Task

①

Given $A = 10\ cm^2$: mass $= 40\ kg$.

$= 10 \times 10^{-4}\ m^2$

$\therefore$ Pressure sustained by the femurs

$= \frac{F}{2A} = \frac{mg}{2A} = \frac{\cancel{40}^{20} \times 10}{\cancel{2} \times 10^{-3}}$

$= 200 \times 10^3 = 2 \times 10^5\ N/m^2 \rightarrow A$

②

Given mass $= 80\ kg$: $A = 0.6\ m^2$.

$\therefore$ Pressure $= \frac{F}{A} = \frac{mg}{0.6} = \frac{80 \times 10}{6 \times 10^{-1}} = \frac{4}{3} \times 10^{3}$

$= 1.3 \times 10^3\ N/m^2 \rightarrow C$

③

Given mass $= 80\ kg$: $A = \cancel{0.08}\ 80 \times 10^{-4} = 8 \times 10^{-3}\ m^2$

Pressure $= \frac{F}{2A} = \frac{mg}{2A} = \frac{80 \times 10}{2 \times 8 \times 10^{-3}} = 10^5\ N/m^2$

$= \frac{10}{2} \times 10^{4}\ N/m^2 \rightarrow B$

$= 5 \times 10^4\ N/m^2$

④

Given $P = 10^5\ Pa$; Area $= 40 \times 80 = 3200\ cm^2 = 3200 \times 10^{-4}\ m^2$

$\therefore F = PA = 10^5 \times 3200 \times 10^{-4}$

$= 3200 \times 10^{1} = 3.2 \times 10^4\ N \rightarrow B$

(5)

density = 1.29 kg/m³ : $P_{at} = 10^5$ Pa

We know variation of Pressure with density

$$P = \rho g h$$

$$\Rightarrow P = 1.29 \times 10 \times h$$

$$\Rightarrow 10^5 = 1.29 \times 10 \times h$$

$$h = \frac{10^4}{1.29} = 8013\,m \rightarrow D$$

(6)

variation of Pressure with depth

$$P = P_a + \rho g h$$

$P_a = 10^5 = 1\,atm$; $\rho = 10^3\,kg/m^3$; Given $h = 10m$

$$\therefore P = 10^5 + 10^3 \times 10 \times 10$$

$$= 10^5 + 10^5 = 2 \times 10^5 = 2\,atm.$$

(7)

weight of the body in air $w_{air} = 25N$.

$w_{water} = 20N$.

upthrust acting on the body $= w_{air} - w_{water}$

$= 25 - 20$

$= 5N \rightarrow A$

(8)

Given

$w_{water} = \frac{1}{3} w_{air} [w_1]$

The apparent loss of weight of the body after immersed in water $= w_{air} - w_{water}$

$\Rightarrow w_{air} - \frac{1}{3} w_{air}$

$\Rightarrow \frac{2}{3} w_{air} = \frac{2}{3} w_1 \rightarrow c$

(9)

Given $w_{air} = 100N$; $w_{kerosene} = 70N$.

Apparent loss of weight of the body $= w_{air} - w_{kerosene}$

$= 100 - 70$

$= 30 N \rightarrow D$

(10)

Given that Pressure at ground floore = 270 k Pa

$\Rightarrow P = 270 \times 10^3$ Pa

$\Rightarrow \rho g h = 270 \times 10^3$

$\Rightarrow \cancel{10^3} \times 1\cancel{0} \times h = 27\cancel{0} \times \cancel{10^3}$

$\Rightarrow h = 27 m$ [where ρ = density of water $= 10^3 kg/m^3$]

$\rightarrow A$

If we take $g = 9.8 m/s^2$ we get $h = 27.55 m$

(11)

(a)

on wearing skies, force due to the weight of the skier acts over a much larger area than the area of the soles of the shoes, this reduce the pressure on the soft surface of the snow and allows the skier to slide over it without sinking.

