

Common mistakes

$$\text{mag.} = \log \left(\frac{\text{ground}}{\text{motion}} \right)$$

Q12P8 Stomach acid 2.0 pH, blood 7.4 pH, $\text{pH} = -\log [\text{H}^+]$
(2.41×10^{-6})

a) Stomach acid

$$2.0 = -\log [\text{H}^+]$$

$$-2.0 = \log [\text{H}^+]$$

$$10^{-2.0} = [\text{H}^+]$$

$$[\text{H}^+] = .01$$

$$[\text{H}^+] = 1.00 \times 10^{-2} \text{ mol/L}$$

Blood

$$10^{-7.4} = [\text{H}^+]$$

$$[\text{H}^+] = .00000004$$

$$[\text{H}^+] = 4.00 \times 10^{-8} \text{ mol/L}$$

$$\text{b) } \frac{[\text{H}^+]_{\text{acid}}}{[\text{H}^+]_{\text{blood}}} = \frac{10^{-2}}{10^{-7.4}} = 251188.6432$$

$$= 2.51 \times 10^5 \text{ times greater}$$

c) $7.4 - 2 = 5$ orders of mag

Q12P6 $\frac{3^x + 3^{-x}}{3} = 4$

$$3^x (3^x + 3^{-x}) = 12$$

$$(3^x)^2 + 1 = 12(3^x)$$

$$\text{Let } 3^x = a$$

$$a^2 + 1 = 12a$$

$$a^2 - 12a + 1 = 0$$

$$a = 3^x = \frac{12 \pm \sqrt{144 - 4}}{2}$$

$$3^x = \frac{12 \pm \sqrt{140}}{2}$$

$$3^x = \frac{12 \pm 2\sqrt{35}}{2}$$

$$3^x = 6 \pm \sqrt{35}$$

$$\boxed{x = \log_3(6 \pm \sqrt{35})} \leftarrow \text{exact soln.}$$

$$\sqrt{140} = 2\sqrt{35}$$

$$\sqrt{4} \sqrt{35}$$

magnitude = $\log \left(\frac{\text{ground}}{\text{motion}} \right)$

$$Q125a \quad \log_{10}(x^2) = 6$$

$$\sqrt{10^6} = \sqrt{x^2}$$

$$\pm 10^3 = x$$

$$x = \pm 1000$$

(solve & check)

check

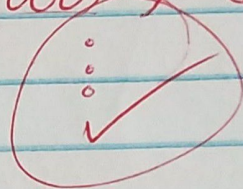
$$\log(1000^2) = 6$$

$$\log(10^3)^2 = 6$$

$$\log 10^6 = 6$$

$$6 = 6 \checkmark$$

$$\log(-1000)^2 = 6$$



$$5b \quad \ln(x^6) = 12$$

$$\sqrt[6]{e^{12}} = \sqrt[6]{x^6}$$

$$\pm e^2 = x$$

$$Q127b \quad \log(x-3) + \log(x+4) = 3 \log 2$$

$$\log(x^2+x-12) = \log 2^3$$

$$x^2+x-12 = 8$$

$$x^2+x-20 = 0$$

$$(x+5)(x-4) = 0$$

$$x = -5, x = 4$$

ext solution

Q10P1 half life \Rightarrow 65 days, 3.5g presently.

$t = \text{days}$

$$f(t) = 3.5 \left(\frac{1}{2}\right)^{\frac{t}{65}} \text{ grams}$$

Q11 P7 $\beta = 10 \log \left(\frac{I}{I_0} \right)$

$I_0 = 10^{-12} \text{ W/m}^2$

Sound	I
whisper	10^{-11}
jet	10^3

a) $\beta = 10 \log \left(\frac{10^{-11}}{10^{-12}} \right)$
 $\beta = 10 \log 10^{-11 - (-12)}$
 $= 10 \log 10^1$
 $= 10(1)$

$\beta = 10 \text{ dB}$

b) $\beta = 10 \log \left(\frac{10^3}{10^{-12}} \right)$
 $= 10 \log 10^{15}$
 $= 10(15)$

$\beta = 150 \text{ dB}$