PHYSICS

BOOKS - ICSE

PHYSICAL QUANTITIES AND MEASUREMENT

Solved Example

1. A stone is immersed in a Eureka can. The mass of the empty beaker into which water

overflowed was 30 g and the mass of the beaker with the water from the Eureka can is 56 g. If the mass of the stone is 87 g. What is the density of the stone?

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2. A piece of steel has a volume of 4cm^3 and a mass of 32 g. What is its density in (a) g/cm^3 (b) kg/m^3?

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3. What is the mass of $5m^3$ of cement of density 3050 $\mathrm{kg/m^3}$?

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4. If the density of wood is 0.6 $\mathrm{g/cm^3}$, what is the mass of $1\mathrm{cm}^3$?

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5. If the density of wood is 0.6 $\mathrm{g/cm^3}$, what is the mass of $2\mathrm{cm^3}$?

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6. If the density of wood is 0.6 $\mathrm{g/cm^3}$, what is the mass of $10\mathrm{cm^3}$?

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7. Two identical flasks - one filled with water to the $500\,\mathrm{cm}^3$ mark, and the other filled with kerosene to the same $500\,\mathrm{cm}^3$ mark are measured on an electronic balance. The flask filled with water is found to weigh 620 g, and that filled with kerosene weighs 520 g. The empty flask is measured and found to be 120 g. Find the densities of water and kerosene.

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8. A block of ice with volume $2.76m^3$ has a mass of 2530 kg, find its density.

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9. A silver cylindrical rod has a length of 0.5 m and radius of 0.4 m, find the density of the rod, if its mass is 2640 kg.

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10. A stone has a mass of 108.5 g. When the stone is totally immersed in water contained in a measuring cylinder, it displaces water from $50\ \mathrm{cm}^3$ to $93\mathrm{cm}^3$. Find the density of the stone.

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11. A beaker contains $262.5\mathrm{cm}^3$ of a certain liquid and weighs 420 g. If the mass of an

empty dry beaker is 210 g, find the density of the liquid.

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12. One litre of water has a mass of 1 kg . What is its density

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Questions Choose The Correct Option To Fill In The Blank

1. The density of an object ..... (remains the same/changes).

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2. Density of water is ..... $\left(10\ \mathrm{g\ cm^{-3}} / 1\ \mathrm{g\ cm^{-3}}\right)$.

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3. Solids which are denser than a liquid ..... (float/sink) in that liquid.

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4. Compared to liquid, gases are .....(more/less) dense.

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Exercises Section I Name The Following

1. The property of the material which tells us how much mass has been packed into a certain amount of space .....

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2. SI unit of density .....

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3. Bottle used to measure density and relative density of a liquid .....

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4. The vessel used in laboratories to measure the volume of a liquid accurately .....

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5. The upward force by the fluid on the object when an object is either totally or partially submerged in a fluid .....

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Exercises Section I Choose The Correct Option

1. Density is given as .....

A. volume x mass

B. volume/mass

C. mass/volume

D. mass + volume

Answer:

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2. 1000 kg/m^3 is equal to .....

A. 1/1000 $\mathrm{g/cm^3}$

B. 1 $\mathrm{g/cm^3}$

C. 100 g/cm^3

D. 1/100 g/cm^3

Answer:

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3. The RD of an object which will float in water will be .....

A. less than 1

B. more than 1

C. equal to one

D. can be less or more than 1

Answer:

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4. When the air gets heated, its density .....

A. increases

B. decreases

C. remains constant

D. becomes zero

Answer:

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5. A solid which has density less than water is .....

A. ice

B. lead

C. steel

D. kerosene

Answer:

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6. The density of water is ..... $\mathrm{kg/m^3}$.

A. 1

B. 10000

C. 1000

D. 1/1000

Answer:

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7. The cause for sea breeze and land breeze is .....

A. convection

B. conduction

C. radiation

D. All of these

Answer:

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Exercises Section I Write T For True And F For False Correct The False Statements

1. The density of an object remains the same irrespective of its shape and size.

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2. The volume of the liquid completely filled in a bottle is the volume of the bottle itself.

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3. Kerosene is denser than water.

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4. The denser the fluid, the lesser the buoyancy of the fluid.

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5. An increase in the volume increases the upthrust.

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6. As the volume increases with temperature, its density decreases.

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Exercises Section I Match The Following

1. Match the following

Column A	*Column B*
1. Lead	a. No unit
2. Ice	b. Sinks in oil
3. Hot air balloon	c. Sinks in water
4. Relative density	d. Mass/volume
5. Density	e. SI unit of density
6. kg/m^3	f. Upthrust

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Exercises Section I Choose The Correct Option To Fill In The Blank

1. As density ..... (changes/does not change), it can be used to identify what a substance is made of.

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2. The density of ice is ..... (less than/greater than the density of water.

