

6302 HW 1 Answers Key

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Q1.1

$A_{05} = K \cdot D$

DEPTH (m)	$K = 1500 \text{ yr/m}$	A_{05} (yr)	DEPTH (m)	$K = 3000 \text{ yr/m}$	A_{05} (yr)
1		1500 yr	1		3000 yr
2		3000 yr	2		6000 yr
5.3		7950 yr	5.3		7950 yr

Q1.2

- i $5^{100} \cdot 5^4 = 5 \times 10^{72}$
- ii $(5^{100})^4 = 5^{400} = 4 \times 10^{279}$
- iii $x^2 \cdot x^3 = x^5$
- iv $\text{Depth}^2 \cdot \text{Depth}^3 = (\text{Depth})^5$
- v $(10^3)^4 = 10^{12} = 1 \times 10^{12}$

Q1.3

- i 1×10^3
- ii 2×10^3
- iii 2.5×10^3
- iv 2.523×10^3
- v 2.3×10^2
- vi 7×10^9

- Q1.4
- i 1×10^{-3}
 - ii 2×10^{-3}
 - iii 2.5×10^{-3}
 - iv 2.523×10^{-3}
 - v 2.3×10^{-6}
 - vi 7×10^{-9}

Q1.5

$$31.6 \text{ Gsec} = 31.6 \times 10^9 \text{ sec}$$

$$(31.6 \times 10^9 \text{ sec}) \left(\frac{1 \text{ min}}{60 \text{ sec}} \right) \left(\frac{1 \text{ hr}}{60 \text{ min}} \right) \left(\frac{1 \text{ day}}{24 \text{ hr}} \right) \left(\frac{1 \text{ yr}}{365 \text{ days}} \right) =$$

1002 years

Q1.6

CONVERSION TABLE

$$0.01 = 1\% = 10 \text{ PPT} = 10,000 \text{ ppm} = 10,000,000 \text{ ppb}$$

$$0.01\% \frac{10,000 \text{ ppm}}{1\%} = 100 \text{ ppm}$$

Q1.7

$$i \quad 2.5 \times 10^{109} + 1.5 \times 10^{109} = 4.0 \times 10^{109}$$

$$ii \quad 2.5 \times 10^{109} + 0.15 \times 10^{109} = 2.65 \times 10^{109}$$

$$iii \quad 2.5 \times 10^{211} - 1.5 \times 10^{211} = 1.0 \times 10^{211}$$

$$iv \quad 2.5 \times 10^{211} - 0.15 \times 10^{211} = 2.35 \times 10^{211}$$

Q1.8

$$i \quad (2 \times 10^{200}) (3 \times 10^{100}) = 6 \times 10^{300}$$

$$ii \quad (4 \times 10^{110})^2 = 4 \times 10^{220}$$

$$iii \quad \frac{4 \times 10^{107}}{2 \times 10^{107}} = 2$$

$$iv \quad \frac{6 \times 10^{100}}{3 \times 10^{50}} = 2 \times 10^{50}$$

Q1.9

$$D = \frac{m}{V} = \frac{5.95 \times 10^{24} \text{ kg}}{1.08 \times 10^{21} \text{ m}^3} = 5509 \frac{\text{kg}}{\text{m}^3}$$

$$5.5 \frac{\text{gm}}{\text{cm}^3}$$

Q1.10

$$K = 1000 \frac{\text{yr}}{\text{m}}$$

$$D = 30 \text{ cm} = 0.30 \text{ m}$$

$$A_{DF} = K D = \left(\frac{1000 \text{ yr}}{\text{m}} \right) 0.30 \text{ m} = 300 \text{ yr}$$

Q1.11

$$Q_d = 3.1 \times 10^4 \quad \mu = 2.7 \times 10^{-2}$$

$$\Delta J = \frac{\mu}{Q_d} = \frac{2.7 \times 10^{-2}}{3.1 \times 10^4} = 8.7 \times 10^{-7}$$

Q1.12

$$\text{MASS gain} = \Delta m A_c =$$

$$\left(6 \times 10^5 \frac{\text{kg}}{\text{yr}} \right) \left(4.5 \times 10^9 \text{ yr} \right) \left(\frac{365 \text{ d}}{\text{yr}} \right) =$$

$$9.8 \times 10^{17} \text{ kg}$$

$$\text{GAIN} = \frac{\Delta m}{M_e} = \frac{9.8 \times 10^{17} \text{ kg}}{5.95 \times 10^{24} \text{ kg}} = 1.7 \times 10^{-7}$$

$$1.7 \times 10^{-7} = 170 \text{ ppb} \quad 1.7 \times 10^{-5} \% \text{ of total mass}$$

RATE IS NOT CONSTANT

Q1.13

$$V = \frac{4\pi r^3}{3} = \frac{4\pi (6.37 \times 10^6 \text{ m})^3}{3}$$

$$1.08 \times 10^{21} \text{ m}^3$$

Q1.14

$$V = \frac{d}{t}$$

$$t = \frac{d}{V} = \frac{100 \text{ km}}{20 \text{ km/hr}} = 5 \text{ hr}$$

$$(i) A = \frac{W}{Vs}$$

$$(ii) A = \frac{5 \times 10^6 \text{ m}}{4 \times 10^{-2} \text{ m/yr}} = 1.25 \times 10^8 \text{ yr}$$

Q1.15

$$\Delta z = h \rho_c / \Delta \rho$$

$$h = 4 \times 10^3 \text{ m}$$

$$\rho_c = 2.5 \times 10^3 \text{ kg/m}^3$$

$$\Delta z = (4 \times 10^3 \text{ m}) (2.5 \times 10^3 \text{ kg/m}^3)$$

$$\Delta \rho = 500 \text{ kg/m}^3$$

$$500 \text{ kg/m}^3$$

$$\frac{1 \times 10^7}{500} \text{ m} = 20,000 \text{ m}$$