

Name: _____ Class: _____ Date: _____

Exercise **4A** Mass and Weight

1. Fill in the blanks below to show the differences between mass and weight.

	Mass	Weight
(a)		Is the force of gravity on the body
(b)	Is constant at any location	
(c)	Is a scalar quantity	
(d)	Is measured in kilograms	
(e)	Is measured using a beam balance	

2. Write down the relationship between mass
- m
- , weight
- W
- and acceleration due to gravity
- g
- .

3. Acceleration due to gravity on the surfaces of the Earth and the Moon are
- 10 m s^{-2}
- and
- 1.6 m s^{-2}
- respectively. Complete the following table by using the information given.

Mass	Weight	
	on Earth	on Moon
1 kg		
100 g		
	600 N	
		8 N

4. A ball of mass 0.5 kg was thrown vertically upwards into the air. It reached a maximum height of 5 m. [Take
- $g = 10 \text{ N kg}^{-1}$
-]

(a) What was the magnitude of the force acting on the ball at the highest point?

(b) What was the acceleration of the ball at the highest point?

- (c) After the ball had fallen 1 m from its highest point, its acceleration decreased. Why?

5. What is meant by the term 'inertia'?

6. Complete these sentences.

- (a) Objects having greater mass will have _____ inertia.
- (b) The greater the mass of a body, the more _____ it is to start it moving or to stop it.
- (c) The law of inertia is consistent with Newton's _____ law of motion.

7. What is meant by 'gravitational field'?

8. Define gravitational field strength.

9. Complete these sentences.

- (a) The SI unit for gravitational field strength is the _____.
- (b) The gravitational field strength has the same value as the _____ due to gravity.

10. The gravitational field strength of Earth, Jupiter and the Sun are 10 N kg^{-1} , 26 N kg^{-1} and 280 N kg^{-1} respectively. The weight of an object on the surface of Jupiter is 130 N.

- (a) What is the mass of the object?

- (b) What is the weight of the object

- (i) on the surface of Earth?

- (ii) on the surface of the Sun?

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Exercise **4B** Density

1. (a) Define density.

- (b) What is the SI unit for density?

2. The density of water is
- 1 g cm^{-3}
- . What is its density expressed in
- kg m^{-3}
- ?

3. Complete the following table to find either the mass, volume or density of the material.

Material	Mass	Volume	Density	
			g cm^{-3}	kg m^{-3}
aluminium	135 g	50 cm^3		
copper	178 g		8.9 g cm^{-3}	8900 kg m^{-3}
glass		40 cm^3	2.5 g cm^{-3}	2500 kg m^{-3}
petrol	160 g	200 cm^3		
mercury		5 cm^3	13.6 g cm^{-3}	$13\,600 \text{ kg m}^{-3}$

4. A rectangular block of metal measures 50 mm by 45 mm by 4 mm. Its mass is 24 g. Calculate

(a) the volume of the metal block,

(b) the density of the metal block in g cm^{-3} .

5. A student was asked to check whether a gold chain is made of pure gold. He found that the gold chain had a mass of 300 g. Using the displacement method, the volume of the gold chain was measured to be
- 20 cm^3
- . Could the gold chain be pure gold? (The density of gold is
- 19.3 g cm^{-3}
- .)

6. Four litres of petrol have a mass of 3.2 kg.
- (a) What is the volume of the petrol expressed in terms of m^3 ?
 - (b) Calculate the density of petrol.
7. A classroom measures 5.0 m by 6.0 m by 3.0 m. The air inside it has a density of 1.3 kg m^{-3} . Calculate
- (a) the volume of air in the classroom,
 - (b) the mass of the air.
8. 200 cm^3 of water with density 1.0 g cm^{-3} are mixed with 300 cm^3 of methylated spirit with density 0.80 g cm^{-3} . Assuming there is no change in total volume after mixing, calculate
- (a) the mass of water,
 - (b) the mass of methylated spirit,
 - (c) the total mass of the mixture,
 - (d) the total volume of the mixture,
 - (e) the density of the mixture.

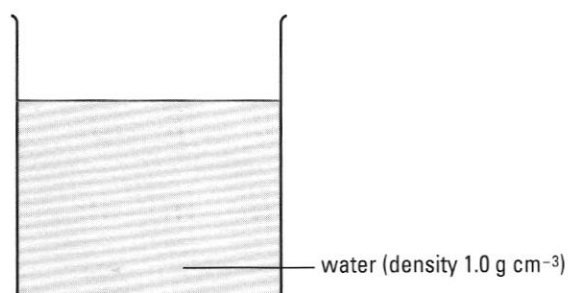
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Exercise **4C** Floating and Sinking

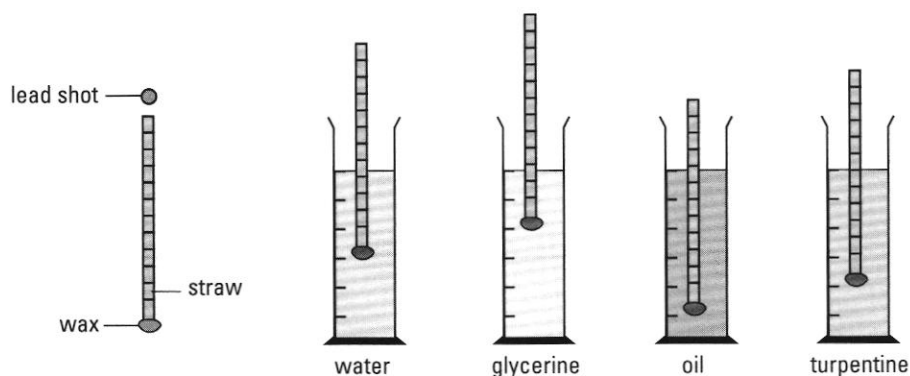
1. Complete these sentences.

- (a) When an object is placed in a liquid of a lower density, it _____.
- (b) When an object is placed in a liquid of a higher density, it _____.
- (c) When an object is placed in a liquid having the same density as the object, it _____.

2. Three objects of densities 0.9 g cm^{-3} , 1.0 g cm^{-3} and 1.1 g cm^{-3} respectively are placed in water of density 1.0 g cm^{-3} . Draw in the diagram below to show how the three objects will settle in water.



3. When an object floats in various types of liquids, the denser the liquid, the _____ the object will float in the liquid.
4. The drawing below shows the relative positions of straws loaded with lead shots and placed in various types of liquids.



(a) Which liquid has the highest density?

(b) Which liquid has the lowest density?

9. An alloy is made by mixing 450 g of cobalt (density 9 g cm^{-3}) with 240 g of iron (density 8 g cm^{-3}).

(a) What is the volume of cobalt used?

(b) What is the volume of iron used?

(c) What is the total volume of cobalt and iron used?

(d) What is the density of the alloy?

10. An alloy is made by mixing metal A and metal B, which have densities of 12 g cm^{-3} and 4 g cm^{-3} respectively. The alloy weighs 100 g and is found to have a volume of 10 cm^3 . Fill in the blanks and find the mass of metal A. [Hint: Let m be the mass of metal A.]

Material	Mass	Volume	Density
Metal A	(a) m	(c) _____ cm^3	12 g cm^{-3}
Metal B	(b) _____	(d) _____ cm^3	4 g cm^{-3}