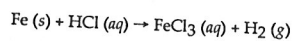


MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1. For the following reaction, what is the correct coefficient for the H_2 ? 1. _____



- A) 1 B) 2 C) 3 D) 4 E) 5

Answer: C

2. How many moles of Al are needed to react exactly with 10.00 moles of Fe_2O_3 according to the following equation? 2. _____



- A) 60.0 moles B) 30.0 moles C) 15.0 moles D) 20.0 moles

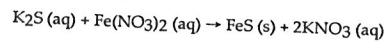
Answer: D

3. The state of matter a substance is in is determined by its _____ 3. _____

- A) electrical conductivity B) density
C) solubility D) temperature

Answer: D

4. Consider the following precipitation reaction: 4. _____



What is the correct **net ionic equation** for the reaction?

- A) $Fe^{2+}(aq) + S^{2-}(aq) \rightarrow FeS(s)$
B) $Fe^{2+}(aq) + S^{2-}(aq) + 2K^+(aq) + 2NO_3^-(aq) \rightarrow FeS(s) + 2K^+(aq) + 2NO_3^-(aq)$
C) $K^+(aq) + NO_3^-(aq) \rightarrow KNO_3(s)$
D) $Fe^{2+}(aq) + S^{2-}(aq) + 2K^+(aq) + 2NO_3^-(aq) \rightarrow Fe^{2+}(aq) + S^{2-}(aq) + 2KNO_3(s)$
E) No reaction occurs.

Answer: A

5. Arrange the following elements in order of *increasing* atomic radii. 5. _____

Sr, Rb, Sb, I, In

- A) $I < Sb < In < Sr < Rb$ B) $I < Sb < In < Rb < Sr$
C) $Rb < Sr < In < Sb < I$ D) $In < Sb < I < Sr < Rb$

Answer: A

6. Which of the following energy-level changes for an electron is most energetic? 6. _____

- A) $6 \rightarrow 1$
B) $4 \rightarrow 1$
C) $3 \rightarrow 1$
D) $5 \rightarrow 1$
E) All changes have the same energy.

Answer: A

7. What is the systematic name for aqueous H_3PO_4 ? 7. _____

- A) hydrophosphorous acid
B) phosphorous acid
C) phosphoric acid
D) hydrophosphoric acid
E) none of the above

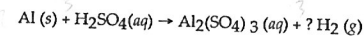
Answer: C

8. Which of the following is the correct electron-dot structure for CS_2 ? 8. _____

- A) $:\ddot{S}=\ddot{C}=\ddot{S}:$
B) $S-C-S$
C) $:\ddot{S}=\ddot{C}=\ddot{S}:$
D) $:\ddot{S}-\ddot{C}=C-\ddot{S}:$
E) $:\ddot{S}-\ddot{C}-\ddot{S}:$

Answer: A

9. What is the coefficient of hydrogen, H_2 , when the following equation is balanced? 9. _____



- A) 1 B) 2 C) 3 D) 4 E) 5

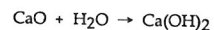
Answer: C

10. In a molecule with covalent bonding, 10. _____

- A) atoms of noble gases are held together by attractions between oppositely charged ions.
B) atoms of different metals form bonds.
C) atoms are held together by sharing electrons.
D) oppositely charged ions are held together by strong electrical attractions.
E) atoms of metals form bonds to atoms of nonmetals.

Answer: C

11. How many grams of slaked lime $[\text{Ca}(\text{OH})_2]$ are produced from 7.00 grams of quicklime (CaO), according to the following balanced chemical equation? 11. _____



- A) 5.30 g B) 518 g C) 9.25 g D) 9.50 g E) 7.00 g

Answer: C

12. What is the name of SnCl_2 ? 12. _____

- A) strontium chloride
B) tin dichloride
C) tin(II) chloride
D) ditin chloride
E) tin chloride

Answer: C

13. Which statement about the boiling point of water is *incorrect*? 13. _____

- A) In a pressure cooker, shorter cooking times are required due to the change in boiling point.
B) The boiling point is less than 100°C for locations at low elevations.
C) The boiling point is greater than 100°C in a pressure cooker.
D) Boiling water at 1 atm will always have a temperature of 100°C .

