Chemistry Placement Exam – Sample Test

1. The product of $0.1400 \cdot 6.02 \cdot 10^{23}$ will have how many significant figures?

a.	2
b.	3
c.	23
d.	10^{23}
e.	7

ANSWER: B

2. How many significant figures should there be in the answer when you divide 4.1 by 7.464?

a.	7
b.	4
c.	3
d.	2
e.	1

ANS: D

3. How many significant figures are there in the result of the following calculation?
$(4.321/2.8) \cdot (6.9234 \cdot 10^{5})$

a.	1
b.	2
c.	3
d.	4
e.	5

ANS: B

4. The result of the following calculation has how many significant figures?
(1.433) (33.1°C – 31.1°C)(612)

a.	1
b.	2
c.	3
d.	4
e.	5

ANS: B

5. A student finds that the weight of an empty beaker is 14.049 g. She places a solid in the beaker to give a combined mass of 14.142 g. To how many significant figures is the mass of the solid known?

a.	2
b.	3
c.	1
d.	5
e.	4

ANS: A

6. Calculate the mass of a rectangular solid that has a density of 3.96 g/cm^3 and measures 2.50 cm by 1.80 cm by 3.00 cm.

a.	3.41 g
b.	53.5 g
c.	9.90 g
d.	28.9 g
e.	56.5 g

ANS: B

7. Find the volume of an object that has a density of 3.14 g/mL and a mass of 94.7 g.

a.	30.2 mL
b.	mL
c.	297 mL
d.	mL
e.	mL

ANS: A

8. If a 100.-g sample of platinum metal has a volume of 4.671 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

ANS: A

9. An experiment requires 74.2 mL of ethyl alcohol. If the density of ethyl alcohol is 0.790 g/cm^3, what is the mass of 74.2 mL of ethyl alcohol?

a.	93.9 g
b.	10.6 g
c.	58.6 g
d.	g
e.	none of these

ANS: C

10. If a 100.-g sample of a metal has a volume of 8.65 mL, what is the density of the metal?

a.	11.6 g/mL
b.	1.16 g/mL
c.	0.0865 g/mL
d.	9 g/mL
e.	none of these

ANS: A

11. The volume (in milliliters) occupied by 41.9 g of mercury (density = 13.6 g/mL) is

a.	570 mL
b.	3.08 mL
c.	0.325 mL
d.	28.3 mL
e.	none of these

ANS: B

12. How many protons, electrons, and neutrons, respectively, does ^{31}P have?

a.	15, 15, 16
b.	15, 16, 15
c.	16, 15, 31
d.	15, 15, 31
e.	15, 31, 16

ANS: A

13. How many protons, electrons, and neutrons, respectively, does oxygen have?

a.	8, 18, 8
b.	8, 8, 8
c.	8, 10, 8
d.	8, 14, 8
e.	8, 18, 16

ANS: B

14. The atom with 69 neutrons and 50 protons has a mass number of

a.	69
b.	50
c.	19
d.	119
e.	cannot be determined from information given

ANS: D

15. How many neutrons are contained in an iodine nucleus with a mass number of 131?

a.	53
b.	74
c.	78
d.	127
e.	131

ANS: C

16. The binary compound PCl_3 is called

a.	phosphorus chloride
b.	triphosphorus chloride
c.	monophosphorus trichloride
d.	phosphorus trichloride
e.	none of these

ANS: D

17. 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.	$(NH_3)_2SO_3$

ANS: D

18. The name of the BrO_3^- ion is

a.	bromate ion
b.	bromite ion
c.	hypobromite ion
d.	perbromate ion
e.	bromoxide ion

ANS: A

19. The name for $MnBr_2$ is

a.	manganese(II) bromide
b.	manganese(I) bromide
c.	magnesium bromide
d.	manganese bromide
e.	manganese(III) bromide

ANS: A

20. The name for $Al(OH)_3$ is

a.	aluminum(III) hydroxide
b.	aluminum trihydroxide
c.	aluminum hydroxide
d.	monaluminum trihydroxide
e.	aluminum(I) hydroxide

ANS: C

21. The name for $Ba(NO_3)_2$ is

a.	barium dinitrate
b.	barium(II) nitrate
c.	barium nitrite
d.	barium(I) nitrate
e.	barium nitrate

ANS: E

22. The name for PCl_5 is _____.

ANS: phosphorus pentachloride

23. The name for N_2O is _____.

ANS: dinitrogen monoxide

24. When the following equation is balanced using the smallest possible integers, what is the number in front of the substance in bold type?

