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QUESTION NO: 1

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Perform the following mathematical operation and express the result to the correct number of significant figures:

$$\frac{(2.100 + 0.35 + 0.05) \times 18.55}{3.247}$$

A. 14.3

B. 14.28

C. 14.282

D. 14.0

E. 14

$$\frac{2.50 \times 18.55}{3.247} \equiv 14.282$$

$$= \boxed{14.3}$$

Two digits after decimal

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QUESTION NO: 2

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A gas has a boiling point of -321°F.
What is this temperature in Kelvin?

A. 77 K

B. 196 K

C. 362 K

D. 546 K

E. 82 K

$$°C = °F - 32 \times \frac{5C}{9F}$$

$$°C = (-321 - 32) \times \frac{5C}{9F} \equiv -196°C$$

$$K = -196 + 273 \equiv \boxed{77K}$$

measured temp (-321°F) has no digit after decimal so 273 will be without decimal.

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QUESTION NO: 3

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A 15.9361 g solid was placed in a graduated cylinder which contains 113.3 mL of water. The water level was increased to 119.1 mL. What is the density of that solid?

A. 2.7 g/mL

B. 2.75 g/mL

C. 2.748 g/mL

D. 27 g/mL

E. 0.27 g/mL

$$\text{density} = \frac{m}{V}, \quad m = 15.9361\,g$$

$$V = 119.1 - 113.3 = 5.8\ ml$$

$$d = \frac{15.9361}{5.8} = 2.74760$$

2 Sig. Fig.

$$\boxed{d = 2.7\ g/ml}$$

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QUESTION NO: 4

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Which one of the following is a heterogeneous mixture?

A. Soil

B. Gasoline

C. Silver

D. a solution of sugar in water

E. NaCl salt

Soil contains mud, rocks, roots and other so its Heterogeneous

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QUESTION NO: 5
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What is the name of Ag_2SO_3 ?

A. Silver sulfite

B. Silver (I) sulfate

C. Silver (I) hyposulfite

D. Silver persulfate

E. Silver sulfate

Silver is ~~in~~ exception in transition metals

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QUESTION NO: 6
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$^{75}_{33}As^{3-}$ and $^{86}_{36}Kr$ have the same number of:

A. electrons

B. protons

C. neutrons

D. protons and neutrons

E. net charge

3^- added 3 extra electrons to As so they have same no. of electrons after addition.

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QUESTION NO: 7
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Which of the following is a transition metal?

A. Os

B. Al

C. Na

D. U

E. Gd

Visit- Periodic Table.

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QUESTION NO: 8
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Which of the following pair of compounds illustrates the Law of Multiple Proportions?

A. SO_2 , SO_3

B. SO_2 , CO_2

C. CO , SO_3

D. NO_2 , CO_2

E. NO_2 , SO_3

Law of Multiple proportions is only possible between TWO DIFFERENT ATOMS. Rest all contains more than two. (S,O, C & O, N, S, O)

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QUESTION NO: 9
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A sample of atomic hydrogen weighing 1.01 g contains the same number of atoms as:

I. 16.00 g of oxygen gas. II. 8.00 g of oxygen gas

III. 12.00 g of ^{12}C.

A. I and III

B. II and III

1g atomic hydrogen. So

QUESTION NO: 10

When a 1.50 g sample of a compound containing only carbon and sulfur is burned, 0.87 g of CO_2 and 2.53 g of SO_2 are produced. Determine the empirical formula of this compound.

A. CS_2

B. CS

C. CS_2

D. C_2S_3

E. C_3S_2

$0.87\,g\,CO_2 \times \frac{1\,mol\,CO_2}{44.01\,g\,CO_2} \times \frac{1\,mol\,C}{1\,mol\,CO_2} \times \frac{12.01\,g\,C}{1\,mol\,C} = 0.24\,g\,C$

$2.53\,g\,SO_2 \times \frac{1\,mol\,SO_2}{64\,g\,SO_2} \times \frac{1\,mol\,S}{1\,mol\,SO_2} \times \frac{32\,g\,S}{1\,mol\,S} = 1.26\,g\,S$

$mols\ C = \frac{0.24}{12.01} = 0.02$, $mol\ of\ S = \frac{1.26}{32} = 0.04$

$C = \frac{0.02}{0.02} = 1$, $S = \frac{0.04}{0.02} = 2$: $\boxed{CS_2}$

QUESTION NO: 11

If 2.00 g of NaI are produced from a mixture of 10.0 g of I_2 and 10.0 g of NaOH, what is the percent yield?

