

KWANTLEN UNIVERSITY COLLEGE
Department of Chemistry

CHEM 0094 FINAL EXAM

April 18, 2002

Answer Key

1. a) Chemical

b) Physical

c) Chemical

2. a) Physical

b) Chemical

c) Physical

3. a) 4

c) 4

b) 3

d) 4

4. a) 8.72×10^6

b) 62.9×10^{-3}

5. a) $-129\text{ }^{\circ}\text{F?}$

b) $58\text{ }^{\circ}\text{C?}$

6. a) $2.59 \times 10^7\text{ mm}$

b) $1.36 \times 10^4\text{ kg/m}^3$

c) 340 m^3

7. 216g

8. 0.266 m^3 of magnetite

9. a) $2.26\text{ J/g}\cdot^{\circ}\text{C}$

b) $5.50 \times 10^4\text{ J}$

10. a) $^{118}_{50}\text{Sn}^{2+}$

b) $27\text{p}^+, 32\text{n}^0, 24\text{e}^-$

c)

i) Xe

ii) Se^{2-}

iii) Ca^{2+}

iv) 18

v) Br_2

vi) Cs

11. 121.8 amu

12. **a)** Cu_2CO_3 **b)** $\text{Fe}(\text{NO}_2)_2$ **c)** P_2O_5
 d) $\text{H}_2\text{S}(\text{aq})$ **e)** $\text{CoCl}_2 \cdot 6\text{H}_2\text{O}$ **f)** $(\text{NH}_4)_2\text{SO}_4$
13. **a)** silver nitrate **b)** sulfuric acid **c)** magnesium hydroxide
 d) tin(IV) oxide **e)** mercury(I) chloride **f)** ammonia

14.

- a)** $\text{P}_4 + 10 \text{Cl}_2 \rightarrow 4 \text{PCl}_5$
b) $\text{NH}_4\text{NO}_3 \rightarrow \text{N}_2\text{O} + 2 \text{H}_2\text{O}$
c) $4 \text{C}_3\text{H}_5\text{N}_3\text{O}_9 \rightarrow 6 \text{N}_2 + 12 \text{CO}_2 + 10 \text{H}_2\text{O} + \text{O}_2$
d) $4 \text{HNCO} + 6 \text{NO} \rightarrow 5 \text{N}_2 + 2 \text{H}_2\text{O} + 4 \text{CO}_2$

15.

- a)** $\text{Pb}(\text{NO}_3)_2(\text{aq}) + 2 \text{HCl}(\text{aq}) \rightarrow \text{PbCl}_2(\text{s}) + 2 \text{HNO}_3(\text{aq})$
b) $\text{Al}(\text{OH})_3(\text{s}) + 3 \text{HNO}_3(\text{aq}) \rightarrow \text{Al}(\text{NO}_3)_3(\text{aq}) + 3 \text{H}_2\text{O}(\text{l})$
c) $\text{Ca}(\text{s}) + 2 \text{H}_2\text{O}(\text{l}) \rightarrow \text{Ca}(\text{OH})_2(\text{s}) + \text{H}_2(\text{g})$
d) $\text{CaCO}_3(\text{s}) \xrightarrow{\text{heat}} \text{CaO}(\text{s}) + \text{CO}_2(\text{g})$
e) $3 \text{Ca}(\text{OH})_2(\text{aq}) + 2 \text{H}_3\text{PO}_4(\text{aq}) \rightarrow \text{Ca}_3(\text{PO}_4)_2(\text{s}) + 6 \text{H}_2\text{O}(\text{l})$
f) $\text{C}_7\text{H}_6\text{O}_3(\text{s}) + 7 \text{O}_2(\text{g}) \rightarrow 7 \text{CO}_2(\text{g}) + 3 \text{H}_2\text{O}(\text{g})$
 (combustion)

16.

- a)** 294.2 g/mol **b)** 0.0340 mol **c)** 1.02×10^{22} molecules
d) 4.09×10^{22} N atoms **e)** 4.9×10^{-22} g aspartame

17. a) $\text{NaC}_5\text{H}_8\text{NO}_4$ b) $n = 1$, $\text{NaC}_5\text{H}_8\text{NO}_4$

18. 131.5g NH_3

19.

a) HCl is the limiting reagent.

b) 23.4 grams of chlorine will be produced.

c) 46.1 grams of MnO_2 are left unused.

20. 56.0g of NaOH is required.

21. 0.0120 moles of Cl are present.

22. 47.2 mL of a solution is required.

23. The molarity of KOH in the final solution is 0.391 mol/L.

24. The molarity of NaOH in the solution is 3.39 mol/L

25. 16.1 mL of the NaOH solution are required.

26. a) $\text{H}^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l})$

b) $\text{Zn}(\text{s}) + \text{Cu}^{2+}(\text{aq}) \rightarrow \text{Zn}^{2+}(\text{aq}) + \text{Cu}(\text{s})$

27. 2.275×10^4 kJ of heat is given off.