TEST YOURSELF

Date ____ Page ____

[A] Objective Questions :

1) (a) False
(b) False
(c) True
(d) True
(e) False
(f) False
(g) True
(h) False
(i) True
(j) True

2) (a) 1000
(b) Volume
(c) kg m^{-3}
(d) 1000
(e) 1000
(f) more
(g) less
(h) more
(i) equal to
(j) Zero.

3) (a) ⟷ (iv)
(b) ⟷ (i)
(c) ⟷ (v)
(d) ⟷ (ii)
(e) ⟷ (iii)

4) (a) (iii)
(b) (ii)
(c) (iii)
(d) (iii)
(e) (iii)
(f) (iii)
(g) (iii)
(h) (i)

B

[B] Short / Long Questions

(1) Density of a substance is its mass per ~~unit area~~ unit volume.

(2) The S.I unit of unit of density is $kg\,m^{-3}$. It is related to $g\,cm^{-3}$

$$1\,kg\,m^{-3} = \frac{1\,kg}{1\,m^3} = \frac{1000\,g}{(100\,cm)^3}$$

$$= \frac{1}{1000}\,g\,cm^{-3}$$

(3) This statement means one cubic centimetre volume of brass has mass of 8.4g.

(4) The increasing order of the density is: Cork, Water, Iron, Brass, Mercury.

(5) The density of liquid (or gas) increase with decrease of temperature and decrease with increase of temperature.

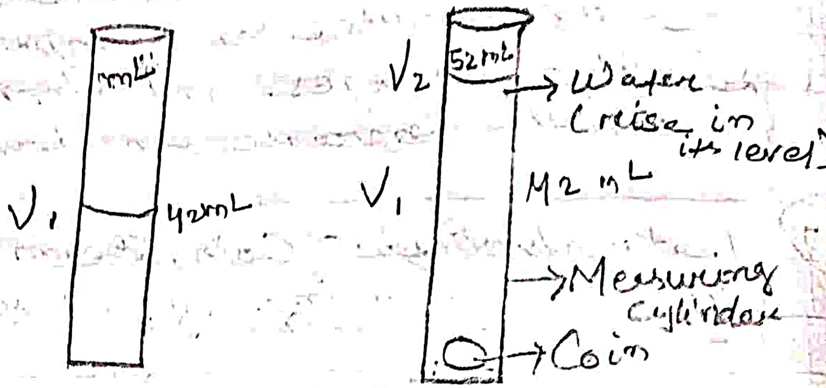
Date
Page

(6) Mass - does not change.
Volume - changes and increases with rise in temperature.
Density - changes and decrease with increase in temperature.

(7) Materials Reqd. - Coin, Beam balance, Water, measuring cylinder.

Procedure - ~~~~ The coin is weighed with the help of the beam balance and its volume is measured by measuring cylinder with water in it & again with only water in the cylinder.
Observation/Conclusion - Let the mass M be 50 g.
Let Initial volume of water = V_1 = 42 mL

let Final volume of water when a coin is added in the cylinder = V_2 = 52 mL
Then volume of coin = $V_2 - V_1$
= 52 - 42 = 10 mL



EXPERIMENT TO DETERMINE THE DENSITY OF THE MATERIAL OF THE COIN.

(8) Materials Reqd - ~~Water~~ Milk, beaker, beam balance.

Prodecure - A ~~beam~~ beaker is taken and the mass of this empty beaker is measured using a common beam balance. Let the mass be M_1 gram. Now, a measu-reing cylinder is taken and milk is poured onto it to a certain level. Let 50 mL. Let the mass of beaker with milk be M_2

Date ______
Page ______

Volume of milk $V = 50$ mL or $50 \, cm^3$
~~The~~ The milk is transferred into the empty beaker. It's mass is measured again. let the mass of beaker with milk be M_2 gram.

The difference $M_2 - M_1 = M$
Let mass $\Rightarrow M = 51.5$ gram.

Calculation of the density of milk using formula -

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}} = \frac{M}{V}$$

$$= \frac{51.5 \, g}{50 \, cm^3} = 1.03 \, g \, cm^{-3}$$

Conclusion → Density is calculated.

(Q) A density bottle is specially designed bottle which is used to determine the density of a liquid. The stopper has a narrow hole through it. When the bottle is filled with the liquid and stopper is inserted, the excess liquid rises through the hole and drains out. Thus, the bottle always contains the same volume of liquid each time when it is filled.

(10) The relative density of a substance is defined as the ratio of the density of the substance to the density of water.

(11) ~~Rel~~ Relative density is a dimensionless quantity and has no unit.

(12)

Density	Relative Density
* SI unit = $kg\,m^{-3}$ CGS unit = $g\,m^{-3}$	* It has no unit.
* It is regarded as specific weight.	* It is regarded as specific gravity.
* It is ratio of mass to ratio of volume.	* It is ratio of density of substance of ratio of density of water.[of]

Date ______
Page ______

(13) It mean that a piece of aluminium of any volume has mass 2.7 times that of an equal volume of water.

