

Chemistry Challenge Practice Exam #1

Multiple Choice

Identify the letter of the choice that best completes the statement or answers the question.

- ___ 1. Express the sum of 7.68 m and 5.0 m using the correct number of significant digits.
- 12.68 m
 - 12.7 m
 - 13 m
 - 10 m
- ___ 2. What is the measurement 111.009 mm rounded off to four significant digits?
- 111 mm
 - 111.0 mm
 - 111.01 mm
 - 110 mm
- ___ 3. Using the periodic table, determine the number of neutrons in ^{16}O .
- 4
 - 8
 - 16
 - 24
- ___ 4. Which of the following isotopes has the same number of neutrons as phosphorus-31?
- $^{32}_{15}\text{P}$
 - $^{32}_{16}\text{S}$
 - $^{29}_{14}\text{Si}$
 - $^{28}_{14}\text{Si}$
- ___ 5. When an electron moves from a lower to a higher energy level, the electron ____.
- always doubles its energy
 - absorbs a continuously variable amount of energy
 - absorbs a quantum of energy
 - moves closer to the nucleus
- ___ 6. What is the electron configuration of potassium?
- $1s^2 2s^2 2p^2 3s^2 3p^2 4s^1$
 - $1s^2 2s^2 2p^{10} 3s^2 3p^3$
 - $1s^2 2s^2 3s^2 3p^6 3d^1$
 - $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$
- ___ 7. Which of the following elements is a transition metal?
- cesium
 - copper
 - tellurium
 - tin
- ___ 8. Atomic size generally ____.
- increases as you move from left to right across a period
 - decreases as you move from top to bottom within a group
 - remains constant within a period
 - decreases as you move from left to right across a period
- ___ 9. Which of the following elements has the smallest first ionization energy?
- sodium
 - calcium
 - potassium
 - magnesium

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- ___ 10. Which of the following statements correctly compares the relative size of an ion to its neutral atom?
- The radius of an anion is greater than the radius of its neutral atom.
 - The radius of an anion is identical to the radius of its neutral atom.
 - The radius of a cation is greater than the radius of its neutral atom.
 - The radius of a cation is identical to the radius of its neutral atom.
- ___ 11. As you move from left to right across the second period of the periodic table ____.
- ionization energy increases
 - atomic radii increase
 - electronegativity decreases
 - atomic mass decreases
- ___ 12. What is the electron configuration of the calcium ion?
- $1s^2 2s^2 2p^6 3s^2 3p^6$
 - $1s^2 2s^2 2p^6 3s^2 3p^4 4s^2$
 - $1s^2 2s^2 2p^6 3s^2 3p^5 4s^1$
 - $1s^2 2s^2 2p^6 3s^2$
- ___ 13. How many valence electrons are in an atom of phosphorus?
- 2
 - 3
 - 4
 - 5
- ___ 14. How many valence electrons are in an atom of magnesium?
- 2
 - 3
 - 4
 - 5
- ___ 15. What is the formula unit of sodium nitride?
- NaN
 - Na₂N
 - Na₃N
 - NaN₃
- ___ 16. Which of the following compounds has the formula KNO₃?
- potassium nitrate
 - potassium nitride
 - potassium nitrite
 - potassium nitrogen oxide
- ___ 17. Which of these elements does not exist as a diatomic molecule?
- Ne
 - F
 - H
 - I
- ___ 18. A molecule with a single covalent bond is ____.
- CO₂
 - Cl₂
 - CO
 - N₂
- ___ 19. Which of the following formulas represents an ionic compound?
- CS₂
 - BaI₂
 - N₂O₄
 - PCl₃

