

bb 6-7 Ch02

Student: _____

1. If the relative atomic mass of ^{56}Fe is 55.935 (on the ^{12}C scale), what is the mass of one ^{56}Fe atom?

- A. 3.37×10^{-25} g
- B. 1.66×10^{-24} g
- C. 7.74×10^{-24} g
- D. 9.29×10^{-23} g
- E. 3.37×10^{-22} g

2. Which has the greatest number of hydrogen atoms?

- A. 10

20 hydrogen atoms

- B. 100 g of water
- C. 5 g of an unknown compound
- D. 20 g of hydrogen gas
- E. 100 g of a substance that is 2% H by mass

3. Which of these carbohydrates has the largest molecular mass?

- A. threose ($\text{C}_4\text{H}_8\text{O}_4$)
- B. ribose ($\text{C}_5\text{H}_{10}\text{O}_5$)
- C. glucose ($\text{C}_6\text{H}_{12}\text{O}_6$)
- D. sucrose ($\text{C}_{12}\text{H}_{22}\text{O}_{11}$)
- E. raffinose ($\text{C}_{18}\text{H}_{32}\text{O}_{16}$)

4. What is the relative molecular mass of the compound trinitrotoluene, $\text{C}_7\text{H}_5\text{N}_3\text{O}_6$ (on the ^{12}C scale)?

- A. 43.03
- B. 205.13
- C. 215.13
- D. 227.13
- E. 278.03

5. Assume a kernel of wheat has a volume of 8 mm

3 . How many moles of wheat kernels can fit in the world's largest grain elevator with a capacity of 20 million bushels (1 bushel = 35.24 L)?

- A. 1.17×10^{-12}
- B. 1.42×10^{-12}
- C. 1.46×10^{-10}
- D. 1.46×10^{-7}
- E. 1.42×10^{-6}

6. Vitamin B₁₂, cyanocobalamin, has the molecular formula, C₆₈H₈₈CoN₁₄O₁₄P. What is the percent mass of cobalt in this compound?

- A. 1.02%
- B. 4.35%
- C. 10.3%
- D. 22.3%
- E. 23.2%

7. Which of the following carbohydrates has the largest percent mass of carbon?

- A. threose (C₄H₈O₄)
- B. ribose (C₅H₁₀O₅)
- C. glucose (C₆H₁₂O₆)
- D. sucrose (C₁₂H₂₂O₁₁)
- E. raffinose (C₁₈H₃₂O₁₆)

8. Magnetite is a mineral compound that is 72.36% iron and 27.64% oxygen by mass. What is the empirical formula for the compound that makes up magnetite?

- A. FeO
- B. Fe₂O
- C. Fe₂O₃
- D. Fe₃O₂
- E. Fe₃O₄

9. You have 25.0 g of a compound that contains only silicon and nitrogen. Chemical analysis reveals that your sample contains 15.0 g of silicon. What is the empirical formula for your compound?

- A. SiN
- B. Si₃N₄
- C. Si₂N₃
- D. SiN₂
- E. Si₂N

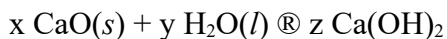
10. You have a compound that contains only carbon and hydrogen. If you burn the compound at high temperature in the presence of oxygen it is completely converted to CO₂ and H₂O. When you react 20.0 g of your sample you generate 62.7 g of CO₂ and 25.7 g of H₂O. Which of the following is a possible formula for your compound?

- A. C₂H₂
- B. C₂H₄
- C. C₂H₆
- D. C₃H₅
- E. C₃H₇

11. Methane CH_4 reacts with molecular oxygen, O_2 , to form carbon dioxide, CO_2 , and water, H_2O . In a balanced chemical equation for this reaction there will always be

- A. the same number of moles of CO_2 and H_2O .
- B. twice as many moles of CO_2 as H_2O .
- C. twice as many moles of H_2O as CO_2 .
- D. twice as many moles of H_2O as O_2 .
- E. twice as many moles of CO_2 as CH_4 .

12. For the given unbalanced reaction



the correct stoichiometric coefficients x, y, & z are

- A. 1,1,1
- B. 1,2,1
- C. 2,1,2
- D. 2,1,1
- E. 1,1,2

13. Barium hydroxide reacts with hydrochloric acid to produce barium chloride and water. A balanced chemical equation for this reaction is?