(14) ~~An ob.~~ A body will float if it is less dense than the liquid it is placed in. A body will sink if it is more dense than the liquid it is placed in.

(15) The cork is less dense than that of the ~~weight~~ density of water so, it floats. The iron nail is more dense than that of the density of water so, it sinks.

(16) Sink - (b) and (c)
Float - (a) and (d)

(17) When a body floats in a liquid, the weight of the liquid displaced by its immersed part

is equal to the total weight of the body. This is the law of floatation.

(18) (a) Piece of iron will sink in water.

(b) Piece of iron will float in mercury.

(19) (a) Same buoyant force in each case.

(b) A

(c) C

(20) 3 cases -

* The weight of the body Will greater than the buoyant force F_B (the body sinks)

* The weight of the body W is equal to the buoyant force F_B (the body floats).

* The weight of the body W is less than the buoyant force. (the body floats & Partly

Date
Page

submerged in the liquid.

(21) A piece of ice floats on water with its $\frac{9}{10}$th part inside the water and only $\frac{1}{10}$th part of it outside the water. The reason is that the density of ice is $0.9\ g\ cm^{-3}$ (or $900\ kg\ m^{-3}$) while the density of water is $1\ g\ cm^{-3}$ ($1000\ kg\ m^{-3}$). Hence, the weight of water displaced by $\frac{9}{10}$th part of ice immersed inside water becomes equal to the total weight of the ice piece.

(22) A nail made of iron sinks in water, but a ship made of iron does not. The reason is that a nail is solid and the density of iron is greater than that of water. The weight of the nail is more than the buoyant force of water on it.

So the nail sinks in water. On the other hand, the ship is hollow and its empty space contains air. This makes the average density of ship less than that of water. Therefore, a ship floats on water.

(23) It is easier for a person to swim in sea water than in river water. The reason is that sea water contains salt and so its density is more than the density of river water. The weight of a man gets balanced by the less immersed part of his body in sea water as compared to that in river water. Thus, it is easier to swim in sea water than in river water.

(24) Icebergs are dangerous for ships. The reason is that the density of ice is less than the density of sea

-water. The density of ice is 0.9 g cm^{-3} and the density of sea water is 1.02 g cm^{-3}. Hence, iceberg floats in sea water with its large portion submerged inside the water and only a little portion of it is above the surface of water. Thus, a ship can collide with the invisible part of iceberg under the surface of water. Hence, it is dangerous for ships.

(25) In water, the stone experiences a buoyant force which counter balances the weight of the stone acting downward and this makes the stone lighter and thus easier to lift the stone in water.

(26) ~~The~~ A submarine is a water-tight ~~water~~ boat which can travel under water like a ship. A submarine is

provided with water tanks. To make the submarine dive, the tanks are filled with water so that the average density of the submarine dive, the tanks are filled with water so that the average density of submarine becomes greater than the density of sea water and it sinks. To Make the submarine rise to ~~the~~ surface of ~~the~~ water these tanks are emptied. This makes the average density of the submarine less than the density of sea water, so the submarine rises up to the surface of water.

(27) A hydrogen or helium filled balloon rises in air. The reason is that the density of these gases is less than ~~the~~ the density of air. Therefore, the buoyant force experienced by the balloon due to air,

Date ____
Page ____

becomes greater than the weight of the balloon. Hence, the balloon rises up under the influence of net upward force

[C] Numericals:

① (a) $1\,l = 1000\ cm^3$
(1000 mL)

$\Rightarrow 1.28\ g \rightarrow 1000\ cm^3$

$\Rightarrow 1\ cm^3 = \_\_\ g$

$\Rightarrow \frac{1.28}{1000} = g$

$\Rightarrow 0.00128\ g/cm^3$

$\Rightarrow 0.00128\ g\ cm^{-3}$

(b) $1.28 - 1\,l$

$1\,l = 1000\ cm^3$

$\left[1\ cm^3 = \frac{1}{100} \right.$

$\left. 1\ cm^3 = \frac{1}{1000000}\ m^3 \right.$

$\left[1000\ cm^3 = \frac{1}{1000}\ m^3 \right]$

$= \frac{1.28}{1000}\ kg \div \frac{1}{1000}\ m^3$

$= 1.28\ kg/m^3$

(2) Density = $1.11 kg\,m^{-3}$

$(L \times B \times H)$

Volume = $10\,m \times 7\,m \times 5\,m$

$= 350 m$.

