

Chem 1141

Exam 1A (Fall 2008)

Name: KEY

Multiple Choice. 2 Points each.

1. Which one of these represents a *physical* change?

- A. water, when heated, forms steam
- B. bleach turns hair yellow
- C. sugar, when heated, becomes brown
- D. milk turns sour
- E. apples, when exposed to air, turn brown

2. The SI prefixes *milli* and *mega* represent, respectively:

- A. 10^6 and 10^{-6} .
- B. 10^{-3} and 10^6 .
- C. 10^3 and 10^{-6} .
- D. 10^{-3} and 10^9 .
- E. 10^{-6} and 10^{-3} .

3. 6.0 km is how many micrometers?

- A. $6.0 \times 10^6 \mu\text{m}$
- B. $1.7 \times 10^{-7} \mu\text{m}$
- C. $6.0 \times 10^9 \mu\text{m}$
- D. $1.7 \times 10^{-4} \mu\text{m}$
- E. $6.0 \times 10^3 \mu\text{m}$

4. The number 1.050×10^9 has how many significant figures?

- A. 2
- B. 3
- C. 4
- D. 9
- E. 13

5. Do the indicated arithmetic and give the answer to the correct number of significant figures.

$$(1.5 \times 10^{-4} \times 61.3) + 2.01 =$$

- A. 2.0192
- B. 2.0
- C. 2.019
- D. 2.02
- E. 2.019195

6. A piece of metal with a mass of 125 g is placed into a graduated cylinder that contains 25.00 mL of water, raising the water level to 56.00 mL. What is the density of the metal?

- A. 5.00 g/cm^3
- B. 4.03 g/cm^3
- C. 2.23 g/cm^3
- D. 1.51 g/cm^3
- E. 0.25 g/cm^3

7. The density of lead is 11.4 g/cm^3 at 25°C . Calculate the volume occupied by 25.0 g of lead.

- A. 2.19 cm^3
- B. 0.456 cm^3
- C. 285 cm^3
- D. 1.24 cm^3
- E. 6.05 cm^3

8. A person walking fast requires 5.0 kcal of energy per minute. How many minutes of such exercise are required to consume 520 kcal, the energy in a large bag of French fries?

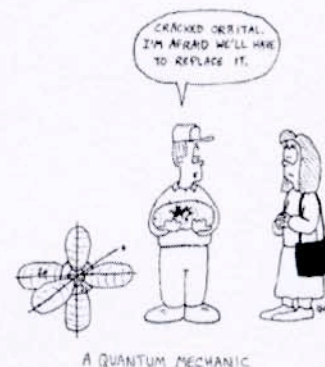
- A. 0.0096 min
- B. 100 min
- C. 130 min
- D. 520 min
- E. 2,600 min



9. Some molecules move with speeds approaching the "escape velocity" from Earth, which is 7.0 miles per second. What is this speed in cm/h? (1 mile = 1609 m)
- A. 313 cm/h B. 4.1×10^5 cm/h C. 4.1×10^9 cm/h
D. 1.1×10^6 cm/h E. 1.6×10^9 cm/h
10. The elements in a column of the periodic table are known as
- A. metalloids. B. a period. C. noble gases. D. a group. E. nonmetals.
11. Which of these materials are usually poor conductors of heat and electricity?
- A. metals B. metalloids C. nonmetals
D. alkaline earth metals E. alkali metals
12. Atoms of the same element with different mass numbers are called
- A. ions. B. neutrons. C. allotropes. D. chemical families.
E. isotopes.
13. How many neutrons are there in an atom of lead whose mass number is 208?
- A. 82 B. 126 C. 208 D. 290 E. none of them
14. Give the number of protons (p), electrons (e), and neutrons (n) in one atom of chlorine-37.
- A. 37 p, 37 e, 17 n B. 17 p, 17 e, 37 n C. 17 p, 17 e, 20 n
D. 37 p, 17 e, 20 n E. 17 p, 37 e, 17 n
15. An aluminum ion, Al^{3+} , has:
- A. 13 protons and 13 electrons B. 27 protons and 24 electrons C. 16 protons and 13 electrons
D. 13 protons and 10 electrons E. 10 protons and 13 electrons
16. What is the formula for the ionic compound formed by calcium ions and nitrate ions?
- A. Ca_3N_2 B. $\text{Ca}(\text{NO}_3)_2$ C. Ca_2NO_3 D. Ca_2NO_2 E. CaNO_3
17. What is the formula for the ionic compound formed by magnesium and iodine?
- A. MgI B. Mg_2I C. MgI_2 D. MgI_3 E. Mg_3I
18. Which is the correct formula for copper(II) phosphate?
- A. Cu_2PO_4 B. $\text{Cu}_3(\text{PO}_4)_2$ C. Cu_2PO_3 D. $\text{Cu}(\text{PO}_4)_2$ E. $\text{Cu}(\text{PO}_3)_2$
19. The correct name for NH_4NO_3 is
- A. ammonium nitrate. B. ammonium nitrogen trioxide. C. ammonia nitrogen oxide.
D. hydrogen nitrogen oxide. E. hydrogen nitrate.
20. Which is the correct formula for lead(IV) chloride?
- A. Pb_4Cl B. PbCl_2 C. PbCl_3 D. PbCl_4 E. Pb_2Cl_4
21. Which of these elements is chemically similar to oxygen?
- A. sulfur B. calcium C. iron D. nickel E. sodium

