

Answers

Worksheet 1 Metrics

Convert

$$1) 1.0 \text{ m} = \frac{100}{1.0 \times 10^{-3}} \text{ cm} = \frac{1.0 \times 10^{-3}}{1.0 \times 10^3} \text{ km} = \frac{1.0 \times 10^3}{1000} \text{ mm or } 1000 \text{ mm}$$

$$2) 1.2 \text{ kg} = \frac{1.2 \times 10^3}{1.2 \times 10^6} \text{ g} = \frac{1.2 \times 10^6}{1.2 \times 10^5} \text{ mg} = \frac{1.2 \times 10^5}{1.2 \times 10^5} \text{ cg}$$

$$3) 0.42 \text{ L} = \frac{4.2 \times 10^4}{420} \text{ kL} = \frac{420}{4.2} \text{ mL} = \frac{4.2}{4.2} \text{ dL}$$

$$4) 0.05 \text{ m} = \frac{0.5}{50} \text{ dm} = \frac{50}{5 \times 10^{-5}} \text{ mm} = \frac{5 \times 10^{-5}}{5 \times 10^{-5}} \text{ km}$$

$$5) 882 \text{ hL} = \frac{88.2}{8.82 \times 10^7} \text{ kL} = \frac{8.82 \times 10^7}{8.82 \times 10^5} \text{ mL} = \frac{8.82 \times 10^5}{8.82 \times 10^5} \text{ dL}$$

$$6) 14.9 \text{ mL} = \frac{1.49 \times 10^{-5}}{1.49 \times 10^{-2}} \text{ kL} = \frac{1.49 \times 10^{-2}}{1.49} \text{ L} = \frac{1.49}{1.49} \text{ cL}$$

$$7) 525 \text{ mm} = \frac{5.25}{525} \text{ dm} = \frac{5.25 \times 10^{-2}}{5.25} \text{ dam} = \frac{5.25 \times 10^{-2}}{5.25} \text{ dam}$$

$$8) 0.099 \text{ km} = \frac{9.9 \times 10^{-5}}{99} \text{ Mm} = \frac{9.9 \times 10^{-5}}{9.9 \times 10^4} \text{ mm}$$

$$9) 491 \text{ cm} = \frac{49.1}{0.491} \text{ dm} = \frac{49.1}{4.91} \text{ dam} = \frac{4.91}{4.91} \text{ m}$$

$$10) 97.0 \text{ mm} = \frac{9.70}{9.70 \times 10^{-3}} \text{ cm} = \frac{9.70 \times 10^{-3}}{9.70 \times 10^{-5}} \text{ dam} = \frac{9.70 \times 10^{-5}}{9.70 \times 10^{-5}} \text{ km}$$

$$11) 232.2 \text{ g} = \frac{2.322 \times 10^5}{23.22} \text{ mg} = \frac{23.22}{0.2322} \text{ dag} = \frac{0.2322}{0.2322} \text{ kg}$$

$$12) 7.67 \text{ Mg} = \frac{7.67 \times 10^3}{7.67 \times 10^6} \text{ kg} = \frac{7.67 \times 10^6}{7.67 \times 10^9} \text{ g} = \frac{7.67 \times 10^9}{7.67 \times 10^9} \text{ mg}$$

2) Circle the ONE value that does Not belong in each row.

- i) a) 300.0 mm b) 0.30 m **c) 0.03 cm** d) 0.003 hm e) 3.0 dm
- ii) a) 0.012 hm b) 12.0 dm c) 0.12 dam **d) 1.2 km** e) 120 cm
- iii) a) 0.07 dm **b) 70 dam** c) 7.0 mm d) 0.7 cm e) 0.007 m
- iv) **a) 1.11 hm** b) 0.111 m c) 111.0 mm d) 11.1 cm e) 0.0111 dam
- v) a) 0.1 km b) 1000 dm c) 1.0 hm d) 10.0 dam **e) 0.01 m**

3) Fill in the appropriate unit.

a) 4.0 m = 400 cm

b) 0.0001 hm = 10.0 mm

c) 6.66 hm = 0.666 km

d) 999.0 mL = 0.999 L

e) 500 m = 5000 dm

f) 8.87 hm = 88 700 cm

g) 42.2 g = 0.042 2 kg

h) 1.059 kg = 1 059 g

Answers

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Worksheet 2

Name _____

20

1) Indicate the significant digits by underlining.

a) 200 100 000 h 4SD

b) 0.000 000 002 000 000 g 7SD

c) 100 000 000 000 000 s 15SD

d) 402 020 001 000 L 9SD

2) Change to S.N.

