

Name: Mr E

Date: _____

**GRADE10 ESSENTIAL
UNIT C – MEASUREMENT
METRIC TEMPERATURE (CELSIUS SCALE)**

1. When man first discovered that fluids expand when hot and that they shrink when cold he invented the thermometer to measure temperature! The best fluid to use was a liquid metal called **mercury**, so they had mercury in very thin tubes called thermometers. (*heat* = 'thermo'; *measure* = 'meter')

2. A scientist named Fahrenheit determined we need a scale on the thermometer so we can count marks on it to see the temperature.

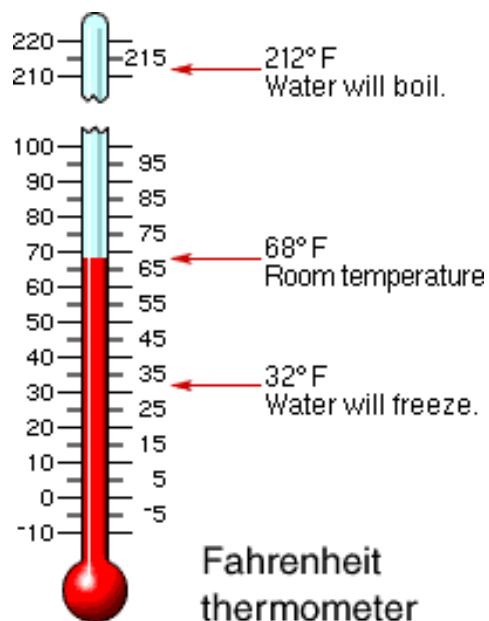
3. He marked where water **froze**, then he marked where water **boiled**. Then he squeezed in as many tick marks (degrees) as he could in between the two temperatures on his thermometer. There was about 180 tick marks.

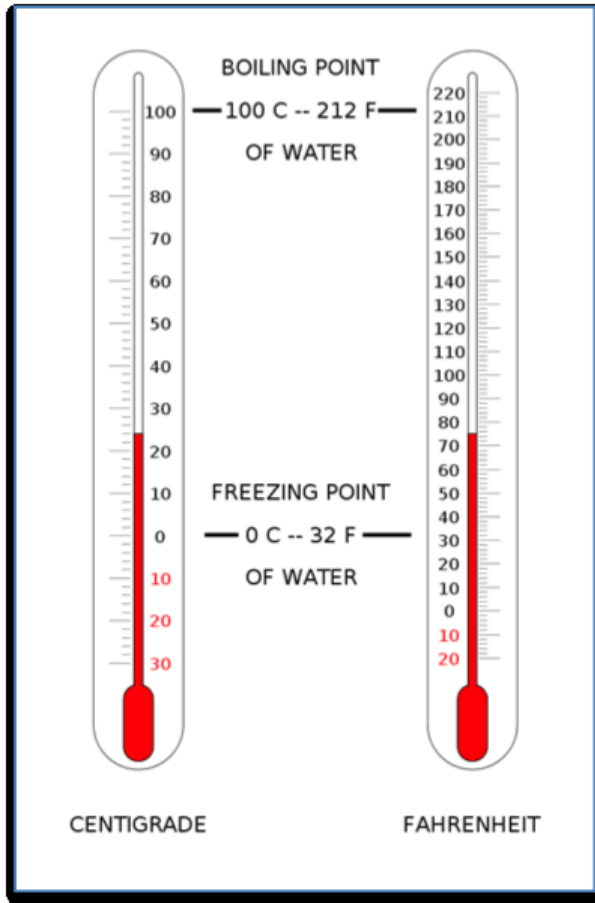
4. So water froze at zero and boiled at 180 degrees (180 °)

5. But then he realized that sometimes (in Europe) the outdoor temperature goes a bit below freezing. So he added 32 to all his tick marks since people would be confused by negative temperatures! That would avoid having negative temperatures!

6. So on the Fahrenheit scale **water froze at 32°F** and **boiled at 212°F**. (180 + 32 = 212).

7. Nobody, except Americans, still use that old Fahrenheit scale. Canadians went metric (counting by 10s and hundreds, etc) in 1975.





