

Chem 1020  
SI Conversions Worksheet

**SI Prefixes:** pico = p =  $10^{-12}$     nano = n =  $10^{-9}$     micro =  $\mu$  =  $10^{-6}$   
milli = m\* =  $10^{-3}$     centi = c\* =  $10^{-2}$     deci = d =  $10^{-1}$   
kilo = k\* =  $10^3$     mega = M =  $10^6$     giga = G =  $10^9$   
(\* = memorize)

Give all answers in scientific notation.

**A. Conversions to and from base unit (no prefix).** (Problem-solving hint: convert the initial number into scientific notation first, then modify the power of 10 in the correct direction. Remember as the unit gets smaller, the number gets larger and vice-versa.)

1. Convert 4.0 cm to m.

$$c = 10^{-2} \text{ so } 4.0 \text{ cm} = 4.0 \times 10^{-2} \text{ m}$$

Just substitute the prefix with its power of 10. You can always do this when you are asked for a base unit (no prefix). It's already in correct scientific notation if you start with a value between 1 and 10.

2. Convert 4.0 m to cm.

$$4.0 \text{ m} = 400 \text{ cm}$$

$$4.0 \text{ m} = 4.0 \times 10^2 \text{ cm}$$

The unit gets smaller by 2 powers of 10 (we're going from  $10^0$  to  $10^{-2}$  in the prefixes) so the number should get larger by 2 powers of 10.

3. Convert 40 mm to m.

$$40 \text{ mm} = 40 \times 10^{-3} \text{ m} = 4 \times 10^{-2} \text{ m}$$

Or start by putting the original value in scientific notation:

$4 \times 10^1 \text{ mm} = 4 \times 10^{-2} \text{ m}$ . The unit gets larger by 3 powers of 10 so the number gets smaller by 3 powers of 10.

4. Convert 40 m to mm.

$4 \times 10^1 \text{ m} = 4 \times 10^4 \text{ mm}$ . The unit gets smaller by 3 powers of 10 so the number gets larger by 3 powers of 10.

5. Convert 0.4 km to m.

$4 \times 10^{-1} \text{ km} = 4 \times 10^2 \text{ m}$ . The unit gets smaller by 3 powers of 10 so the number gets larger by 3 powers of 10.

6. Convert 0.4 m to km.

$4 \times 10^{-1} \text{ m} = 4 \times 10^{-4} \text{ km}$ . The unit gets larger by 3 powers of 10 so the number gets smaller by 3 powers of 10.

7. Convert 40.0 m to mm.

$4.00 \times 10^1 \text{ m} = 4.00 \times 10^4 \text{ mm}$ . The unit gets smaller by 3 powers of 10 so the number gets larger by 3 powers of 10.

8. Convert 400.0 m to mm.

$4.000 \times 10^2 \text{ m} = 4.000 \times 10^5 \text{ mm}$ . The unit gets smaller by 3 powers of 10 so the number gets larger by 3 powers of 10.

9. Convert 4 nL to L.

$4 \text{ nL} = 4 \times 10^{-9} \text{ L}$ . This is a simple replacement.

10. Convert 4 L to nL.

$4 \text{ L} = 4 \times 10^9 \text{ nL}$ . The unit gets smaller by 9 powers of 10 so the number gets larger by 9 powers of 10.

11. Convert 40.0  $\mu\text{L}$  to L.

$4.00 \times 10^1 \mu\text{L} = 4.00 \times 10^{-5} \text{ L}$ . The unit gets larger by 6 powers of 10 so the number gets smaller by 6 powers of 10.

12. Convert 40.0 L to  $\mu\text{L}$ .

$4.00 \times 10^1 \text{ L} = 4.00 \times 10^7 \mu\text{L}$ . The unit gets smaller by 6 powers of 10 so the number gets smaller by 6 powers of 10.

13. Convert 0.04 GL to L.

$4 \times 10^{-2} \text{ GL} = 4 \times 10^7 \text{ L}$ . The unit gets smaller by 9 powers of 10 so the number gets larger by 9 powers of 10.

14. Convert 0.04 L to GL.

$4 \times 10^{-2} \text{ L} = 4 \times 10^{11} \text{ GL}$ . The unit gets larger by 9 powers of 10 so the number gets smaller by 9 powers of 10.