$Sn + NaOH \rightarrow Na_2SnO_2 + \mathbf{H_2}$

a.	1
b.	2
c.	3
d.	4
e.	5

ANS: A

25. When the following equation is balanced using the smallest possible integers, what is the number in front of the substance in bold type?

$\mathbf{Na_2S_2O_3} + I_2 \rightarrow NaI + Na_2S_4O_6$

a.	1
b.	2
c.	3
d.	4
e.	6

ANS: B

26. When the following equation is balanced using the smallest possible integers, what is the number in front of the substance in bold type?

$Pb(NO_3)_2 + K_2CO_3 \rightarrow PbCO_3 + \mathbf{KNO_3}$

a.	5
b.	4
c.	3
d.	2
e.	1

ANS: D

27. When the following equation is balanced using the smallest possible integers, what is the number in front of the substance in bold type?

$Al + Fe_3O_4 \rightarrow Al_2O_3 + \mathbf{Fe}$

a.	1
b.	3
c.	6
d.	9
e.	12

ANS: D

28. When the following equation is balanced using the smallest possible integers, what is the number in front of the substance in bold type?

$CH_3OH + O_2 \rightarrow CO_2 + \mathbf{H_2O}$

a.	1
b.	2
c.	3
d.	4
e.	6

ANS: D

29. When the following equation is balanced using the smallest possible integers, what is the number in front of the substance in bold type?

P_4O_{10} + H_2O □ H_3PO_4

a.	10
b.	6
c.	4
d.	2
e.	1

ANS: E

30. When the following equation is balanced using the smallest possible integers, what is the number in front of the substance in bold type?

NO_2 + H_2O □ HNO_3 + NO

a.	1
b.	2
c.	3
d.	4
e.	5

ANS: C

31. When the following equation is balanced using the smallest possible integers, what is the number in front of the substance in bold type?

MnO_2 + **HCl** □ $MnCl_2$ + Cl_2 + H_2O

a.	5
b.	4
c.	3
d.	2
e.	1

ANS: B

32. When the following equation is balanced using the smallest possible integers, what is the number in front of the substance in bold type?

$PCl_5 + H_2O \rightarrow H_3PO_4 + \mathbf{HCl}$

a.	1
b.	2
c.	3
d.	4
e.	5

ANS: E

33. How many atoms of calcium are present in 58.2 g of calcium?

a.	$8.74 \cdot 10^{23}$
b.	$2.41 \cdot 10^{-24}$
c.	$3.50 \cdot 10^{25}$
d.	$6.02 \cdot 10^{23}$
e.	none of these

ANS: A

34. A 30.5-g sample of Ca contains how many calcium atoms?

a.	$4.58 \cdot 10^{23}$ atoms
b.	61.0 atoms
c.	$7.61 \cdot 10^{-1}$ atoms
d.	$1.84 \cdot 10^{25}$ atoms
e.	30.5 atoms

ANS: A

35. Calculate the mass of $3.53 \cdot 10^{26}$ atoms of silver.

a.	$6.32 \cdot 10^{4}$ g
b.	$3.81 \cdot 10^{28}$ g
c.	$1.97 \cdot 10^{48}$ g
d.	$5.86 \cdot 10^{2}$ g
e.	none of these

ANS: A

36. 66.4 g of Pt represents how many atoms?

a.	$2.05 \cdot 10^{23}$ atoms
b.	0.340 atoms
c.	$4.00 \cdot 10^{25}$ atoms
d.	$2.15 \cdot 10^{-20}$ atoms
e.	none of these

ANS: A

37. A sample containing 0.398 mol of sodium has a mass of _____ g.

a.	9.15
b.	$1.73 \cdot 10^{-2}$
c.	23.388
d.	$5.78 \cdot 10^{1}$
e.	$2.40 \cdot 10^{23}$

ANS: A

38. A 3.37-mol sample of aluminum represents how many atoms?

a.	$2.03 \cdot 10^{24}$ atoms
b.	$5.60 \cdot 10^{-24}$ atoms
c.	$1.25 \cdot 10^{23}$ atoms
d.	$5.48 \cdot 10^{25}$ atoms
e.	none of these

ANS: A

39. A 7.11-g sample of potassium chlorate was decomposed according to the following equation:

$2KClO_3 \rightarrow 2KCl + 3O_2$

How many moles of oxygen are formed?

A) 2.78 g
B) 0.0580 mol
C) 0.0387 mol
D) 0.0870 mol
E) none of these

ANS: D

40. Consider the following reaction:

$$CH_4(g) + 4Cl_2(g) \rightarrow CCl_4(g) + 4HCl(g)$$

What mass of CCl_4 is formed by the reaction of 5.14 g of methane with an excess of chlorine?

