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SP-A e)

Characteristic velocity

```
Ru = 8.314;
Tc = 5163.9956;
gamma = 1.194;
molarMass = 36.04;

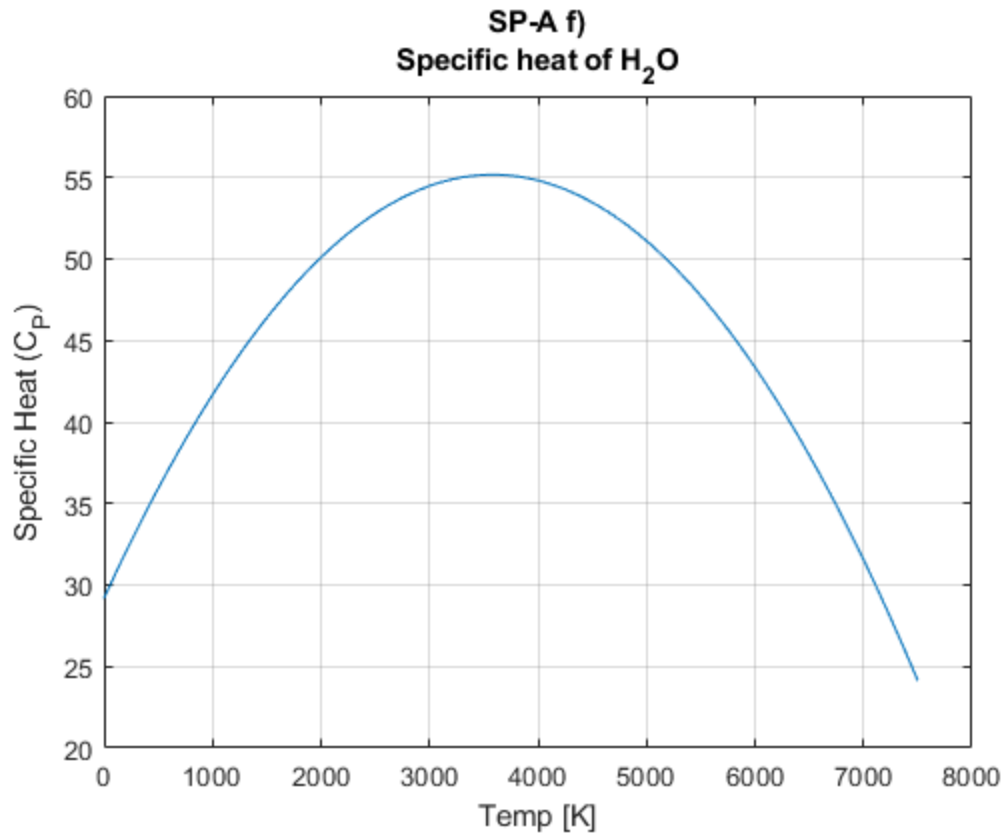
cStar = sqrt(1000*Ru*Tc/(gamma*molarMass)) * (2/(gamma+1))^( -(gamma+1)/
(2*(gamma-1)) );
```

SP-A f)

Plot Specific Heat of water as a function of temperature

```
T = linspace(0,7500,1000);
cP = 29.182 + 14.503*(T/1000) - 2.0235*(T/1000).^2;

figure(1)
plot(T,cP)
grid on
title({'SP-A f'),'Specific heat of H_2O'})
xlabel('Temp [K]')
ylabel('Specific Heat (C_P)')
```

