

elimination examinations

Chemistry Connections

radiance of sagacity

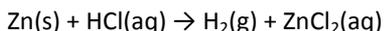
Directions: Write your name, ID number, year and course as they appear on your Ateneo ID on the answer sheet. Mark your Ch 7 section and write the ID numbers of your other teammates on the space provided.

Mark your answer by completely shading the circle. Change your answer by crossing out the previous answer and marking the new answer. Any stray marks on the answer sheet will invalidate the result of the test. Any questions regarding the typography or mechanics of the test must be directed only on the examiner or the proctors.

You are given exactly 30 minutes to answer the test. You are NOT expected to finish the entire test but you are expected to make the most of the allotted time to answer as many questions correctly.

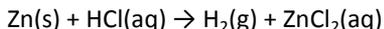
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- A gas that evolved from the fermentation of glucose has a volume of 0.5328 L at 13.1 °C and 1.34 atm. What was the volume of this gas at the fermentation temperature of 36.1 °C and 1.40 atm pressure?
 - 0.550 L
 - 1.40 L
 - 0.551 L
 - 1.41 L
 - The empirical formula of a compound is CH. At 250 °C, 0.133 g of this compound occupies 85.2 mL at a pressure of 0.86 atm. What is the molecular formula of this compound?
 - C₆H₆
 - C₅H₁₈
 - C₃H₃
 - C₈H₈
 - Nitroglycerin, an explosive compound, decomposes according to the equation
$$4 \text{C}_3\text{H}_5(\text{NO}_3)_3(\text{s}) \rightarrow 12 \text{CO}_2(\text{g}) + 10\text{H}_2\text{O}(\text{g}) + 6\text{N}_2(\text{g}) + \text{O}_2(\text{g})$$
Calculate the total volume of gases when collected at 1.5 atm and 45 °C from 2.0 X 10² g of nitroglycerin.
 - 110 mL
 - 110 L
 - 16 L
 - 16 mL

4. Given the reaction



How many electrons were transferred?

- a. 0
b. 1 electron
c. 2 electrons
d. 3 electrons
5. A 1.25×10^2 mL sample of 1.10 M HCl solution is treated with 5.70 g Zn according to the reaction



Which is the limiting reactant?

- a. Zn
b. HCl
c. Insufficient Information
d. H_2
6. In 1799, Joseph Proust defined a concept as “when elements combine to form a compound, there’s a definite ratio.” Today, it is known as:
- a. Law of Definite Composition
b. Law of Multiple Proportions
c. Law of Conservation of Mass
d. The Atomic Theory

7. Which gas law states that pressure is directly proportional to temperature?

- a. Boyle’s Law
b. Avogadro’s Law
c. Gay Lussac’s Law
d. Amonton’s Law

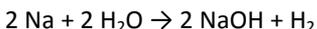
8. You filled up a glass container with a gas and sealed it, so that it has a pressure of 760 torr at 30.0 °C. The evacuated container weighs 134.614 g. With the gas, it weighs 135.66 g. Filled with water, it weighs 1067.00 g. What is the molecular weight of the gas?

- a. 8 g/mol
b. 28 g/mol
c. 4 g/mol
d. 32 g/mol

9. Which of the following contains the greatest number of molecules?

- a. 1.0 liter of O_2 at 27 °C and 760 mmHg
b. 1.0 liter of N_2 at STP
c. 1.0 liter of CO_2 at 27 °C and 760 mmHg
d. 1.0 liter of CO_2 at 0 °C and 800 mmHg

10. How many moles of sodium will react with water to produce 4.0 mol of hydrogen in the following reaction?



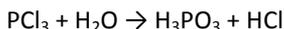
- a. 8 mol
b. 6 mol
c. 4 mol
d. 2 mol

11. Which unit of concentration should be used in an experiment where the temperature fluctuates?
- Molarity
 - Parts by volume
 - Molality
 - Kilogram
12. What is the density of O_2 in g/L at 25 °C and 0.850 atm?
- 2.23 g/L
 - 1.11 g/L
 - 1.55 g/L
 - 2.38 g/L
13. Find the molecular formula of allicin, given that MW = 162 g/mol and that it is composed of 44.4% carbon, 39.5% sulfur, 9.86% oxygen, and 6.21% hydrogen.
- C_6SH_8O
 - $C_4S_2H_{10}O_2$
 - $C_6S_2H_8O$
 - $C_6S_2H_{10}O$
14. How many grams of O_2 are there in a 50.0 L gas cylinder at 21 °C when O_2 pressure is 15.7 atm?
- 1.04×10^3 g
 - 1.63 g
 - 32.5 g
 - 2.25×10^5 g
15. A 20.0 mL sample of an element with a density of 3.0 g/mL contains 4×10^{23} atoms. What is the atomic weight of this element?
- 300
 - 40
 - 90
 - None of the above
16. Approximately how many mL of water must be added to 300 mL of 0.75 M HCl to dilute the solution to 0.25 M?
- 900 mL
 - 600 mL
 - 300 mL
 - 930 mL
17. Which element can be drawn into thinner wires and hammered into thinner sheets than any other element?
- Cu
 - Au
 - Ag
 - Na
18. Which is false?
- No. of protons = No. of electrons
 - No. of neutrons = Atomic number
 - No. of protons = Atomic number
 - No. neutrons = (Atomic mass) – (No. of protons)
19. What is the number of oxygen atoms in 55.0 g of iron(II)hydroxide $[Fe(OH)_2]$ (molar mass = 89.85 g/mol)?
- 1.22
 - 2.00
 - 3.69×10^{23}
 - 7.37×10^{23}

