1996
American Chemical Society
High School Chemistry Scholarship Examination

Reminder: Choose the single best answer in each of the following.

1. Which one of the following is the largest distance?
   a. 10 μL ← VOLUME
   b. 2 km
   c. 1×10^4 mm
   d. 1 kPa ← Pressure

MEASUREMENT

2. When the number 0.0640510 is rounded to three significant figures, it is reported as:
   a. 0.06
   b. 0.064
   c. 0.0641
   d. 0.06405

.0641

MEASUREMENT

3. Report the answer to the following mathematical operations using the correct number of significant figures.

$$\frac{15.32 - 8.2}{7.84} = \frac{7.12}{7.84}$$

$= .90816326$

MEASUREMENT

   a. 0.9
   b. 0.91
   c. 0.908
   d. 0.9082

4. The yellow light emitted by a sodium vapor lamp has a wavelength equal to 589 nm. What is the frequency of this radiation?
   a. 5.09×10^{14} s^{-1}
   b. 1.96×10^{3} s^{-1}
   c. 0.0509 s^{-1}
   d. 1.96×10^{-15} s^{-1}

QUANTUM

$c = \lambda\nu$

$\nu = \frac{c}{\lambda}$

$= \frac{2.998 \times 10^8 m}{s} \Big| \frac{}{589 \times 10^{-9} m}$

$= 5.08998 \times 10^{14}$

5. Which of the following are chemical changes?

(I) baking bread
(II) melting solder
(III) breaking of glass
(IV) dissolving sugar in water
(V) lighting a match

VOCABULARY

a. I, V
b. II, III, IV
c. I, II, V
d. II, IV, V

6. How many square inches are in 53.6 m^2?

a. 3.46×10^2 in^2
b. 4.68×10^4 in^2
c. 8.31×10^4 in^2
d. 2.11×10^3 in^2

$53.6\ m^2 \left(\frac{100\ cm}{1\ m}\right)^2 \left(\frac{1\ in}{2.54\ cm}\right)^2$ MEASUREMENT

$= 83080.16\ in^2$

7. How many protons, neutrons, and electrons are contained in the nuclide $^{53}_{24}Cr^{3+}$?

a. 24 protons, 29 neutrons, 27 electrons
b. 24 protons, 26 neutrons, 21 electrons
c. 24 protons, 29 neutrons, 21 electrons
d. 29 protons, 24 neutrons, 26 electrons

24 p
29 n
21 e^-

29

$24 - 3 = 21$

ATOMIC STRUCTURE

8. Which one of the following formulas correctly matches its name?

a. $BaSO_3$ barium sulfite
b. KSO_4 potassium sulfate
c. Na_2S disodium hyposulfite
d. $CuSO_4$ copper(I) sulfate

FORMULA

9. An element X combines with sulfur to form a compound having the formula X_2S_3. X could be:

a. Ba
b. Rb
c. Si
d. Al

S^{-2}

X^{+3}

FORMULA

10. The normal boiling point of liquid nitrogen is 77.35 K. What is the boiling point of nitrogen in °F?

a. -76.78 °F
b. -171.2 °F
c. -320.4 °F
d. -384.4 °F

°C = K − 273.15

°F = 1.8(°C) + 32

ENERGY

°C = 77.35 − 273.15

= −195.80 °C

1.8 (−195.80) + 32

−352.44 + 32 = −320.44

11. What is the formula of iron (II) hydrogen phosphate?

a. $Fe(HPO_4)_2$
b. $FeHPO_4$
c. $Fe(H_2PO_4)_2$
d. Fe_2HPO_4

Fe^{+2} PO_4^{-3} FORMULA
HPO_4^{-2}
$\Rightarrow FeHPO_4$

12. What is the correct formula for the compound magnesium nitrate?

a. $Mg(NO_3)_2$
b. $MgNO_2$
c. $Mg(NO_2)_3$
d. $Mn(NO_3)_2$

Mg^{+2} NO_3^{-1} FORMULA

13. What is the correct empirical formula of the compound $C_8H_{16}O_4$?

a. $C_4H_8O_2$
b. $C_8H_{16}O_4$
c. $C_2H_4O_2$
d. C_2H_4O

C_2H_4O FORMULA

14. If 0.50 mole $C_8H_{16}O_4$ is completely decomposed into its constituent elements, how many moles of hydrogen gas (H_2) would be produced?