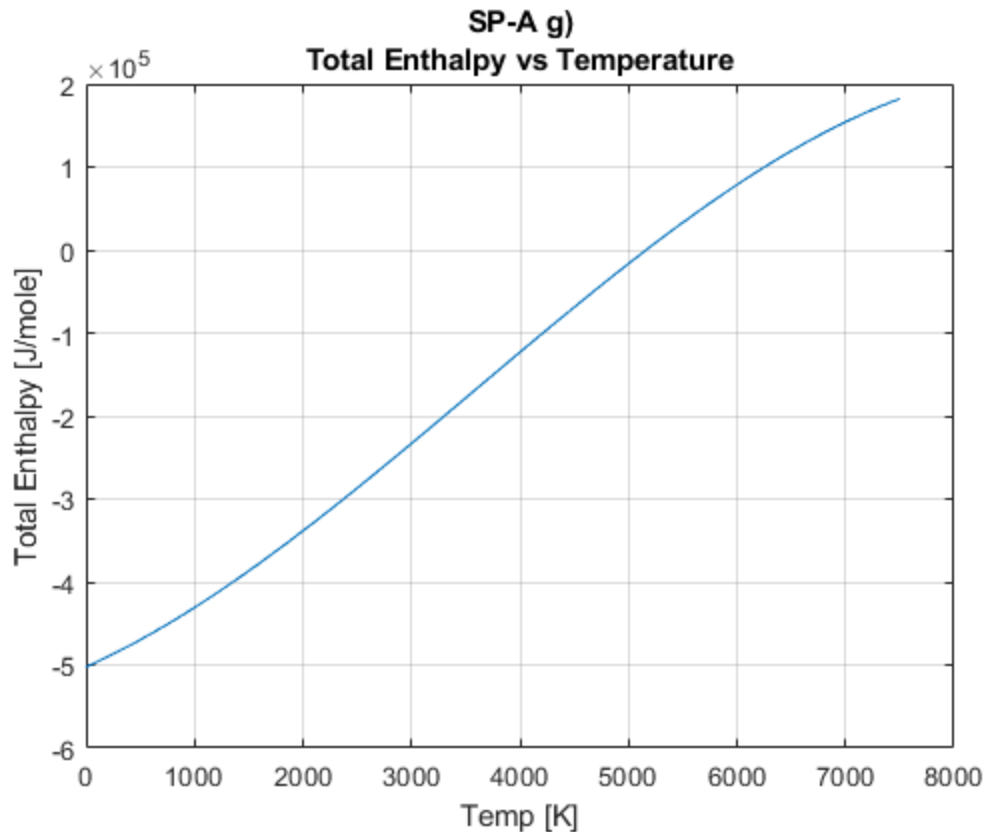


SP-A g)

Plot total enthalpy as a function of temperature

```
T = linspace(0,7500,1000);
enthalpyA = 2*(-57.7979*4184 + 29.182*T + (14.503/2)*T.*(T/1000) -
(2.0235/3)*T.*(T/1000).^2 - (29.182*298 + (14.503/2)*298*(298/1000) -
(2.0235/3)*298*(298/1000).^2));

figure(2)
plot(T, enthalpyA)
grid on
title({'SP-A g)', 'Total Enthalpy vs Temperature'})
xlabel('Temp [K]')
ylabel('Total Enthalpy [J/mole]')
```



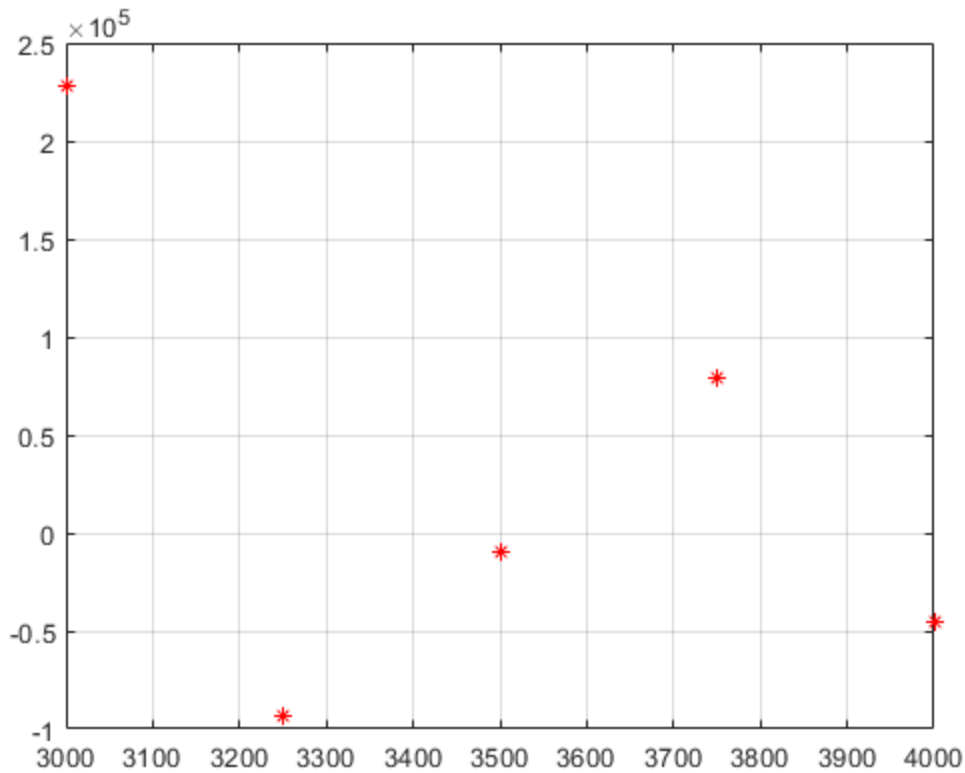
SP-B a)