20. Combustion analysis of a hydrocarbon produces 0.396 g of CO_2 and 0.163 g of H_2O . Which of the following molecular formulas is consistent with the analysis?

- a. CH_4
- b. C_2H_6
- c. C_2H_2
- d. C_2H_4

21. This equation is unbalanced:



When it is correctly balanced, the coefficients are, respectively

- a. 1, 3, 1, 1
- b. 1, 1, 1, 3
- c. 1, 3, 1, 3
- d. 2, 3, 2, 3

22. Which law does not belong to the atomic theory?

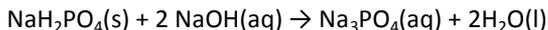
- a. Law of conservation of mass and energy
- b. Law of multiple proportions
- c. Law of chemical equilibrium
- d. Law of definite composition

23. Given 6 mol of each reactant, which one would be limiting in the following reaction?



- a. Au
- b. NaCN
- c. O_2
- d. H_2O

24. How many grams of NaH_2PO_4 are needed to react completely with 57.48 mL of 0.225 M NaOH? The molar mass of NaH_2PO_4 is 119.98 g/mol.



- a. 38.80 g
- b. 0.776 g
- c. 0.388 g
- d. 0.194 g

25. In accordance with the solubility rules, which of the following is true when solutions of $\text{KCl}(\text{aq})$ and $\text{AgNO}_3(\text{aq})$ are mixed?

- a. No precipitate will form.
- b. KNO_3 will precipitate and Ag^+ and Cl^- will be spectator ions.
- c. ClNO_3 will precipitate and K^+ and Ag^+ will be spectator ions.
- d. AgCl will precipitate and K^+ and NO_3^- will be spectator ions.

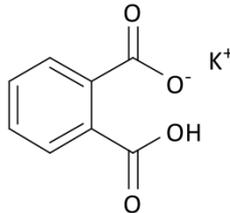
26. When barium nitrate and sodium phosphate are mixed together in water a precipitate is formed. The most likely chemical formula for the precipitate is:

- a. $\text{Ba}_3(\text{PO}_4)_2$
- b. Na_3PO_4
- c. $\text{Ba}(\text{NO}_3)_2$
- d. NaNO_3

27. In the reaction of 30 mL of 0.15 M HCl with 35 mL of 0.10 M NaOH, which of the following statements best describes the resulting solution?
- The acid has been neutralized.
 - Another 5 mL of base must be added to neutralize the solution.
 - The solution is basic.
 - The solution is acidic.
28. Balance the equation:
- $$\text{Mg}_3\text{N}_2(\text{s}) + \text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{MgSO}_4(\text{aq}) + (\text{NH}_4)_2\text{SO}_4(\text{aq})$$
- 1, 4, 3, 1
 - 2, 5, 6, 1
 - 1, 3, 3, 1
 - 1, 4, 3, 2
29. What intermolecular forces do geckos use to stick to walls and ceilings?
- Dipole-dipole attractions
 - van der Waals forces
 - Hydrogen bonding
 - Static ionic attractions
30. Calculate the following quantities (observe proper significant figures):
- Mass (in grams) of 1.73 mol CaH_2
 - Number of moles of $\text{Mg}(\text{NO}_3)_2$ in 3.25 g of this substance
 - Number of molecules in 0.245 mol CH_3OH
- 72.8 g CaH_2 , 0.0219 mol $\text{Mg}(\text{NO}_3)_2$, 1.48×10^{23} CH_3OH molecules
 - 84.6 g CaH_2 , 0.0219 mol $\text{Mg}(\text{NO}_3)_2$, 1.48×10^{23} CH_3OH molecules
 - 72.8 g CaH_2 , 0.0328 mol $\text{Mg}(\text{NO}_3)_2$, 1.48×10^{23} CH_3OH molecules
 - 72.8 g CaH_2 , 0.022 mol $\text{Mg}(\text{NO}_3)_2$, 1.5×10^{23} CH_3OH molecules
31. Which of the "rare" gases is the most common in the atmosphere?
- Xenon
 - Neon
 - Argon
 - Helium
32. Salts of which of the following elements give fireworks a blue color?
- Potassium
 - Copper
 - Iron
 - Strontium
33. Name the following compounds: $\text{Ba}(\text{OH})_2$ and FeCl_3
- Boron hydroxide and iron(II)chloride
 - Barium hydroxide and iron(II)chloride
 - Barium hydroxide and ferrous chloride
 - Barium hydroxide and iron(III)chloride

