

S.S Applications

① The pH of a solution is given by $\text{pH} = -\log [\text{H}^+]$
where $[\text{H}^+]$ is the concentration of hydrogen ions in moles per litre.

a) Determine the pH of soil to the nearest tenths if its hydrogen ion concentration is: 5×10^{-8} mol/L.

$$\text{pH} = -\log (5 \times 10^{-8})$$

$$\text{pH} = 7.3$$

b) What is the hydrogen ion concentration of a solution with a pH of 3.1?

$$\text{pH} = -\log[\text{H}^+]$$

$$3.1 = -\log[\text{H}^+]$$

$$-3.1 = \log[\text{H}^+]$$

$$10^{-3.1} = [\text{H}^+] = \boxed{7.9 \times 10^{-4} \text{ mol/L}}$$

② An amount of money is invested at 9% / a. Determine the length of time it will take for the original amount to double if its interest is compounded monthly.

$$A = A_0 \left(1 + \frac{r}{n}\right)^{nt}$$

$$2 = 1 \left(1 + \frac{0.09}{12}\right)^{12t}$$

$$2 = (1.0075)^{12t}$$

$$\log 2 = 12t \log(1.0075)$$

$$t = \frac{\log 2}{12 \log(1.0075)} = \boxed{7.73 \text{ years}}$$

③ The half-life of a radioactive substance is 7 days.

How long will it take for 65% of the substance to decay?
(2 decimal places)

$$A = A_0 \left(\frac{1}{2}\right)^{\frac{t}{c}}$$

c = "chunk of time" it takes to halve itself
↳ "half-life"

$$0.35 = 1 \left(\frac{1}{2}\right)^{\frac{t}{7}}$$

$$\log(0.35) = \frac{t}{7} \log\left(\frac{1}{2}\right)$$

$$\frac{7 \log(0.35)}{\log\left(\frac{1}{2}\right)} = t$$

$$t = 10.60 \text{ days}$$

④ It is estimated that 75% of a certain substance remains after 8 months. What is the half-life? (2 decimal places)

$$A = A_0 \left(\frac{1}{2} \right)^{\frac{t}{c}}$$

$$0.75 = 1 \left(\frac{1}{2} \right)^{\frac{8}{c}}$$

$$\log(0.75) = \frac{8}{c} \log\left(\frac{1}{2}\right)$$

$$c \log(0.75) = 8 \log\left(\frac{1}{2}\right)$$

$$c = \frac{8 \log\left(\frac{1}{2}\right)}{\log(0.75)}$$

$$c = 19.28 \text{ months}$$

5 A bacteria culture doubles every 5 days. How long will it take for 500 bacteria to become 3.5 million bacteria?

$$A = A_0(r)^{\frac{t}{c}}$$

$$3500000 = 500(2)^{\frac{t}{5}}$$

$$7000 = 2^{\frac{t}{5}}$$

$$\log 7000 = \frac{t}{5} \log 2$$

$$\frac{5 \log 7000}{\log 2} = t$$

$$t = 63.87 \text{ days}$$

⑥ What is the Richter Scale measurement of an earthquake that is 350 times more powerful than an earthquake that measures 4.5 on the Richter Scale?

$$(10^{4.5})(350) = 11067971.81$$

Intensity of bigger earthquake

$$\log[(10^{4.5})(350)] = \boxed{7.0}$$

$$\begin{aligned} 10^x &= 11067971.81 \\ \log 10^x &= \log(11067971.81) \\ x \log 10 &= \log(11067971.81) \end{aligned}$$

Ry 236

1, 4-6, 10, 11

* Decreases by 15% \rightarrow Rate = 0.85 ($1 - 0.15$)

* Increases by 20% \rightarrow Rate = 1.20 ($1 + 0.20$)

Ry 238
REVIEW

* 1-65 (not 37)