22. [16 pts.] Name the following compounds:

- i) $MgCl_2$ magnesium chloride
 ii) $FeBr_3$ iron(III) bromide
 iii) Cl_4O_7 tetrachlorine heptoxide
 iv) CuO copper(I) oxide
 v) N_2F_6 dinitrogen hexafluoride
 vi) NH_4NO_3 ammonium nitrate
 vii) N_9O_{10} nonanitrogen decoxide
 viii) $LiHCO_3$ lithium bicarbonate



23. [16 pts.] Write formulas for the following compounds:

- i) sodium hydroxide NaOH
 ii) potassium sulfate K_2SO_4
 iii) trinitrogen pentoxide N_3O_5
 iv) heptachlorine octafluoride Cl_7F_8
 v) magnesium nitrate $Mg(NO_3)_2$
 vi) calcium sulfite $CaSO_3$
 vii) sodium carbonate decahydrate $Na_2CO_3 \cdot 10H_2O$
 viii) sulfuric acid H_2SO_4

Show all work to receive credit on the following problems.

24. [6 pts.] What volume would 45.60 g of gold occupy? The density of gold is 19.3 g/cm^3 .

$$d = \frac{m}{V} \Rightarrow V = \frac{m}{d} = \frac{45.60 \text{ g}}{19.3 \text{ g/cm}^3} = 2.36 \frac{\text{g}}{\text{g/cm}^3}$$

$$= 2.36 \text{ g} \times \frac{\text{cm}^3}{\text{g}} = 2.36 \text{ cm}^3$$

25. [8 pts.] Convert a density of 3.4 mg/cL into units of $\text{ng}/\mu\text{L}$. Use the conversion-factor method.

$$\left. \begin{array}{l} \text{mg} = 10^{-3} \text{ g} \\ \text{cL} = 10^{-2} \text{ L} \\ \text{ng} = 10^{-9} \text{ g} \\ \mu\text{L} = 10^{-6} \text{ L} \end{array} \right\}$$

$$\frac{3.4 \text{ mg}}{\text{cL}} \left| \frac{10^{-3} \text{ g}}{\text{mg}} \right| \left| \frac{\text{ng}}{10^{-9} \text{ g}} \right| \left| \frac{\text{cL}}{10^{-2} \text{ L}} \right| \left| \frac{10^{-6} \text{ L}}{\mu\text{L}} \right| = 3.4 \frac{10^{-3} \times 10^{-6} \text{ ng}}{10^{-9} \times 10^{-2} \mu\text{L}}$$

$$= 3.4 \times \frac{10^{-9}}{10^{-11}} \text{ ng}/\mu\text{L}$$

$$= 3.4 \times 10^{+2} \text{ ng}/\mu\text{L}$$

26. [6 pts.] How many protons, neutrons, and electrons are there in an atom of beryllium-9?

$$Z = 4$$



$$\Rightarrow \boxed{4p^+, 4e^-}$$

$$\text{Mass \# (A)} = 9 = \#p^+ + \#n^0 \\ = 4 + \#n^0$$

$$\Rightarrow \boxed{\#n^0 = 5}$$

27. [6 pts.] How many significant figures do the following measurements have:

i) 0.00102 kg

3

ii) 23.0×10^{27} s

3

iii) 1200 mol

2

iv) 1.000 A

4

v) 230.01 m

5

vi) 1.29 mg

3