Chem Semester 1 Review 06
Answer Section

COMPLETION

1. ANS: monatomic

MATCHING

2. ANS: G
3. ANS: D
4. ANS: J
5. ANS: A
6. ANS: B
7. ANS: F
8. ANS: P
9. ANS: I
10. ANS: N
11. ANS: E
12. ANS: M
13. ANS: H
14. ANS: C
15. ANS: L
16. ANS: K
17. ANS: O
18. ANS: Q

SHORT ANSWER

19. ANS:
$\_\_2\_\_Cr(s) + \_\_2\_\_H_3PO_4(aq) \rightarrow \_\_3\_\_H_2(g) + \_\_2\_\_CrPO_4(s)$
20. ANS:
$\_\_1\_\_SiO_2(s) + \_\_2\_\_ C(s) \rightarrow \_\_1\_\_SiC(s) + \_\_2\_\_ CO(g)$
21. ANS:
$Al(NO_3)_3(aq) + 3NaOH(aq) \rightarrow Al(OH)_3(s) + 3NaNO_3(aq)$
double-replacement
22. ANS:
$4Mg(s) + 3N_2(g) \rightarrow 2Mg_2N_3(s)$
synthesis
23. ANS:
$CuO(s) + H_2(g) \rightarrow Cu(s) + H_2O(l)$
single-replacement

24. ANS:
$2NaCl(l) \rightarrow 2Na(s) + Cl_2(g)$
decomposition
25. ANS:
$C_5H_{12}(l) + 8O_2(g) \rightarrow 6H_2O(g) + 5CO_2(g)$
combustion
26. ANS:
$RbCl(aq) + Ca(s)$
27. ANS:
NR
28. ANS:
$NaF(aq) + I_2(s)$
29. ANS:
Na, Al, P, S
30. ANS:
Br^-, Cl^-, F^-
31. ANS:
The electrons are not shared equally, but are more attracted to the more electronegative atom. The bond is polar covalent.
32. ANS:
N is more electronegative than B. Both are in period 2, with N to the right of B.
P is more electronegative than Al. Both are in period 3, with P to the right of Al.
33. ANS:

Step	Explanation	Solution
1	Write a balanced chemical equation for the reaction.	$2C_2H_2(g) + 5O_2(g) \rightarrow 4CO_2(g) + 2H_2O(g)$
2	Determine the number of moles of the known substance, using mass-to-mole conversion.	$20.0 \text{ g } C_2H_2 \times \frac{1 \text{ mol } C_2H_2}{26.04 \text{ g } C_2H_2} = 0.768 \text{ mol } C_2H_2$
3	Determine the number of moles of the unknown substance, using mole-to-mole conversion.	$0.768 \text{ mol } C_2H_2 \times \frac{4 \text{ mol } CO_2}{2 \text{ mol } C_2H_2} = 1.54 \text{ mol } CO_2$
4	Determine the mass of the unknown substance, using mole-to-mass conversion.	$1.54 \text{ mol } CO_2 \times \frac{44.01 \text{ g } CO_2}{1 \text{ mol } CO_2} = 67.6 \text{ g } CO_2$

34. ANS:
$SnS_2(s) + 3O_2(g) \rightarrow SnO_2(s) + 2SO_2(g)$
35. ANS:
$2Al(s) + 6HCl(aq) \rightarrow 2AlCl_3(aq) + 3H_2(g)$
36. ANS:
$Ba^{2+}(aq) + 2NO_3^-(aq) + 2H^+(aq) + SO4^{2-}(aq) \rightarrow$
$BaSO_4(s) + 2H^+(aq) + 2NO_3^-(aq)$
$Ba^{2+}(aq) + SO_4^{2-}(aq) \rightarrow BaSO_4(s)$

37. ANS:
$Fe^{3+}(aq) + 3Cl^{-}(aq) + 3NH_4^{+}(aq) + PO_4^{3-}(aq) \rightarrow$
$FePO_4(s) + 3NH_4^{+}(aq) + 3Cl^{-}(aq)$
$Fe3^{+}(aq) + PO_4^{3-}(aq) \rightarrow FePO_4(s)$

38. ANS:
$K+(aq) + Cl^{-}(aq) + Ag^{+}(aq) + C_2H_3O_2^{-}(aq) \rightarrow$
$AgCl(s) + K^{+}(aq) + C_2H_3O_2^{-}(aq)$
$Cl^{-}(aq) + Ag^{+}(aq) \rightarrow AgCl(s)$

39. ANS:
The process by which the atoms of one or more substances are rearranged to form different substances is called a chemical reaction.