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3. If an object is less dense than the fluid in which it is placed it will ..... (sink in/ float on) the fluid.

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4. The buoyant force acts ..... (along/opposite to) the direction of gravity

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5. Larger the volume of the body submerged in the liquid, ... (greater/lesser) the upthrust.

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6. The unit of upthrust is ..... (Kg/N)

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Exercises Section Ii Give Reasons For The Following

1. A ring and a brick made of gold have the same density.

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2. More specialized measuring vessel is used to measure volume of chemicals in a laboratory

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3. Relative density of a substance remains the same in both Sl and CGS units.

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4. A nail sinks in water whereas it floats on mercury.

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5. Swimming in sea water is easier than in fresh water.

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6. Gases have the least density.

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7. When a ship enters sea water from fresh water it sinks less.

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Exercises Section Ii Distinguish Between The Following

1. Explain Mass and density.

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2. Give relation between Volume and density.

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3. Generally which one is greater among Density of solids and density of liquid ?

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4. Give formula for Density and relative density.

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5. Explain Sinking and floating.

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Exercises Section Ii Short Answer Questions

1. Define density. What does it tell you in terms of how the molecules are packed?

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2. What do you mean by capacity of a container?

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3. How do we take measurements from a convex meniscus liquid?

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4. How do you measure density of a gas?

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5. What do you mean by relative density? What does it tell you?

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6. How do the density of an object and density of liquid affect sinking and floating?

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7. What do you mean by buoyant force? On what factors does it depend?

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8. How does a submarine work?

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9. What do you mean by convection?

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Exercises Section Ii Long Answer Questions

1. Describe an activity to show that the volumes of different objects are different although their masses are the same. What do you conclude from this?

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2. Explain how would you measure density of an irregular solid using a Eureka can.

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3. How do you measure density of a liquid using a graduated measuring cylinder?

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4. How do you measure density of a liquid using a density bottle?

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5. Compare densities of solids, liquids, and gases.

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6. How does a hot air balloon work?

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Exercises Section Ii Numerical Questions

1. The density of sand is $1500\mathrm{kg}/\mathrm{m}^3$. What is the mass of $1m^3$ of sand ?

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2. The density of sand is $1500\mathrm{kg}/\mathrm{m}^3$. What is the mass of $10m^3$ of sand ?

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3. What is the density of milk if 1 mL of milk has a mass of 1.03 g?

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4. Which will occupy more space- 720 g of mahogany wood (of density 0.720 $\mathrm{g/cm^3}$) or 2710 g of marble (of density 2.71 $\mathrm{g/cm^3}$) ?

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5. The volume of 60 g of a substance is $20\ \mathrm{cm}^2$. If the density of water is $1\mathrm{g}/\mathrm{cm}^3$, will the substance sink or float in water?

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6. Find the volume of 900 g of cooking oil whose density is $0.9\mathrm{g}/\mathrm{cm}^3$. Give the answer in litres.

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7. What is the mass of air in a room measuring 10.0 m x 5.2 m x 2.5 m, if the density of air is 1.3 kg/m^3 ?

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8. An empty density bottle weighs 30 g, and 54 g when filled with kerosene. If the volume of the bottle is 30 ml, find the density of kerosene in (a) g/cm^3 (b)kg/m^3 .Also find its RD.

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9. An empty beaker weighs 100 g. A volume of 75 mL of salt solution is taken and weighed. It is found to be 190 g. What is the density of the salt solution in $\mathrm{g/cm^3}$ and also in $\mathrm{kg/m^3}$?

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10. An empty RD bottle weighs 30.5 g. When completely filled with water, it is found to weigh 60.5 g. When filled with alcohol it is

found to weigh 53.5 g. What is the relative density of alcohol?

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11. A pebble of mass 33 g is lowered into a measuring jar containing water so that it is completely covered in water. The initial level of water was 60 ml and after lowering the stone it was found to be 74 ml. What is the density of stone?

