Name_____ WS Dimensional Analysis

This set of questions uses the conversion factors below (These conversions are EXACT, meaning they are infinitely significant):

1 dozen = 12 things 1 six-pack = 6 drinks 1 case = 24 drinks

1. 7 Dozen = _____ Donuts

$$7\ \text{dozen} \times \frac{12\ \text{donuts}}{1\ \text{dozen}} = 84\ \text{donuts}$$

2. 72 Sodas = _____ Six-packs

$$72\ \text{sodas} \times \frac{1\ \text{six-pack}}{6\ \text{sodas}} = 12\ \text{six-packs}$$

3. 8 Dozen drinks = _____ Cases

$$8\ \text{dozen drinks} \times \frac{12\ \text{drinks}}{1\ \text{dozen}} \times \frac{1\ \text{case}}{24\ \text{drinks}} = 4\ \text{cases}$$

This set of questions uses the conversion factors below (These conversions are EXACT, meaning they are infinitely significant):

1 hour = 60 minutes	1 minute = 60 seconds	1 day = 24 hours
1 week = 7 days	1 year = 365.25 days	1 century = 100 years

4. 1 Week = _____ Seconds

$$1\ \text{week} \times \frac{7\ \text{days}}{1\ \text{week}} \times \frac{24\ \text{hr}}{1\ \text{day}} \times \frac{60\ \text{min}}{1\ \text{hr}} \times \frac{60\ \text{sec}}{1\ \text{min}} = 604800\ \text{sec}$$

5. 2 Centuries = _____ Minutes

$$2\ \text{centuries} \times \frac{100\ \text{yr}}{1\ \text{century}} \times \frac{365.25\ \text{day}}{1\ \text{yr}} \times \frac{24\ \text{hr}}{1\ \text{day}} \times \frac{60\ \text{min}}{1\ \text{hr}} = 105190000\ \text{min}$$

6. 30 Seconds = _____ Days

$$30\ \text{sec} \times \frac{1\ \text{min}}{60\ \text{sec}} \times \frac{1\ \text{hr}}{60\ \text{min}} \times \frac{1\ \text{day}}{24\ \text{hr}} = 0.0003472\ \text{day}$$

7. 10,000,000 Seconds = _____ Years

$$10000000\ \text{sec} \times \frac{1\ \text{min}}{60\ \text{sec}} \times \frac{1\ \text{hr}}{60\ \text{min}} \times \frac{1\ \text{day}}{24\ \text{hr}} \times \frac{1\ \text{yr}}{365.25\ \text{day}} = 0.3169\ \text{yr}$$

This set of questions involves metric prefix interconversion. To review the meanings of each metric prefix, review the Metric Units Lesson. (These conversions are all EXACT, meaning they are infinitely significant):

8. 1 Gigabyte = _____ Bytes

$$1\ \text{Gbyte} \times \frac{1\times10^{9}\ \text{bytes}}{1\ \text{Gbyte}} = 1000000000\ \text{bytes}$$

9. 1 Micrometer = _____ Hectometers

$$1\ \mu\text{m} \times \frac{1\times10^{-6}\ \text{m}}{1\ \mu\text{m}} \times \frac{1\ \text{hm}}{1\times10^{2}\ \text{m}} = 0.00000001\ \text{hm}$$

10. 1 Kilogram = _____ Milligrams

$$1\ \text{kg} \times \frac{1\times10^{3}\ \text{g}}{1\ \text{kg}} \times \frac{1\ \text{mg}}{1\times10^{-3}\ \text{g}} = 1000000\ \text{mg}$$

11. 1 CentiLiter = _____ DecaLiters

$$1\ \text{cL} \times \frac{1\times10^{-2}\ \text{L}}{1\ \text{cL}} \times \frac{1\ \text{daL}}{1\times10^{1}\ \text{L}} = 0.001\ \text{daL}$$

This set of questions uses the conversion factors below. Metric interconversions are assumed to be known (see the Metric Units Lesson). Conversions which are EXACT are stated as such. Otherwise, the significance of the conversion factor is limited by the number of significant figures presented:

1 mile = 5280 feet (exactly)	1 foot = 12 inches (exactly)	1 inch = 2.54 cm (exactly)
1 pound = 16 ounces (exactly)	1.00 pound = 454 grams	1 yard = 3 feet (exactly)
1 gallon = 4 quarts (exactly)	1 pint = 16 fluid ounces (exactly)	1 ton = 2000 pounds (exactly)
1 quart = 2 pints (exactly)	1.00 Liter = 1.06 quarts	1 milliliter = 1 cm3 (exactly)

12. 1 Mile = _____ Kilometers

$$1\ \text{mile} \times \frac{5280\ \text{ft}}{1\ \text{mile}} \times \frac{12\ \text{in}}{1\ \text{ft}} \times \frac{2.54\ \text{cm}}{1\ \text{in}} \times \frac{1\times10^{-2}\,\text{m}}{1\ \text{cm}} \times \frac{1\ \text{km}}{1\times10^{3}\,\text{m}} = 1.61\ \text{km}$$

