Exam 1 Review
Chapters 1-3 (Math)

1. How many significant figures are there in 1.7094×10^{-3}? Take this value out of scientific notation. 5 sig figs

small number

0.001 7094 → .0017094

2. How many significant figures are there in 1,330.450? What is this value in scientific notation? 7 sig figs

1330.450 → 1.330450×10^{3}

*BIG NUMBER X

3. How many significant figures are there in 0.0001503? What is this value in scientific notation? 4 sig figs

0.0001503 → 1.503×10^{-4}

*SMALL NUMBER X

4. The total U.S national debt in 2016 was approximately \$18,416,000,000,000. Express this number in scientific notation. How many significant figures are there in this value?

period, not decimal

5 sig figs 1.8416×10^{13}

5. Express the number 0.000038 in scientific notation. How many significant figures are in this value?

2 sig figs 0.000038 3.8×10^{-5}

6. When the value 3,399,467 is rounded to four significant figures, how should the number be represented?

a.) 3,399,000

4 sf 3.399×10^{6} ✓

b.) 3.399×10^{6}

4 sf 3.399000 ✓

c.) 3,400,000

2 sf X

d.) 3.399×10^{-6}

4 sf X

4 SF

7. Which value has the same amount of significant figures as 9.109?

a.) 54,000

2 SF

b.) 1.2×10^4

2 SF

c.) 0.023

2 SF

d.) 1.090

4 SF

2 + 4 = 5

8. The radius of a dust speck is 4.5×10^{-3} mm. What is the correct value of this number in decimal notation (i.e., express the number without using scientific notation)

a.) 4500 mm b.) 0.045 mm c.) 0.0045 mm d.) 0.00045 mm

9. How many significant figures should be reported in the answer to the following calculation? (56.56 x1.14) + 44.6799 =

P
E
MD
AS

a.) 5 4 SF 3 SF

b.) 3

c.) 4

d.) 2

64.4|784
+ 44.6|799
109.1|583 → 109.2

10. Put the answer to the following calculation in the correct amount of significant figures.

67.3 + (1.45 x 11.67)

3 SF 4 SF

1.45 * 11.67 = 16.9215

67.3|
+ 16.9|215
84.2|215 → 84.2

11. Put the answer to the following calculation in the correct amount of significant figures.

3 SF

1.55 x (65.339 + 23.112)

65.339
+ 23.112
88.451

1.55 * 88.451 = 137.09905 → 137

12. How many grams are in 4,559.6879 kg?

1000 g → 1 kg

$$4559.6879\ \text{kg} \left| \frac{1000\ \text{g}}{1\ \text{kg}} \right. = 4559687.9\ \text{g}$$

cm → inches → feet 2.54 → 1 in 12 in → 1 ft

13. How many feet are 194 cm? (3 sf)

$$\frac{194\ \text{cm}}{1} \cdot \frac{1\ \text{in}}{2.54\ \text{cm}} \cdot \frac{1\ \text{ft}}{12\ \text{in}} = 6.3648\ldots\ \text{ft}$$

6.36 ft (2 sf)

14. A recipe for making creamy pasta sauce calls for 0.75L of cream. Your measuring cup measures only in cups. How many cups of cream should you use?

L → mL → cups 1 L = 1000 mL 1 cup = 236.588 mL

$$\frac{0.75\ \text{L}}{1} \cdot \frac{1000\ \text{mL}}{1\ \text{L}} \cdot \frac{1\ \text{cup}}{236.588\ \text{mL}} = 3.1700678\ \text{cups}$$

3.2 cup

15. The speed limit on many U.S highways is 75 mi/hr (miles per hour). What is this speed in kilometers per second (km/s)? mi → km; hr → s

$$\frac{75\ \text{mi}}{1\ \text{hr}} \cdot \frac{1\ \text{km}}{0.6214\ \text{mi}} \cdot \frac{1\ \text{hr}}{60\ \text{min}} \cdot \frac{1\ \text{min}}{60\ \text{sec}} = 0.033526046\ \text{km/s}$$

0.034 km/s

16. Vegetable oil has a density of 0.8976 g/mL. What is the mass of 63.2 mL of vegetable oil? (density: 4 sf; 63.2 mL: 3 sf)

$m = DV$

$m = 0.8976\ \text{g/mL} \cdot 63.2\ \text{mL} = 56.72832\ \text{g}$

56.7 g

17. Calculate the density of a cup of sweet tea that has a volume of 66.3 mL and a mass of 23.6 kg.

$D = \frac{m}{V}$

kg → g

1) $\frac{23.6\ \text{kg}}{1} \cdot \frac{1000\ \text{g}}{1\ \text{kg}} = 23600\ \text{g} = m$

2) $\frac{23600\ \text{g}}{66.3\ \text{mL}} = 355.9578\ \text{g/mL}$

356 g/mL

18. The density of a cup of milk is 10.96 mL/g. If the cup of milk has a mass of 15.78 g, then how much milk is there in the cup?

