

6.3 Volume of solids

ACTIVITY 1 Units of volume

a) What is the volume of a cube with 1 cm edges? 1 cm³



b) Consider the cube on the right with 1 dm edges.

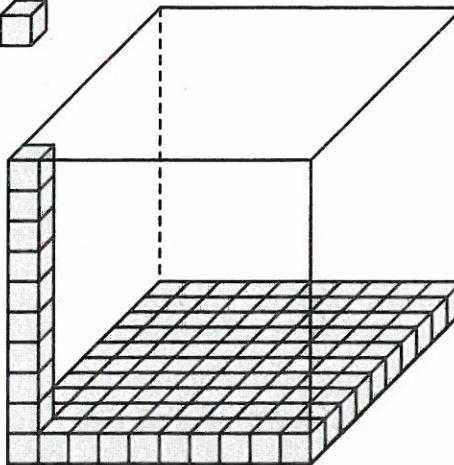
1. Express its volume in dm³. 1 dm³

2. How many small cubes with 1 cm edges can the large cube on the right contain? 1000

3. Complete the equality: 1 dm³ = 1000 cm³.

$$1 \text{ cm}^3 = 1 \text{ mL}$$

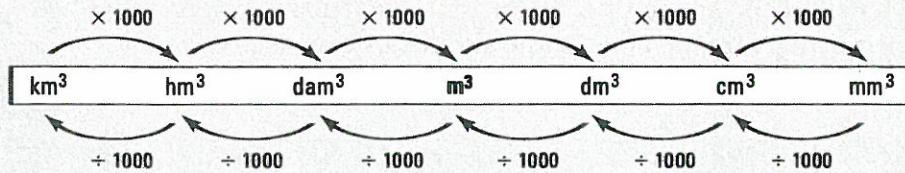
$$1 \text{ dm}^3 = 1 \text{ L}$$



UNITS OF VOLUME

- The principal unit of volume is the cubed metre (m³). It corresponds to the measure of space occupied by a cube with 1 m edges.

When going from a unit of volume to the next lowest unit of volume (or next highest), multiply (or divide) the measure by 1000.



$$\text{Ex.: } 0.43 \text{ m}^3 = 430 \text{ dm}^3; 24.5 \text{ cm}^3 = 0.0245 \text{ dm}^3$$

1. Indicate the most appropriate units for determining the volume of the following solids.

- | | | | |
|------------------------------|--------|-----------------------------|--------|
| a) A freezer _____ | m^3 | b) A glue stick _____ | cm^3 |
| c) An Egyptian pyramid _____ | m^3 | d) Rolling dice _____ | cm^3 |
| e) A ping pong ball _____ | cm^3 | f) An office building _____ | m^3 |
| g) A book _____ | dm^3 | h) A coin _____ | mm^3 |

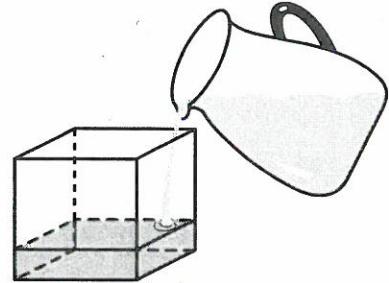
2. Convert the following volumes into the requested units.

- | | | |
|--|---|---|
| a) $3 \text{ m}^3 =$ <u>3000</u> dm ³ | b) $2 \text{ m}^3 =$ <u>2 000 000</u> cm ³ | c) $4 \text{ m}^3 =$ <u>4 000 000 000</u> mm ³ |
| d) $8 \text{ dm}^3 =$ <u>0.008</u> m ³ | e) $50 \text{ cm}^3 =$ <u>0.05</u> dm ³ | f) $3000 \text{ cm}^3 =$ <u>0.003</u> m ³ |
| g) $240 \text{ dm}^3 =$ <u>0.24</u> m ³ | h) $7000 \text{ mm}^3 =$ <u>7</u> cm ³ | i) $48 000 \text{ cm}^3 =$ <u>0.048</u> m ³ |

- 3.** Convert the following volumes into the requested units.
- $0.018 \text{ m}^3 = \underline{18} \text{ dm}^3$
 - $34.5 \text{ cm}^3 = \underline{0.0345} \text{ dm}^3$
 - $0.00045 \text{ dm}^3 = \underline{450} \text{ mm}^3$
 - $2.4 \text{ cm}^3 = \underline{2400} \text{ mm}^3$
 - $0.18 \text{ cm}^3 = \underline{180} \text{ mm}^3$
 - $1.7 \text{ dm}^3 = \underline{0.0017} \text{ m}^3$
 - $18\ 000 \text{ mm}^3 = \underline{0.018} \text{ dm}^3$
 - $5.4 \text{ m}^3 = \underline{5\ 400\ 000} \text{ cm}^3$
 - $4530 \text{ mm}^3 = \underline{0.00453} \text{ dm}^3$
- 4.** Convert each of the following volumes into m^3 .
- $48\ 000 \text{ cm}^3 = \underline{0.048 \text{ m}^3}$
 - $34\ 000\ 000 \text{ mm}^3 = \underline{34 \text{ m}^3}$
 - $73.1 \text{ dm}^3 = \underline{0.0731 \text{ m}^3}$
- 5.** Convert each of the following volumes into cm^3 .
- $0.74 \text{ m}^3 = \underline{740\ 000 \text{ cm}^3}$
 - $12.7 \text{ dm}^3 = \underline{12\ 700 \text{ cm}^3}$
 - $53.2 \text{ mm}^3 = \underline{0.0532 \text{ cm}^3}$
- 6.** Perform the following operations and express your answer in dm^3 .
- $3 \text{ m}^3 + 12\ 500 \text{ cm}^3 = \underline{3012.5 \text{ dm}^3}$
 - $0.25 \text{ m}^3 - 3500 \text{ cm}^3 + 0.08 \text{ m}^3 = \underline{326.5 \text{ dm}^3}$
 - $3.18 \text{ cm}^3 + 425\ 000 \text{ mm}^3 = \underline{0.42818 \text{ dm}^3}$
 - $3.54 \text{ m}^3 - 124\ 000 \text{ cm}^3 = \underline{3416 \text{ dm}^3}$
- 7.** How much will a block of granite cost if its volume is 435 dm^3 , and knowing that this particular type of granite costs $\$320/\text{m}^3$? $\$139.20$
- 8.** A truck driver is transporting construction materials. He delivers 3.75 m^3 of dirt, 40.8 dm^3 of cement and 11.7 m^3 of bricks. What is, in dm^3 , the total volume of his cargo? $15\ 490.8 \text{ dm}^3$