DIF: 1 REF: Page 277 OBJ: 10.1.1 Recognize evidence of chemical change.
STO: B.3 TOP: Recognize evidence of chemical change.
KEY: Chemical reactions MSC: 1

40. ANS:
The starting substances of a chemical reaction are called reactants.

DIF: 1 REF: Page 278 OBJ: 10.1.2 Represent chemical reactions with equations.
STO: UCP.1, UCP.2, B.3 TOP: Represent chemical reactions with equations.
KEY: Chemical reactions MSC: 1

41. ANS:
The substances formed in a chemical reaction are called products.

DIF: 1 REF: Page 278 OBJ: 10.1.2 Represent chemical reactions with equations.
STO: UCP.1, UCP.2, B.3 TOP: Represent chemical reactions with equations.
KEY: Chemical reactions MSC: 1

42. ANS:
Ions that do not participate in a reaction are called spectator ions.

DIF: 1 REF: Page 293 OBJ: 10.3.1 Describe aqueous solutions.
STO: B.2, B.3 TOP: Describe aqueous solutions. KEY: Ionic equation
MSC: 1

43. ANS:
The equation that uses chemical formulas to identify the reactants and the products is called a skeleton equation.

DIF: 1 REF: Page 279 OBJ: 10.1.2 Represent chemical reactions with equations.
STO: UCP.1, UCP.2, B.3 TOP: Represent chemical reactions with equations.
KEY: Skeleton equation MSC: 1

44. ANS:
Ionic equations that include only the particles that participate in the reaction are called net ionic equations.

DIF: 1 REF: Page 293 OBJ: 10.3.1 Describe aqueous solutions.
STO: B.2, B.3 TOP: Describe aqueous solutions. KEY: Net ionic equation
MSC: 1

45. ANS:
A chemical reaction in which a single compound breaks down into two or more elements or new compounds is called a decomposition reaction.

DIF: 1 REF: Page 286 OBJ: 10.2.1 Classify chemical reactions.
STO: UCP.1, B.3 TOP: Classify chemical reactions. KEY: Decomposition reactions
MSC: 1

PROBLEM

46. ANS:

$$2.15 \text{ mol Au} \times \frac{6.02 \times 10^{23} \text{ atoms Au}}{1 \text{ mol Au}}$$

$$= 1.29 \times 10^{24} \text{ atoms Au}$$

47. ANS:

$$11.5 \text{ mol KBr} \times \frac{6.02 \times 10^{23} \text{ formula units KBr}}{1 \text{ mol KBr}}$$

$$= 6.92 \times 10^{24} \text{ formula units KBr}$$

48. ANS:

$$8.92 \times 10^{23} \text{ atoms Ba} \times \frac{1 \text{ mol Ba}}{6.02 \times 10^{23} \text{ atoms Ba}}$$

$$= 1.48 \text{ mol Ba}$$

49. ANS:

$$5.50 \times 10^{25} \text{ molecules CO} \times \frac{1 \text{ mol CO}}{6.02 \times 10^{23} \text{ molecules CO}}$$

$$= 91.4 \text{ mol CO}$$

50. ANS:

$$1.24 \text{ mol Be} \times \frac{9.01 \text{ g Be}}{1 \text{ mol Be}}$$

$$= 11.2 \text{ g Be}$$

51. ANS:

$$6.35 \text{ g Li} \times \frac{1 \text{ mol Li}}{6.94 \text{ g Li}}$$

$$= 0.915 \text{ mol Li}$$

52. ANS:

$$1 \text{ mol } CaC_2 \times \frac{2 \text{ mol C}}{1 \text{ mol } CaC_2} \times \frac{12.01 \text{ g C}}{1 \text{ mol C}}$$

$$= 24.02 \text{ g C}$$

$$1 \text{ mol } CaC_2 \times \frac{1 \text{ mol Ca}}{1 \text{ mol } CaC_2} \times \frac{40.08 \text{ g Ca}}{1 \text{ mol Ca}}$$

$$= 40.08 \text{ g Ca}$$

$$(24.02 \text{ g} + 40.08 \text{ g}) = 64.10 \text{ g}$$

The molar mass of calcium carbide is 64.10 g/mol.

$$3.75 \text{ g } CaC_2 \times \frac{1 \text{ mol } CaC_2}{64.10 \text{ g } CaC_2}$$

$$= 0.0585 \text{ mol } CaC_2$$

53. ANS:

$$1.24 \text{ g Co} \times \frac{1 \text{ mol Co}}{58.93 \text{ g Co}} \times$$

$$\frac{6.02 \times 10^{23} \text{ atoms Co}}{1 \text{ mol Co}}$$

$$= 1.27 \times 10^{22} \text{ atoms Co}$$

54. ANS:

$$1.33 \times 10^{24} \text{ atoms Ar} \times \frac{1 \text{ mol Ar}}{6.02 \times 10^{23} \text{ atoms Ar}} \times$$

$$\frac{39.95 \text{ g Ar}}{1 \text{ mol Ar}}$$

$$= 88.3 \text{ g Ar}$$

The quantity 4.16×10^{23} atoms of radium has the greatest mass.

