Kelvin Temperatures and Very Cold Things!

183 K	Vostok, Antarctica
160 K	Phobos
134 K	Superconductors
128 K	Europa summertime
120 K	Moon at night
95 K	Titan Noon
90 K	Liquid oxygen
88 K	Miranda Noon
81 K	Enceladus summertime
77 K	Liquid nitrogen
70 K	Mercury at night
63 K	Solid nitrogen
55 K	Pluto summertime
54 K	Solid oxygen
50 K	Quaoar summertime
45 K	Moon shadowed crater
40 K	Star-forming nebula
33 K	Pluto wintertime
20 K	Hydrogen liquifies
19 K	Bose-Einstein matter
4 K	Helium liquifies
3 K	Cosmic fireball light
1 K	Helium becomes solid
0 K	ABSOLUTE ZERO

To keep track of some of the coldest things in the universe, scientists use the Kelvin temperature scale which begins at 0 Kelvin, which is also called Absolute Zero. Nothing can ever be colder than Absolute Zero because at this temperature, all motion stops. The table to the left shows some typical temperatures of different systems in the universe.

You are probably already familiar with the Centigrade (C) and Fahrenheit (F) temperature scales. The two formulas below show how to switch from degrees-C to degrees-F.

$$C = \frac{5}{9} (F - 32) \qquad F = \frac{9}{5} C + 32$$

Because the Kelvin scale is related to the Centigrade scale, we can also convert from Centigrade to Kelvin (K) using the equation:

$$K = 273 + C$$

Use these three equations to convert between the three temperature scales:

Problem 1:   212 F   converted to K

Problem 2:   0 K   converted to F

Problem 3:   100 C   converted to K

Problem 4:   -150 F   converted to K

Problem 5:   -150 C   converted to K

Problem 6:   Two scientists measure the daytime temperature of the moon using two different instruments. The first instrument gives a reading of + 107 C while the second instrument gives + 221 F. A) What are the equivalent temperatures on the Kelvin scale; B) What is the average daytime temperature on the Kelvin scale?

$$C = \frac{5}{9} (F - 32) \qquad F = \frac{9}{5} C + 32 \qquad K = 273 + C$$

Problem 1:   212 F   converted to K :
First convert to C: C = 5/9 (212 - 32) = +100 C.   Then convert from C to K:
K = 273 + 100 = 373 Kelvin

Problem 2:   0 K   converted to F: First convert to Centigrade:
   C = K - 273 so C = -273 degrees. Then convert from C to F:
F = 9/5 (-273) + 32 = -459 Fahrenheit.

Problem 3:   100 C   converted to K   :   K = 273 + C = 373 Kelvin.

Problem 4:   -150 F   converted to K   : Convert to Centigrade
C = 5/9 (-150 - 32) = -101 C. Then convert from Centigrade to Kelvin: K = 273 - 101
= 172 Kelvin.

Problem 5:   -150 C   converted to K :   K = 273 + (-150) = 123 Kelvin

Problem 6:   Two scientists measure the daytime temperature of the moon using two different instruments. The first instrument gives a reading of + 107 C while the second instrument gives + 221 F.

A) What are the equivalent temperatures on the Kelvin scale?;
107 C becomes K = 273 + 107 = 380 Kelvins.
221 F becomes C = 5/9 (221 - 32) = 105 C, and so K = 273 + 105 = 378 Kelvins.

B) What is the average daytime temperature on the Kelvin scale?
Answer: (380 + 378)/2 = 379 Kelvins.