- A. $\text{Ba}(\text{OH})_2 + \text{HCl} \rightarrow \text{BaCl}_2 + \text{H}_2\text{O}$
- B. $\text{Ba}(\text{OH}) + \text{HCl} \rightarrow \text{BaCl} + \text{H}_2\text{O}$
- C. $\text{Ba}(\text{OH})_2 + 2\text{HCl} \rightarrow \text{BaCl}_2 + 2\text{H}_2\text{O}$
- D. $\text{Ba}(\text{OH})_2 + 2\text{HCl} \rightarrow \text{BaCl}_2 + \text{H}_2\text{O}$
- E. $\text{Ba}(\text{OH}) + 2\text{HCl} \rightarrow \text{BaCl} + \text{H}_2\text{O}$

14. Which of the following is not correctly balanced?

- A. $2 \text{Al} + 6 \text{HCl} \rightarrow 2 \text{AlCl}_3 + 3 \text{H}_2$
- B. $2 \text{C}_6\text{H}_6 + 15 \text{O}_2 \rightarrow 12 \text{CO}_2 + 6 \text{H}_2\text{O}$
- C. $16 \text{Cr} + 3 \text{S}_8 \rightarrow 8 \text{Cr}_2\text{S}_3$
- D. $2 \text{NaHCO}_3 \rightarrow \text{Na}_2\text{CO}_3 + 2 \text{CO}_2 + \text{H}_2\text{O}$
- E. $\text{Fe}_2\text{O}_3 + 2 \text{Al} \rightarrow 2 \text{Fe} + \text{Al}_2\text{O}_3$

15. In fermentation, sucrose, $\text{C}_{12}\text{H}_{22}\text{O}_{11}$, reacts with water to form ethanol, $\text{C}_2\text{H}_5\text{OH}$, and carbon dioxide. A balanced chemical equation for this reaction is?

- A. $\text{C}_{12}\text{H}_{22}\text{O}_{11}(aq) + 3 \text{H}_2\text{O}(l) \rightarrow 5 \text{C}_2\text{H}_5\text{OH}(aq) + 2 \text{CO}_2(g)$
- B. $\text{C}_{12}\text{H}_{22}\text{O}_{11}(aq) + 7 \text{H}_2\text{O}(l) \rightarrow 2 \text{C}_2\text{H}_5\text{OH}(aq) + 8 \text{CO}_2(g)$
- C. $\text{C}_{12}\text{H}_{22}\text{O}_{11}(aq) + 2 \text{H}_2\text{O}(l) \rightarrow 6 \text{C}_2\text{H}_5\text{OH}(aq) + \text{CO}_2(g)$
- D. $\text{C}_{12}\text{H}_{22}\text{O}_{11}(aq) + 2 \text{H}_2\text{O}(l) \rightarrow 4 \text{C}_2\text{H}_5\text{OH}(aq) + 4 \text{CO}_2(g)$
- E. $\text{C}_{12}\text{H}_{22}\text{O}_{11}(aq) + \text{H}_2\text{O}(l) \rightarrow 4 \text{C}_2\text{H}_5\text{OH}(aq) + 4 \text{CO}_2(g)$

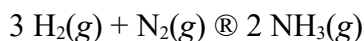
16. Tetrasilane (Si_4H_{10}) is a liquid with can react with oxygen to form SiO_2 and water. How many moles of water are produced from each mole of tetrasilane that reacts?

- A. 0.1
- B. 2.5
- C. 4
- D. 5
- E. 10

17. Citric acid ($\text{C}_6\text{H}_8\text{O}_7$) is produced from fermentation of sugars such as sucrose ($\text{C}_{12}\text{H}_{22}\text{O}_{11}$). In this process oxygen reacts with the sugar to produce citric acid and water as products. How many moles of citric acid can be produced from one mole of sucrose?

- A. 2
- B. 1
- C. 0.5
- D. 0.333
- E. 0.1

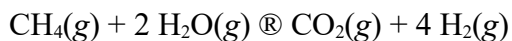
18. Nitrogen gas reacts with hydrogen gas to produce ammonia.



How many grams of nitrogen are required to produce 1.000 g of ammonia?

- A. 0.8224
- B. 1.644
- C. 0.5000
- D. 0.6667
- E. 0.4112

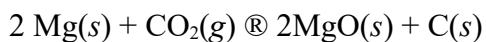
19. Methane can be reacted with steam to produce carbon dioxide and hydrogen gas in a two step reaction. The resulting overall reaction can be written



How many grams of hydrogen can be produced from each gram of methane?

- A. 1.006
- B. 0.503
- C. 0.377
- D. 0.251
- E. 4.000

20. Magnesium will react with carbon dioxide to form magnesium oxide and carbon.



20.0 grams of magnesium react completely with excess carbon dioxide. How many grams of solid product should be formed?

- A. 20.0 grams
- B. 27.5 grams
- C. 30.0 grams
- D. 38.1 grams
- E. 40.0 grams

Calcium carbide, CaC_2 , reacts with water to produce calcium hydroxide and acetylene gas, C_2H_2 .



How many grams of acetylene can be produced from 30.0 g of calcium carbide?

