Practice Exam

Name: _____ Date: _____

1. Write 8,336 in standard scientific notation.
   A) 8336
   B) 8.336×10^{-3}
   C) 833.6×10^{1}
   D) 8.336×1000
   E) 8.336×10^{3}

2. Express the number 0.00315 in scientific notation.
   A) 3.15×10^{-3}
   B) 3.15×10^{3}
   C) 0.315×10^{-3}
   D) 315×10^{-5}
   E) none of these

3. 7.3 milliseconds is equal to how many seconds?
   A) 7.3×10^{3} s
   B) 7.3×10^{2} s
   C) 7.3×10^{-3} s
   D) 7.3×10^{-2} s
   E) 0.73 s

4. Using the rules of significant figures, calculate the following:
   14.8903 – 2.14 =
   A) 12.7503
   B) 12.75
   C) 12.750
   D) 12
   E) 13

5. How many significant figures are in the number 60.02×10^{5}?
   A) 2
   B) 3
   C) 4
   D) 5
   E) none of these

6. What is the result of the following multiplication expressed in scientific notation to the correct number of significant figures?
   $(2.08 \times 10^{5})(7.0 \times 10^{-5})$ =
   A) 1.4×10^{-1}
   B) 1.456×10^{1}
   C) 1.5×10^{1}
   D) 1×10^{1}
   E) 1.46×10^{1}

7. Convert: 0.00938 cm = _____ mm.
   A) 9.38 mm
   B) 9.38×10^{-2} mm
   C) 0.938 mm
   D) 9.38×10^{-4} mm
   E) 9.38×10^{-5} mm

8. Convert: 850.2 K = _____ ^{o}C.
   A) 1123.2^{o}C
   B) 577.2^{o}C
   C) 1562.4^{o}C
   D) 504.3^{o}C
   E) 472.3^{o}C

9. If a 100.-g sample of platinum metal has a volume of 4.668 mL, what is the density of platinum in g/cm^{3}?
   A) 21.4 g/cm^{3}
   B) 2.14 g/cm^{3}
   C) 0.0467 g/cm^{3}
   D) 467 g/cm^{3}
   E) none of these

10. The symbol for the element zinc is
    A) Zn
    B) Z
    C) Zi
    D) Zc
    E) Zin

11. The symbol Fe stands for the element
    A) francium
    B) fluorine
    C) fermium
    D) tin
    E) iron

12. List the three main subatomic particles.

13. An atom with 15 protons and 16 neutrons is an atom of
    A) P
    B) Ga
    C) S
    D) Pd
    E) Rh

14. The correct name for FeO is
    A) iron oxide
    B) iron(II) oxide
    C) iron(III) oxide
    D) iron monoxide
    E) iron(I) oxide

15. The correct name for the Al^{3+} species is
    A) aluminum ion
    B) aluminum(III) ion
    C) aluminum
    D) trialuminum ion
    E) aluminum(3A) ion

16. The correct formula for ammonium sulfate is
    A) NH_4SO_3
    B) NH_4SO_4
    C) $(NH_4)_2SO_3$
    D) $(NH_4)_2SO_4$
    E) $(NH_3)_2SO_3$

17. The name for the compound PI_3 is _____.

18. The correct formula for nickel(III) phosphate is
    A) Ni_3PO_4
    B) $Ni_3(PO_4)_2$
    C) $Ni_2(PO_4)_3$
    D) $NiPO_4$
    E) Ni_2PO_3

19. Balance the equation
    $Mg_3N_2(s) + H_2O(l) \rightarrow NH_3(g) + Mg(OH)_2(s)$

20. Balance the equation
    $NH_3(g) + O_2(g) \rightarrow NO(g) + H_2O(l)$

Use the following to answer question 21:

Write and balance molecular equations for the following reactions between aqueous solutions. You will need to decide on the formulas and phases of the products in each of the cases.

21. An aqueous solution of copper(II) nitrate is mixed with an aqueous solution of sodium hydroxide.

22. 3.73 moles of water weighs
    A) 2.07×10^{-1} g
    B) 67.2 g
    C) 4.83 g
    D) 21.8 g
    E) 72.9 g

23. 18.1 g of Mg represents how many moles?
    A) 4.40×10^{2} mol
    B) 0.745 mol
    C) 1.34 mol
    D) 42.4 mol
    E) none of these

24. A 3.7-mol sample of $KClO_3$ was decomposed according to the equation

$$2KClO_3(s) \rightarrow 2KCl(s) + 3O_2(g)$$

How many moles of O_2 are formed assuming 100% yield?
A) 2.5 mol
B) 3.1 mol
C) 3.7 mol
D) 1.9 mol
E) 5.6 mol

