## Practice Exercises

Final Exam, Fall 2000
Dr. Palmer Graves

## Unit 1 Basic Concepts Review

1: Which of the following statements are true?
i. Si, Gd, and Mg are the symbols for silicon, gold, and magnesium
ii. P, As, and Ca are the symbols for potassium, arsenic, and calcium.
iii. mercury, copper, and selenium are symbolized by $\mathrm{Hg}, \mathrm{Cu}$, and Se .
A: i only
B: ii only
C: iii only
D: i\& ii
E: i \& iii

2: An aluminum cylinder has a diameter of 2.00 cm and a mass of
42.57 g . If the density of aluminum is $2.71 \mathrm{~g} / \mathrm{cm}^{3}$, what is the height of the cylinder?
(the volume of a cylinder is; $V=\pi r^{2} h$ )
A: 8.67 cm
B: 15.7 cm
C: 3.05 cm
D: 1.25 cm
E: 5.00 cm
3: Which statement is true regarding the symbol below?
${ }_{38}^{90} X$
i. The atom has 90 electrons
ii. The atom has 38 neutrons
iii. The element is Sr
iv. The element has 52 neutrons
A: i only
B: ii only
C: ii and iv
D: i and iii
E: iii and iv

4: Which of the following is the correct formula for calcium nitride?
A: CaN
B: $\mathrm{CaN}_{2}$
C: $\mathrm{Ca}_{2} \mathrm{~N}$
D: $\mathrm{Ca}_{3} \mathrm{~N}_{2}$
E: $\mathrm{Ca}_{2} \mathrm{~N}_{3}$
5: Which of the following pairs correctly match the formula with the name of a polyatomic ion?

A: sulfite; $\mathrm{SO}_{4}{ }^{2-}$
B: ammonium; $\mathrm{NH}_{3}{ }^{+}$
$\mathrm{C}:$ nitrate; $\mathrm{NO}_{3}{ }^{2-}$
D: perchlorate; $\mathrm{ClO}_{4}^{-}$
$\mathrm{E}:$ hypochlorate; $\mathrm{ClO}_{2}^{-}$
6: What is the sum of the coefficients when the following equation is balanced using the lowest, whole numbered coefficients?

$$
-\mathrm{FeCO}_{3}+_{--} \mathrm{HNO}_{3} \quad--->{ }_{--} \mathrm{Fe}\left(\mathrm{NO}_{3}\right)_{2}+_{--} \mathrm{CO}_{2}+_{--} \mathrm{H}_{2} \mathrm{O}
$$

A: 5
B: 6
C: 7
D: 8
E: 11

7: Diborane, $\mathrm{B}_{2} \mathrm{H}_{6}$, can be prepared according to the following reaction. If 18.9 g of $\mathrm{NaBH}_{4}$ is used in a reaction and 7.50 g of $\mathrm{B}_{2} \mathrm{H}_{6}$ gas is produced, what is the percent yield of $\mathrm{B}_{2} \mathrm{H}_{6}$ ?
$3 \mathrm{NaBH}_{4}+4 \mathrm{BF}_{3}--->3 \mathrm{NaBF}_{4}(\mathrm{aq})+2 \mathrm{~B}_{2} \mathrm{H}_{6}$
A: $9.00 \%$
B: $11.1 \%$
C: 81.4 \%
D: 92.4 \%
E: 75.0 \%
8: If 2.70 g Al is reacted with $4.05 \mathrm{~g} \mathrm{Cl}_{2}$ according to the following reaction, how much $\mathrm{AlCl}_{3}$ would be produced.

$$
2 \mathrm{Al}(\mathrm{~s})+3 \mathrm{Cl}_{2}(\mathrm{~g})-->2 \mathrm{AlCl}_{3}(\mathrm{~s})
$$

A: 13.3 g
B: 53.4 g
C: 45.7 g
D: 7.67 g
E: 5.08 g
9: What is the concentration of a solution made by mixing 2.50 g NaOH in enough water to make 500.0 mL of solution?

A: 0.0625 M
B: 0.125 M
C: $1.25 \times 10^{-4} \mathrm{M}$
D: 0.00500 M
E: 5.00 M
10: What is the concentration of a solution made by mixing 25 mL of water into 5 mL of a 0.050 M HCl solution?