Answer: B

14. Which of the following names is paired with an *incorrect* formula? 14. _____

- A) Iron(III) chloride - FeCl_3 B) Copper(II) nitride - Cu_3N_2
C) Lithium bromide - LiBr D) Copper(II) oxide - Cu_2O

Answer: D

15. How many centimeters are there in 57.0 in.? 15. _____

- A) 22 cm B) 22.4 cm C) 145 cm D) 0.0445 cm E) 140 cm

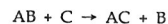
Answer: C

16. The measurement 0.000 0043 m, expressed correctly using scientific notation, is 16. _____

- A) 4.3×10^{-6} m.
B) 4.3×10^{-7} m.
C) 4.3×10^6 m.
D) 4.3 m.
E) 0.43×10^{-5} m.

Answer: A

17. What type of reaction is represented by the following equation? 17. _____



- A) decomposition
B) combustion
C) double displacement
D) single displacement
E) combination

Answer: D

18. A thimble of water contains 4.0×10^{21} molecules. The number of moles of H_2O is: 18. _____

- A) 6.6×10^{-23} B) 6.6×10^{-3} C) 2.4×10^{45} D) 2.4×10^{23}

Answer: B

19. A pure substance A is found to change upon heating into two new pure substances, B and C. C can be decomposed by chemical means, B cannot be decomposed by chemical means. From this we may conclude that _____ 19. _____

- A) A is an element, B and C are compounds B) A, B and C are all elements
C) A and C are compounds, B is an element D) A is a compound, B and C are elements

Answer: C

20. Which of the following pairs of subatomic particles have charges of equal magnitude but opposite in sign? 20. _____

- A) proton and electron B) electron and neutron
C) neutron and proton D) proton and positron

Answer: A

21. The mass of a particular drop of water was determined to be 0.0521 g. How many water molecules are in this drop of water? 21. _____

- A) 3.14×10^{21}
B) 1.74×10^{21}
C) 2.08×10^{26}
D) 1.74×10^{22}
E) 3.14×10^{22}

Answer: B

22. Which is an example of a homogeneous mixture? 22. _____

- A) chocolate chip cookie B) oil & vinegar salad dressing
C) a rock collection D) glucose solution

Answer: D

23. Which of the following setups would convert centimeters to feet?

- A) $\text{cm} \times \frac{1 \text{ in.}}{2.54 \text{ cm}} \times \frac{1 \text{ ft}}{12 \text{ in.}}$
B) $\text{cm} \times \frac{2.54 \text{ in.}}{1 \text{ cm}} \times \frac{1 \text{ ft}}{12 \text{ in.}}$
C) $\text{cm} \times \frac{2.54 \text{ cm}}{1 \text{ in.}} \times \frac{1 \text{ ft}}{12 \text{ in.}}$
D) $\text{cm} \times \frac{1 \text{ in.}}{2.54 \text{ cm}} \times \frac{12 \text{ in.}}{1 \text{ ft}}$
E) $\text{cm} \times \frac{2.54 \text{ cm}}{1 \text{ in.}} \times \frac{12 \text{ in.}}{1 \text{ ft}}$

Answer: A

24. Place the following elements in order of **increasing** electronegativity.

K Cs P

- A) $P < K < Cs$
B) $P < Cs < K$
C) $K < P < Cs$
D) $Cs < P < K$
E) $Cs < K < P$

Answer: E

25. A nugget of gold with a mass of 521 g is added to 50.0 mL of water. The water level rises to a volume of 77.0 mL. What is the density of the gold?

- A) 6.77 g/mL
B) 1.00 g/mL
C) 0.0518 g/mL
D) 10.4 g/mL
E) 19.3 g/mL

Answer: E

26. What is the chemical name of $\text{Pb}_3(\text{PO}_4)_4$?

- A) lead (III) phosphate
B) lead triphosphide
C) lead (IV) phosphate
D) lead phosphate

Answer: C

27. Which group contains only elements which normally exist as diatomic molecules?

- A) helium; neon, argon
B) nitrogen; sulfur, bromine
C) hydrogen; lithium, sodium
D) oxygen; phosphorus, germanium
E) nitrogen; oxygen, fluorine

Answer: E

28. Calculate the number of moles of aspirin, $\text{C}_9\text{H}_8\text{O}_4$, in a 4.0 gram tablet.

- A) 0.022
B) 2.2×10^{-4}
C) 2.2
D) 4.6×10^{-3}

Answer: A

29. The main group element E reacts with chlorine to form an ionic compound with the formula ECl_2 . The element E is a member of what group in the Periodic Table?