a. 16.0 moles
b. 8.0 moles
c. 4.0 moles
d. 0.5 moles

MOLE

$$\frac{.50 \text{ mole } C_8H_{16}O_4 \mid 8 \text{ mole } H_2}{\mid 1 \text{ mole } C_8H_{16}O_4} = 4 \text{ mole } H_2$$

15. If 0.50 mole $C_8H_{16}O_4$ is completely decomposed into its constituent elements, how many grams of carbon would be produced?

a. 96 g
b. 48 g
c. 4.8 g
d. 4.0 g

MOLE

$$\frac{.50 \text{ mol } C_8H_{16}O_4 \mid 8 \text{ mol C} \mid 12.01 \text{ g C}}{\mid 1 \text{ mol } C_8H_{16}O_4 \mid 1 \text{ mol C}} = 48.04 \text{ g}$$

16. What is the formula mass of magnesium phosphite, $Mg_3(PO_3)_2$?

a. 71.7
b. 182.3
c. 230.9
d. 309.9

MOLE

$3 \times 24.31 = 72.93$
$2 \times 30.97 = 61.94$
$6 \times 16.00 = 96.00$
230.87

17. When 33.0 mg of an unknown compound was submitted for elemental analysis, it contained 21.60 mg carbon (C), 3.00 mg hydrogen (H), and 8.40 mg nitrogen (N). What is the empirical formula of this unknown compound?

a. C_3H_5N
b. $C_{1.8}H_3N_{0.6}$
c. $C_7H_{14}N_3$
d. $C_{18}H_{30}N_6$

MOLE

$$\frac{21.60 \text{ g} \mid 1 \text{ mol C}}{\mid 12.01 \text{ g C}} = 1.7985012 \text{ mol C}$$

$$\frac{3.00 \text{ g} \mid 1 \text{ mol H}}{\mid 1.01 \text{ g H}} = 2.970297 \text{ mol H}$$

$$\frac{8.40 \text{ g N} \mid 1 \text{ mol N}}{\mid 14.01 \text{ g}} = .59957173$$

$\frac{1.7985012}{.599..} = 3$ $\frac{2.970297}{.599..} = 5$ $\frac{.59957173}{.599..} \text{ mol N} = 1$

C_3H_5N

18. When the equation below is properly balanced, what is the coefficient of barium chloride ($BaCl_2$)?

$$2\ AlCl_{3(aq)} + Ba_3(PO_4)_{2(aq)} \longrightarrow 2\ AlPO_{4(s)} + 3\ BaCl_{2(aq)}$$

REACTIONS

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

19. When 22.34 g iron (Fe, atomic mass = 55.85) is consumed in the following reaction, how many grams of hydrogen gas will be produced?

$$6\ HNO_{3(aq)} + 2\ Fe_{(s)} \longrightarrow 3\ H_{2(g)} + 2\ Fe(NO_3)_3$$

a. 0.600 g
b. 0.798 g
c. 1.200 g
d. 33.51 g

STOICHIOMETRY

$\frac{22.34 g\ Fe}{} \left| \frac{1\ mol\ Fe}{55.85 g\ Fe} \right| \frac{3\ mol\ H_2}{2\ mol\ Fe} \left| \frac{2.02 g\ H_2}{1\ mol\ H_2} \right.$ 1.212

20. When 14.0 g cyclohexane reacts with 14.0 g chlorine

$$C_6H_{12(s)} + Cl_{2(g)} \longrightarrow C_6H_{11}Cl(s) + HCl(g)$$

$\frac{14.0 g}{} \left| \frac{1\ mol\ C_6H_{12}}{84.0 g} \right.$ .1667 mol

$\frac{14.0 g}{} \left| \frac{1\ mol\ Cl_2}{70.90 g} \right.$ = .19746 mol Cl_2

Substance	Molecular weight
C_6H_{12}	84.0
Cl_2	70.9
$C_6H_{11}Cl$	118.5

$\frac{14.0 g}{} \left| \frac{1\ mol\ C_6H_{12}}{84.0 g} \right| \frac{1\ mol\ Cl_2}{1\ mol\ C_6H_{12}}$

= .1667 mol Cl_2 needed

more than enough Cl_2

∴ C_6H_{12} is L.R.