25. In the reaction

$$Cu(s) + 2AgNO_3(aq) \rightarrow 2Ag(s) + Cu(NO_3)_2(aq)$$

what number of grams of silver can be produced from the reaction of 83.3 g of copper?
A) 283 g Ag
B) 141.4 g Ag
C) 70.7 g Ag
D) 98.1 g Ag
E) 1.31 g Ag

26. The specific heat capacity of iron is 0.45 J/g ^oC. How many joules of energy are needed to warm 1.20 g of iron from 20.00^oC to 29.00^oC?
A) 16 J
B) 11 J
C) 24 J
D) 10 J
E) 4.9 J

27. The electron configuration for the sulfur atom is
A) $1s^2 2s^2 2p^6 3s^2 3p^2$
B) $1s^2 2s^2 2p^6 3s^2 3p^4$
C) $1s^2 2s^2 2p^6 3s^5$
D) $1s^2 2s^2 2p^6 3s^2 3p^5$
E) none of these

28. The number of unpaired electrons in a nitrogen atom is
    A) 1
    B) 2
    C) 3
    D) 4
    E) 5

29. Which of the following atoms has the highest ionization energy?
    A) Na
    B) Mg
    C) Si
    D) P
    E) Cl

30. Which of the following atoms has the smallest atomic radius?
    A) As
    B) Sb
    C) Bi
    D) P
    E) N

31. True or false: Covalent bonding occurs when electrons are shared by nuclei.
    A) True
    B) False

32. True or false? Ionic bonding occurs between atoms with small differences in electronegativities.
    A) True
    B) False

33. Which of the following bonds would be the most polar without being considered ionic?
    A) Mg-O
    B) C-O
    C) O-O
    D) Si-O
    E) N-O

34. Which of the following has nonpolar bonds?
    A) H_2S
    B) HCl
    C) Br_2
    D) OF_2
    E) All are nonpolar.

35. Which element or ion listed below has the electron configuration $1s^2 2s^2 2p^6 3s^2 3p^6$?
    A) Cl
    B) Br^-
    C) Se
    D) Ca^{2+}
    E) two of these

36. The electron configuration for the bromide ion is identical to that of
    A) Br
    B) Kr
    C) K
    D) I^-
    E) none of these

37. Which of the following is the product of the reaction Al + O_2?
    A) AlO
    B) AlO_2
    C) AlO_3
    D) Al_3O_2
    E) Al_2O_3

38. Complete the table by giving the predicted formulas of the compounds formed between the elements listed.

	Br	S
Na	_____	_____
Mg	_____	_____
Al	_____	_____

39. Draw the Lewis electron structure for the sulfide ion.

40. Which of the following molecules are polar? (Check all that apply.)
    A) CH_3OH
    B) CH_4
    C) H_2O
    D) C_2H_6

41. A sample of helium gas occupies 14.3 L at 23°C and 0.956 atm. What volume will it occupy at 40.°C and 0.956 atm?
    A) 24.9 L
    B) 0.0661 L
    C) 13.5 L
    D) 15.1 L
    E) none of these

42. 3.02 mol of CO_2 at STP will occupy
    A) 73.9 L
    B) 67.7 L
    C) 8.90×10^{-2} L
    D) 33.8 L
    E) 67.7 g

43. A gas occupies 29.0 L at 2.00 atm pressure and 27°C. How many moles of gas are present in the sample?
    A) 26.2 mol
    B) 1.18 mol
    C) 2.36 mol
    D) 3.86 mol
    E) 4.76 mol

44. Calculate the quantity of energy required to change 5.02 mol of liquid water to steam at 100°C. The molar heat of vaporization of water is 40.6 kJ/mol.
    A) 8.09 kJ
    B) 40.6 kJ
    C) 204 kJ
    D) 50.2 kJ
    E) 45.6 kJ

45. The specific heat capacity of liquid water is 4.18 J/g °C. Calculate the quantity of energy required to heat 10.0 g of water from 26.5°C to 83.7°C.
    A) 3.50×10^3 J
    B) 1.11×10^3 J
    C) 23.9 J
    D) 2.39×10^3 J
    E) none of these

46. A nitric acid solution that is 70.0% HNO_3 (by mass) contains
    A) 70.0 g HNO_3 and 100.0 g water
    B) 70.0 mol HNO_3
    C) 70.0 g HNO_3 and 30.0 g water
    D) 70.0 g HNO_3 and 70.0 g water
    E) none of these

47. Determine the concentration of a solution made by dissolving 16.4 g of sodium chloride in 750.0 mL of solution.
    A) 0.210 *M*
    B) 21.9 *M*
    C) 0.281 *M*
    D) 0.374 *M*
    E) 12.3 *M*

48. What is the minimum volume of a 2.91 *M* NaOH solution needed to make 150.0 mL of a 0.800 *M* NaOH solution?
    A) 375 mL
    B) 20.6 mL
    C) 53.2 mL
    D) 120. mL
    E) 41.2 mL