- A) 1A
B) 2A
C) 7A
D) 6A
E) none of the above

Answer: B

30. The elements in groups 1A, 7A and 8A are called, respectively:

- A) alkali metals, chalcogens, halogens
B) alkaline earth metals, halogens, chalcogens
C) alkali metals, halogens, noble gases
D) alkaline earth metals, transition metals, halogens

Answer: C

31. How many joules are required to raise the temperature of a 35.0 g sample of iron from 25 °C to 35 °C? Iron has a specific heat of 0.450 J/g °C.

- A) 350 J
B) 160 J
C) 35 J
D) 10. J
E) 16 J

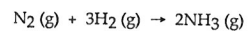
Answer: B

32. How many kilograms are in 452 mg?

- A) $4.52 \times 10^8 \text{ kg}$
B) $4.52 \times 10^{-7} \text{ kg}$
C) $4.52 \times 10^{-4} \text{ kg}$
D) 0.452 kg

Answer: C

33. For the equation given, how many grams of ammonia will result from 44.0 g of nitrogen (N_2) and sufficient hydrogen (H_2)?



- A) 107 g
B) 53.4 g
C) 214 g
D) 88.0 g
E) 26.7 g

Answer: B

34. A beaker contains 0.964 grams of N_2 . How many moles of N_2 does the beaker contain?

- A) 0.0344 mol
B) 0.0688 mol
C) 2.262×10^{23} mol
D) 2.64 mol

Answer: A

54. Which of the following ionic compounds is named without using a Roman numeral?
 A) AuCl₃ B) CuS C) Fe₂O₃ D) Ca(OH)₂
 Answer: D

55. How many liters of a 0.050 M KCl solution contain 0.163 moles of KCl?
 A) 1.48 L B) 3.37 L C) 2.96 L D) 8.97 L E) 1.12 L
 Answer: C

56. What is the molarity of a solution that contains 17 g of NH₃ in 0.50 L of solution?
 A) 2.0 M B) 0.029 M C) 34 M D) 1.0 M E) 0.50 M
 Answer: A

57. The chemical formula for heptasulfur dioxide is _____
 A) O₂S B) SO₂ C) S₂O₇ D) S₇O₂
 Answer: D

58. A solution with the same osmotic pressure as the blood is _____
 A) molar to the blood.
 B) isotonic to the blood.
 C) nontonic to the blood.
 D) hypertonic to the blood.
 E) hypotonic to the blood.
 Answer: B

59. The Group 8A elements _____
 A) react vigorously with water.
 B) are unreactive and are rarely found in combination with other elements.
 C) are liquids at room temperature.
 D) melt at high temperatures.
 E) are good conductors of electricity.
 Answer: B

60. A bond where the electrons are shared equally is called a(n) _____ bond.
 A) coordinate covalent
 B) ionic
 C) pure (nonpolar) covalent
 D) polar covalent
 E) none of the above
 Answer: C

48. What is the balanced complete ionic equation for the following reaction in aqueous solution?
 $Pb(NO_3)_2(aq) + 2NaCl(aq) \rightarrow PbCl_2(s) + 2NaNO_3(aq)$
 Answer: B

49. What is the mass percent oxygen in sodium carbonate, Na₂CO₃?
 A) 43.4% B) 11.3% C) 56.6% D) 15.1% E) 54.7%
 Answer: A

50. If the following ions Ca²⁺, Cl⁻, Na⁺ and CO₃²⁻ are placed in a test tube, the precipitate formed is _____
 A) CaCO₃
 B) NaCl
 C) CaCl₂
 D) no precipitate will be formed
 Answer: A