(b)

In fluids, The atoms are free to move around in an enclosed fluids, they transmit pressure to all parts of the fluid as well as the container's walls.

This what says Pascal's law.

(12)

13

we know that Pressure $= \frac{F}{A} \Rightarrow P \propto \frac{1}{A}$

Because camels feet having large area compared with man feet they exert less pressure on sand as a result camels experience less reaction force on their feet. so they can walk easily on sand

14

(15)

when rain drops are falling ~~from~~ at certain height

Total upward force [Buoyant force + Viscous force]

is equal to weight of the drop.

$\Rightarrow$ Net force acting on the body $= 0$

$\therefore$ the ~~bod~~ drop moves with constant velocity

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... body immersed in water and will not affect the total load on the scale pan

)

(5) → Since the box is air tight no air can pass through it. so if a bird is sitting then the total weight is equal to the sum of weight of box + bird

→ If the bird is flying, the reaction force applied on the floor of the box will be equal to its weight. So there is no change in the total weight of the box.

Because inter molecular forces are ...

when the brick is on the boat, the weight of both brick and the boat pushes the water down and raises the water level.

when the brick is at bottom of the water it replaces it's volume in the water, not its weight. The ~~res~~ density of brick is higher than the density of water's volume, so the water level drops.

1

Given

$$\text{Area} = 20\ cm^2 = 20 \times 10^{-4}\ m^2$$

$$\text{mass}\ m = 50\ kg$$

$$\text{Pressure} = \frac{F}{2A}\ [\text{two legs}]$$

$$= \frac{mg}{2A} = \frac{50 \times \cancel{10}}{2 \times \cancel{20}_{2} \times 10^{-4}}$$

$$= \frac{50}{4} \times 10^4 = 12.5 \times 10^4\ N/m^2$$

$$= 1.25 \times 10^5\ N/m^2 \rightarrow A$$

2

Given Area $= 0.5\ m^2$; mass $m = 60\ kg$.

$$\text{Pressure} = \frac{F}{A} = \frac{mg}{A} = \frac{60 \times 10}{0.5} = 1200\ N/m^2$$

$$= 12 \times 10^2\ N/m^2 \rightarrow C$$

3

Given mass $m = 90\ kg$; Area $= 90\ cm^2$
$= 90 \times 10^{-4}\ m^2$

$$\text{Pressure} = \frac{F}{A} = \frac{mg}{2A}\ [\text{supported by two legs}]$$

$$= \frac{\cancel{90} \times 10}{2 \times \cancel{90} \times 10^{-4}} = 5 \times 10^4\ N/m^2 \rightarrow B$$

(4)

Given $P = 10^5$ Pa.

$\because$ Area of room $A = 10cm \times 20cm$

$= 200\ cm^2$

$= 200 \times 10^{-4}\ m^2$

From defination of Pressure $= \frac{Force}{A}$

$\Rightarrow$ Force $= P \times A$

$= 10^5 \times 200 \times 10^{-4}$

$\Rightarrow 2000 = 0.2 \times 10^4$ N.

$\rightarrow$ B

(5)

$d_{atm} = 1.29\ kg/m^3$

we know variation of pressure with altitude

$P = \rho g h$ where P = atmospheric Pressure

$= 1.05 \times 10^5\ N/m^2$

$\Rightarrow 1.05 \times 10^5 = 1.29 \times 10 \times h$

$\Rightarrow h = \frac{1.05 \times 10^5}{1.29 \times 10} \simeq 8013 \rightarrow$ D

(6)

Given depth $h = 5m$; $P_{atm} = 10^5\ N/m^2$.

Variation of pressure with depth $P = \rho g h + P_a$

$P \Rightarrow 10^5 + 10^3 \times 10 \times 5$

$\Rightarrow$ ~~h=10m~~. $P = 10^5 + 0.5 \times 10^5$

$= 1.5 \times 10^5$

$= 1.5$ atm

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