

Quiz 1 Solutions

- In 2003 the birth rate in India was 25 per year per 1000 population and the death rate was 8 per year per 1000. The total population was about 1 billion.
 - What was the population growth rate in percent per year (ignoring immigration)?

$$r = b - d = \frac{25}{1000} - \frac{8}{1000} = \frac{17}{1000} = 1.7 \frac{\%}{y}$$

- If birth and death rates remain constant, when would the population reach 2 billion?

$$T_{2x} = \frac{\ln(2)}{r} = \frac{0.69}{0.017} = 41 y + 2003 = 2044$$

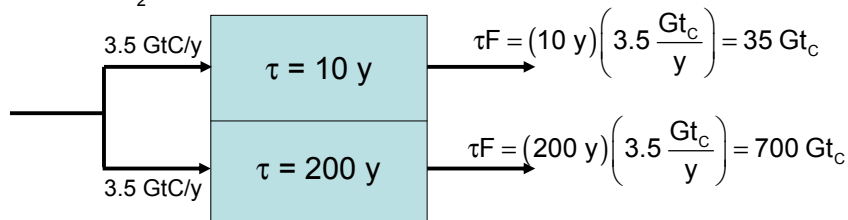
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- In 2003 the birth rate in India was 25 per year per 1000 population and the death rate was 8 per year per 1000. The total population was about 1 billion.
 - According to some projections, the total fertility rate will fall to about 2 in about 2050. True or false: shortly thereafter India will achieve zero population growth.

FALSE. Although the population of young people will remain roughly constant, the population will continue to grow as the population pyramid fills out.

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- The preindustrial concentration of CO₂ was about 275 ppmv (590 GtC). Human emissions of CO₂ represent a new flow into the atmosphere. Nearly all of this CO₂ ultimately will be absorbed by the oceans and biosphere. Assume that half of the anthropogenic CO₂ remains in the atmosphere with a residence time of 10 y, and that the other half remains in the atmosphere with a residence time of 200 y. If emissions remain constant at 7 GtC/y, what will happen to the CO₂ concentration?



$$c = c_0 \frac{S}{S_0} = (275) \left(\frac{590 + 35 + 700}{590} \right) = (275) \left(\frac{1325}{590} \right) \approx 620 \text{ ppmv}$$

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- Concentration will increase rapidly for the first decade or so, tapering off to a steady increase of about 1.6 ppmv/y for nearly a century, eventually leveling off at about 620 ppmv after many centuries.