13. 8 Fl. Ounces = _____ Gallons

$$8\ \text{fl. oz} \times \frac{1\ \text{pt}}{16\ \text{fl oz}} \times \frac{1\ \text{qt}}{2\ \text{pt}} \times \frac{1\ \text{gal}}{4\ \text{qt}} = 0.0625\ \text{gal}$$

14. 1 Ton = _____ Grams

$$1\ \text{ton} \times \frac{2000\ \text{lb}}{1\ \text{ton}} \times \frac{454\ \text{g}}{1\ \text{lb}} = 908000\ \text{g}$$

15. 35.3 Centiliters = _____ Fl. Ounces

$$35.3\ \text{cL} \times \frac{1\times10^{-2}\ \text{L}}{1\ \text{cL}} \times \frac{1.06\ \text{qt}}{1\ \text{L}} \times \frac{2\ \text{pt}}{1\ \text{qt}} \times \frac{16\ \text{fl oz}}{1\ \text{pt}} = 12.0\ \text{fl oz}$$

16. 1 Pound = _____ Milligrams

$$1\ \text{lb} \times \frac{454\ \text{g}}{1\ \text{lb}} \times \frac{1\ \text{mg}}{1\times10^{-3}\ \text{g}} = 454000\ \text{mg}$$

17. 1 inch = _____ Millimeters

$$1\ \text{in} \times \frac{2.54\ \text{cm}}{1\ \text{in}} \times \frac{1\times10^{-2}\ \text{m}}{1\ \text{cm}} \times \frac{1\ \text{mm}}{1\times10^{-3}\,\text{m}} = 25.4\ \text{mm}$$

This set of questions involve multi-dimensional unit conversion using the above conversion factors.

18. 1 Yd^2 = _____ in^2

$$1\ \text{yd}^2 \times \frac{(3\ \text{ft})^2}{(1\ \text{yd})^2} \times \frac{(12\ \text{in})^2}{(1\ \text{ft})^2} = 1296\ \text{in}^2$$

19. 1 m^3 = _____ km^3

$$1\ \text{m}^3 \times \frac{(1\ \text{km})^3}{(1\times10^3\ \text{m})^3} = 0.000000001\ \text{km}^3$$

20. 1 Ft^3 = _____ m^3

$$1\ \text{ft}^3 \times \frac{(12\ \text{in})^3}{(1\ \text{ft})^3} \times \frac{(2.54\ \text{cm})^3}{(1\ \text{in})^3} \times \frac{(1\times10^{-2}\text{m})^3}{(1\ \text{cm})^3} = 0.0283\ \text{m}^3$$

21. 327 In^3 = _____ L

$$327\ \text{in}^3 \times \frac{(2.54\ \text{cm})^3}{(1\ \text{in})^3} \times \frac{1\ \text{mL}}{1\ \text{cm}^3} \times \frac{1\times10^{-3}\ \text{L}}{1\ \text{mL}} = 5.36\ \text{L}$$

This set of questions involve conversions in both the numerator and denominator of a combination of units.

22. 60 miles/hour = _____ ft/s

$$60\frac{\text{miles}}{\text{hr}} \times \frac{5280\ \text{ft}}{1\ \text{mile}} \times \frac{1\ \text{hr}}{60\ \text{min}} \times \frac{1\ \text{min}}{60\ \text{sec}} = 88.0\frac{\text{ft}}{\text{sec}}$$

23. 925 ft/min^2 = _____ m/s^2

$$925\frac{\text{ft}}{\text{min}^2} \times \frac{12\ \text{in}}{1\ \text{ft}} \times \frac{2.54\ \text{cm}}{1\ \text{in}} \times \frac{1\times10^{-2}\text{m}}{1\ \text{cm}} \times \frac{(1\ \text{min})^2}{(60\ \text{sec})^2} = 0.0783\frac{\text{m}}{\text{sec}^2}$$

24. 5.0 gal/day = _____ mL/min

$$5.0\frac{\text{gal}}{\text{day}} \times \frac{4\ \text{qt}}{1\ \text{gal}} \times \frac{1\ \text{L}}{1.06\ \text{qt}} \times \frac{1\ \text{mL}}{1\times10^{-3}\ \text{L}} \times \frac{1\ \text{day}}{24\ \text{hr}} \times \frac{1\ \text{hr}}{60\ \text{min}} = 13.1\frac{\text{mL}}{\text{min}}$$

25. 1.0 kg/m^3 = _____ g/mL

$$1.0\frac{\text{kg}}{\text{m}^3} \times \frac{1\times10^3\ \text{g}}{1\ \text{kg}} \times \frac{(1\times10^{-2}\ \text{m})^3}{(1\ \text{cm})^3} \times \frac{1\ \text{cm}^3}{1\ \text{mL}} = 0.0010\frac{\text{g}}{\text{mL}}$$