Exam 3
Chapters 17-23

Exam starts Friday, April 10 and ends Monday, April 13, at 4:00. The Periodic Table of the Elements will be attached to the exam. This PowerPoint review will be put online.

Things to do as we approach the end of the semester

1. Do the course evaluation online for PS 110A.
2. When you have completed the course evaluation put in 30 points for quiz #28. Must do by Tuesday of next week.
3. Pick up homework etc. from the boxes in the lab.
4. Make sure you check your scores and grades daily. Correct any problems through your TA’s or me.

For today’s practice points make records on Quiz #25.

Interesting Point

P1: List the following atoms in order of increasing diameter: nitrogen, oxygen, silicon, N O S N S O S N O S O N S

Question

How many atoms of carbon are there in each molecule of methane that has the formula CH₄

a) 1
b) 2
c) 5
d) 7

Question

Disorder remains the same in

a) high temperature processes
b) irreversible processes
c) reversible processes
d) processes that release chemical energy
e) none of these
Question
Which type of bonding is the strongest?

a) covalent bonding  
b) hydrogen bonding  
c) dispersion forces  
d) dipole-dipole interactions

Question
Which of the following processes is a reversible process?

a) a man diving into a swimming pool  
b) water falling down Niagara Falls and becoming turbulent water at the base of the falls  
c) scrambling eggs  
d) a pendulum swinging in a frictionless environment  
e) toxic waste polluting a lake

Question
Pure water has a pH of

a) 1  
b) 7  
c) 10  
d) 14  
e) 0

Question
P2: According to the material in chapter 18, which of these types of energy has the highest order or is the most useful?

a) electrical household energy  
b) macroscopic kinetic energy  
c) chemical energy  
d) thermal energy of boiling water

Question
Which of the following is not correct for ionic compounds?

a) Their bonds arise from electrostatic interactions.  
b) Their energy levels are widely spaced.  
c) Their crystals are brittle.  
d) Their charge carriers are very mobile.  
e) Their crystals are often transparent to visible light.

Question
Which one of these chemical reactions is balanced correctly?

a) $Mg + N_2 \rightarrow MgN_3$  
b) $Zn + O_2 \rightarrow 2ZnO$  
c) $N_2 + 3H_2 \rightarrow 2NH_3$  
d) $Na + O_2 \rightarrow NaO_3$  
e) $KClO_3 \rightarrow KCl + O_2$
Question

The octet rule relates to

a) s and d electrons
b) s and p electrons
c) p and d electrons
d) f electrons

Question

In semiconductors, which property of the materials affects electronic transfer across the gap?

a) density
b) pressure
c) brittleness
d) temperature

Question

The correct formula for potassium sulfide is

a) K₂S
b) KS
c) KS₂
d) KS₃
e) K₂S₃

Question

Which of the following types of materials exhibits a gap between electronic bands of levels?

a) salts
b) organic compounds
c) metals
d) semiconductors

Question

Which of the following sets of room-temperature characteristics best describe the element Pt

a) Solid metal
b) Noble gas
c) Liquid metal
d) Solid nonmetal
e) Gaseous nonmetal (but not a noble gas)

Question

In a metallically bonded substance

a) the substance consists of discrete (physically separate) molecules
b) the substance consists of discrete (physically separate) atoms
c) discrete (physically separate) molecules or atoms do not exist
**Question**

What is the oxidation state of iron (Fe) in Fe\(_2\)O\(_3\)?

- a) -2
- b) -1
- c) +1
- d) +2
- e) +3

**Question**

The number of covalent bonds for a hydrogen gas molecule is

- a) 1
- b) 2
- c) 3
- d) 4
- e) 5

**Question**

P3: Write the names of the following compounds:

- a) CrO
- b) CrO\(_3\)
- c) Cr\(_2\)O\(_3\)
- d) N\(_2\)O (laughing gas)
- e) SO\(_3\)

**Question**

Which of the following atoms is easiest to ionize

- a) aluminum
- b) boron
- c) argon
- d) cesium
- e) fluorine

**Question**

If strontium (Sr) and bromine (Br) form a compound, which of the following characteristics will it show?

