

Q1.

The radius of the hydrogen nucleus is  $1.0 \times 10^{-12}$  cm and its mass is  $1.67 \times 10^{-24}$  g. What is the density of the hydrogen nucleus in kg/L?

(Volume of a sphere is  $\frac{4}{3} \pi r^3$  where r is a radius)

- A)  $4.0 \times 10^{11}$
  - B)  $4.0 \times 10^9$
  - C)  $3.8 \times 10^7$
  - D)  $2.5 \times 10^{12}$
  - E)  $5.2 \times 10^8$
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Q2.

Which of the followings is a pure substance?

- A) Water
  - B) Air
  - C) Soil
  - D) Gasoline
  - E) Wood
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Q3.

Assume that the freezing point and melting point of mercury (Hg), which are  $-39^\circ\text{C}$  and  $356^\circ\text{C}$  respectively, are defined as  $0^\circ\text{A}$  and  $200^\circ\text{A}$  respectively. What is the equivalent of  $0^\circ\text{C}$  in  $^\circ\text{A}$ ?

- A) 20
  - B) 30
  - C) 35
  - D) 40
  - E) 25
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Q4.

${}_{20}^{40}\text{Ca}^{2+}$  has

- A) 20 protons, 20 neutrons, and 18 electrons.
  - B) 22 protons, 20 neutrons, and 20 electrons.
  - C) 20 protons, 22 neutrons, and 18 electrons.
  - D) 22 protons, 18 neutrons, and 18 electrons.
  - E) 20 protons, 20 neutrons, and 22 electrons.
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Q5.

How many ions of  $\text{Na}^+$  are available in 77.4 g of  $\text{Na}_2\text{CO}_3$ ?

- A)  $8.79 \times 10^{23}$
- B)  $4.40 \times 10^{23}$

- C)  $6.02 \times 10^{23}$
- D)  $1.20 \times 10^{24}$
- E)  $2.10 \times 10^{24}$

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Q6.

Two elements R and Q, combine to form two binary compounds. In the first compound, 14.0 g of R combines with 3.00 g of Q. In the second compound, 7.00 g of R combines with 4.50 g of Q. If the formula of the second compound is RQ, what is the formula of the first compound?

- A)  $R_3Q$
- B)  $R_2Q$
- C)  $RQ_2$
- D)  $RQ_3$
- E)  $R_2Q_3$

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Q7.

The name of the compound  $NH_4H_2PO_4$ .

- A) Ammonium dihydrogen phosphate
- B) Ammonium hydrogen phosphate
- C) Ammonium phosphate
- D) Tetraammonium dihydrogen phosphate
- E) Tetraammonium hydrogen phosphate

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Q8.

Natural rubidium has the average mass of 85.4678 and is composed of two isotopes  $^{85}\text{Rb}$  (84.9117 amu) and  $^{87}\text{Rb}$  (86.9220 amu). What is the relative abundance of isotope  $^{85}\text{Rb}$ ?

- A) 72.33%
- B) 27.85%
- C) 50.00%
- D) 31.47%
- E) 68.53%

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Q9.

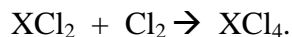
A given sample of xenon fluoride compound contains molecules of the type  $\text{XeF}_n$  where n is a whole number, Given that  $9.03 \times 10^{20}$  molecules of  $\text{XeF}_n$  weighs 0.368 g. Determine the value for "n" in the formula.

- A) 6
- B) 5
- C) 4
- D) 3
- E) 2

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Q10.

An element X reacts with chlorine to form  $\text{XCl}_2$  and  $\text{XCl}_4$ .  $\text{XCl}_2$  is converted to  $\text{XCl}_4$  by the equation,



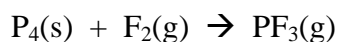
Treatment of 10.00 g of  $\text{XCl}_2$  with excess chlorine forms 12.55 g  $\text{XCl}_4$ . Calculate the atomic mass of X.