a) 32 000 000 s

= 3.2×10^7 s

b) 6 250 000 000 000 000 000 electrons

= 6.25×10^{18} e⁻

c) 0.000 000 000 038 kg

= 3.8×10^{-11} kg

d) 9 999 999 min

= $9.999\ 999 \times 10^6$ or 1.00×10^7 min

3) Solve

a) $81.257 + 3.2 = 84.457 \rightarrow = \underline{84.5}$ (1 decimal place)

b) $66 \times 3.25 = 214.5 \rightarrow = \underline{210}$ (2SD)

c) $(32.57)(2.1) = 68.397 \rightarrow = \underline{68}$ (2SD)

d) $(3 \times 10^5)(4 \times 10^7) = 1.2 \times 10^{13} \rightarrow = \underline{1 \times 10^{13}}$ (1SD)

e) $(6.6 \times 10^{13}) \div (2.2 \times 10^{-12}) = 3.0 \times 10^{25}$ (2SD)

f) $1.2 \times 10^2 + 1.2 \times 10^3 = 1320 = \underline{1.3 \times 10^3}$ (1dp)

g) $(3.5 \times 10^{-7}) - (4.0 \times 10^{-8}) = 3.1 \times 10^{-7}$ (1dp.)

h) $(4.27 \times 10^9)(5.2 \times 10^{-6}) = 22204 = \underline{2.2 \times 10^4}$ (2SD)

4) Round off to 3 significant digits.

a) 7.155 = 7.16

b) 0.000 029 242 = 0.000 0292 = 2.92×10^{-5}

c) 88.65 = 88.6

d) 8 294 = 8290 = 8.29×10^3

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Answers

Worksheet 3

Name _____

25

A. Express the following measurements in S.N. to 2 significant digits

- | | |
|---|---|
| 1) 37 005 m = <u>3.7×10^4</u> m | 4) 0.003 14 s = <u>3.1×10^{-3}</u> s |
| 2) 0.028 cm = <u>2.8×10^{-2}</u> cm | 5) 22 m = <u>2.2×10^1</u> m |
| 3) 570 m = <u>5.7×10^2</u> m | 6) 0.004 270 g = <u>4.3×10^{-3}</u> g |

B. Simplify the following then express in S.N. to the appropriate number of significant digits.

- | | |
|--|---|
| 1) $10^4 \times 10^{-7} = \underline{1 \times 10^{-3}}$ | 5) $\frac{2.5 \times 10^{-3}}{5.0 \times 10^2} = \underline{5.0 \times 10^{-6}}$ |
| 2) $10^{-2} \times 10^{-15} = \underline{1 \times 10^{-17}}$ | 6) $\frac{28.00 \text{ m/s} - 5.00 \text{ m/s}}{10.0 \text{ s}} = \underline{2.30 \times 10^0 \text{ m/s}^2}$ |
| 3) $10^{-5} \times 10^2 = \underline{1 \times 10^{-3}}$ | 7) $\frac{29.0 \text{ m/s} - 9.00 \text{ m/s}}{5.0 \text{ s}} = \underline{4.0 \times 10^0 \text{ m/s}^2}$ |
| 4) $\frac{3.6 \times 10^7}{12 \times 10^{-2}} = \underline{3.0 \times 10^8}$ | 8) $\frac{3200 \text{ m/s} - 4000 \text{ m/s}}{4 \text{ s}} = \underline{-2 \times 10^2 \text{ m/s}^2}$ |

3) Solve for the required variable.

- | | |
|--|--|
| 1) if $A = \frac{B+C}{D}$ then $B = \underline{AD - C}$ | 4) if $B = \frac{A-D}{C}$ then $D = \underline{A - BC}$ |
| 2) if $A = \frac{B+C}{D}$ then $D = \underline{\frac{B+C}{A}}$ | 5) if $B = \frac{A-D}{C}$ then $C = \underline{\frac{A-D}{B}}$ |
| 3) if $B = \frac{A-D}{C}$ then $A = \underline{BC + D}$ | 6) if $A = C - BD$ then $C = \underline{A + BD}$ |
| | 7) if $A = C - BD$ then $D = \underline{\frac{C-A}{B}}$ |

D. A student experimentally determines that an object accelerates downward due to the force of gravity at 9.5 m/s^2 . If the actual acceleration caused by gravity is 9.81 m/s^2 then what is the absolute error and the relative (degree of) error in the calculation?

$AV = 9.81 \text{ m/s}^2$
 $MV = 9.5 \text{ m/s}^2$
 $PE = ?$
 4 $AE = ?$

a) $AE = MV - AV$
 $= (9.5 - 9.81) \text{ m/s}^2$
 $= (-0.31) \text{ m/s}^2$
 $= \underline{-0.3 \text{ m/s}^2 (1dp)}$

b) $PE = \frac{MV - AV}{AV} \times 100\%$
 $= \frac{(9.5 - 9.81)}{9.81} \times 100\%$
 $= -3.16\%$
 $= \underline{-3.2\% (2sd)}$

∴ The measured value is 0.3 m/s^2 below accepted value

∴ The measured value is 3.2% below accepted value