15. Convert 400.00 dL to L.

$4.0000 \times 10^2 \text{ dL} = 4.0000 \times 10^1 \text{ dL}$ . The unit gets larger by 1 power of 10 so the number gets smaller by 1 power of 10.

16. Convert 400.00 L to dL.

$4.0000 \times 10^2 \text{ L} = 4.0000 \times 10^3 \text{ dL}$ . The unit gets smaller by 1 power of 10 so the number gets larger by 1 power of 10.

**B. Conversions between two SI prefixes.**

17. Convert 8.56 mg to kg.

$10^{-3} \rightarrow 10^3$ : the unit gets larger by 6 powers of 10. The number will get smaller by 6 powers of 10.  
 $8.56 \text{ mg} = 8.56 \times 10^{-6} \text{ kg}$

18. Convert 8.56 kg to mg.

$10^3 \rightarrow 10^{-3}$ : the unit gets smaller by 6 powers of 10. The number will get larger by 6 powers of 10.  
 $8.56 \text{ kg} = 8.56 \times 10^6 \text{ mg}$

19. Convert 12.53 cL to mL.

$10^{-2} \rightarrow 10^{-3}$ : the unit gets smaller by 1 power of 10. The number will get larger by 1 power of 10.  
 $12.53 \text{ cL} = 125.3 \text{ mL}$   
 $1.253 \times 10^1 \text{ cL} = 1.253 \times 10^2 \text{ mL}$

20. Convert 12.53 mL to cL.

$10^{-3} \rightarrow 10^{-2}$ : the unit gets larger by 1 power of 10. The number will get smaller by 1 power of 10.  
 $12.53 \text{ mL} = 1.253 \text{ cL}$   
 $1.253 \times 10^1 \text{ mL} = 1.253 \times 10^0 \text{ cL}$

21. Convert  $2.36 \times 10^{-4}$  cm to km.

$10^{-2} \rightarrow 10^3$ : the unit gets larger by 5 powers of 10. The number will get smaller by 5 powers of 10.  
 $2.36 \times 10^{-4} \text{ cm} = 2.36 \times 10^{-9} \text{ km}$

22. Convert  $2.36 \times 10^{-4}$  km to cm.

$10^3 \rightarrow 10^{-2}$ : the unit gets smaller by 5 powers of 10. The number will get larger by 5 powers of 10.

$$2.36 \times 10^{-4} \text{ km} = 2.36 \times 10^1 \text{ cm} = 23.6 \text{ cm}$$

23. Convert 3482.4 cm to  $\mu\text{m}$ .

$10^{-2} \rightarrow 10^{-6}$ : the unit gets smaller by 4 powers of 10. The number will get larger by 4 powers of 10.

$$3.4824 \times 10^3 \text{ cm} = 3.4824 \times 10^7 \mu\text{m}$$

24. Convert 0.000235  $\mu\text{m}$  to cm.

$10^{-6} \rightarrow 10^{-2}$ : the unit gets larger by 4 powers of 10. The number will get smaller by 4 powers of 10.

$$2.35 \times 10^{-4} \mu\text{m} = 2.35 \times 10^{-8} \text{ cm}$$

25. Convert 426.3 ng to mg.

$10^{-9} \rightarrow 10^{-3}$ : the unit gets larger by 6 powers of 10. The number will get smaller by 6 powers of 10.

$$4.263 \times 10^2 \text{ ng} = 4.263 \times 10^{-4} \text{ mg}$$

26. Convert 823,320.0 mL to nL.

$10^{-3} \rightarrow 10^{-9}$ : the unit gets smaller by 6 powers of 10. The number will get larger by 6 powers of 10.

$$8.233200 \times 10^5 \text{ mL} = 8.233200 \times 10^{11} \text{ nL}$$

27. Convert 0.0032 Mg to mg.

$10^6 \rightarrow 10^{-3}$ . The unit gets smaller by 9 powers of 10. The number will get larger by 9 powers of 10.

$$3.2 \times 10^{-3} \text{ Mg} = 3.2 \times 10^6 \text{ mg}$$

28. Convert 322.8 dm to pm.

$10^{-1} \rightarrow 10^{-12}$ : the unit gets smaller by 11 powers of 10. The number will get larger by 11 powers of 10.

$$3.228 \times 10^2 \text{ dm} = 3.228 \times 10^{13} \text{ pm}$$