The force of gravity from a spherically symmetric body (even with a non-uniform internal density profile) is the same as if all the mass were concentrated at the center. Newton's Law of Universal Gravitation then gives that the force from the Earth on an object at the surface of the Earth is F=G*(Mass of Earth)*(mass of object)/(distance from surface to center of Earth)^2. Surface gravity is defined as the gravitational acceleration at the surface, g, which is related using Newton's Second Law F=ma to give that this gravitational force is equal to F = (mass of object)*g. Combining these two and solving for g, we see that the mass of the object cancels out (all objects fall to the Earth at the same rate, independent of mass, as Galileo showed) and that:

g = GM/d^2

which is the standard equation for surface gravity. The surface density of the present day Earth is about g=9.81 m/s^2. Assuming that the mass of the Earth is constant implies that d would be half of the present-day radius for "demi-Earth". In that case, the denominator is (1/2)^2 times as big, resulting in an increase in surface gravity by a factor of 4, giving a surface gravity of 39.24 m/s^2.

As far as atmospheric pressure, it is provided by the weight of the atmosphere. A famous calculation shows that you can calculate the surface pressure (at sea level) by taking the mass of the whole atmosphere of the Earth (about 10^18 kg) and dividing it by the surface area of the Earth. This yields the 1 "atmosphere" of pressure that we're used to. (There are many different units for this, including 1 atm = 10^5 Pascals = 10^5 kg/m^2.) That argument (as well as others) shows that the atmosphere pressure at sea level on demi-Earth would have been 4 atm. This is equivalent to being under 30 metres of water.

The atmosphere as a whole also shrinks. One can derive a quantity called the "atmospheric scale height", which is the height which you must go for the atmosphere pressure to decrease by a factor of "e"=2.74. Atmospheric pressure is thus exponential in height. On demi-Earth, with g four times higher, it can be shown that the scale height would be 4 times smaller. That is, the smaller Earth (with the same mass) has a density 8 times higher than present-day Earth and thus can hold on to the atmosphere 4 times tighter, shrinking it in all proportions (including thickness) by a factor of 4.