A: 0.010 M
B: 0.25 M
C: 0.045 M
D: 0.0083 M
E: 0.00010 M

11: A piece of copper wire is 10.0 cm long and has a diameter of 0.400 cm . If the density of copper is $8.92 \mathrm{~g} / \mathrm{cm}^{3}$, how many moles of copper are contained in the piece of wire? (The volume of a cylinder can be calculated with the formula $V=\pi r^{2} h$ where $h$ can be the length of the wire.)

A: 0.176 mol
B: 8.82 mol
C: 0.00221 mol
D: 11.2 mol
E: 6.35 mol
12: A solution contains sodium carbonate and sodium perchlorate. Which of the following reagents could be used to separate the two anions contained in the solution?

A: HCl
B: NaOH
C: $\mathrm{CaCl}_{2}$
D: $\mathrm{NH}_{4} \mathrm{NO}_{3}$
E: $\mathrm{KCH}_{3} \mathrm{CO}_{2}$
13: Which of the following reactions is a (are) redox reaction(s)?
i. $2 \mathrm{HClO}_{2}(\mathrm{aq})+\mathrm{Ca}(\mathrm{OH})_{2}(\mathrm{aq})--->2 \mathrm{H}_{2} \mathrm{O}(\mathrm{I})+\mathrm{Ca}\left(\mathrm{ClO}_{2}\right)_{2}(\mathrm{aq})$
ii. $\mathrm{Mg}(\mathrm{s})+2 \mathrm{HCl}(\mathrm{aq})-->\mathrm{MgCl}_{2}+\mathrm{H}_{2}(\mathrm{~g})$
iii. $\mathrm{Ba}(\mathrm{OH})_{2}(\mathrm{aq})+\mathrm{H}_{2} \mathrm{SO}_{4}(\mathrm{aq})-->\mathrm{BaSO}_{4}(\mathrm{~s})+\mathrm{H}_{2} \mathrm{O}(\mathrm{I})$
A: i only
B: ii only
C: iii only
D: i\& ii
E: i \& iii

14: Which of the following reactions correctly balances the redox reaction shown below, in an acidic solution?
$\mathrm{As}_{2} \mathrm{O}_{3}(\mathrm{~s})+\mathrm{NO}_{3}^{-}(\mathrm{aq})-->\mathrm{H}_{3} \mathrm{AsO}_{4}(\mathrm{aq})+\mathrm{NO}(\mathrm{g})$
i. $\quad 3 \mathrm{H}_{2} \mathrm{O}+\mathrm{As}_{2} \mathrm{O}_{3}+\mathrm{NO}_{3}^{-}-->2 \mathrm{H}_{3} \mathrm{AsO}_{4}+\mathrm{NO}$
ii. $7 \mathrm{H}_{2} \mathrm{O}+4 \mathrm{H}^{+}+3 \mathrm{As}_{2} \mathrm{O}_{3}+4 \mathrm{NO}_{3}^{-}-->6 \mathrm{H}_{3} \mathrm{AsO}_{4}+4 \mathrm{NO}$
iii. $3 \mathrm{H}^{+}+3 \mathrm{As}_{2} \mathrm{O}_{3}+4 \mathrm{NO}_{3}+3 \mathrm{OH}^{-}-->6 \mathrm{H}_{3} \mathrm{AsO}_{4}+4 \mathrm{NO}$
A: i
B: ii
C: iii
D: i and ii
E: none

15: A shade of yellow light has a wavelength of 590 nm . What is its frequency
A: $1.97 \times 10^{-15} \mathrm{~Hz}$
B: $5.08 \times 10^{-4} \mathrm{~Hz}$
C: $5.1 \times 10^{5} \mathrm{~Hz}$
D: $5.08 \times 10^{14} \mathrm{~Hz}$
E: . 0051 Hz

16: Calculate the frequency of a photon released from a hydrogen atom during a transition from $n=7$ to $n=4$
A: $2.34 \times 10^{14} \mathrm{~Hz}$
B: 583 nm
C: $9.2 \times 10^{-19} \mathrm{~Hz}$
D: 142 nm
E: $1.38 \times 10^{14} \mathrm{~Hz}$

17: Identify the element with the following electron configuration:
[Ar] $4 s^{2} 3 d^{10} 4 p^{4}$
A: tin
B: selenium
C: sulfur
D: aluminum
E: cobalt

18: How many photons of frequency $1.50 \times 10^{14} \mathrm{~Hz}$ are needed to supply 20.1 J of energy?
A: $2.02 \times 10^{20}$ photons
B: $9.94 \times 10^{-20}$ photons
C: $3.2 \times 10^{20}$ photons
D: $9.94 \times 10^{20}$ photons
E: $5.83 \times 10^{20}$ photons

19: What is the final molarity of a solution made by mixing 25 mL of a $16 \mathrm{M} \mathrm{HNO}_{3}$ solution with 475 mL of water?