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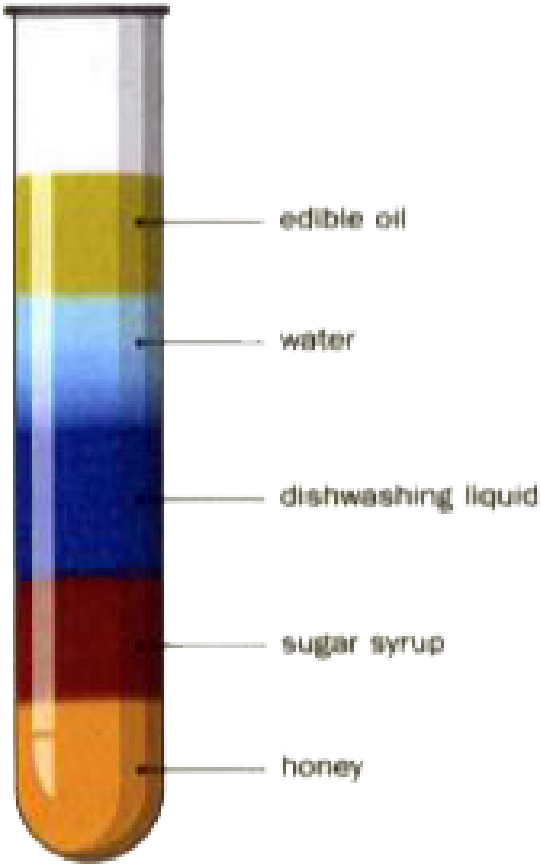
Picture Study

1. In Figure A. determine which liquid is (a) denser than sugar syrup (b) lighter than sugar

syrup but heavier than water.



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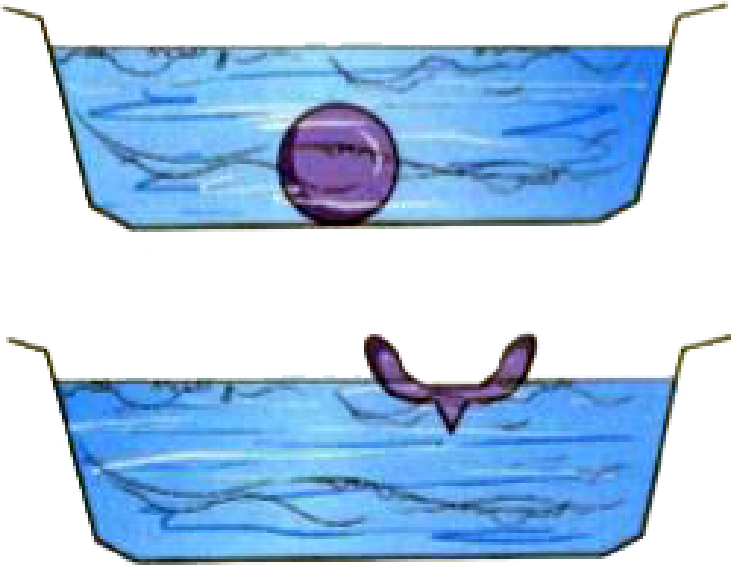
2. Figure B shows two different objects in the same liquid. On which of these objects is the upthrust more and why?



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3. A stone is weighed using a spring balance (Fig. C) and it weighs 40 g. But when it is dipped in water, it weighs only around 25 g. Why does it weigh less in water? Which force acting on the stone is responsible for this?

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Numerical Problems

1. A piece of lead weighs 232 g and has a volume of $20cm^3$. Find the density of lead.

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2. 5 litres of alcohol has a mass of 4 kg. Calculate the density of alcohol in (a) g/cm^3 and (b) kg/m^3.

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3. Find the mass of $555cm^3$ of iron in kg when density of iron is $7.6g/cm^3$.

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4. A density bottle weighs 20.25 g when empty, 40.75 g when filled with a liquid and 50.25 g when filled with water. Find (a) volume of bottle (b) density of liquid.

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Exercise Objective Type Questions Fill In The Blanks

1. The density of zinc is 4.2g cm^{-3}. The volume of 420 g of zinc is ..... cm^3.

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2. An iron needle sinks in water as its density is ..... than $1gmc^{-3}$

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3. A solid 'S'floats in liquid 'L'. The density of 'S' is ..... than liquid 'L'.

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4. The density of milk is 1.04 g cm^{-3}. Therefore, 1 cm^3 of milk has a ..... of 1.04 g

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5. Sea breeze blows from the ..... towards the earth.

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Exercise Objective Type Questions Incorrect Or Correct

1. Weight per unit volume of a substance is called density.

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2. More is the density of a liquid than a solid, more the volume of solid will submerge in it.

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3. A piece of iron (density 7.6 g cm^{-3}) sinks in mercury (density $13.6g\ cm^{-3}$).

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4. Land breeze flows from the sea towards the land.

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5. With the rise in temperature of air its density increases.

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Exercise Objective Type Questions True Or False

1. A body having density more than 1 g cm^{-3} sinks in water.

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2. The hot air rises up as its density increases.

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3. Liquids have high density due to their molecules are tightly packed in a small volume.

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4. The sea breeze in the coastal region blows at night.

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5. Write True/False:

The hot air in the rooms rises up and flows out of ventilators. The fresh and cold air from outside flows into room from doors and windows.