What is the maximum number of grams of chlorocyclohexane that could be produced?

a. 19.75 g
b. 21.00 g
c. 23.40 g
d. 43.15 g

$\frac{14.0 g}{} \left| \frac{1\ mol}{84.0 g} \right| \frac{1\ mol\ C_6H_{11}Cl}{1\ mol\ C_6H_{12}} \left| \frac{118.5 g}{1\ mol} \right.$ = 19.75 g

STOICHIOMETRY

21. How many grams of calcium bromide ($CaBr_2$, MW = 200.) must be used to prepare 500. mL of 0.400 M $CaBr_2$ solution?

a. 20.0 g
b. 40.0 g
c. 60.0 g
d. 80.0 g

$\frac{500. mL}{} \left| \frac{1 L}{1000 mL} \right| \frac{.400\ mol\ CaBr_2}{1 L} \left| \frac{200. g\ CaBr_2}{1\ mole\ CaBr_2} \right.$ = 40.0 g

SOLUTIONS

22. What is the concentration of the final solution when 500. mL of 0.400 M $CaBr_2$ solution is diluted to 1.60 L?

a. 0.125 M
b. 0.400 M
c. 1.28 M
d. 25.0 M

SOLUTIONS

$M_1V_1 = M_2V_2$

$M_2 = \frac{M_1V_1}{V_2}$

$\frac{.400 M}{} \left| \frac{500. mL}{1.60 L} \right| \frac{1 L}{1000 mL}$ = .125 M

How many moles in each?

$\frac{200.\text{ mL}}{} \Big| \frac{1\text{ L}}{1000\text{ mL}} \Big| \frac{.600\text{ mol}}{1\text{ L}} = .12\text{ moles}$ $\frac{400.\text{ mL}}{} \Big| \frac{1\text{ L}}{1000\text{ mL}} \Big| \frac{1.2\text{ mol}}{1\text{ L}} = .48\text{ moles}$

23. What is the concentration of the solution obtained when 200. mL of a 0.600 M solution of sulfuric acid (H_2SO_4, MW = 98.1) is added to 400. mL of a 1.2 M solution of sulfuric acid to make a total volume of 600. mL? total moles / total volume

SOLUTIONS

a. 0.200 M
b. 0.800 M
c. 0.480 M
d. 1.00 M

$.12 + .48 = .60\text{ moles}$

$\frac{.60\text{ moles}}{600.\text{ mL}} \Big| \frac{1000\text{ mL}}{1\text{ L}} = 1\text{ mol/L} = 1\text{ M}$

24. What is the concentration of a solution of hydrochloric acid if 37.50 mL of a 0.200 M solution of sodium hydroxide is necessary to neutralize a 50.00 mL aliquot?

$NaOH + HCl \rightarrow NaCl + H_2O$

Substance	Molecular weight
HCl	36.5
NaOH	40.0

STOICHIOMETRY + SOLUTIONS

a. 0.267 M
b. 0.205 M
c. 0.188 M
d. 0.150 M

$\frac{37.50\text{ mL NaOH}}{} \Big| \frac{1\text{ L}}{1000\text{ mL}} \Big| \frac{.200\text{ mol NaOH}}{1\text{ L}} \Big| \frac{1\text{ mol HCl}}{1\text{ mol NaOH}} = .0075\text{ mol H}$

$M = \frac{.0075\text{ mol}}{50.00\text{ mL}} \Big| \frac{1000\text{ mL}}{1\text{ L}} = .15\text{ M}$

25. Which of the following 0.10 M aqueous solutions would have the lowest freezing point?

SOLUTIONS

a. KBr
b. Na_2SO_4
c. $NaNO_3$
d. $MgSO_4$

28. Which of the following describes bromine at room temperature?

PERIODIC TABLE

a. reddish-brown liquid
b. greenish-yellow liquid
c. greenish-yellow gas
d. violet gas

29. Given the following two reactions:

$$C_{(graphite)} + O_{2(g)} \longrightarrow CO_{2(g)} \qquad \Delta H = -393.5\ kJ$$

$$2\ Fe_{(s)} + 3/2\ O_{2(g)} \longrightarrow Fe_2O_{3(s)} \qquad \Delta H = -824.2\ kJ$$

Calculate the enthalpy change for

$$2\ Fe_2O_{3(s)} + 3\ C_{(graphite)} \longrightarrow 4\ Fe_{(s)} + 3\ CO_{2(g)}$$

a. $\Delta H = +467.9$ kJ
b. $\Delta H = -467.9$ kJ
c. $\Delta H = +430.7$ kJ
d. $\Delta H = -430.7$ kJ