- a) brittle, transparent, electrically non-conducting solid
- b) electrically conducting, metallic alloy
- c) colored gas
- d) malleable solid with a dull finish
- e) rubbery solid that sparkles

**Question**

No process can occur in which the total effect results in heat flowing from a cooler object to a hotter object because

- a) it would violate the law of conservation of energy
- b) it would violate the law of increasing disorder
- c) it would violate the law of conservation of linear momentum
- d) it would violate the law of conservation of charges
- e) it would violate the law of conservation of mass
Question

If aluminum (Al) and sulfur (S) combine to form a compound, one would expect the compound to be:

a) AlS
b) Al₂S
c) AlS₂
d) Al₂S₃
e) Al₃S₂

Question

When combining with nonmetals, metals tend to

a) lose electrons
b) gain electrons
c) share electrons
d) keep the same number of electrons
e) do more than one of the above items

Question

Carbon dioxide (CO₂) is analyzed in a mass spectrometer. What are the masses of the fragments that probably show up in the display?

a) 6, 8, 14, 16, 22
b) 12, 16, 28, 32, 44
c) 6, 8, 22
d) 12, 16, 44
e) 6, 8, 10, 12, 14, 18, 20, 36

Shouldn’t get 32 because the O’s are not bound to each other in CO₂

Question

P₄: Which one of these nonmetals will react most vigorously with metals?

a) boron
b) flourine
c) nitrogen
d) neon
e) sulfur
f) oxygen

Question

Which one of the following is true for an apple growing on a tree?

a) The total order in the universe remains unchanged.
b) The order in the apple itself is decreasing, and the order in its environment is increasing by the same amount.
c) The order in the apple is increasing, and its environment’s order is decreasing by the same amount.
d) The decrease in the environment’s order is greater than the increase in the apple’s order.
e) None of these.

Question

The mass of a sodium (Na) atom in atomic mass units is 23. The atom has

a) 23 protons
b) 23 neutrons
c) 23 electrons
d) 12 neutrons
e) 11 neutrons
Question

What characteristics would you find for the compound SrS?

a) electrically conducting, metallic solid
b) opaque gas
c) transparent gas
d) brittle, electrically non-conducting solid
e) transparent liquid

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Question

P5: Nitrogen forms the gas N₂. Decide how many covalent bonds are between the two atoms.

a) single bond
b) double bond
c) triple bond
d) quadruple bond
e) shared metallic bond

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Question

How many valence electrons does sodium have?

a) 11
b) 1
c) 2
d) 23
e) 12
g) 0

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Question

Which of the following is not chemically similar to Cl?

a) Br
b) F
c) I
d) At
e) Na

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Question

Salts are generally

a) brittle
b) opaque
c) electrically conducting when solid
d) of low melting point

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Question

Which of the following are not common properties of metals?

a) poor thermal conductors
b) good electrical conductors
c) light does not pass through them
d) can be hammered into thin sheets without shattering
e) highly reflective
Question

Which one of the following is not a mixture?

a) sodium chloride
b) salt and pepper
c) a solution of alcohol in water
d) brass
e) carbonated drinks

Question

In an irreversible process entropy

a) is zero
b) becomes zero
c) increases
d) becomes very large
e) decreases
f) does not change

Question

Which of the following is an element?

a) water
b) carbon dioxide
c) RNA
d) chlorine gas
e) 2-methyl isothiouronium iodide

Question

Which of the following sets of room-temperature characteristics best describes mercury?

a) solid metal
b) noble gas
c) liquid metal
d) solid nonmetal
e) liquid nonmetal
f) gaseous nonmetal

P6: The element barium has an atomic number of 56. From its position in the Periodic Table, we can infer that

a) barium is a nonmetal
b) barium has a principle oxidation number of -2
c) barium forms a compound with chlorine that has the formula BaCl₂
d) barium has 56 valence electrons
e) the valence electrons of barium are in p-type orbitals

Question

The correct formula for potassium sulfide is

a) K₂S
b) KS
c) KS₂
d) KS₃
e) K₂S₃
Question

P7: Which of the following are not true about catalysts?
   a) Catalysts speed up reactions
   b) Catalysts are used up during the course of a reaction.
   c) Catalysts only work on reactions which break up large molecules.
   d) a) and c)
   e) b) and c)

Question

An atom of uranium has a mass number of 238 and an atomic number of 92. In other words, it has
   a) 92 neutrons
   b) 92 protons and 238 neutrons
   c) 92 protons and 146 neutrons
   d) 238 protons and 92 neutrons
   e) 238 protons and 238 electrons

Question

In some liquid fueled rockets, liquid oxygen and liquid hydrogen react to form gaseous steam (H₂O) and a great deal of energy is given off to propel the rocket.

   a) The reaction is favored from both an energy and an entropy perspective.
   b) The reaction is not favored from either an energy or an entropy perspective.
   c) The reaction is favored from an energy perspective, but not an entropy perspective.
   d) The reaction is favored from an entropy perspective, but not an energy perspective.

Question

P8: A particular type of chlorine atom has a mass number of 35. The chlorine ion for this atom, found in the blood, is formed when the atom gains an electron. This chlorine ion has
   a) 18 electrons
   b) 18 protons
   c) 16 electrons
   d) 17 neutrons
   e) 36 electrons

The last two:

Why is salt a conductor of electricity when you melt it, but sugar is not?

Does covalent bonding allow the formation of the ion SO₄²⁻?