. Pascal's paradox
B. Archimedes' principle
C Pascal's principle
D. true, but none of the above
E. false

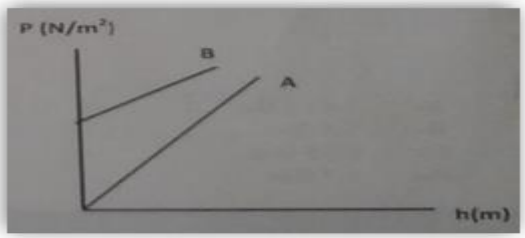
48- When you drink a liquid through a straw, you reduce the pressure in your mouth and let the atmosphere moves the liquid. can you use a straw to sip a drink on the moon?
A: no, a straw will not work on the moon because there is no atmosphere
B: yes, a straw will work on the Moon because of the pressure difference
C: No, a Straw will not work on the moon because there is low gravity
D: yes, a straw will work on the moon because of the pressure difference between mouth and the surrounding atmosphere.

49- Which one of the following barometers has the highest atmospheric pressure reading?

A: Both have the same reading
B: Figure 1
C: Figure 2
D: None of them

50-The opposite graph indicates the change in pressure as going deeper into liquid A and into liquid B?

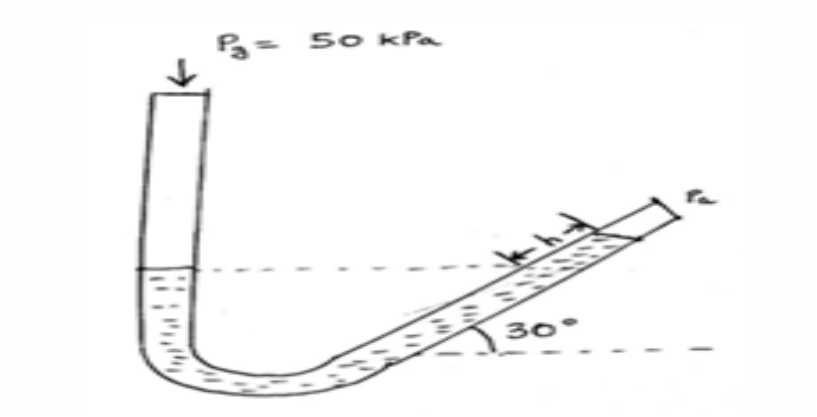
A: Liquid A has more density than liquid B
B: liquid B has more density than liquid A
C: liquid B is in a closed container
D: Liquid A is in an opened container



51-What is fluid mechanics?
a) Study of fluid behavior at rest
b) Study of fluid behavior in motion
c) Study of fluid behavior at rest and in motion

52- What is fluid mechanics used for?
a) Fluid mechanics enables to comprehend the behavior of solid fluids under pressure
b) Fluid mechanics enables to comprehend the behavior of fluids under a variety of forces & atmospheric conditions
c) Fluid mechanics enables to comprehend the behavior of fluids under various temperatures only
d) None of the mentioned

53- The below figure shows an inclined U-tube mercury manometer. The vertical end of the tube is exposed to a gas of gauge pressure 50 kPa and the inclined end is exposed to the atmosphere. The inclined part of the tube is at an angle of 30o with the horizontal. Find the value of h (in cm) (take g = 9.8 m/s2, ρ of mercury = 13600 kg/m3)



a) 60
b) 50
c) 75
d) 25

54- A single column manometer is connected to a pipe containing a liquid of specific gravity 0.75. Find the pressure in the pipe if the area of reservoir is 250 times the area of tube for the manometer reading. The difference in mercury level is 40 cm. On the left limb the fluid is upto the height of 20 cm.
a) 10.42 N/cm2
b) 5.21 N/cm2
c) 2.60 N/cm2

55- A manometric liquid should suitably have _____
A. Low density & Low Vapor pressure
B. Low density & High Vapor pressure
C. High density & High Vapor pressure
D. High density & Low Vapor pressure