55. ANS:

$$3.35 \text{ mol } C_9H_8O_4 \times \frac{9 \text{ mol C}}{1 \text{ mol } C_9H_8O_4} = 30.2 \text{ mol C}$$

$$3.35 \text{ mol } C_9H_8O_4 \times \frac{8 \text{ mol H}}{1 \text{ mol } C_9H_8O_4} = 26.8 \text{ mol H}$$

$$3.35 \text{ mol } C_9H_8O_4 \times \frac{4 \text{ mol O}}{1 \text{ mol } C_9H_8O_4} = 13.4 \text{ mol O}$$

56. ANS:

7.89 ~~g K~~ × 1 mol K/39.10 ~~g K~~ = 0.202 mol K
2.42 ~~g C~~ × 1 mol C/12.01 ~~g C~~ = 0.201 mol C
9.69 ~~g O~~ x 1 mol O/16.00 ~~g O~~ = 0.606 mol O

0.202 mol K/0.201 mol C = 1.00 mol K/1.00 mol C = 1 mol K/1 mol C
0.201 mol C/0.201 mol C = 1.00 mol C/1.00 mol C = 1 mol C/1 mol C
0.606 mol O/0.201 mol C = 3.01 mol O/1.00 mol C = 3 mol O/1 mol C
1 mol K : 1 mol C: 3 mol O
empirical formula: KCO_3
(39.10 g + 12.01 g + 48.00 g) = 99.11 g
molar mass KCO_3 = 99.11 g/mol KCO_3

n = molar mass of molecular formula/molar mass of empirical formula = 198.22 ~~g/mol~~/99.11 ~~g/mol~~ = 2

$(KCO_3)n$
The molecular formula of the compound is $K_2C_2O_6$.

57. ANS:

2.00 g $FeCl_2 \cdot xH_2O$ – 1.27 g $FeCl_2$ = →.73 g H_2O
0.73 g $H_2O \times 1$ mol H_2O/18.02 g H_2O = 0.040 mol H_2O
1.27 g $FeCl_2 \times 1$ mol $FeCl_2$/126.75 g $FeCl_2$ = 0.0100 mol $FeCl_2$
0.040 mol H_2O/0.0100 mol $FeCl_2$ = 4 mol H_2O/1 mol $FeCl_2$
4 mol H_2O : 1 mol $FeCl_2$
$FeCl_2 \cdot 4H_2O$
iron(II) chloride tetrahydrate

58. ANS:

$$1 \text{ mol MnO} \times \frac{1 \text{ mol Mn}}{1 \text{ mol MnO}} \times \frac{54.94 \text{ g Mn}}{1 \text{ mol Mn}}$$
$$= 54.94 \text{ g Mn}$$
$$1 \text{ mol MnO} \times \frac{1 \text{ mol O}}{1 \text{ mol MnO}} \times \frac{16.00 \text{ g O}}{1 \text{ mol O}}$$
$$= 16.00 \text{ g O}$$
$$(54.94 \text{ g} + 16.00 \text{ g}) = 70.94 \text{ g}$$

The molar mass of manganese oxide is 70.94 g/mol.

$$\textit{mass percent Mn} = \frac{54.94 \text{ g Mn}}{70.94 \text{ g MnO}} \times 100$$
$$= 77.45\% \text{ Mn}$$
$$\textit{mass percent O} = \frac{16.00 \text{ g O}}{70.94 \text{ g MnO}} \times 100$$
$$= 22.55\% \text{ O}$$

59. ANS:

Mass of Hg = 80.68 g Hg

Mass of O = 12.87 g O

Mass of S = 6.45 g S

$$80.68 \text{ g Hg} \times \frac{1 \text{ mol Hg}}{200.59 \text{ g Hg}} = 0.4022 \text{ mol Hg}$$

$$12.87 \text{ g O} \times \frac{1 \text{ mol O}}{16.00 \text{ g O}} = 0.8044 \text{ mol O}$$

$$6.45 \text{ g S} \times \frac{1 \text{ mol S}}{32.07 \text{ g S}} = 0.2011 \text{ mol S}$$

$$\frac{0.4022 \text{ mol Hg}}{0.2011 \text{ mol S}} = \frac{2.000 \text{ mol Hg}}{1.000 \text{ mol S}} = \frac{2 \text{ mol Hg}}{1 \text{ mol S}}$$

$$\frac{0.8044 \text{ mol O}}{0.2011 \text{ mol S}} = \frac{4.000 \text{ mol O}}{1.000 \text{ mol S}} = \frac{4 \text{ mol O}}{1 \text{ mol S}}$$

$$\frac{0.2011 \text{ mol S}}{0.2011 \text{ mol S}} = \frac{1.000 \text{ mol S}}{1.000 \text{ mol S}} = \frac{1 \text{ mol S}}{1 \text{ mol S}}$$

2 mol Hg : 4 mol O : 1 mol S

The empirical formula is Hg_2SO_4.

ESSAY

60. ANS:
See section 10-3 in your book and table C-10 in the back of your book.