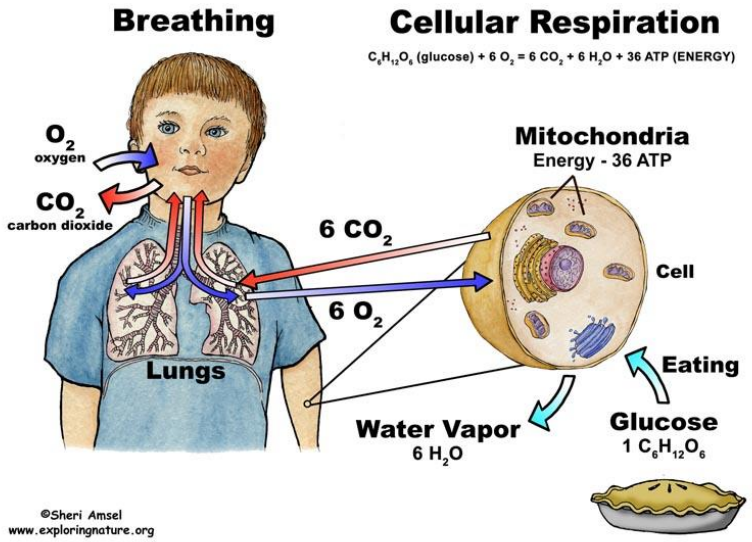
1. **10 points**

The human body needs on average 1.03×10^{-2} moles/minute of O_2 for cellular respiration. How many grams of glucose does the human body consume each day?

$$C_6H_{12}O_{6(s)} + 6\ O_{2(g)} \rightarrow 6\ CO_{2(g)} + 6\ H_2O_{(l)}.$$



$1.03 \times 10^{-2} \frac{moles\ O_2}{minute} \left(\frac{1\ mole\ C_6H_{12}O_{6(s)}}{6\ moles\ of\ O_{2(g)}}\right)$

$= 0.001716666667$ moles $C_6H_{12}O_{6(s)}$/minute

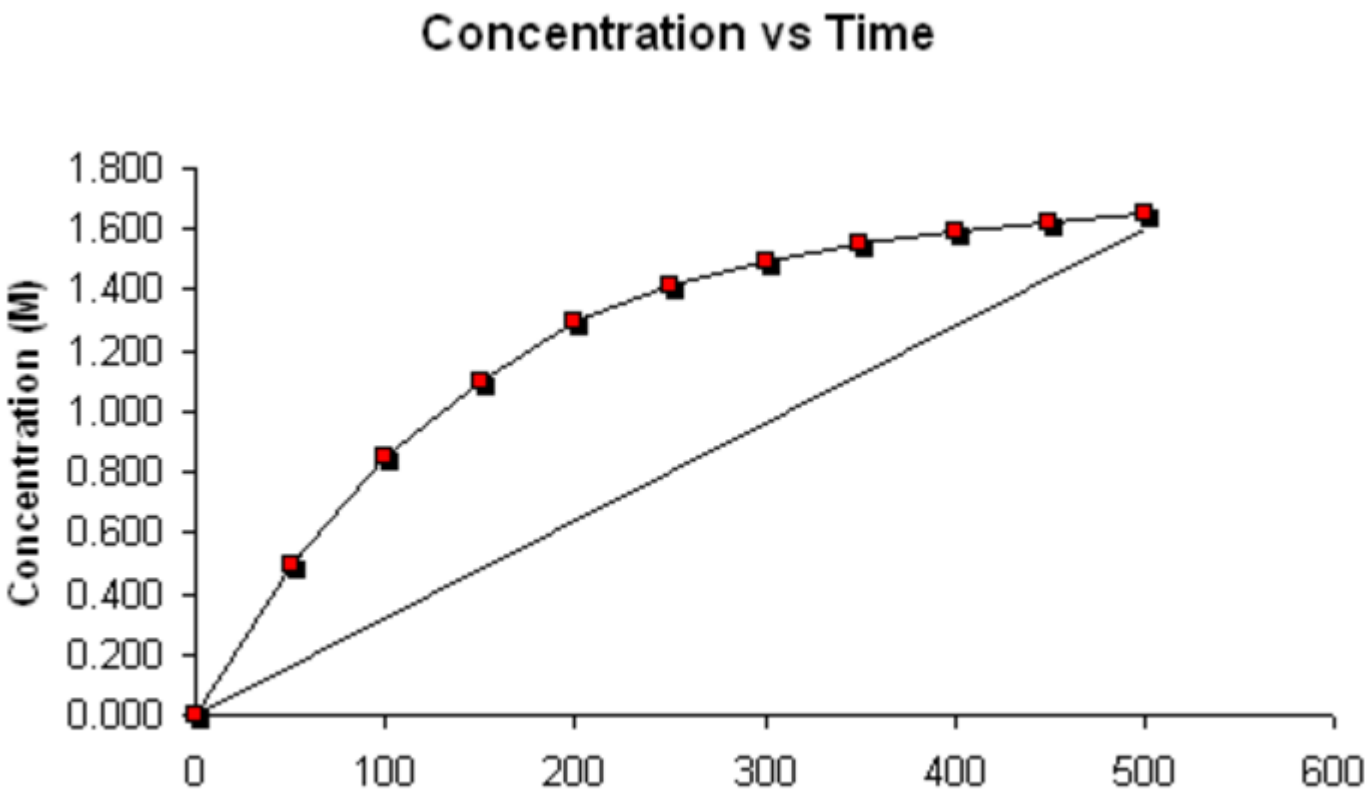
Multiply by 60 min/h*24 h

= 2.472000001 moles

= 2.472000001 moles(180. g/mole)