56- A spherical ball of density ρ=0.70kgL has a radius of r=10cm. If the ball is placed on the surface of water and released, how much of the ball becomes submerged in the water? g=10m/s^2
a) 6.81L
b) 2.93L
c) 3.66L
d) 0.93L

Team Leader
-Marven Waheed

57- A ship has crashed and is currently sinking to the bottom of the ocean. At time t=0s, the ship is at a depth of 100m and has reached a terminal velocity of 5ms downward. What is the hydrostatic pressure on the ship at time t=12s? (g=10ms2 ρw=1027kgm3)

a)1.6MPa
b)940kPa
c)2.1MPa
d)1.2MPa
e)510kPa

58- The two arms of a U-tube are not identical, one having twice the diameter of the other. A cork in the narrow arm requires a force of 16N to remove it. The tube is filled with water and the wide arm is fitted with a piston. The minimum force that must be applied to the piston to push the cork out is:

A. 4N
B. 8N
C. 16N
D. 32N
E. 64N

59- A tin can has a volume of 1000cm3 and a mass of 100g. Approximately what mass of lead shot can it carry without sinking in water?

A. 900g
B. 100g
C. 1000g
D. 1100g
E. 980g

60- A 0.50-N metal sinker appears (as measured using a spring scale) to have a weight of 0.45N when submerged in water. The specific gravity of the metal is:

A. 6
B. 8
C. 9
D. 10
E. 12

LO.08 fluids answers

1- **ANS: B**

The net force would be Perpendicular to the flat side of the hemisphere and would be equal to the pressure multiplied by the projected area of the curved surface: F = P π r^2

2- **ANS: A**

P=F/A
A is given as 80cm ^ 2=80×10−4m2 , F =600N
Pf=600/80× 10 ^-4 =7.5×10 ^ 4Pa
Pf=Pa−Pi-4
Pi=Pa−Pf=10.1×10 ^ 4−7.5×10 ^ 4=2.6×10 ^ 4Pa

3- **ans: B**

Explanation: The spring balance indicate 30n in air. So therefore, Fb = W − Wa
ρwVg = 30 − 20 V = 10/ρwg
The spring balance indicate 20n when the object is submerged in water.
So, in liquid : ρw/2 * Vg = 30 − Wab
Wab = 30 − ρw/2 . (10g/ρwg)^5 = 25 N

4- **ANS:D**

Loss of weight =1400−900=500N
Loss of weight=Weight of displaced liquid
500=ρVg
V= 500/998×9.8= 0.05m^3

5- **Ans: D**

Since weight in an elevator moving down = m x (g – a), substituting g with (g – a) in this case, Then, pressure = ρ(g−a)Δh

6- **ANS: D**

7- **Ans: C**

Regardless of fresh water, salt water, or mercury, simply because weight of displaced liquid is equal to the weight of the boat, weight of slat-water displaced = 16000 N

8- **ANS:D**

$\implies$ specific gravity $= \frac{\text{mass}}{\text{volume}}$ Because density of water e water equal 1