- A. 1.42 g
- B. 12.2 g
- C. 28.0 g
- D. 30.0 g
- E. 64.1 g

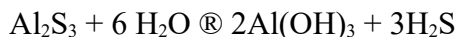
Ammonium perchlorate, NH_4ClO_4 , is used with aluminum as rocket fuel.



If 100.0 g of aluminum are reacted with 60.0 g of ammonium perchlorate, how many grams of aluminum oxide are produced?

- A. 34.71 g
- B. 40.00 g
- C. 123.8 g
- D. 151.1 g
- E. 1789 g

Aluminum sulfide reacts with water to form aluminum hydroxide and hydrogen sulfide by the following reaction



If 25 g of aluminum sulfide is reacted with 25 g of water how many moles of hydrogen sulfide will be formed?

- A. 0.12 moles
- B. 0.50 moles
- C. 0.78 moles
- D. 2.0 moles
- E. 3.0 moles

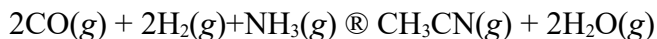
Iron oxide can be reduced to iron by a reaction with carbon to form carbon monoxide



If 95.0 grams of iron oxide is reacted with excess carbon yields 63 g of iron, what is the percent yield of this reaction?

- A. 12%
- B. 59%
- C. 66%
- D. 95%
- E. 100%

Acetonitrile, CH_3CN , can be synthesized from carbon monoxide, hydrogen, and ammonia in the presence of a catalyst at high temperatures by the following reaction



If 20 g of carbon monoxide, 20 g of hydrogen, and 10 g of ammonia are reacted, which will be the limiting reagent?

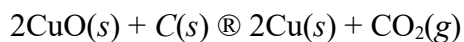
- A. carbon monoxide
- B. hydrogen
- C. ammonia
- D. none of them
- E. there is no way to know

Which has a larger molar volume (the volume occupied by one mole):
gold (density = 19.3 g cm^{-3})

or tin (density = 7.31 g cm^{-3})?

- A. gold
- B. tin
- C. they are exactly the same
- D. there is no way to know without other information

Copper oxide ore, CuO, can be smelted with carbon to make copper metal and carbon dioxide.



If 100.0 g of a mixed ore is smelted and produces 75.9 grams of pure copper. What percentage of the mixed ore is CuO? (You can assume the reaction yield is 100%, there is excess carbon, and that CuO is the only source of copper.)

- A. 28.0%
- B. 48.5%
- C. 75.9%
- D. 79.9%
- E. 95.0%

The hard ceramic boron carbide, B₄C, can be made the reaction of boron oxide, B₂O₃, with carbon in an arc furnace. How many grams of boron carbide can be made from 10.0 g of boron oxide?

- A. 3.10 g
- B. 3.97 g
- C. 5.00 g
- D. 10.0 g
- E. 12.6 g

A vanadium oxide contains 56.02% vanadium by mass. What is its empirical formula?

- A. V₂O
- B. VO
- C. V₂O₃
- D. VO₂
- E. V₂O₅

Caffeine has the molecular formula, C₈H₁₀N₄O₂. If it is burned in excess oxygen it will form carbon dioxide, water vapor, and nitrogen gas. Which gas will be most abundant by mass?

- A. CO₂
- B. H₂O
- C. N₂
- D. they will all be the same
- E. it depends on the mass of caffeine

Triphenylene is an organic compound containing only carbon and hydrogen with 3 carbon atoms for every two hydrogen atoms. Which of the following is a possible molecular mass for triphenylene?

- A. 34.0 g/mol
- B. 228.29 g/mol
- C. 366.8 g/mol
- D. 400.0 g/mol
- E. b or c could be correct

Sodium perbromate can be synthesized via the following reaction that gives off Xenon gas.

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

A reaction is started with 200.0g of NaBrO_3 , 250.0g of XeF_2 and 100.0g of water. Assuming that the reaction goes to completion, and that all of the formed xenon gas is allowed to escape into the atmosphere, what will be the minimum mass of products and reactants remaining in the reaction vessel?

A. 173.4 g

- B. 193.9 g
- C. 376.0 g
- D. 356.1 g
- E. None of the above

When acetaldehyde is treated with aqueous sodium hydroxide (in excess), aldol is formed via the following reaction in a 50% yield.

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

A. 88 g
B. 176 g
C. 200 g
D. 400 g
E. 50.0 g

bb 6-7 Ch02 Key

1. D
2. D
3. E
4. D
5. C
6. B
7. E
8. E
9. B
10. B
11. C
12. A
13. C
14. D
15. E
16. D
17. A
18. A
19. B
20. D
- B
- A
- B
- D
- A
- B
- E
- B
- E

A
B
C
C