A) 12.3 g
B) 0.54 g
C) 791 g
D) 49.3 g
E) none of these

ANS: D

41. Nitric oxide, NO, is made from the oxidation of NH_3, and the reaction is represented by the equation:

$4NH_3 + 5O_2 \rightarrow 4NO + 6H_2O$

What mass of NO can be produced from 7.55 g of NH_3?

A) 4.28 g NO
B) 13.3 g NO
C) 7.55 g NO
D) 20.0 g NO
E) 16.6 g NO

ANS: B

42. Nitric oxide, NO, is made from the oxidation of NH_3, and the reaction is represented by the equation:

$4NH_3 + 5O_2 \rightarrow 4NO + 6H_2O$

What mass of O_2 would be required to react completely with 6.85 g of NH_3?

A) 4.56 g O_2
B) 10.3 g O_2
C) 8.04 g O_2
D) 16.1 g O_2
E) 12.9 g O_2

ANS: D

43. For the reaction $P_4O_{10}(s) + 6H_2O(l) \rightarrow 4H_3PO_4(aq)$, what mass of P_4O_{10} must be consumed if 3.71×10^{23} molecules of H_2O are also consumed?

A) 1.05×10^3 g P_4O_{10}
B) 29.1 g P_4O_{10}
C) 175 g P_4O_{10}
D) 1.85 g P_4O_{10}
E) 66.6 g P_4O_{10}

ANS: B

44. Phosphoric acid can be prepared by reaction of sulfuric acid with "phosphate rock" according to the equation:

$$Ca_3(PO_4)_2 + 3H_2SO_4 \rightarrow 3CaSO_4 + 2H_3PO_4$$

Suppose the reaction is carried out starting with 129 g of $Ca_3(PO_4)_2$ and 97.4 g of H_2SO_4. Which substance is the limiting reactant?

A) $Ca_3(PO_4)_2$
B) H_2SO_4
C) $CaSO_4$
D) H_3PO_4
E) none of these

ANS: B

45. Suppose the reaction $Ca_3(PO_4)_2 + 3H_2SO_4 \rightarrow 3CaSO_4 + 2H_3PO_4$ is carried out starting with 153 g of $Ca_3(PO_4)_2$
and 76.8 g of H_2SO_4. How much phosphoric acid will be produced?

A) 76.7 g
B) 51.1 g
C) 229.8 g
D) 115.1 g
E) 96.7 g

ANS: B

46. SO_2 reacts with H_2S as follows:

$$2H_2S + SO_2 \rightarrow 3S + 2H_2O$$

When 7.50 g of H_2S reacts with 12.75 g of SO_2, which statement applies?

A) 6.38 g of sulfur are formed.
B) 10.6 g of sulfur are formed.
C) 0.0216 moles of H_2S remain.
D) 1.13 g of H_2S remain.
E) SO_2 is the limiting reagent.

ANS: B

47. Consider the following reaction:

$$CH_4(g) + 4Cl_2(g) \rightarrow CCl_4(g) + 4HCl(g)$$

What mass of CCl_4 will be formed if 1.20 moles of methane react with 1.11 moles of chlorine?

A) 185 g
B) 171 g
C) 683 g
D) 42.7 g
E) 19.7 g

ANS: D

48. The electron configuration for the barium atom is:
    A) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10}$
    B) $[Xe]6s^2$
    C) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$
    D) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$
    E) none of these

    ANS: B

49. The electron configuration for the carbon atom is:
    A) $1s^2 2s^2 2p^2$
    B) $[He]2s^4$
    C) $[Ne]2s^2 2p^2$
    D) $1s^2 2p^4$
    E) none of these

    ANS: A

50. All alkaline earths have the following number of valence electrons:
    A) 1
    B) 3
    C) 6
    D) 2
    E) none of these

    ANS: D

51. Order the elements S, Cl, and F in terms of increasing ionization energy.
    A) S, Cl, F
    B) Cl, F, S
    C) F, S, Cl
    D) F, Cl, S
    E) S, F, Cl

    ANS: A

52. Order the elements S, Cl, and F in terms of increasing atomic radii.
    A) S, Cl, F
    B) Cl, F, S
    C) F, S, Cl
    D) F, Cl, S
    E) S, F, Cl

    ANS: D

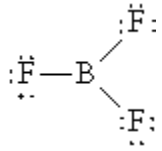
53. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^2$ is the correct electron configuration for which of the following atoms?
A) Ca
B) Ti
C) Ge
D) Zr
E) none of these