$\implies$ force = mass (m) × acceleration

$\rightarrow$ acceleration due to gravity (g) $= 9.8\ \frac{m}{s^2}$

$\therefore$

$\rightarrow 160 = \text{mass (m)} \times 9.8$

$\rightarrow m = \frac{160}{9.8}$

$\rightarrow \boxed{m = 16.32\ kg}$

Also ,we know that ,

$\implies$ specific gravity $= \frac{\text{mass}}{\text{volume}}$

$\implies$ volume $= \frac{16.32}{0.6}\ m^3$

$\implies \boxed{\text{volume} = 27.2\ m^3}$

Now ,let additional force is "x" ,

Additional force (x) will be -

•°• density of water $= 1\ \frac{g}{cm^3}$

$\rightarrow 1 = \frac{m+\frac{x}{9.8}}{27.2}$

$\rightarrow 27.2 = 16.32 + \frac{x}{9.8}$

$\rightarrow \frac{x}{9.8} = 10.88$

$\rightarrow x = 106.62$

9. Ans: C
Because the fb= ρvg
Doesn't matter if the pressure is different

10. ANS: C
Fb=w
Pl(Vol)lg =ρs(Vol)sg
ρL(Vol)l=ρs(Vol)s 1000X30 =ρsx60
ρs=500kg/m3

11. ANS: C
Sea water has greater density than fresh water

12. ANS: A
Pnet = 0.15 X 1.013 x 105 pa = 15195 N/m²
Fnet = PxA = 15195 x (1.82m x 0.91m)
= 25165.9 N = 2.5 X104 N

13. ANS: D
1 atm = 101,325 Pa
1 atm = 760 torr
1 atm = 1.013 bar
So ,Pa > Torr>Bar >atm

14. ANS:C
P= pa + pgh = 1.013 bar x (1 atm / 1 .013 bar) + 38 cm Hg x (1 atm / 76 cm Hg) = 1.5 atm

15- ANS: A

16- ANS: B
76 cm Hg = 1.013 x 105 pa = 1.013 x 10^2 Kpa
760 cm Hg = 1.013 x 10^3 Kpa

17- ANS: A
As the altitude increases the boiling point decreases

18- ANS: C
As they will have the same height so they will exert the same pressure

19- ANS: D
As the altitude increase the pressure decreases

20- ANS: A
SG (specific gravity) = 920/ 1000 = 0.92
The ice is immersed by 92 % So it is floated by 8%

21- ANS: D
Net pressure = Inside pressure − outside pressure
Inside pressure = 1 ×105 = 100000Pa
Outside pressure = 0.30 × 105 = 30000Pa
Net pressure = 100000 −30000 = 70000Pa
Area of the door = 2.0×1.0 = 2.0m2

22- ANS: D

$$P(Pa) = \frac{F(N)}{A(m^2)}$$

Convert area from cm^2 to m^2. Then $0.50 \times (10^{-2})^2 = {}^{1}/_{20000}\, m^2$

$$P(Pa) = \frac{45}{\frac{1}{20000}} = 900000Pa$$

23-

Barometer is used to measure the pressure of the atmosphere while the manometer is used to measure the pressure gauge of the pressure of a gas not the atmosphere so we will add the values of both.

24- ANS: A

$$40Kpa = 40000Pa$$

Pressure while using water is the same as using mercury.
The only difference is the change in density of each liquid.

$$P = \rho gh \quad \text{Then } h_{mercury} = \frac{P}{\rho g} = \frac{40000}{13600 \times 9.8} \cong 0.30m$$

$$h_{water} = \frac{P}{\rho g} = \frac{40000}{1000 \times 9.8} \cong 4.08m$$

$$\text{Difference in the heights} = 4.08 - 0.30 = 3.78m$$

$$\textbf{Percentage of difference in height} = \frac{\mathbf{3.78}}{\mathbf{0.30}} \times \mathbf{100} = \mathbf{1260\%}$$

25 - ANS: C

$$\rho_{Al} = \frac{M}{V} \quad \text{then } v = \frac{M}{\rho_{Al}} = \frac{775}{2.70} \cong 287.03cm^3.$$

The volume of the aluminium piece is the same volume of the rising oil.

$$\rho_{Oil} = \frac{M}{V} \quad \text{then } M = V \times \rho_{Oil} = 287.03 \times 0.650 \cong 186.6g$$

This is the mass of the oil that will be reduced from the mass of the aluminium

Mass of aluminium submerged in oil is 775−186.6 ≅ 588g

26- ANS: C

The water level will go down. While in the boat displace an equal weight of water. Once over the side, they displace an equal volume. Since they sink, the former displacement is larger than the latter; less water is displaced, and the level will fall

27- ANS:B

The specific gravity of water is 1. The specific gravity of block wood is stated to be 0.8 Since the specific gravity of wood is less by 0.2, the block will sink in water up to 80% 20% of the height of block will be above water surface.

28- ANS: A

Since the pressure on the membrane from the two sides is equal so:

pwater = **p**oil

Then po+pwater **×g×h1 = po+p**oil **×g×h2**

The atmospheric pressure will be cancelled with each other.