30. The symbol for cesium is
a. Ce
b. Cm
c. Cs
d. Se

PERIODIC TABLE

31. What do phosphorus, sulfur and oxygen have in common?
a. outer shell electron configuration
b. pyrophoric behavior
c. semimetallic behavior
d. existence of allotropic forms

PERIODIC TABLE

32. What is the name of the product of the following reaction:

$$2\ K_{(s)} + O_{2(g)} \longrightarrow K_2O_{2(s)}$$

a. potassium dioxide
b. potassium peroxide
c. potassium oxide
d. potassium superoxide

FORMULA

33. What is the temperature change when 4.00 g Fe absorbs 55.5 J?
[specific heat of Fe = 0.4998 J/g·°C]

a. 27.8°C
b. 55.5°C
c. 111.0°C
d. insufficient information

ENERGY

$q = mC\Delta T$

$\Delta T = \dfrac{q}{mC}$

$\dfrac{+55.5\ J}{4.00\ g} \cdot \dfrac{g\ ^\circ C}{.4998\ J}$

$= 27.76$

34. The combustion of methane is given by the following reaction:

$$CH_{4(g)} + 2\ O_{2(g)} \longrightarrow CO_{2(g)} + 2\ H_2O_{(aq)} \qquad \Delta H = -890.4\ kJ$$

How much heat is evolved in the combustion of 2.00 g methane?

a. 55.7 kJ
b. 111 kJ
c. 890. kJ
d. 1780 kJ

STOICHIOMETRY

$\frac{2.00g\ CH_4}{} \left| \frac{1\ mol\ CH_4}{16.05g\ CH_4} \right| \frac{-890.4\ kJ}{1\ mol\ CH_4} = -110.95327 = 111$ evolved

35. Which one of the following electron configurations represents Cr^{2+}?

a. $[Ar]4s^2 3d^4$
b. $[Ar]4s^2 3d^2$
c. $[Ar]3d^4$
d. $[Ar]3d^2$

$Cr \Rightarrow [Ar]4s^1 3d^5$

$Cr^{+2} \Rightarrow [Ar]3d^4$

ELECTRON CONFIGURATION

36. Which of the following most likely represents a negative entropy change?

a. $H_2O_{(aq)} \longrightarrow H_2O_{(g)}$
b. $MgCO_{3(s)} \longrightarrow MgO_{(s)} + CO_{2(g)}$
c. $Zn_{(s)} + 2\ HCl_{(aq)} \longrightarrow ZnCl_{2(aq)} + H_{2(g)}$
d. $NaCl_{(aq)} + AgNO_{3(aq)} \longrightarrow NaNO_{3(aq)} + AgCl_{(s)}$

38. Which of the following elements has the lowest first ionization energy?

a. antimony
b. arsenic
c. nitrogen
d. phosphorus

PERIODIC TRENDS

39. Which of the following isoelectronic species is the largest?

Kr $\quad Rb^+ \quad Se^{2-} \quad Sr^{2+}$

a. Kr
b. Rb^+
c. Se^{2-}
d. Sr^{2+}

PERIODIC TRENDS

40. The chemical properties of an element correlate best with

a. its state of matter.
b. ionic radii.
c. atomic weight.
d. electron configuration.

PERIODIC TABLE

41. Arrange the following radiation in order of increasing energy.
microwave ultraviolet green light orange light

a. microwave < orange light < green light < ultraviolet
b. ultraviolet < microwave < green light < orange light
c. orange light < green light < microwave < ultraviolet
d. ultraviolet < green light < orange light < microwave

QUANTUM

42. Which of the following bonds is the most polar?
a. H-H
b. H-C
c. C-F
d. C-Cl

VSEPR

43. Which of the following compounds is most ionic?
a. N_2O
a. Cl_2O_7
a. P_2O_5
a. Na_2O

VSEPR | BONDING

44. Which of the following terms best describes CaO?
a. an acidic oxide
b. a basic oxide
c. an amphoteric oxide
d. a neutral oxide

PERIODIC TABLE

45. Which element below has the most metallic character?
a. As
b. Sb
c. P
d. Bi

PERIODIC TABLE

46. Which elements combine with the alkali metals to form ionic compounds?
a. alkaline earth metals
b. d-transition series elements
c. noble gases
d. halogens

PERIODIC TABLE

47. What is the formal charge on the indicated nitrogen in the neutral molecule below?
N=N=O

a. 0
b. -1
c. +1
d. +2

S=C=S   O=C=O   H–C=O

4+12=16   4+2+6=12

48. What do the following species have in common?

CS_2 CO_2 CH_2O

VSEPR

a. All are gases are room temperature.
b. All contain pi (p) bonding.
c. All are isoelectronic with each other.
d. All have no dipole moment.