A: 0.84 M
B: 1.19 M
C: 1.25 M
D: 4.00 M
E: 0.80 M
20: How many electrons can occupy the orbitals having the principle quantum number of 6 ?

A: 2
B: 18
C: 72
D: 36
E: 92
21: Which of the following atoms would be polar?
A: $\mathrm{CCl}_{4}$
B: $\mathrm{BF}_{3}$
C: $\mathrm{PCl}_{5}$
D: $\mathrm{SF}_{6}$
$\mathrm{E}: \mathrm{SF}_{4}$
22: What is the correct geometry about the iodine atom in $\mathrm{ICl}_{4}^{-}$(no $\mathrm{Cl}-\mathrm{Cl}$ bonds)?
A: tetrahedral
B: square planar
C: square pyramid
D: see saw
E: face centered cubic

23: Which of the following Lewis Structures correctly shows the structure of $\mathrm{XeF}_{2}$ ?

A:


B:


C:


D:


E:


24: Which of the following statements are true?
i. the electron and the molecular geometries must be the same
ii. the electron geometry and the number of bonds determines the molecular geometry
iii. a molecule with see-saw geometry has triangular bipyramid electronic geometry
A: i only
B: ii only
C: iii only
D: i and ii
E: ii and iii

25: What is $q$, if enough energy is added to a beaker of water to raise the temperature of 500 g of water from $25.0^{\circ} \mathrm{C}$ to $50.0^{\circ} \mathrm{C}$ ?

A: -52.3 kJ
B: 12.5 kJ
C: 52.3 kJ
D: -12.5 kJ
E: 5000 J
26: Oxygen gas can be produced in the following reaction:

$$
2 \mathrm{KClO}_{3}(\mathrm{~s})--->2 \mathrm{KCl}(\mathrm{~s})+3 \mathrm{O}_{2}(\mathrm{~g}) \Delta \mathrm{H}^{\circ}=-89.4 \mathrm{~kJ}
$$

How much heat is released if the reaction produces 4.80 g of oxygen?
A: 8.94 kJ
B: 4.47 kJ
C: 26.8 kJ
D: 89.4 kJ
E: 430 kJ

27: What is the specific heat of copper if adding 192.5 J of heat energy to 5.00 grams of copper causes the temperature of the metal to increase from $20.0^{\circ} \mathrm{C}$ to $120.0^{\circ} \mathrm{C}$ ?

A: $9.62 \mathrm{~J} / \mathrm{g}^{\circ} \mathrm{C}$
B: $.385 \mathrm{~J} / \mathrm{g}^{\circ} \mathrm{C}$
C: $4.20 \mathrm{~J} / \mathrm{g}^{\circ} \mathrm{C}$
D: $39 \mathrm{~J} / \mathrm{g}^{\circ} \mathrm{C}$
E: . $004 \mathrm{~J} / \mathrm{g}^{\circ} \mathrm{C}$

| Chapter/ Question | Answer Sheet for Test "F00 Final Review", 12/8/0 |
| :---: | :---: |
|  | Test Correct |
|  | Question Answer |
| The following questions are in section "Unit 1" |  |
| 1-1 | 1 C |
| 1-12 | 2 E |
| 2-3 | 3 E |
| 2-10 | 4 D |
| 2-11 | 5 D |
| 3-1 | 6 B |
| The following questions are in section "Unit 2" |  |
| 3-5 | 7 C |
| 3-7 | 8 E |
| 3-9 | 9 B |
| 3-11 | 10 D |
| 3-14 | 11 A |
| 4-9 | 12 C |
| 4-15 | 13 B |
| 4-19 | 14 B |
| 5-1 | 15 D |
| 5-4 | 16 E |
| 5-7 | 17 B |
| 5-9 | 18 A |
| 5-17 | 19 E |
| 5-19 | 20 C |
| The following questions are in section "Unit 3" |  |
| 7-5 | 21 E |
| 7-9 | 22 B |
| 7-17 | 23 B |
| 7-19 | 24 E |
| 8-3 | 25 C |
| 8-6 | 26 B |
| 8-17 | 27 B |