34. How many protons, neutrons, and electrons are in the following atoms:
 ^{60}Ni and ^{238}U
- $^{60}\text{Ni} \rightarrow 28\text{p}, 30\text{n}, 28\text{e}; ^{238}\text{U} \rightarrow 92\text{p}, 146\text{n}, 90\text{e}$
 - $^{60}\text{Ni} \rightarrow 28\text{p}, 32\text{n}, 28\text{e}; ^{238}\text{U} \rightarrow 92\text{p}, 140\text{n}, 92\text{e}$
 - $^{60}\text{Ni} \rightarrow 28\text{p}, 32\text{n}, 28\text{e}; ^{238}\text{U} \rightarrow 92\text{p}, 146\text{n}, 92\text{e}$
 - $^{60}\text{Ni} \rightarrow 20\text{p}, 32\text{n}, 28\text{e}; ^{238}\text{U} \rightarrow 72\text{p}, 126\text{n}, 42\text{e}$
35. How many grams of Na_2SO_4 are required to make 0.350 L of 0.500 M Na_2SO_4 ? (MW $\text{Na}_2\text{SO}_4 = 142 \text{ g}$)
- 24.9 g
 - 25 g
 - 50 g
 - 20.5 g
36. An unknown oxide is found to react with either an acid or a base. Upon treatment with sodium hydroxide, a gelatinous precipitate is formed; however, the precipitate dissolves after continuous addition of sodium hydroxide. This The chief element is extracted through an electrolytic reduction known as the thermite reaction where the unknown oxide is mixed with powdered iron and the reaction is activated with great amounts of heat. In this reaction, iron reduces the chief element by donating electrons. Upon analysis, the ionic formula unit is determined to be X_2O_3 . What is the chief element in the oxide?
- Boron
 - Aluminum
 - Gallium
 - Silicon
37. p-Nitrophenolglucopyranoside (PNPG) is a linked compound of glucose and p-Nitrophenol that can broken with amylase, an enzyme from saliva. p-Nitrophenol is a yellow compound soluble in water, and its solutions follow Beer-Lambert-Bouguer law, which means that the solution absorbs light depending on the concentration of p-Nitrophenol. From this information, which of the following is true?
- p-Nitrophenolglucopyranoside follows Beer-Lambert-Bouguer's law.
 - The rate at which amylase breaks down p-Nitrophenolglucopyranoside can be deduced by monitoring the absorbance of the solution as time goes.
 - p-Nitrophenolglucopyranoside is a colored compound.
 - The reactivity of amylase with respect to degrading p-Nitrophenol can be deduced if the amount of p-Nitrophenolglucopyranoside is known.

38. Potassium hydrogen phthalate (KHP) is used in quantitative analysis to determine the concentration (standardization) of solutions used to titrate solutions of unknown concentrations through an acid-base (proton-transfer) reaction. Based on the structure of potassium hydrogen phthalate, which among the following household substances cannot be standardized by potassium hydrogen phthalate?



potassium hydrogen phthalate

- Hydrochloric acid (muriatic acid): HCl
 - Sodium hydroxide (lye): NaOH
 - Ammonia (cleanser): NH₃
 - Hydrogen peroxide (antiseptic/bleach): H₂O₂
39. The pressure due to a height of a fluid is given by the equation: $p = \rho gh$ where ρ is the density of the liquid, g is the acceleration of gravity defined as 9.80665 m/s^2 and h is the height of the fluid. The atmospheric pressure at a particular altitude is given by the equation: $p = p_0 e^{-h/H}$ where p_0 is the pressure at sea level, h is the altitude, and H is equal to RT/Mg where R is the ideal gas law constant, T is the temperature, M is the average molecular weight of air and g is the standard acceleration of gravity. If the rate pressure decreases with altitude is directly proportional to the pressure at that particular altitude, which of the following must have been?
- The density of air is the same everywhere in the atmosphere.
 - The temperature of air varies with altitude.
 - The rate of change of air pressure and altitude is the same.
 - Air is a fluid that exerts a force due to gravity.
40. Soaps like sodium stearate contains a hydrophilic ionic head and a hydrophobic hydrocarbon tail 18 carbons long from the reaction of sodium hydroxide (water soluble) and stearic acid (water insoluble). This is soluble in all except which of the following medium?
- Water
 - Hydrochloric acid
 - Sodium hydroxide
 - Coconut oil

Chemistry Connections

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Ateneo Chemical Society

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