49. How many lone pairs are found in the entire molecule PBr_5?

VSEPR

5+35 = 40/2 = 20 pair

a. none
b. 5
c. 15
d. 20

50. A molecule has the following properties:
The molecule contains two different halogens.
The molecule has no dipole moment.
The molecule does not form hydrogen bonds. – none of these do

VSEPR

What molecule could it be?

a. OF_2 — only 1 halogen
b. IBr_3 — polar
c. PCl_2Br – polar
d. IBr_4^- ← square planar

51. Predict the order for increasing O-O bond energy of the species

O_2 O_2^+ O_2^{2-}

VSEPR

O=O   O≡O

TYPO

a. $O_2 < O_2^{2-} < O_2^+$
b. $O_2^+ < O_2^{2-} < O_2$
c. $O_2 < O_2^+ < O_2^{2-}$
d. $O_2^{2-} < O_2 < O_2^+$

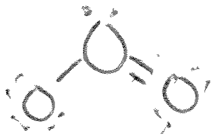
52. Pi bonding can be found in which of the following?

VSEPR

a. carbon monoxide — C≡O
b. acetone EVEN IF YOU DON'T KNOW THIS FORMULA
c. sulfur dioxide —
d. All of the above molecules contain pi bonding.

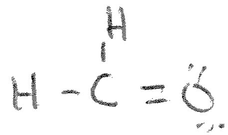
H − C ≡ C − H

53. Linear geometry best describes which of the following molecules?
   a. acetylene (C_2H_2)
   b. ozone (O_3)
   c. hydrogen peroxide
   d. All of the above molecules are linear.



VSEPR

54. How many sigma and pi bonds does formaldehyde (CH_2O) have?
   a. 3 sigma bonds and no pi bond
   b. 3 sigma bonds and 1 pi bond
   c. 2 sigma bonds and 1 pi bond
   d. 2 sigma bonds and 2 pi bonds



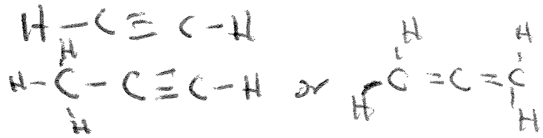
VSEPR

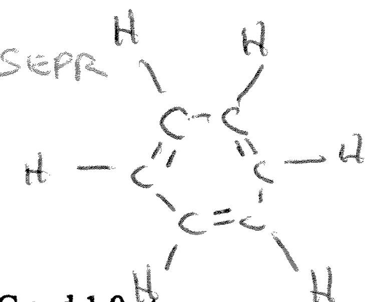
55. A molecule can be described by the following major characteristics:
The molecule contains at least one sp^2 hybrid orbital.
The molecule contains at least one sp hybrid orbital.
The molecule contains no triple bonds.

Which molecule could it be?

VSEPR

   a. C_2H_2 (acetylene)
   b. C_3H_4 (allene)
   c. C_6H_6 (benzene)
   d. C_6H_5OH (phenol)





58. If 148 g SnO_2 (MW = 150.69) are reacted with excess carbon at 0°C and 1.0 atm, what volume of carbon dioxide is evolved?

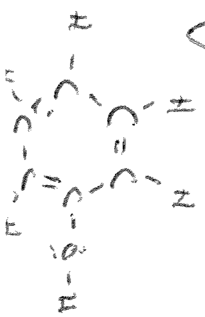
$$SnO_{2(s)} + C_{(s)} \longrightarrow CO_{2(g)} + Sn_{(s)}$$

@ STP 1 mole of any gas = 22.4 L

   a. 1.0 L
   b. 11 L
   c. 22 L
   d. 150 L

STOICHIOMETRY

GAS LAWS



$$\frac{148\,g\ SnO_2}{} \left| \frac{1\,mole\ SnO_2}{150.69\,g} \right| \frac{1\,mole\ CO_2}{1\,mole\ SnO_2} \left| \frac{22.4\,L\ CO_2}{1\,mole\ CO_2} \right.$$

22 L

The following information applies to questions 60 and 61.

