Exam 1
Chem 121
Spring 2007

Name: KEY

Show all work to receive credit.

Q1. When a block of ice melts in a warm room, is this a chemical or physical change? (3 pts.)

Physical

Q2. Is iced tea a compound, element, or a mixture? Explain. (3 pts.)

Mixture. Contains 2 or more components in variable proportions.

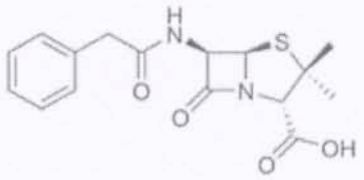
Q3. Is table salt a compound, element, or a mixture? Explain. (3 pts.)

Compound. Contains 2 elements (Na, Cl) in a fixed proportion

Q4. Fill in the blanks: (You must spell the name correctly for full credit.) (20 pts.)

Element Name	Element Symbol
carbon	C
Iron	Fe
potassium	K
Nitrogen	N
phosphorus	P
Gold	Au
lead	Pb
Tin	Sn
magnesium	Mg
Barium	Ba

Q5. Write the formula of penicillin G, used in the treatment of bacterial infections, if the molecule contains sixteen carbon atoms, eighteen hydrogen atoms, two nitrogen atoms, four oxygen atoms and one sulfur atom. (5 pts.)



$C_{16}H_{18}N_2O_4S$

Q6. Give three properties of (6 pts.)

(A) Metals

i) Shiny
ii) Ductile
iii) Malleable

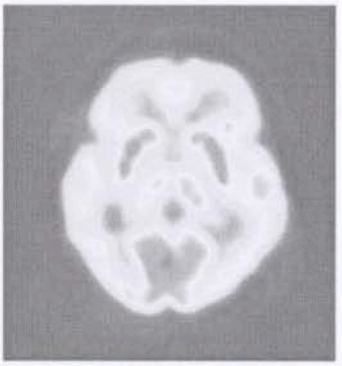
(B) Non-metals

i) Dull
ii) Brittle
iii) Poor electrical conductors

Q7. Fill in the blanks: (20 pts.)

Prefix	Symbol	Meaning
centi	c	$\times 10^{-2}$
deci	d	$\times 10^{-1}$
micro	μ	$\times 10^{-6}$
mega	M	$\times 10^{6}$
Kilo	k	$\times 10^{3}$

Q8. Positron emission tomography (PET) is a nuclear medicine medical imaging technique which produces a three-dimensional image or map of functional processes in the body.



PET scan of a human brain.

To conduct the scan, a short-lived radioactive tracer isotope (which has been chemically incorporated into a metabolically active molecule) is injected into the living subject. There is a waiting period while the metabolically active molecule becomes concentrated in tissues of interest; then the research subject or patient is placed in the imaging scanner.

The molecule most commonly used for this purpose is fluorodeoxyglucose (FDG), a sugar, for which the waiting period is typically an hour.

The fluorine atom in FDG is normally the fluorine-18 isotope.

How many protons and neutrons are there in an atom of fluorine-18? (6 pts.)

9
F

$Z=9 \Rightarrow 9p^+$

$\uparrow$ mass #(A) $= \#p^+ + \#n^0$

$\Rightarrow 18 = 9 + \#n^0$

$\Rightarrow \#n^0 = 9$

Q9. How many significant figures do the following measurement contain? (10 pts.)

a) 0.0010 m — 2 s.f.
b) 5.0 s — 2 s.f.
c) 1201.560 kg — 7 s.f.
d) 3.50×10^5 mL — 3 s.f.
e) 410 m^3 — 2 s.f.

Q10. Write the electron configuration of the following atoms: (10 pts)

a) Na (component of body fluids; necessary for nerve action)

2-8-1

b) Si (helps form connective tissue and bone)

2-8-4

c) S (component of proteins; necessary for blood clotting)

2-8-6

Q11. A patient who weighs 175 lbs requires 45.4 mg of methylprednisolone. Using the conversion-factor method, how many milligrams of methylprednisolone would a 215 lbs patient require? How many 8-mg tablets is this equivalent to? (No credit unless the conversion-factor method is used.) (10 pts.)

m.p.

175 lb patient = 45.4 mg methylprednisolone

$$\Rightarrow 215\ \text{lb patient} \times \frac{45.4\ \text{mg m.p.}}{175\ \text{lb patient}} = 55.8\ \text{mg m.p. (3 s.f.)}$$

1 tablet = 8 mg of m.p. (assume exact!)

$$\Rightarrow 55.8\ \text{mg m.p.} \times \frac{1\ \text{tablet}}{8\ \text{mg m.p.}} = 6.98\ \text{tablets} \approx 7$$

Q12. What is the name commonly given to elements in group IIA of the periodic table? (2 pts.)

Alkaline Earth metals

Q13. What is the name commonly given to elements in group VIIA of the periodic table? (2 pts.)

Halogens

BONUS QUESTION:
Gold has a density of 19.3 g/mL. What volume of gold would a 544.1 g sample occupy?

$d = m/V \Rightarrow V = m/d$

$$= \frac{544.1\ \text{g}}{19.3\ \text{g/mL}} = 28.2\ \text{mL (3 s.f.)}$$