- A) 207.1
- B) 125.4
- C) 147.3
- D) 186.7
- E) 139.2

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Q11.

Consider the following unbalanced reaction:



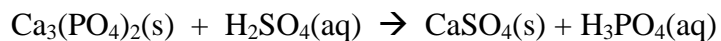
What mass of  $\text{F}_2$  is needed to produce  $1.20 \times 10^2$  g of  $\text{PF}_3$  if the reaction has a 78.1% yield?

- A) 99.6 g  $\text{F}_2$
- B) 77.8 g  $\text{F}_2$
- C) 88.7 g  $\text{F}_2$
- D) 72.3 g  $\text{F}_2$
- E) 83.6 g  $\text{F}_2$

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Q12.

Consider the following unbalanced reaction:



What masses of calcium sulfate will be produced from the reaction of 1.0 kg calcium phosphate with 980 g pure sulfuric acid?

- A) 1.3 kg
- B) 1.4 kg
- C) 1.6 kg
- D) 1.7 kg
- E) 1.1 kg

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Q13.

The compound adrenaline contains 56.79% C, 6.56% H, 28.37% O, and 8.28% N by mass. What is the empirical formula for adrenaline?

- A)  $C_8H_{11}O_3N$
- B)  $C_6H_9O_3N$
- C)  $C_9H_{13}O_4N_2$
- D)  $C_4H_8O_2N$
- E)  $C_5H_{10}O_2N$

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Q14.

Which of the followings is a weak base?

- A)  $NH_3$
- B)  $NaOH$
- C)  $HC_2H_3O_2$
- D)  $KOH$
- E)  $HCl$

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Q15.

Which of the listed chlorides is insoluble in water at room temperature?

- A)  $PbCl_2$
- B)  $BaCl_2$
- C)  $CaCl_2$
- D)  $MgCl_2$
- E)  $KCl$

Sec# Types of Chemical Reactions and Solution Stoichiometry - Precipitation Reactions

Grade# 60

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Q16.

Calculate the sodium ion ( $Na^+$ ) concentration when 70.0 mL of 3.0 M  $Na_2CO_3(aq)$  is added to 30.0 mL of 1.0 M  $NaHCO_3(aq)$ .

- A) 4.5 M
- B) 0.45 M
- C) 0.03 M
- D) 6.4 M
- E) 8.3 M

Sec# Types of Chemical Reactions and Solution Stoichiometry - The Composition of Solutions

Grade# 60

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Q17.

What mass of  $Na_2CrO_4$  is required to precipitate all of the silver ions from 75.0 mL of a 0.100 M solution of  $AgNO_3$ ?

- A) 0.608 g
  - B) 1.21 g
  - C) 2.43 g
  - D) 16.2 g
  - E) 7.85 g
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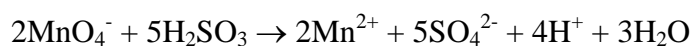
Q18.

What volume of 0.0200 M  $\text{Ca}(\text{OH})_2$  is required to neutralize 35.00 mL of 0.0500 M  $\text{HNO}_3$ ?

- A) 43.8 mL
  - B) 175 mL
  - C) 87.5 mL
  - D) 65.3 mL
  - E) 120 mL
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Q19.

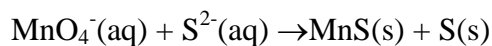
The oxidizing agent in the following oxidation-reduction reaction is,



- A)  $\text{MnO}_4^-$
  - B)  $\text{H}_2\text{SO}_3$
  - C)  $\text{Mn}^{2+}$
  - D)  $\text{SO}_4^{2-}$
  - E)  $\text{H}^+$
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Q20.

When the following oxidation-reduction reaction that occurs in basic solution is balanced, the mole ratio of  $\text{S}^{2-}(\text{aq})$  to  $\text{H}_2\text{O}(\text{l})$  is,



- A) 7/8
  - B) 8/7
  - C) 7/2
  - D) 1/3
  - E) 2/5
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