= 445 g

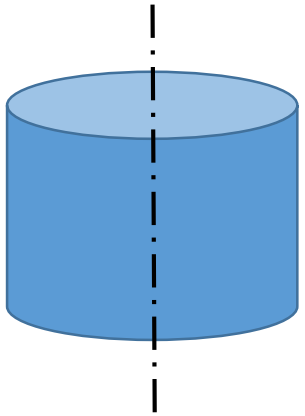
2. 10 points: What's obtained if you calculate the slope of the line drawn? (A) instantaneous rate at t = 500s (B) inst. rate at 0 s (C) average rate over 500s (D) nothing meaningful



C

3. **Bet 0→15: If you cut the cylinder of Zn as shown, how much faster will it react compared to the uncut cylinder?**

$$A_{cylinder} = 2\pi rh + 2\pi r^2$$



h= 2r and r = 1.00 cm

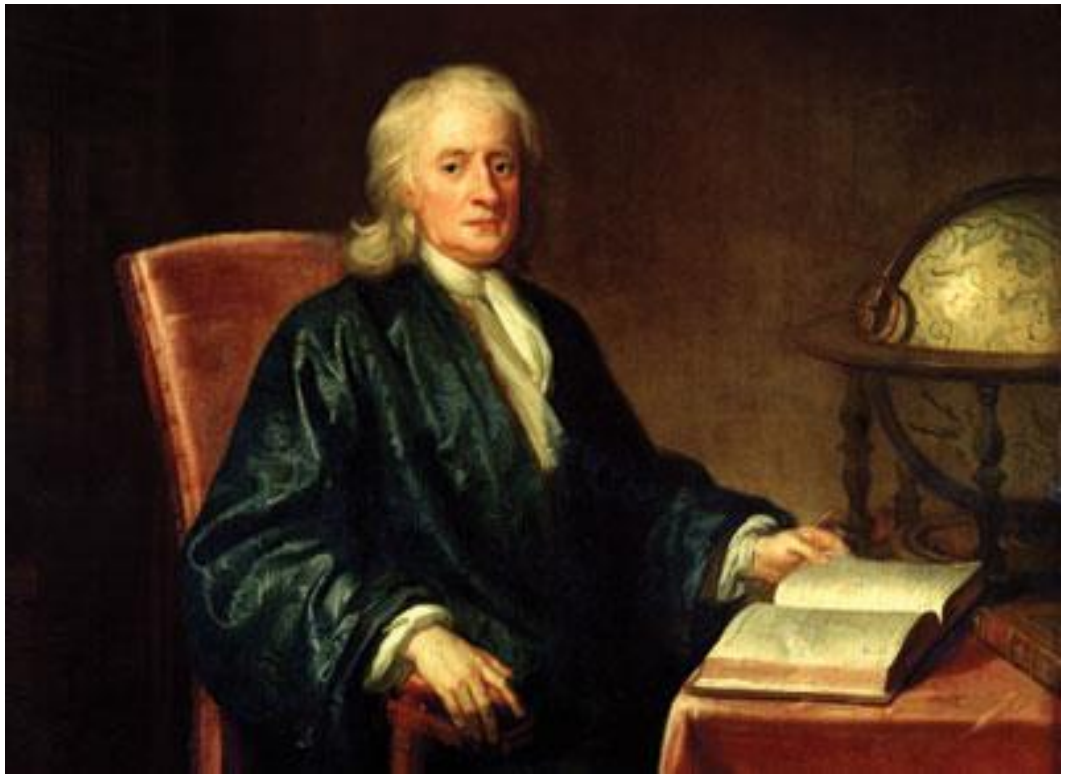
$$\frac{r_2}{r_1} = \frac{A_2}{A_1} = \frac{2\pi(1)(2)(1) + 2\pi(1)^2 \quad +2 \text{ rectangles } \textit{exposed}}{2\pi(1)(2)(1) + 2\pi(1)^2}$$

$$= \frac{6\pi + 2lw}{6\pi} = \frac{6\pi + 2\,(2)(1)(2)(1)}{6\pi} = \frac{6\pi + 8}{6\pi}$$

=1.42 times faster

4. a) Speed round 10 points (2 quickest answers qualify for calculator duel):

Who is this chemist?