ACTIVITY 2 Units of capacity

- Construct a cube with 1 dm edges. Use thick cardboard.
- Pour one litre of any liquid in the cube that you have constructed. What do you notice?
The cube is full to capacity.
- Complete the following expression using the appropriate symbol $>$, $=$ or $<$. $1 \text{ dm}^3 \underline{\quad} 1 \text{ litre}$



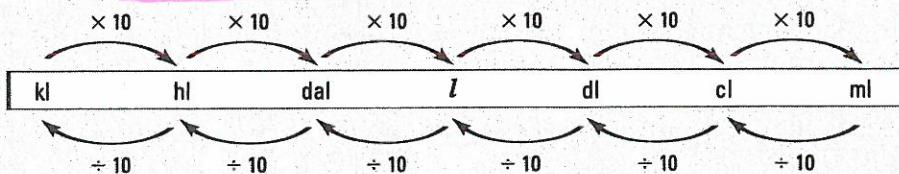
$$1 \text{ dm}^3 = 1 \text{ litre}$$

UNITS OF CAPACITY

- Units of capacity are used to measure the volume of a liquid in a container such as water, milk, gasoline or to measure the volume of certain substances such as detergent.
- The principal unit of capacity is the litre. It corresponds to the capacity of a cube-shaped recipient with 1 dm edges.

$$1 \text{ litre} = 1 \text{ dm}^3$$

- When going from a unit of capacity to the next lowest unit of capacity (or next highest), multiply (or divide) the measure by 10.



Ex.: $5.4 \text{ l} = 540 \text{ cl}$; $35 \text{ dl} = 3.5 \text{ l}$.

It is deduced that: $1 \text{ dl} = 0.1 \text{ dm}^3$, $1 \text{ cl} = 0.01 \text{ dm}^3$, $1 \text{ ml} = 0.001 \text{ dm}^3 = 1 \text{ cm}^3$.

- 9.** Convert the following capacities to the requested units.

a) $4.3 \text{ l} = \underline{43} \text{ dl}$ b) $0.05 \text{ dl} = \underline{5} \text{ ml}$ c) $35 \text{ cl} = \underline{0.35} \text{ l}$
 d) $2.3 \text{ dal} = \underline{230} \text{ dl}$ e) $0.0054 \text{ dal} = \underline{54} \text{ ml}$ f) $2.35 \text{ l} = \underline{235} \text{ cl}$

- 10.** Convert the following measures to litres.

a) $3 \text{ cm}^3 = \underline{0.003} \text{ l}$ b) $0.02 \text{ m}^3 = \underline{20} \text{ l}$ c) $3.4 \text{ dm}^3 = \underline{3.4} \text{ l}$ d) $350\,000 \text{ mm}^3 = \underline{0.35} \text{ l}$

- 11.** Convert the following measures to millilitres.

a) $8.7 \text{ dm}^3 = \underline{8700} \text{ ml}$ b) $0.0008 \text{ m}^3 = \underline{800} \text{ ml}$ c) $875 \text{ mm}^3 = \underline{0.875} \text{ ml}$ d) $7.5 \text{ cm}^3 = \underline{7.5} \text{ ml}$

- 12.** Place the following volumes in increasing order.

a) $38 \text{ cl}; 135 \text{ cm}^3; 250 \text{ ml}; 0.092 \text{ dm}^3; 45\,000 \text{ mm}^3; 0.00004 \text{ m}^3$.

$\underline{0.00004 \text{ m}^3; 45\,000 \text{ mm}^3; 0.092 \text{ dm}^3; 135 \text{ cm}^3; 250 \text{ ml}; 38 \text{ cl}}$.

b) $2.43 \text{ dl}; 0.45 \text{ dm}^3; 0.5 \text{ l}; 250\,000 \text{ mm}^3; 34 \text{ cl}; 540 \text{ ml}$.

$\underline{2.43 \text{ dl}; 250\,000 \text{ mm}^3; 34 \text{ cl}; 0.45 \text{ dm}^3; 0.5 \text{ l}; 540 \text{ ml}}$.

- 13.** How many small bottles of 12.5 ml can be filled with 1 dm³ of perfume? 80 small bottles

- 14.** The capacity of a container is 3.18 l. Express these contents in cm³. 3180 cm³

- 15.** How many times must we pour the contents of a 20 cm³ test tube to fill a 1 l container?
50 times

- 16.** After submerging an object in a recipient of water, the water level rose from 50 cl to 58 cl. What is the volume, in cm³, of the object? 80 cm³