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- ___ 20. Sulfur hexafluoride is an example of a ____.
- monatomic ion
 - polyatomic ion
 - binary compound
 - polyatomic compound
- ___ 21. Which of the following compounds contains the lead(II) ion?
- PbO
 - PbCl₄
 - Pb₂O
 - Pb₂S
- ___ 22. Which of the following elements exists as a diatomic molecule?
- neon
 - lithium
 - nitrogen
 - sulfur
- ___ 23. How many moles of tungsten atoms are in 4.8×10^{25} atoms of tungsten?
- 8.0×10^2 moles
 - 8.0×10^1 moles
 - 1.3×10^{-1} moles
 - 1.3×10^{-2} moles
- ___ 24. How many moles of silver atoms are in 1.8×10^{20} atoms of silver?
- 3.0×10^{-4}
 - 3.3×10^{-3}
 - 3.0×10^2
 - 1.1×10^{44}
- ___ 25. What is the molar mass of (NH₄)₂CO₃?
- 144 g
 - 138 g
 - 96 g
 - 78 g
- ___ 26. What is the percent composition of carbon, in heptane, C₇H₁₆?
- 12%
 - 19%
 - 68%
 - 84%
- ___ 27. Which of the following is the correct skeleton equation for the reaction that takes place when solid phosphorus combines with oxygen gas to form diphosphorus pentoxide?
- $\text{P}(s) + \text{O}_2(g) \rightarrow \text{PO}_2(g)$
 - $\text{P}(s) + \text{O}(g) \rightarrow \text{P}_5\text{O}_2(g)$
 - $\text{P}(s) + \text{O}_2(g) \rightarrow \text{P}_2\text{O}_5(s)$
 - $\text{P}_2\text{O}_5(s) \rightarrow \text{P}_2(s) + \text{O}_2(g)$
- ___ 28. Chemical equations must be balanced to satisfy ____.
- the law of definite proportions
 - the law of multiple proportions
 - the law of conservation of mass
 - Avogadro's principle
- ___ 29. What are the missing coefficients for the skeleton equation below?
 $\text{Cr}(s) + \text{Fe}(\text{NO}_3)_2(aq) \rightarrow \text{Fe}(s) + \text{Cr}(\text{NO}_3)_3(aq)$
- 4, 6, 6, 2
 - 2, 3, 2, 3
 - 2, 3, 3, 2
 - 1, 3, 3, 1

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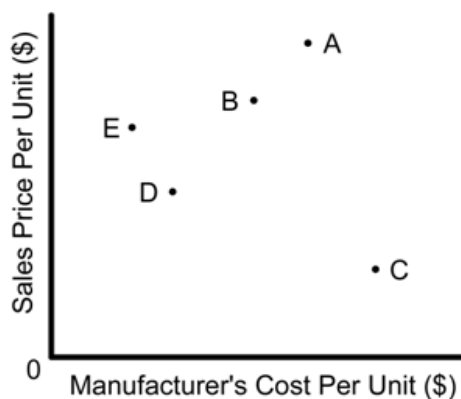
- ___ 30. Which of the following is an INCORRECT interpretation of the balanced equation shown below?
 $2S(s) + 3O_2(g) \rightarrow 2SO_3(g)$
- 2 atoms S + 3 molecules $O_2 \rightarrow 2$ molecules SO_3
 - 2 g S + 3 g $O_2 \rightarrow 2$ g SO_3
 - 2 mol S + 3 mol $O_2 \rightarrow 2$ mol SO_3
 - none of the above
- ___ 31. How many moles of glucose, $C_6H_{12}O_6$, can be "burned" biologically when 10.0 mol of oxygen is available?
 $C_6H_{12}O_6(s) + 6O_2(g) \rightarrow 6CO_2(g) + 6H_2O(l)$
- 0.938 mol
 - 1.67 mol
 - 53.3 mol
 - 60.0 mol
- ___ 32. At STP, how many liters of oxygen are required to react completely with 3.6 liters of hydrogen to form water?
 $2H_2(g) + O_2(g) \rightarrow 2H_2O(g)$
- 1.8 L
 - 3.6 L
 - 2.0 L
 - 2.4 L
- ___ 33. How are conditions of pressure and temperature, at which two phases coexist in equilibrium, shown on a phase diagram?
- by a line separating the phases
 - by the endpoints of the line segment separating the phases
 - by the planar regions between lines in the diagram
 - by a triple point on the diagram
- ___ 34. As the temperature of a fixed volume of a gas increases, the pressure will ____.
- vary inversely
 - decrease
 - not change
 - increase
- ___ 35. Which of the following compounds is a nonelectrolyte?
- sodium bromide
 - magnesium sulfate
 - copper chloride
 - carbon tetrachloride
- ___ 36. What mass of Na_2SO_4 is needed to make 2.5 L of 2.0M solution? (Na = 23 g; S = 32 g; O = 16 g)
- 178 g
 - 284 g
 - 356 g
 - 710 g
- ___ 37. What is the number of moles of K^+ ions are present in 250 mL of a 0.4M KCl solution?
- 0.1 mol
 - 0.16 mol
 - 0.62 mol
 - 1.6 mol