Then you got: h1/h2= p1/p2 =0.92

29- ANS: D

You should know the buoyancy:

The needed buoyancy-(G)=The force required=(density of water) × gravity × (volume of T.T. ball) - mg

So we need to calculate the volume

Sphere's volume=(4/3) × π × (radius³)

radius=diameter/2=3.80cm/2=1.9cm=0.019m

Put into equation: Sphere's volume=(4/3) × π × (0.019³)m

≈ 2.87×10^-5 m³

Put into equation: The force required=1000kg/m × 9.8N/kg ×(2.87×10^-5)-mg≈0.28N

[(8.68*10^-6)*9.8N/kg]N≈0.279N

Answer: Needed force is 0.279N.

30- ANS: (C)

Because the ice have the same mass after being melt

31- ANS:D

FBD has Ft pointing down Fb pointing up and weight (mg) down.

Fnet = 0 , Fb – Ft – mg = 0 The buoyant force is given by the weight of the displaced water. Since the waters displaced volume is equal to the corks displaced volume and the water weight for the same volume would be **4 times heavier** (based on the given cork weight = **25%** water weight) compared to the cork, the buoyant force is equal to 4 x the cork weight = 4mg. Using the force equation created initially. **Ft = Fb – mg = 4mg – mg = 3mg**

32- ANS: C

Buoyant force is based on how much weight of water is displaced. Since all three are completely submerged they all displace the same amount of water so have equal buoyant forces

33- ANS: C

Definition of buoyant force

34- ANS:C

Because the pressure in the input and output is constant so $\frac{F_1}{A_1} = \frac{F_2}{A_2}$ Then

$$\frac{88}{5^2} = \frac{F_2}{50^2}$$

$$F2 = \frac{88 \times 50^2}{25} = 8800 \text{ N}$$

By Marven

35- ANS: D
36- Ans: b,c
37- ANS: A
The pressure is directly proportional to the boiling point.

38- Ans: A

The net force on the ball is expressed as:
Fnet = ma
Since it is accelerating downward, we know that the force of gravity is stronger than the buoyant force, so we can write:
Fnet = Fg - Fb
Substitute expressions for each variable:
Fnet = mg – Vball * ρwater * g
Rearrange to solve for the volume of the ball:

$$\textbf{Vball} = \frac{m(g-a)}{\rho water * g} = \frac{(10kg)(10-4m/s2)}{(1000kg/m3)(10\ m/s2)}$$

Vball = 0.006m3

39- ans: C

Explanation:

To answer this question, we'll need to make use of the concept of buoyancy and apply the following equation:

$$F_b = \rho V g$$

Also, remember that in this equation, the density and volume are that of the fluid that is displaced, not that of the object!

Since we are told that the object has a mass of 300g and is initially floating, we can set the buoyant force equal to the weight of the object.

$$F_b = W$$

$$\rho V g = mg$$

It's important to realize that the volume of the fluid displaced is going to be equal to that portion of the object's volume that is submerged underwater. Since we're told that the object is cylindrical, and that 4cm of its height is under water, we can set up the following relationship:

$$V_{fluid\ displaced} = Ah = A(4\ cm)$$

Where A = Area of the cylinder and h = height of cylinder underwater

Plugging this value into the above equation and canceling common units on both sides, we obtain:

$$\rho Ahg = mg$$

$$\rho Ah = m$$

$$\left(1\frac{g}{cm_3}\right)(A)\,(4cm) = 300g$$

$$A = 75\ cm^2$$

Now that we have found the area, we can calculate the mass that needs to be added to the cylinder in order to make it sink. To do this, we need to consider the scenario in which the cyclinder is completely submerged in the water the instant before it is about to sink. In this case, we're able to calculate the mass that needs to be added to the cylinder to make this happen.

$$F_b^{'} = W^{'}$$

$$\rho V^{'} g = (m + x)g$$

Where x = the mass of mercury added to the cylinder

$$\rho V^{'} = (m + x)$$

$$\rho Ah^{'} = (m + x)$$

$$(\frac{1g}{cm^3})\,(75cm^2)\,(10cm) = (300g + x)$$

$$x = 450g$$

Thus far, we have determined that 450g of mercury needs to be added. Now, we just need to use the density of mercury in order to determine the volume needed.