51. Identify the spectator ions in the following molecular equation.
 $KBr(aq) + AgNO_3(aq) \rightarrow AgBr(s) + KNO_3(aq)$
 A) Ag⁺ & Br⁻
 B) K⁺ & Br⁻
 C) Ag⁺ & NO₃⁻
 D) K⁺ & NO₃⁻
 E) There are no spectator ions in this reaction.
 Answer: D

52. What is the correct name for the following compound, (NH₄)₃PO₄?
 A) ammonium phosphide
 B) ammonium phosphate
 C) triammonium phosphate
 D) nitrogen tetrahydride phosphorus
 Answer: B

53. The calculator answer obtained from multiplying 21.08 x 1.9634 is 41.388472. The answer to the correct number of significant figures is _____
 A) 41.3884
 B) 41.4
 C) 41.388
 D) 41.39
 Answer: D

35. Which solution is the most concentrated? Each choice refers to the same solute and solvent. 35. _____
A) 2.4 g solute in 5 mL solution
B) 30 g solute in 150 mL solution
C) 50 g solute in 175 mL solution
D) 2.4 g solute in 2 mL solution
E) 20 g solute in 50 mL solution
Answer: D

36. Choose the best electron-dot structure for OCl_2 . 36. _____
A) $\text{Cl} \text{---} \text{O} \text{---} \text{Cl}$
B) $\text{Cl} \text{---} \text{O} = \text{Cl}$
C) $\text{Cl} = \text{O} = \text{Cl}$
D) $\text{Cl} = \text{O} \text{---} \text{Cl}$
E) $\text{Cl} \text{---} \text{O} \text{---} \text{Cl}$
Answer: A

37. What is the correct formula that forms when calcium and sulfur react? 37. _____
A) CaS B) CaSO_4 C) CaSO_3 D) Ca_3S_2
Answer: A

38. The correct answer obtained from subtracting 1.2 from 123.96 contains _____ 38. _____
A) 5 significant figures B) 2 significant figures
C) 4 significant figures D) 3 significant figures
Answer: C

39. The statement that best describes the formation of an ionic compound is: 39. _____
A) Electrons are shared between two atoms and discrete molecules are formed.
B) Electrons are transferred from a non-metal to a metal, and the resulting charged particles form a crystalline network.
C) Electrons move freely among a network of nuclei in fixed positions.
D) Electrons are transferred from a metal to a non-metal, and the resulting charged particles form a crystalline network.
E) Each atom achieves an octet using electrons provided from an external electrical supply.
Answer: D

40. The main type of interaction between molecules of hydrogen (H_2) are 40. _____
A) dipole-dipole.
B) ionic bonds.
C) hydrogen bonds.
D) dispersion forces.
E) polar covalent.
Answer: D

41. How many grams of sodium hydroxide (NaOH) are there in 0.150 mol? 41. _____
A) 40.0 g B) 1.50 g C) 150. g D) 6.00 g E) 600. g
Answer: D

42. Calculate the number of grams of sulfuric acid (H_2SO_4) in 6.00 mol. 42. _____
A) 6.00 g B) 5.00 g C) 98.1 g D) 588 g E) 16.3 g
Answer: D

43. What is the concentration, in (m/m) %, or (w/w)% of a solution prepared from 50.0 g NaCl and 150.0 g of water? 43. _____
A) 25.0% B) 33.3% C) 40.0% D) 3.00% E) 0.250%
Answer: A

44. Calculate the percent by mass sulfur in sulfuric acid, H_2SO_4 . 44. _____
A) 48.9% B) 32.7% C) 16.3% D) 8.16% E) 23.4%
Answer: B

45. What is the correct formula for cobalt (II) cyanide? 45. _____
A) $\text{Co}(\text{SCN})_2$ B) CoCN C) CoSCN D) $\text{Co}(\text{CN})_2$
Answer: D

46. The energy of 4.72 kJ is the same as _____ cal. 46. _____
A) 8.86 B) 1.13 C) 19 800 D) 4.184 E) 1130
Answer: E

47. A pure substance has been isolated in the laboratory. Based on the two characteristics below, how can the substance be classified? 47. _____
I. The species can not be separated by physical means.
II. The species can be separated by chemical means.
A) a homogeneous mixture B) a heterogeneous mixture
C) an element D) a compound
Answer: D