___ 1 A large balloon is being filled with He from gas cylinders. The temperature is 25.0°C and the pressure is 2.00 atmosphere. The volume of the inflated balloon is 2000. m^3. What was the volume of He in the cylinders if the gas was under a pressure of 130. atmospheres and at a temperature of 12.0°C when in the gas cylinders?

A) $29.4\,m^3$ B) $26.5\,m^3$ C) $14.7\,m^3$ D) $32.4\,m^3$ E) $58.9\,m^3$

___ 2 A cylinder contains oxygen gas at a temperature of $7°C$ and a pressure of 15 atm in a volume of 100 L. A fitted piston is lowered in the cylinder, decreasing the volume occupied by the gas to 80 L and raising the temperature to $40°C$. The gas pressure is now approximately

A) 17 atm B) 21 atm C) 8 atm D) 3 atm E) 75 atm

___ 3 A hailstorm causes an average pressure of 1.90 N/m^2 on the 190. m^2 flat roof of a house. The hailstones, each of mass 0.00800 kg, have an average velocity of 35.0 m/s perpendicular to the roof and rebound after hitting the roof with the same speed. How many hailstones hit the roof each second?

A) 322 B) 1418 C) 1289 D) 645 E) 1225

___ 4 Five molecules of a gas have the following speeds: 200 km/ s, 300 km/ s, 400 km/ s, 500 km/ s, 600 km/ s The rms speed for these molecules is

A) 400 km/ s B) 419 km/ s C) 424 km/ s D) 388 km/ s E) 410 km/ s

___ 5 If the rms speed of oxygen molecules is 490 m/ s at 0°C, the rms speed of oxygen molecules at 273°C is

A) 346. m/ s B) 1960. m/ s C) 693. m/ s D) 980. m/ s E) 490. m/ s

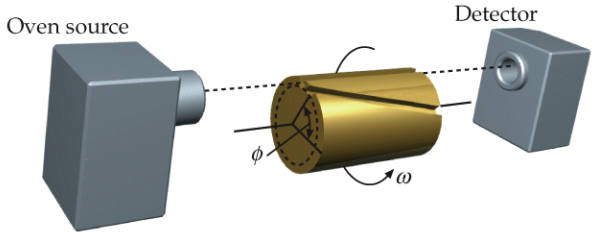

Figure 1: Problem 6

___ 6 A device used to measure the speed of molecules is shown above. When the cylinder is rotated at constant angular velocity only molecules that have the right speed will pass through the slanted slot and land on the detector. Derive an expression for the speed v in terms of the angular velocity ω, ϕ and L. L is the length of the cylinder and ϕ is the angle subtended by the slanted slot.

A) $v = \dfrac{\omega L}{4\phi}$ B) $v = \dfrac{2\pi\omega L}{\phi}$ C) $v = \dfrac{\omega L}{\phi}$

D) $v = \dfrac{\omega L}{2\pi\phi}$ E) $v = \dfrac{\omega L}{\pi\phi}$