CELSIUS and FAHRENHEIT

8. The metric system uses degrees Celsius; °C. (Celsius was another scientist). He figured folks could understand negative numbers and just marked off **freezing at 0** and called **boiling 100**. So much easier! It is **metric!**

Some folks still mistakenly call it 'centigrade'.

9. In the Celsius scale water freezes at **0°C** and boils at **100°C**.

10. And most moms and dads know that body temperature for a human is 98.6°F or 37°C. (nominally)

And normal room temperature is normally *about* 68 to 70°F or about 20 to 21°C.

11. In daily use we tend to just give temperatures rounded to the nearest whole degree.

CONVERSION BETWEEN °F and °C

12. From the description of how the two temperature scales work a simple formula can be used to convert between the two temperature scales.

To convert from a known Celsius temperature to a Fahrenheit temperature:

$$^{\circ}\text{F} = \frac{9}{5} (^{\circ}\text{C}) + 32$$

To convert from a known Fahrenheit temperature to a Celsius temperature:

$$^{\circ}\text{C} = \frac{5}{9} (^{\circ}\text{F} - 32)$$

13. **Example 1.** Celsius to the old Fahrenheit

Convert 30°C (a nice hot summer day for us) to $^{\circ}\text{F}$ for your friend in the USA.

The general formula is: $^{\circ}\text{F} = \frac{9}{5}(^{\circ}\text{C}) + 32$

So: $^{\circ}\text{F} = \frac{9}{5}(30) + 32 = 54 + 32 = 86^{\circ}\text{F}$

14. **Example 2.** The old Fahrenheit to the proper Celsius

Your really old cook book says you have to cook your chicken at 425°F . Most ovens we buy are still in $^{\circ}\text{F}$ (default) since they are made in the USA but say you have a metric oven! (or somebody accidentally changed the oven to work in $^{\circ}\text{C}$ by holding the broil button for 5 seconds).

Convert 425°F to $^{\circ}\text{C}$:

The general formula is: $^{\circ}\text{C} = \frac{5}{9}(^{\circ}\text{F} - 32)$

So $^{\circ}\text{C} = \frac{5}{9}(425 - 32) = \frac{5}{9}(393) = \mathbf{218.33^{\circ}\text{C}}$

So you would probably set the oven at 220°C if your oven was set up in degrees C.

Convert the following $^{\circ}\text{C}$ to $^{\circ}\text{F}$: *Checking with the diagram above comparing the two thermometers would confirm your calculation! Round to nearest degree*

a. $40^{\circ}\text{C} = \underline{\hspace{2cm}}^{\circ}\text{F}$ b. $20^{\circ}\text{C} = \underline{\hspace{2cm}}^{\circ}\text{F}$

c. $10^{\circ}\text{C} = \underline{\hspace{2cm}}^{\circ}\text{F}$ d. $0^{\circ}\text{C} = \underline{\hspace{2cm}}^{\circ}\text{F}$

e. $-20^{\circ}\text{C} = \underline{\hspace{2cm}}^{\circ}\text{F}$ f. $-40^{\circ}\text{C} = \underline{\hspace{2cm}}^{\circ}\text{F}$

Convert the following °F to °C: *Checking with the diagram above comparing the two thermometers would confirm your calculation!. Round to nearest degree.*

a. $32^{\circ}\text{F} = \underline{\hspace{2cm}}^{\circ}\text{C}$

b. $98.6^{\circ}\text{F} = \underline{\hspace{2cm}}^{\circ}\text{C}$
(body temp)

c. $212^{\circ}\text{F} = \underline{\hspace{2cm}}^{\circ}\text{C}$

d. $12^{\circ}\text{F} = \underline{\hspace{2cm}}^{\circ}\text{C}$

e. $80^{\circ}\text{F} = \underline{\hspace{2cm}}^{\circ}\text{C}$

f. $-40^{\circ}\text{F} = \underline{\hspace{2cm}}^{\circ}\text{C}$

You make up a few conversions and compare them with the diagram of the thermometers to see if you are right!!

PS: You will always be given the formulas for converting!