guess T use that to get Kp use that to find a plug in to equation and see how it looks

```
Ts = [3000, 3250, 3500, 3750, 4000];
kp = [0.21, 9.5786, 4.9295, 2.7498, 16.623];
a = [0.20914, 1.51728, 1.309, 1.0852, 1.65];

for i=1:length(Ts)
    enthalpyB(i) = a(i)*((-57800*4.184) + (29.182*Ts(i) +
    (14.503/2)*Ts(i)*(Ts(i)/1000) - (2.0235/3)*Ts(i)*(Ts(i)/1000)^2) -
    ((29.182*298 + (14.503/2)*298*(298/1000) - (2.0235/3)*298*(298/1000)^2 ))...
    + (2 - a(i))*(26.896*Ts(i) + (4.35011/2)*Ts(i)*(Ts(i)/1000) -
    (0.32674/3)*Ts(i)*(Ts(i)/1000)^2) - (26.896*298 + (4.35011/2)*298*(298/1000)
    - (0.32674/3)*298*(298/1000)^2)...
    + ((2-a(i))/2)*(28.186*Ts(i) + (6.3011/2)*Ts(i)*(Ts(i)/1000) -
    (0.74986/3)*Ts(i)*(Ts(i)/1000)^2) - (28.186*298 + (6.3011/2)*298*(298/1000) -
    (0.74986/3)*298*(298/1000)^2);
end

plot(Ts,enthalpyB, 'r*')
grid on
```



SP-B b)

```
B = -1.8559E-10;
C = 2.3375E-06;
D = -1.0500E-02;
E = 1.6715E+01;
```

```
T = 3500;
```

```
kp = B*T^3 + C*T^2 + D*T + E;
```

SP-B d)

```
cph2o = 29.182 + 14.503*(3500/1000) - 2.0235*(3500/1000)^2;
cph2 = 26.896 + 4.350*(3500/1000) - 0.32674*(3500/1000)^2;
cpo2 = 28.186 + 6.3011*(3500/1000) - 0.74986*(3500/1000)^2;
```

```
cp = cph2o + cph2 + cpo2;
```

SP-B e)

```
Ru = 8.314;
Tc = 3500;
gamma = 1.066;
```

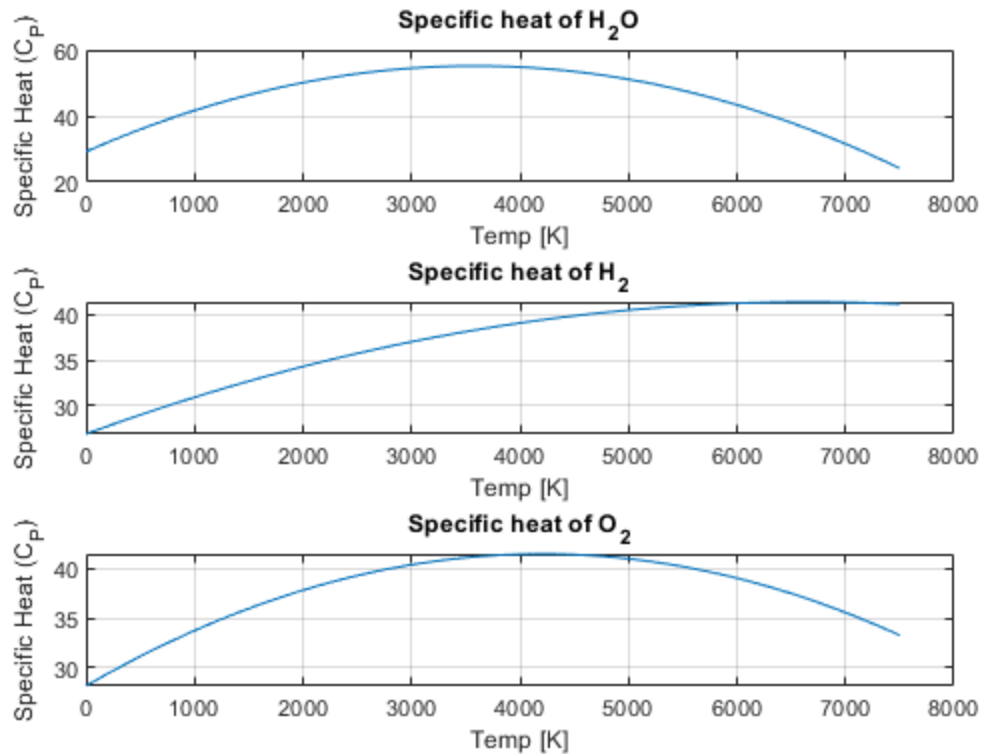
```
molarMass = 36.04;
```

```
cStar = sqrt(1000*Ru*Tc/(gamma*molarMass)) * (2/(gamma+1))^(-(gamma+1)/  
(2*(gamma-1)));
```