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- ___ 38. To 225 mL of a $0.80M$ solution of KI, a student adds enough water to make 1.0 L of a more dilute KI solution. What is the molarity of the new solution?
- | | |
|-----------|------------|
| a. $180M$ | c. $0.35M$ |
| b. $2.8M$ | d. $0.18M$ |
- ___ 39. Why does a higher temperature cause a reaction to go faster?
- There are more collisions per second only.
 - Collisions occur with greater energy only.
 - There are more collisions per second and the collisions are of greater energy.
 - There are more collisions per second or the collisions are of greater energy.
- ___ 40. Which of these solutions is the most basic?
- | | |
|---------------------------------|----------------------------------|
| a. $[H^+] = 1 \times 10^{-2}M$ | c. $[H^+] = 1 \times 10^{-11}M$ |
| b. $[OH^-] = 1 \times 10^{-4}M$ | d. $[OH^-] = 1 \times 10^{-13}M$ |
- ___ 41. What volume, in liters, of $0.40 M$ NaCl solution contains 0.10 moles of NaCl?
- | | |
|----------|---------|
| a. 0.040 | c. 0.25 |
| b. 0.10 | d. 0.40 |
- ___ 42. Which substance is liquid at room temperature and 1 atmosphere pressure?
- | | |
|------------|------------|
| a. sulfur | c. silicon |
| b. mercury | d. barium |
- ___ 43. Groups of elements _____
- have the same number of isomers.
 - have the same principle quantum number (n).
 - have the same number of valence electrons.
 - both (b) and (c) are correct.
- ___ 44. If 0.015 moles of NaOH is added to 0.015 moles of H_2SO_4 ,
- an acidic solution results.
 - a basic solution results.
 - a neutral solution results.
 - H_2 gas is formed.
- ___ 45. If 1 part water is mixed with 3 parts $0.2 M$ NaCl (aq), what is the molarity of this mixture?
- | | |
|-------------|-------------|
| a. $0.67 M$ | c. $0.15 M$ |
| b. $0.5 M$ | d. $0.2 M$ |
- ___ 46. Which process has a negative value of ΔG at room temperature and 1 atm pressure?
- | | |
|-------------------|---------------------------------|
| a. water freezing | c. ice melting |
| b. water boiling | d. both (a) and (b) are correct |

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- ___ 47. An irregularly shaped object weighed 122.9 g. When placed in a graduated cylinder that originally contained 24.3 ml of water, the resulting volume was 35.7 ml. What is the density of the object?
- 5.06 g/ml
 - 3.44 g/ml
 - 10.8 g/ml
 - 20.5 g/ml
- ___ 48. If one 5-kg log is burned in a first fireplace, and two 5-kg logs are burned in a second fireplace, then
- slightly more heat is produced in the first fireplace.
 - twice as much heat is produced in the first fireplace.
 - slightly more heat is produced in the second fireplace.
 - twice as much heat is produced in the second fireplace.
 - the same amount of heat will be produced in each fireplace.
- ___ 49. An example of a pure substance is
- uranium
 - sodium chloride
 - pure water
 - carbon dioxide
 - all of the above
- ___ 50. Companies A, B, C, D, and E all manufacture and sell a similar product. The graph below compares manufacturing costs and sales prices per unit among the five companies. If all five companies have sold the same number of units, which company has earned the greatest profit from those sales?



- A
 - B
 - C
 - D
 - E
- ___ 51. A parking garage charges \$2.00 for the first hour and \$1.50 for each additional hour. Saturday and Sunday, the rates are decreased by 50%. How much does it cost to park a car from 5 p.m. on Friday until 2 a.m. on Saturday?
- \$9.50
 - \$9.75
 - \$12.50
 - \$12.75
 - \$14.00

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- _____ 52. A television is on sale for \$300. If the sale price is 20% less than the regular price, what was the regular price?
- a. \$240
 - b. \$360
 - c. \$375
 - d. \$600
 - e. \$1,500
- _____ 53. A chemist has one solution that is 30.% acid and another solution that is 18% acid. How much of each solution should be used to get 300. L of a solution that is 21% acid?
- a. 23 L of the 30.% solution and 277 L of the 18% solution
 - b. 75 L of the 30.% solution and 225 L of the 18% solution
 - c. 131 L of the 30.% solution and 169 L of the 18% solution
 - d. 138 L of the 30.% solution and 162 L of the 18% solution
 - e. 244 L of the 30.% solution and 56 L of the 18% solution

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Answer Section

MULTIPLE CHOICE

1. B
2. B
3. B
4. B
5. C
6. D
7. B
8. D
9. C
10. A
11. A
12. A
13. D
14. A
15. C
16. A
17. A
18. B
19. B
20. C
21. A
22. C
23. B
24. A
25. C
26. D
27. C
28. C
29. C
30. B
31. B
32. A
33. A
34. D
35. D
36. D
37. A
38. D
39. C
40. C

- 41. C
- 42. B
- 43. C
- 44. A
- 45. D
- 46. C
- 47. C
- 48. D
- 49. E
- 50. E
- 51. C
- 52. C
- 53. B