An experiment is performed in which 1.0 J of heat is added to10. g ethanol (C_2H_5OH). The same amount of heat is added to 10. g benzene (C_6H_6) and the following temperature changes are observed:

Substance	ΔT
ethanol	+0.041 K
benzene	+0.057 K

ENERGY

60. Which compound has the larger specific heat?
   a. ethanol
   b. benzene
   c. They have the same specific heat.
   d. It cannot be determined from the information given.

$q = mC\Delta T$

$C = \frac{q}{m\Delta T}$

$q = 1.0\,J$

$m = 10.\,g$

$\therefore \uparrow \Delta T = \downarrow C$

$\uparrow C = \downarrow \Delta T$

61. Which has the larger molar heat capacity?
   a. ethanol
   b. benzene
   c. They have the same molar heat capacity.
   d. It cannot be determined from the information given.

B

= J/mole

ENERGY

$\frac{10.g\ C_2H_5OH}{} \Big| \frac{1\,mol\ C_2H_5OH}{46.08\,g} = .217013$ mol

$\frac{10.g\ C_6H_6}{} \Big| \frac{1\,mol}{78.12\,g} = .128008$ mol

63. If 1.0 L each of oxygen and hydrogen are reacted at constant temperature and pressure, how much water vapor will be produced?
   a. 1.0 L
   b. 2.0 L
   c. 0.5 L
   d. 4.0 L

$2H_2 + O_2 \rightarrow 2H_2O$

$\frac{1\,L\ H_2}{} \Big| \frac{1\,mole}{22.4\,L} \Big| \frac{1\,mol\ O_2}{2\,mol\ H_2} \Big| \frac{22.4\,L}{1\,mol\ O_2} = .5$ mol O_2 needed

$\therefore H_2$ is L.R

STOICHIOMETRY

LIMITING REAGENT

$2H_2 \rightarrow 2H_2O$

So...

$1\,L\ H_2 = 1\,L\ H_2O$

66. The rise of a liquid in a thin tube against the force of gravity is called
   a. capillary action.
   b. dispersion forces.
   c. surface tension.
   d. viscosity.

BONDING

70. An aqueous solution of calcium chloride is 15.0% by mass $CaCl_2$. If the solution has a density of 1.12 g/mL, what is the molarity of the solution?
   a. 1.28 M
   b. 1.35 M
   c. 1.51 M
   d. 1.68 M

$15.0\% = \frac{15.0\,g\ CaCl_2}{100.0\,g\ soln}$

SOLUTIONS

$M = \frac{solute}{solution} \quad \frac{mole}{L}$

$\frac{15.0\,g\ CaCl_2}{100.0\,g\ soln} \Big| \frac{1\,mole\ CaCl_2}{110.98\,g\ CaCl_2} \Big| \frac{1.12\,g\ soln}{1\,mL\ soln} \Big| \frac{1000\,mL}{1\,L} = 1.51378$

72. An endothermic process always

a. corresponds to a negative enthalpy change.
b. involves an absorption of heat by the system.
c. corresponds to a temperature increase.
d. involves a release of heat by the system.

ENERGY

The following reaction applies to questions 91 and 92.

$$14\ H^+ + Cr_2O_7^{2-} + 3\ Ni \longrightarrow 3Ni^{2+} + 2Cr^{3+} + 7H_2O$$

$\phi \longrightarrow +2 \rightarrow$ oxidized

+6 reduced. +3

91. Identify the oxidizing agent in the reaction above.

a. H^+
b. $Cr_2O_7^{2-}$
c. Ni
d. Cr^{3+}

↳ contains the reduced element

REACTIONS

92. Which substance is oxidized in the reaction above.

a. H^+
b. $Cr_2O_7^{2-}$
c. Cr^{3+}
d. Ni

REACTIONS

93. What is the oxidation number of manganese in $KMnO_4$?

a. +3
b. +5
c. +7
d. +9

+1 $-2 \times 4 = -8$

FORMULA

$+1 + x + (-8) = 0$ $x = 7$

94. What is the stoichiometric coefficient for ZnS(s) in the following equation when it is correctly balanced? Assume acidic conditions.

$$ZnS_{(s)} + NO_3^-{}_{(aq)} \longrightarrow Zn^{2+}{}_{(aq)} + S_{(s)} + NO_{(g)}$$

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

REDOX REACTION

95. What is the oxidation number of gold in $K_3[Au(CN)_4]$?

a. +1
b. +2
c. +3
d. +4

K = +1   +3

CN = −1 $-1 \times 4 = -4$

?

REDOX REACTION + FORMULA

$3 + x - 4 = \phi$

$x = 1$