SP-B f)

Plot Specific Heat of water as a function of temperature

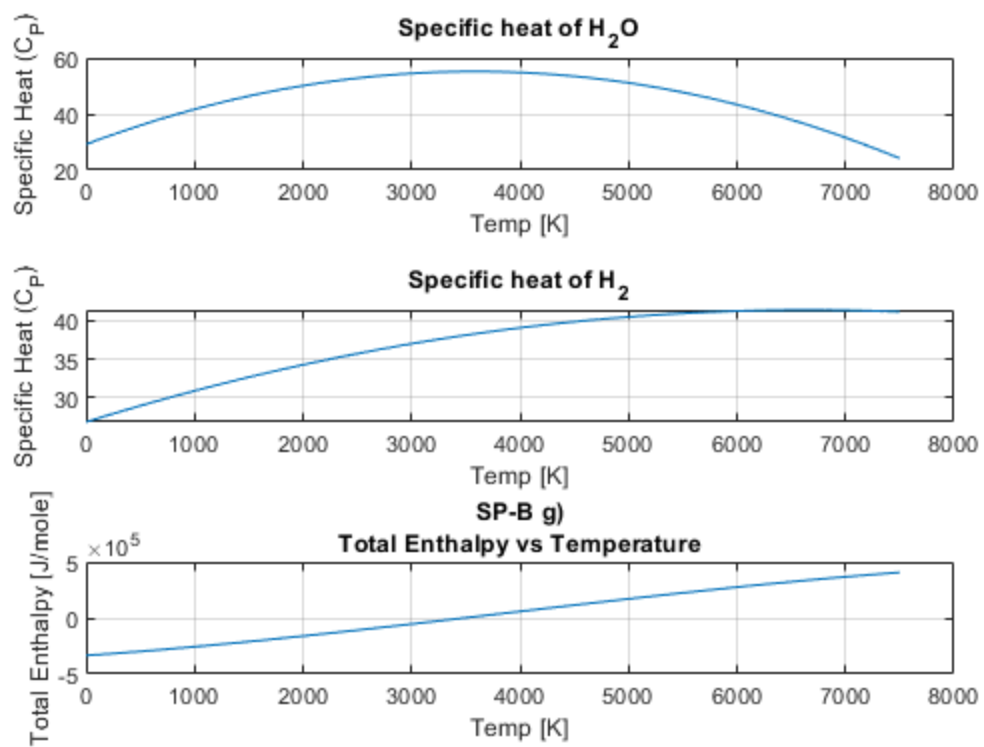
```
T = linspace(0,7500,1000);  
cph2o = 29.182 + 14.503*(T/1000) - 2.0235*(T/1000).^2;  
cph2 = 26.896 + 4.350*(T/1000) - 0.32674*(T/1000).^2;  
cpo2 = 28.186 + 6.3011*(T/1000) - 0.74986*(T/1000).^2;  
  
figure(3)  
subplot(3,1,1)  
plot(T,cph2o)  
grid on  
title('Specific heat of H_2O')  
xlabel('Temp [K]')  
ylabel('Specific Heat (C_P)')  
subplot(3,1,2)  
plot(T,cph2)  
grid on  
title('Specific heat of H_2')  
xlabel('Temp [K]')  
ylabel('Specific Heat (C_P)')  
subplot(3,1,3)  
plot(T,cpo2)  
grid on  
title('Specific heat of O_2')  
xlabel('Temp [K]')  
ylabel('Specific Heat (C_P)')
```



SP-A g)

Plot total enthalpy as a function of temperature

```
Ts = linspace(0,7500,1000);
a = 1.266;
enthalpy = a*((-57800*4.184) + (29.182*Ts + (14.503/2)*Ts.*(Ts/1000) -
(2.0235/3)*Ts.*(Ts/1000).^2) - ((29.182*298 + (14.503/2)*298*(298/1000) -
(2.0235/3)*298*(298/1000)^2))...
+ (2 - a)*(26.896*Ts + (4.35011/2)*Ts.*(Ts/1000) -
(0.32674/3)*Ts.*(Ts/1000).^2) - (26.896*298 + (4.35011/2)*298*(298/1000) -
(0.32674/3)*298*(298/1000)^2)...
+ ((2-a)/2)*(28.186*Ts + (6.3011/2)*Ts.*(Ts/1000) -
(0.74986/3)*Ts.*(Ts/1000).^2) - (28.186*298 + (6.3011/2)*298*(298/1000) -
(0.74986/3)*298*(298/1000)^2);
plot(T, enthalpy)
grid on
title({'SP-B g'),'Total Enthalpy vs Temperature'})
xlabel('Temp [K]')
ylabel('Total Enthalpy [J/mole]')
```



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