$$450g_{Hg}\left(\frac{1cm^3}{13.6g}\right)\left(\frac{1mL}{1cm^3}\right) = 33mL$$

40- ANS: A

41- Ans: E

The pressure at the point on the fluids depend on the depth, not on the horizontal dimensions of the container

42- Ans: A

At the level of boundary between cylinder and oil, pressure
Will be equal in both arms
L φg= W/A
W= AL φg

43- Ans: B

when water is poured over the setup, then it gets some additional upthrust from water too.
Due to this the steel ball gets raised to some extent

44- Ans: C

The total Weight is equal to the buoyant force.
p= density of substance, p′= density of water
Buoyant force = mass of water displaced
p= mass/volume.
p×total volume×g=Volume under water×p′×g
v= Total volume, V′= Volume under water
p=v′/V×density of water which was assumed to be 1g/cm3.
p=0.6
density of the water is equal to fraction of substance under water, it is 0.6.

45- ans: A

when the mercury goes down by h in the left arn, it will rise in the other arm by the same h. we now have 2h for the mercury

Given:

Pressure due to depth of water,

- $d_w = 10\ cm$

Now,

$$\rightarrow P_1 = P_{atm} + \rho_w g d_w$$

When the **mercury** is **incompressible**, the pressure due to **depth's mercury** will be:

- $d_{Hg} = 2h$

then,

$$\rightarrow P_2 = P_{atm} + \rho_{Hg} g d_{Hg}$$

$$= P_{atm} + 2\rho_{Hg} g h$$

By **equating** first as well as the second pressure we get

$$\rightarrow P_{atm} + \rho_w g d_w = P_{atm} + 2\rho_{Hg} g h$$

$$\rho_w d_w = 2\rho_{Hg} h$$

$$h = \frac{1}{2} \frac{\rho_w d_w}{\rho_{Hg}}$$

By substituting the values, we get

$$= 0.5 \times \frac{1000 \times 0.10}{14000}$$

$$= 0.36\ cm$$

46- Ans: D

the change in volume of water, **ΔV = 9%**
the bulk modulus of ice, **K = 2 x 10^9 N/m^2**
Bulk modulus is given by;

$$K = -V\frac{dP}{dV}$$

for pressure increase in the automobile engine block, when the water in there froze;

$$dP = K(\frac{dV}{V})$$
$$dP = K(\frac{0.09V}{V})$$
$$dP = 0.09K$$
$$dP = 0.09(2 * 10^9)$$
$$dP = 1.8 * 10^8\ N/m^2$$
$$dP = 1782.18\ ATM$$

Therefore, the pressure increase inside the automobile engine block is **1782.18 ATM**

47- Ans: D
48- Ans: A
Because the atm help in this process and there is no atm on the moon

49- Ans: B
Because it has the greatest height

50- Ans: A
Because it has more density

51- Ans: c
The study of fluid behavior (liquids, gases, blood, and plasmas) at rest and in motion is known as fluid mechanics. Fluid mechanics has numerous applications in mechanical and chemical engineering, as well as biological and astrophysical systems.

52- Ans: c
fluid mechanics enables to comprehend the behavior of fluids under a variety of forces and atmospheric conditions, as well as to select the appropriate fluid for a variety of applications.

53- Ans: c
Pressure along the dotted line will be 50 kPa. Gauge pressure in an inclined manometer is given by P = ρ.g.h.sin (Θ). Substituting P, ρ and Θ, we get the value of h as 0.75 m

54- Ans: b
Pressure = a /A height × (density of mercury × 9.81-density of fluid × 9.81)+height in right limb × density of mercury × 9.81 – height in left limb × density of fluid × 9.81
= 5.21 N/cm2 { Here a/A = 1/ 250}

55- Ans: D
56- Ans: D
57- Ans: a
58- Ans: E
59- ans: A
60- Ans: D

Good job