5. 10 points (if the duelists are both wrong question opens up to other teams):

$$R = 8.31 \frac{L\,kPa}{K\,mole}$$

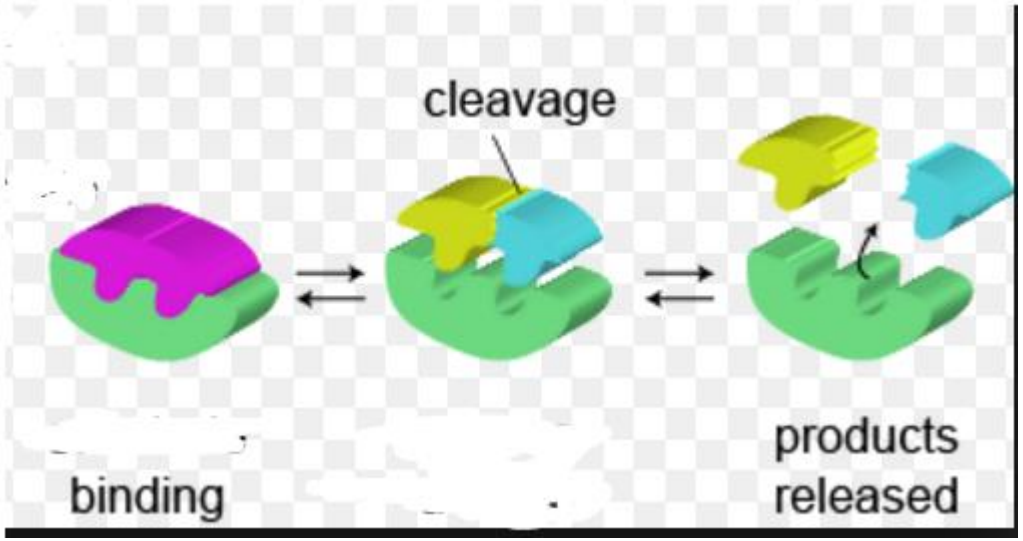
k = Boltzmann's constant = R expressed in

different units = __?__ $\frac{J}{K\,molecule}$

Just divide by Avogadro's number= 1.38 X 10^{-23} J/($K\,mole$); recall 1 J = 1 L kPa

6. 15 points

What color is the catalyst in the following reaction?



Green; it's the one that's being recycled

7. **Bet 0→20 (you have to correctly answer both parts of the question to get the points)**

a) **What happens to the potential energy of the new activated complex in an catalyzed reaction?**

(Goes up?; goes down? Stays the same? Goes to Arizona?)

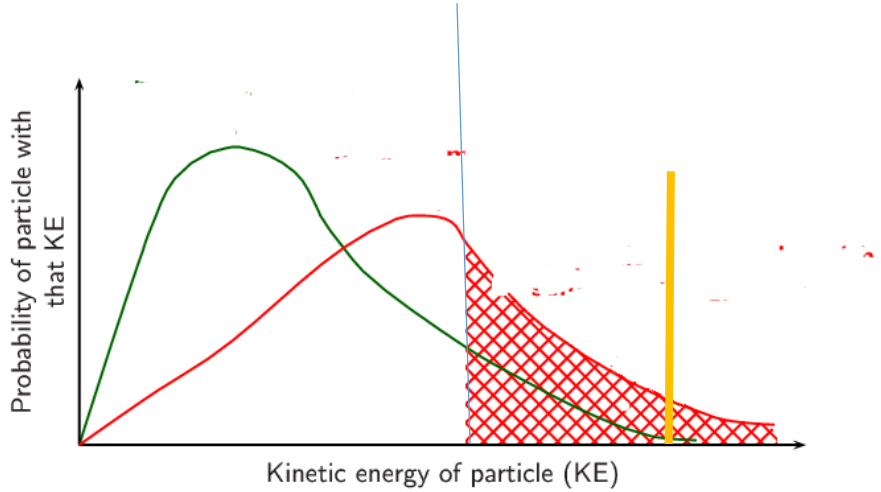
b) **Calculate the A_e for the reverse reaction if $H_{reactants}$ = 45 kJ; $H_{activated\ complex}$ = 165 kJ and $H_{products}$ = 55 kJ** **reverse: 165 – 55 = 110 kJ**

8. 25 points(you have to correctly answer all 3 parts of the question to get the points)

a) What color is the curve with the highest temperature? red

b) Redraw the graph but draw and label the activation energy.

c) On the same graph show an inhibited reaction



9. Bet 0→ 30 points

$$H_2(g) + 2ICl(g) \longrightarrow I_2(g) + 2HCl(g)$$

What happens to the rate of the above overall reaction if you double the concentration of iodine chloride gas (ICl) and triple the concentration of HI?

Here is the mechanism: (It will double: HI isn't part of slow step and has no effect on the rate; the expression is rate =k[ICl][H_2])

$$H_2 + ICl \xrightarrow{k_1} HI + HCl$$ Slow

$$HI + ICl \xrightarrow{k_2} I_2 + HCl$$ Fast