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Exercise Objective Type Questions

1. The density of mercury is $13.6 gcm^{-3}$ in CGS system. Its density in SI system is :

A. $136 kgm^{-3}$

B. $1360 kgm^{-3}$

C. $13600 kgm^{-3}$

D. no change in density

Answer:

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2. When a liquid is heated, it expands and its level:

A. rises upward

B. moves downward

C. remains same

D. none of these

Answer:

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3. In order to find the density of a solid we have to find its :

A. mass and area

B. weight and volume

C. weight and area

D. mass and volume

Answer:

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4. When the air cools, its density :

A. increases

B. decreases

C. does not change

D. none of these

Answer:

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5. In coastal regions the density of air above sea, during night is:

A. more than that of land air

B. less than that of land air

C. same as that of land air

D. none of these

Answer:

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6. Match the statements in column A, with those in column B.

Column A	Column B
1. A tiny glass bottle used for finding the density of a liquid.	(a) Density
2. Lines marked on the hull of merchant ships.	(b) 1000 kgm^{-3}
3. A wind blowing in coastal regions during night.	(c) Plimsoll lines
4. The mass per unit volume.	(d) Density bottle
5. The density of freshwater in SI system.	(e) Land breeze

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Exercise Study Questions

1. You are provided with a glass stopper and a measuring cylinder. How will you proceed to find the density of stopper? Diagrams not required.

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2. Briefly describe how will you find experimentally density of kerosene oil with a density bottle.

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3. How does the density of a liquid change with the rise in its temperature?

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4. On the basis of change of density with the change in temperature, explain how do the liquids get heated up, when heated in a vessel.

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5. How does the density of gases change with the rise in temperature?

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6. How is land breeze formed? Explain.

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7. How is sea breeze formed? Explain.

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8. Two solids A and B of density 2.5 g cm^{-3} and 0.80g cm^{-3} are placed in a liquid L of density 1.2 g cm^{-3} Which solid is likely to float and why?

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9. Why do objects like metals or stones sink in water ?

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10. Why do objects made of wood or plastic float in water?

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11. Why an iron needle sinks in water, but an iron ship floats in water?

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12. Describe comparison of densities in the three states of matter.

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13. A piece of wood of mass 150 g has a volume of 200 cm^3. Find the density of wood in

(a) CGS system

(b) SI system.

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14. 5 litres of kerosene oil is found to weigh 4.40 kg. Find the density of kerosene oil in (a) CGS system, (b) SI system.

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15. Calculate the volume of wood of mass 6000 kg, when density of wood is 0.8 g cm^{-3}

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16. Volume of a metal cube is 200 cm^3. If the density of metal cube is 7.5 g cm^{-3}, find the mass of metal cube in kilogram.

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17. An empty density bottle weighs 22 g. When filled completely with water, it weighs 50 g. When filled completely with brine solution, it weighs 54 g. Calculate (a) volume of density

bottle (b) density of brine solution.

[(a) $28cm^3$ (b) 1.14g cm^{-3}]

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Theme Assignment Objective Type Questions

1. The density of gold is $19.6gcm^{-3}$. Its density in SI system is _____ kgm^{-3}

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2. The Eureka can is used to determine the volume of a _____ solid. (regular/ irregular)

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3. During natural ventilation the _____ leaves from the ventilators. (cold air/warm air)

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4. Density of solids hardly changes with a rise in temperature by $20^{\circ} C$.

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5. Monsoon is a kind of giant sea breeze which blows towards the land.

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6. Plimsoll lines are marked on the hull of a ship for decorative purposes.

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7. When the water in a beaker is heated the warm water

A. rises upward

B. sinks downward

C. stays at one place

D. moves side-ways

Answer:

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8. The SI unit of density is :

A. gcm^{-3}

B. gm^{-3}

C. $kgcm^{-3}$

D. kgm^{-3}

Answer:

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9. With a rise in temperature, the density increases maximum in case of

A. solids

B. liquids

C. gases

D. none of these

Answer:

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10. A piece of wood (density $0.65 gcm^{-3}$) sinks in alcohol (density $0.80 gcm^{-3}$).

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11. The substances having density 1 g/ cm^3 sink in water.

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12. State true or false A ship fully loaded in seawater submerges less in the river water.

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13. What do you mean by density of a substance Define its units also.

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14. Why does density vary from one substance to another substance?

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15. Explain why do the bodies such as cork or wood float on the surface of water.

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16. How do you measure density of an irregula solid by using Eureka can?

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17. Describe comparison of densities in the three states of matter.

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18. The volume of a piece of metal is 50 cm^3. If the density of metal is 2.5 g cm^{-3}, find the mass of metal.

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