ANS: B

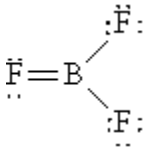
54. Which of the following compounds contains only one unshared pair of valence electrons?
A) NH_3
B) H_2O
C) CH_4
D) NaCl
E) BF_3

ANS: A

55. Which of the following Lewis structures best describes BF_3?
A)



B)



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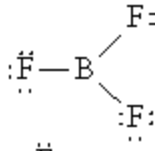

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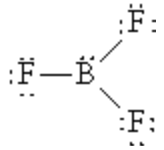

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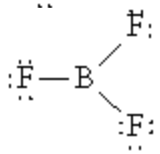

ANS: A

56. The molecular structure of OF_2 is
    A) pyramidal
    B) none of these
    C) octahedral
    D) trigonal planar
    E) V-shaped

    ANS: E

57. NI_3
    A) pyramidal
    B) tetrahedral
    C) square planar
    D) octahedral
    E) none of these

    ANS: A

58. SiH_4
    A) pyramidal
    B) tetrahedral
    C) square planar
    D) octahedral
    E) none of these

    ANS: B

59. The molecular structure of NCl_3 is
    A) pyramidal
    B) none of these
    C) octahedral
    D) trigonal planar
    E) bent

    ANS: A

60. A 16.4-g sample of HF is dissolved in water to give 2.0×10^2 mL of solution. The concentration of the solution is:
    A) 0.82 *M*
    B) 0.16 *M*
    C) 0.08 *M*
    D) 4.1 *M*
    E) 8.2 *M*

    ANS: D

61. A 38.1-g sample of $SrCl_2$ is dissolved in 112.5 mL of solution. Calculate the molarity of this solution.
    A) 27.0 *M*
    B) 2.14 *M*
    C) 53.7 *M*
    D) 0.339 *M*
    E) none of these

    ANS: B

62. You mix 55 mL of 1.00 *M* silver nitrate with 25 mL of 0.84 *M* sodium chloride. What mass of silver chloride should you form?
    A) 3.0 g
    B) 6.0 g
    C) 3.3 g
    D) 6.6
    E) none of these

    ANS: A

63. Calculate the $[H^+]$ in a solution that has a pH of 9.88.
    A) 4.1 *M*
    B) 9.9 *M*
    C) 7.6×10^{-5} *M*
    D) 1.3×10^{-10} *M*
    E) none of these

    ANS: D

64. Calculate the $[H^+]$ in a solution that has a pH of 2.73.
    A) 2.7 *M*
    B) 11.3 *M*
    C) 1.9×10^{-3} *M*
    D) 5.4×10^{-12} *M*
    E) none of these

    ANS: C

65. Calculate the $[H^+]$ in a solution that has a pH of 8.73.
    A) 1.9×10^{-9} *M*
    B) 5.4×10^{-6} *M*
    C) 8.7×10^{-9} *M*
    D) 9.4×10^{-1} *M*
    E) 7.2×10^{-1} *M*

    ANS: A

66. The pH of a solution at 25°C in which $[OH^-] = 3.9 \times 10^{-5}\ M$ is:
A) 4.41
B) 3.90
C) 9.59
D) 4.80
E) none of these

ANS: C

67. You fill a balloon with 2.50 moles of gas at 22°C at a pressure of 1.62 atm. What is the volume of the balloon?
A) 15.7 L
B) 98.0 L
C) 37.4 L
D) 2.79 L
E) 22.4 L

ANS: C

68. What volume is occupied by 21.0 g of methane (CH_4) at 27°C and 1.25 atm?
A) 37.2 L
B) 25.8 L
C) 2.32 L
D) 4.14×10^2 L
E) not enough data to calculate

ANS: B

69. Gaseous C_2H_4 reacts with O_2 according to the following equation:

$$C_2H_4(g) + 3O_2(g) \rightarrow 2CO_2 + H_2O(g)$$

What volume of oxygen gas at STP is needed to react with 5.75 mol of C_2H_4?
A) 17.3 L
B) 42.9 L
C) 3.86×10^2 L
D) 1.29×10^2 L
E) Not enough information is given to solve the problem.

ANS: C

70. Given the equation:

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

A 3.00-g sample of $KClO_3$ is decomposed and the oxygen at 24.0°C and 0.717 atm is collected. What volume of oxygen gas will be collected assuming 100% yield?

A) 8.32×10^2 mL
B) 1.01×10^2 mL
C) 1.25×10^3 mL
D) 5.55×10^2 mL
E) none of these

ANS: C