Caffeine Problem for Week 5: Chem 1C (Kahn)

1) The deepest man-made borehole ever drilled into Earth is the Kola Superdeep Well located in the Northern Russia with depth of 12,262 meters. Temperature measurements indicated that the temperature at the bottom of the well reached about 180 °C. Studies of higher rock layers surprisingly showed that some of these layers are very moist. Assuming that the heat of vaporization of water has a temperature-independent value of 40.6 kJ/mol and the barometric pressure at the bottom of the well is 3232 mmHg, calculate the boiling point of water at the bottom of the Kola well and identify the correct answer**:**

A) Due to the high pressure, water exists as ice at the bottom of the Kola well.

B) The temperature at the bottom of the well is below the boiling point and thus water exists as normal liquid at the bottom of the well

C) The temperature and pressure at the bottom of the well are such that we cannot make a distinction between liquid and gas; we are in the supercritical regime

D) The temperature at the bottom of the well is above the boiling point and thus water exists as steam at the bottom of the well

E) The boiling point of water at the bottom of the well is about 112 °C

2) 10 g of 1 % solution of NaCl was diluted with 20 mL of pure water (density = 1). What is the molality of the resulting solution?

A) 0.59.

B) 58.44

C) 0.0171

D) 0.000171

E) None of the above