49. A 0.146-g sample of NaCl (molar mass = 58.44 g/mol) is dissolved in enough water to make 5.20 mL of solution. Calculate the molarity of the resulting solution.
    A) 0.480 *M*
    B) 2.50×10^{-3} *M*
    C) 2.08 *M*
    D) 0.592 *M*
    E) 0.336 *M*

50. Assume that vinegar is a 0.852 *M* solution of acetic acid ($HC_2H_3O_2$) in water. What volume of 0.2136 *M* NaOH would be needed to completely neutralize 6.35 mL of vinegar?
    A) 5.41 mL
    B) 1.36 mL
    C) 1.59 mL
    D) 25.3 mL
    E) 4.00 mL

51. Consider the reaction $HC_2H_3O_2(aq) + H_2O(l) \rightarrow H_3O^+(aq) + C_2H_3O_2^-(aq)$. Which species is the conjugate acid?
    A) $HC_2H_3O_2(aq)$
    B) $H_2O(l)$
    C) $H_3O^+(aq)$
    D) $C_2H_3O_2^-(aq)$
    E) two of these

52. A solution with a pH of 2.17 is
    A) basic
    B) acidic
    C) neutral

53. A solution where $[H^+] = 10^{-13}$ *M* is _____.
    A) basic
    B) neutral
    C) acidic
    D) strongly acidic
    E) two of these

54. A solution has $[H^+] = 4.8 \times 10^{-8}$ *M*. The pH of this solution is
    A) 6.68
    B) 6.00
    C) 7.32
    D) 9.79
    E) none of these

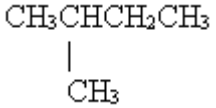
55. A solution is prepared by dissolving 114.0 g HCl(*g*) in enough water to make 150.0 L of solution. The pH of this solution is
    A) 0.119
    B) 1.68
    C) 12.32
    D) 3.13
    E) none of these

56. In the reaction $2Ca(s) + O_2(g) \rightarrow 2CaO(s)$, calcium is _____.
    A) reduced
    B) electrolyzed
    C) synthesized
    D) oxidized
    E) none of these

57. Polonium is a naturally radioactive element decaying with the loss of an alpha particle.
    $^{210}_{84}Po \rightarrow {}^{4}_{2}H + ?$
    What is the second product of this decay?
    A) $^{214}_{86}Rn$
    B) $^{206}_{82}Pb$
    C) $^{206}_{85}At$
    D) $^{208}_{80}Hg$
    E) none of these

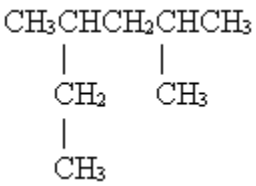
58. What is the correct formula for the saturated alkane that contains four carbon atoms?
    A) C_4H_4
    B) C_4H_6
    C) C_4H_8
    D) C_4H_{12}
    E) C_4H_{10}

59. Name the following molecule.



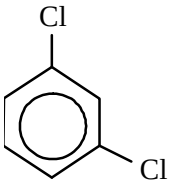
60. Name the following molecule.
$CH_3 - (CH_2)_7 - CH_3$
A) heptane
B) hexane
C) octane
D) nonane
E) decane

61. Name the following molecule.

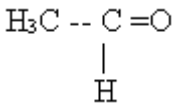


62. True or false? Amines are characterized by the presence of the -OH group.
A) True
B) False

63. Name the molecule below.



64. Classify the following molecule.

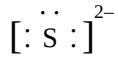


A) acid
B) aldehyde
C) amine
D) ketone
E) carbonyl

Answer Key

1. E
2. A
3. C
4. B
5. C
6. C
7. B
8. B
9. A
10. A
11. E
12. electron, proton, neutron
13. A
14. B
15. A
16. D
17. phosphorus triiodide
18. D
19. $Mg_3N_2(s) + 6H_2O(l) \rightarrow 2NH_3(g) + 3Mg(OH)_2(s)$
20. $4NH_3(g) + 5O_2(g) \rightarrow 4NO(g) + 6H_2O(l)$
21. $Cu(NO_3)_2(aq) + 2NaOH(aq) \rightarrow Cu(OH)_2(s) + 2NaNO_3(aq)$
22. B
23. B
24. E
25. A
26. E
27. B
28. C
29. E
30. E
31. A
32. B
33. D
34. C
35. D
36. B
37. E
38.

	Br	S
Na	NaBr	Na_2S
Mg	$MgBr_2$	MgS
Al	$AlBr_3$	Al_2S_3

39. 
40. A, C
41. D
42. B
43. C
44. C
45. D
46. C
47. D
48. E
49. A
50. D
51. C
52. B
53. A
54. C
55. B
56. D
57. B
58. E
59. 2-methylbutane
60. D
61. 2,4-dimethylhexane
62. B
63. 1,3-dichlorobenzene or *m*-dichlorobenzene
64. B