$$3I_2(s) + 6NaOH(s) \rightarrow 5NaI(s) + NaIO_3(s) + 3H_2O(l)$$

A. 20.3%

B. 76.9%

C. 40.6%

D. 65.6%

E. 15.5%

$10.0\,g\,I_2 \times \frac{1\,mol\,I_2}{253.8\,g\,I_2} \times \frac{5\,mol\,NaI}{3\,mol\,I_2} \times \frac{149.89\,g\,NaI}{1\,mol\,NaI} = 9.84\,g\ NaI$

$10.0\,g\,NaOH \times \frac{1\,mol\,NaOH}{40\,g\,NaOH} \times \frac{5\,NaI}{6\,mol\,NaOH} \times \frac{149.89\,g\,NaI}{1\,mol\,NaI} = 31.2\,g\ NaI$

Since I_2 give less amount so it's Limiting Reactant & 9.84 g is Theoret. yield

$\%\ yield = \frac{Actual}{Theor.} \times 100$, $\frac{2.00\,g}{9.84} \times 100 = \boxed{20.3\%}$

QUESTION NO: 12

Antimony (Sb) occurs naturally in two major isotopic forms: ^{121}Sb with mass 120.9038 amu and ^{123}Sb with mass 122.9041 amu. Determine the percentage natural abundance of the ^{121}Sb isotope, if the weighted average atomic mass is 121.75 amu for antimony.

A. 57.7%

B. 42.3%

C. 50.0%

D. 99.3%

E. 75.7%

$121.75 = 120.9038 \times \%\,Ab + 122.9041 \times \%\,Ab.$

$= 120.9038x + 122.9041(1-x)$

$= 120.9038x + 122.9041 - 122.9041x$

$121.75 = 122.9041 - 2.00x$, $2.00x = 122.9041 - 121.75$

$x = \frac{1.154}{2.0} = 0.577 \times 100 = \boxed{57.7\%}$

QUESTION NO: 13

Identify the reducing agent in the following redox reaction:

$$5Fe^{2+} + MnO_4^- + 8H^+ \rightarrow 5Fe^{3+} + Mn^{2+} + 4H_2O$$

A. Fe^{2+}

B. MnO_4^-

Fe^{2+} oxidized itself to Fe^{3+} so it's reducing agent.

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QUESTION NO: 14

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25 mL of 0.60 M $Mg(OH)_2$ are added to 25 mL of 0.40 M HCl. Calculate the molar concentration of OH^- in the resulting solution. (Assume that the base is completely dissociated)

A. 0.40 M
B. 0.30 M
C. 0.20 M
D. 0.50 M
E. 0.10 M

mols of $OH^- = 0.025L \times \frac{0.60 mol\ OH^-}{L} \times 2 = 0.030$ mol OH^-

since $Mg(OH)_2$ has 2 OH^- so multiplied by 2

mol of $H^+ = 0.025L \times \frac{0.04 mol}{L} = 0.010$ mol H^+

Acid-base Neutralization $H^+ + OH^- \rightarrow H_2O + OH^-$

0.01 0.03 0.01 0.02 excess

molar con. $OH^- = 0.02/0.025+0.025 = \boxed{0.40M}$

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QUESTION NO: 15

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What volume of water must be added to 15 mL of 0.60 M H_2SO_4 to prepare a 0.045 M solution?

A. 185 mL
B. 135 mL
C. 385 mL
D. 120 mL
E. 240 mL

$M_1V_1 = M_2V_2$

$0.60 \times 15 = 0.045 \times V_2$

$V_2 = \frac{0.60 \times 15}{0.045} = 200$ ml needed

but 15 ml ~~H_2O~~ is already present

so $200 - 15 = \boxed{185 \text{ ml needed}}$

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QUESTION NO: 16

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Given the redox reaction:

$MnO_4^- + I^- \rightarrow MnO_2 + IO_3^-$

When the above equation is balanced in basic solution, the smallest whole number coefficeint of H_2O is:

$3H_2O + I^- \rightarrow IO_3^- + 6H^+ + 6e^-$

A. 1
B. 2
C. 3
D. 4
E. 10

$3e^- + 4H^+ + MnO_4^- \rightarrow MnO_2 + 2H_2O$ } x2 in order to same no. e^- in both half rxn

$6e^- + 8H^+ + 2MnO_4^- \rightarrow 2MnO_2 + 4H_2O$

$3H_2O + I^- \rightarrow IO_3^- + 6H^+ + 6e^-$

$2H^+ + 2MnO_4^- + I^- \rightarrow 2MnO_2 + IO_3^- + H_2O$

$2OH^-$ $2OH^-$

$2H_2O$ H_2O

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QUESTION NO: 17

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