Set 25: Ideal Gas. No restarts! T0 used everywhere.

Scuba Diver (1): P1*V1=NR*T1, P2*V2=NR*T2.

```
> restart; depth:=47.0*m: V1:=17.0*cm^3: T0:=273.15*K: T1:=(T0+5.0*K)
  :
> T2:=(T0+23.0*K): rho:=1.025*10^3*kg/m^3: g:=9.81*N/kg: P0:=101.325*
  10^3*N/m^2:
> P1:=depth*rho*g+P0; P2:=P0; f:=(T2/P2)*(P1/T1); V2:=f*V1;
```

$$P1 := \frac{5.739217500\ 10^{5}\ N}{m^{2}}$$

$$P2 := \frac{1.01325000\ 10^{5}\ N}{m^{2}}$$

$$f := 6.030714151$$

$$V2 := 102.5221406\ cm^{3} \qquad \textbf{(1)}$$

Pressure in a Neon gas container (3): P0*Vmol=R*T0, P*V=n*R*T.

```
> Vmole:=22.4*l: V:=53.7*l: M:=104.0*kg: T:=T0+20*K; mu:=20.18*
  kg/10^3:
> n:=M/mu; P:=n*P0*(Vmole/V)*(T/T0)*Pa*(m^2/N);
```

$$T := 293.15\ K$$

$$n := 5153.617443$$

$$P := 2.337713131\ 10^{8}\ Pa \qquad \textbf{(2)}$$

Ideal Gas (3): New pressure from PV=nRT.

```
> V1:=58.6*l: T1:=T0+18.0*K: P1:=2.12*atm: Vf:=51.9*l: Tf:=T0+50.0*K:

> Pf:=P1*(Tf/T1)*(V1/Vf);
```

$$Pf := 2.656767102\ atm \qquad \textbf{(3)}$$

Escaping Hydrogen (4): H2 molecules Kav=MH*v**2/2=3*k*T/2, k Boltzmann constant.

```
> k:=1.381*10**(-23)*J/K: vescape:=11.2*10**3*m/s: T:=T0+43.0*K:
  Kav:=3*k*T/2;
> J:=kg*m**2/s**2: MH:=2*1.673*10**(-27)*kg: assume(m>0): assume(s>0)
  :
> v:=sqrt(2*Kav/MH); Rat:=v/vescape;
```

$$Kav := 6.549047250\ 10^{-21}\ J$$

$$v := \frac{1978.522946\ m\sim}{s\sim}$$

$$Rat := 0.1766538345 \qquad \textbf{(4)}$$

Kinetic Energy of a Gas II (5): n number of moles, Kav=3*k*T/2.

```
> Avogadro:=6.023*10**23: n:=1.67: T:=410*K: Ktot:=n*Avogadro*3*k*
  T/2;
```

$$Ktot := \frac{8542.758489\ kg\ m\sim^{2}}{s\sim^{2}} \qquad \textbf{(5)}$$

```
>
```