D = 10.96 mL/g m = 15.78 g 4 sf

$V = \frac{m}{d}$ $\quad \frac{15.78\ g}{10.96\ mL/g} = 1.43978...\ mL$

$1.43978...\ mL \rightarrow 1.440\ mL$

19. Convert 56.57 °C to Fahrenheit, then Kelvin.

C → F ; C → K

(1) $C = \frac{F° - 32}{1.8}$ $\quad 56.57°C = \frac{X - 32}{1.8}$ $\quad (1.8)$

$\times 1.8$

$32 + 101.826 = X - 32$ $\quad +32$ $\quad °F = 133.826$

$°F = 133.8$

(2) $K = C + 273.15$

$K = 56.57 + 273.15$

$329.72\ K$

20. Convert 34 °F to Kelvin.

F → C → K

$C = \frac{F° - 32}{1.8}$ $\quad C = \frac{34°F - 32}{1.8} = 1.11°C + 273.15 = 274.2611...\ K$

$274.2611...\ K \rightarrow 270\ K$ or $2.7 \times 10^2\ K$

21. How many joules are in 154.67 Calories? 5 sf

1 cal = 4.184 J 1000 cal = 1 Cal

$\frac{154.67\ Cal}{1} \left| \frac{1000\ cal}{1\ Cal} \right| \frac{4.184\ J}{1\ cal} = 647139.28\ J$

$647139.28\ J \rightarrow 647140\ J$ or $6.4714 \times 10^5\ J$

22. How many calories are in 567.89 Calories?

$\frac{567.89\ Cal}{1} \left| \frac{1000\ cal}{1\ Cal} \right. = 567890\ cal$

$q = mc\Delta T$

$T_f - T_i$

23. You find a 1975 copper penny (pre-1982 pennies are nearly pure copper) in the snow and pick it up. How much heat does the penny absorb as it warms from the temperature of the snow, -5.0 °C, to the temperature of your body, 37.0 °C? Assume the penny is pure copper and has a mass of 3.10 g. The specific heat capacity of copper is 0.385 J/g °C. What kind of reaction is this?

$q = ?$

$m = 3.10\ g$

$c = 0.385\ J/g\,°C$

$\Delta T = 37.0°C + 5.0°C =$

$42.0°C$

$3.10\ g * 0.385\ J/g\,°C * 42.0°C =$

$50.127\ J$

$\downarrow$

$\boxed{50.1\ J}$

endothermic, the penny is gaining heat.

24. A chemistry student finds a shiny rock that she suspects is gold. She weighs the rock on a balance and determines that its mass is 14.3 g. She then finds that the temperature of the rock rises from 25 °C to 52 °C upon absorption of 174J of heat. Find the heat capacity of the rock and determine whether the value is consistent with the heat capacity of gold which is 0.128 J/g °C.

$q = 174\ J$

$m = 14.3\ g$

$c = ?$

$\Delta T = 52°C - 25°C =$

$27°C$

$174\ J = 14.3\ g\,(x)\,27°C$

$\frac{174\ J}{386.1} = \frac{386.1\,(x)}{386.1}$

$x = 0.450466 \rightarrow \boxed{0.451\ J/g°C}$

NO, $0.451\ J/g°C \neq 0.128\ J/g°C$

25. How much heat must be absorbed by 125g of ethanol to change its temperature from 21.5 °C to 34.8 °C. The specific heat capacity of ethanol is 2.42 J/g °C.

$q = ?$

$m = 125\ g$

$c = 2.42\ J/g°C$

$\Delta T = 34.8°C - 21.5°C =$

$13.3°C$

$125\ g * 2.42\ J/g°C * 13.3°C$

$q = 4023.25$

$\downarrow$

$\boxed{q = 4020\ J}$