Mass = Density x Volume

$= 1.11 \times 350$

$= 388.5 kg$.

$$\begin{array}{r} 350 \\ \times\ 1.11 \\ \hline 350 \\ 350\times \\ 350\times\times \\ \hline 388.50 \end{array}$$

(3) $1g = \frac{1}{1000} kg$

$2.7 g = \frac{2.7}{1000} = 2.7 \times 10^{-3} kg$

$1 cm^3 = 1000000^{-3} m^3$

$= 10^{-6} m^3$

$kg\,m^{-3} = \frac{2.7 \times 10^{-3} kg}{10^{-6} m^3}$

Density of aluminium $= 2700 kg/m^3$

$= 2700 kg\,m^{-3}$

$\frac{2.7 \times 1000000}{1000000}$

Date
Page

(4) 1kg = 1000 g
600kg = 600 × 1000
= 600000 g

$1 m^{-3} = 100 cm^{-3} = 100000 cm^{-3}$

$1 g/cm^{-3} = \frac{6\cancel{00000}}{1\cancel{000000}}$

$= 0.60 g/cm^{-3} = 0.60 g cm^{-3}$

(5) Mass of the zinc = 438.6 g
Volume = ~~200 cm³~~ 86 cm³

$\text{Density} = \frac{\text{Mass}}{\text{Vol.}} = \frac{438.6}{86}$

$= 5.1 g cm^{-3}$

86) 438.6 (5.1
430
86
86
0

(6) (a) Mass = 150 g
Volume = 200 cm³

$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$

$= \frac{15\cancel{0}}{20\cancel{0}}$

$= 0.75 g/cm^3$
$= 0.75 g cm^{-3}$

200) 1500 (0.75
1400
1000
1000
0

(e) $g/cm^3 \longrightarrow kg/m^3$

$\Rightarrow \frac{0.75}{1000} \div 1000000$

$\Rightarrow \frac{0.75}{1000} \times \frac{1}{1000000}$

$= 0.0075 \times \frac{1}{10000}$

$1000g = 1kg$

$0.75g = \frac{0.75}{1000} kg$

$1cm = \_\_\_ m^3$

$1cm = \frac{1}{100} m$

$1cm^3 = \left(\frac{1}{100} \times \frac{1}{100} \times \frac{1}{100}\right) = \frac{1}{1000000} m$

0.00075

$= 0.75g = 1$ ↓

$\Rightarrow \frac{0.75}{1000} \div \frac{1}{1000000}$

$\Rightarrow \frac{0.75}{1000} \times 1000000$

$\Rightarrow 0.75 \times 1000$

$\Rightarrow 750\ kg\,m^{-3}$

Date
Page

(7) Mass of wood = 6000kg
Density of wood = 0.8 g cm -3
Volume of wood = $\frac{Mass}{Density}$

$= \frac{6000}{0.8} = \frac{60000}{8}$

$= \frac{60000}{8}$ = 7.5

= 7.5 m^3.

(8) Mass of the solid = 72 g = (M)
Initial volume of water
in measuring cylinder = 24 mL (V_1)
Find volume of water
when solid is completely
immersed in water = 42 mL (V_2)

Volume = $V_2 - V_1$ = 42 - 24
= 18 mL or 18 cm^3

Mass = 72 g.

Density of the solid = $\frac{Mass}{Vol.}$

= $\frac{72 g}{18 cm^3}$ = 4.0 g cm^{-3} = 4 = 4.0 g cm^{-3}

(9) (a) Mass of the empty density bottle = M = 21.8 g

Mass of bottle which is completely filled with water = V_1 = 41.8 g

Mass of bottle which is completely filled with liquid = V_2 = 40.6 g

Volume = V = 41.8 g − 21.8

= 20 g = 20 cm³ = 20 mL

(b) Mass of empty bottle = (M_1) = 21.8 g

Mass of bottle + water = (M_2) = 41.8 g

Mass of bottle + Liquid = (M_3) = 40.6 g

Mass of water = $(M_2 - M_1)$ g

= (41.8 − 21.8) g

= 20 g

Mass of liquid = $(M_3 - M_1)$ g

= (40.6 − 21.8) g

= 18.8 g

40.6
21.8

Date ______
Page ______

$$\frac{\text{Mass of liquid}}{\text{Mass of equal vol. of water}}$$

$$\frac{M_3 - M_1}{M_2 - M_1} = \frac{18.8}{20} = 0.94$$

(10) Mass of empty density bottle = 22 g (M_1)

Mass of bottle + water = 50 g (M_2)

Mass of bottle + brine sol. = 54 g (M_3)

Mass of water = $M_2 - M_1$
= 50 g − 22 g
= 28 g

Mass of brine sol. = ~~9~~ $M_3 - M_1$
= ~~54 g~~ 54 g − 22 g
= 32 g

Density of brine sol. =

$$\frac{\text{Mass of brine solution}}{\text{Mass of water}}$$

$$= \frac{32}{28} = 1.14\ g/cm^3$$
$$= 1.14\ g\ cm^{-3}$$

~~Relative~~

Relative density = 1.14

(11) (a) Mass of empty density bottle = 30 g (M_1)

Mass of bottle when filled completely with water = 75 g (M_2)

Mass of bottle when filled completely with liquid = 65 g (M_3)

Volume = ~~65 − 30~~

= 75 − 30 = ~~35g~~ 45 g

= 45 cm3

= 45 mL

(b) Density = $\frac{\text{Mass}}{\text{Vol.}}$

= $\frac{35}{45}$ = 0.77 g cm^{-3}

(Mass of liquid = $M_3 - M_1$ = 65 − 30 = 35 g

(c) Relative density of liquid = 0.77