```
> restart;
```

Suggested Solution problem 1400-2, FYS3410/9310

Problem text:

Starting with equation 14.1,

```
> eq14_1a:=F=hg*(Cg-Cs);eq14_1b:=F=ks*Cs;
```

$$eq14\_1a := F = hg\,(Cg - Cs)$$

$$eq14\_1b := F = ks\,Cs \tag{1}$$

derive equation 14.2.

```
> eq14_2:=R = ks*hg*Cg/(N*(ks+hg));
```

$$eq14\_2 := R = \frac{ks\,hg\,Cg}{N\,(ks + hg)} \tag{2}$$

SOLUTION

Straight forward

We write the growth rate *R* from the flux F (of molecules) when n is the number of Si atoms pr gas molecule and N_Si is the atomic density of Si xtal

```
> eq1:=R=n*F/N_Si;
```

$$eq1 := R = \frac{n\,F}{N\_Si} \tag{3}$$

So, by putting equation 14_1b for the flux we have

```
> eq2a:=subs(eq14_1b,eq1);
```

$$eq2a := R = \frac{n\,ks\,Cs}{N\_Si} \tag{4}$$

We now need to express Cs in terms of Cg which is the concentration we can control.

Since the definition in the book of N is n/N_Si =1/N, with we have

```
> eq3:=N_Si=n*N;
```

$$eq3 := N\_Si = n\,N \tag{5}$$

```
> eq2:=subs(eq3,eq2a);
```

$$eq2 := R = \frac{ks\,Cs}{N} \tag{6}$$

```
> eq4:=Cs=solve(rhs(eq14_1a)=rhs(eq14_1b),Cs);
```

$$eq4 := Cs = \frac{hg\,Cg}{ks + hg} \tag{7}$$

```
> QED:=subs(eq4,eq2);
```

$$QED := R = \frac{ks\,hg\,Cg}{N\,(ks + hg)} \tag{8}$$

----

or equivalently skip the explicit step eq2a, include eq3 and write in on line

```
> qed:=subs(Cs=solve(rhs(eq14_1a)=rhs(eq14_1b),Cs),
                                   subs(eq3,subs(eq14_1b,eq1)));
```

$$qed := R = \frac{ks\,hg\,Cg}{N\,(ks + hg)} \tag{9}$$