

Name: _____ Date: _____ Period: _____

Solutions and Mixtures

Terms related to Solutions

solution, solute, solvent, dissolve, dissociate, ionize, saturated, unsaturated, supersaturated, solubility, concentrated, dilute, concentration, electrolyte, “like dissolves like,” alloy.

Special Notes

Review how to read and create solubility graphs.

Equations and Formulas of Interest

$$\frac{r \text{ g solute}}{100 \text{ g solvent}} = \frac{x \text{ g solute}}{y \text{ g solvent}}$$

Solubility is on left. You will be given either x or y . Cross multiply and divide to solve for the one you don't have.

Practice Problems

1. The solubility of sugar in water at 20°C is 203.8 g/100g water. How much water is needed to dissolve 35g of sugar at 20°C? (“How much water is needed to make a saturated solution containing 35g of sugar” is an equivalent question, different wording.)
2. How much sugar can be dissolved in 135g of water at 20°C? (“How much sugar is needed to saturate 135g of water at 20°C?” is an equivalent question, different wording.)
3. Use the graph on p. 427 of your textbook. If a solution of 100g water and 80g of KBr is at 80°C, is the solution saturated? What if the temperature is only 10°C?

Answers to Practice Problems

1. 17.17g of water
2. 275.13g of sugar
3. Unsaturated at 80°C, supersaturated at 10°C

Atomic Structure and Periodic Table

Yes, you will be permitted to use your periodic table and polyatomic ion formula chart during the final exam.

Terms related to atomic structure:

proton, neutron, nucleus, electron, isotope, strong force.

Terms related to the periodic table

element, compound, periodic table, average atomic mass (atomic mass number), group (of periodic table), period (of periodic table), halogens (group 17 of periodic table), noble gases (group 18 of periodic table), alkali metals (group 1 of periodic table), transition metals (groups 3 through 12 of periodic table).

Special Notes

Review your periodic table! Know what the various types of elements are and where they are (metals, non-metals, metalloids). What do all the numbers in each entry in the table mean? You should especially be familiar with the first 20 elements on the table (atomic numbers 1 – 20).

Formulas and Equations of Interest

There really aren't any for this unit.

Practice Problems

4. How many protons and neutrons are in the Boron-9 isotope? The Boron-10 isotope?
5. What is the average atomic mass (atomic mass number) of Chlorine?
6. How many electrons does a Nitrogen atom normally have?

Answers to Practice Problems

4. 5 protons, 4 neutrons. 5 protons, 5 neutrons.
5. 35.45
6. 7

Chemical Bonding and Naming***Terms related to Bonding***

electron shell, valence electrons, electron configuration, ions, polyatomic ions, cation, anion, ionic bond, covalent bond, oxidation number (ion charge), Lewis dot diagrams, paired and unpaired electrons, ionic compound, covalent compound (molecule), single-double- and triple- covalent bonds

Special Notes

Review naming of ionic and covalent compounds.

Review how to figure out the correct chemical formula for ionic compounds.

Also, review how to tell if two elements will combine to form ionic or covalent compounds!

Formulas and Equations of Interest

Charge of an ion = # protons - # electrons

Review the “criss-cross” method for determining the formula for ionic compounds.

Practice Problems

7. What is the oxidation number (charge) on a Sodium ion?
8. What is the correct name for $K_2C_2O_4$?
9. What is the correct formula for Gallium Chloride?
10. What is the correct name for Fe_2O_3 ?
11. What is the correct formula for phosphorus tribromide?
12. Noble gases tend not to form ions. Why?
13. How can you predict if two elements will be ionic or covalent?
14. If an atom loses three electrons to form an ion, its charge will be _____.
15. Draw the Lewis dot diagram and ball-and-stick diagram for CO_2 .

Answers to Practice Problems

7. +1
8. Potassium Oxalate
9. $GaCl_3$
10. Iron (III) Oxide
11. PBr_3
12. Noble gases already have stable outer electron shell configurations, so they do not want to gain or lose electrons: doing either would make them less stable. In order to become an ion, an atom needs to gain or lose electrons to become more stable than the original atom.
13. Ionic compounds are formed between a metal and a non-metal; covalent compounds are formed between two non-metals.
14. +3
15. $O=C=O$ (this diagram omits the paired valence electrons that are not involved in the bonding.)

Waves and Sound

Terms related to waves and sound

medium, transverse, longitudinal (compression), amplitude, wavelength, crest, trough, rest position, frequency, period, wave velocity, Hertz, wave front, interference (both constructive and destructive), resonance, harmonics, natural frequency, superposition, pitch, intensity, loudness, Doppler Effect, sound quality (timbre)

Special Notes

Many of the terms here are also used for EM radiation.

Review what factors affect the speed of sound through a medium.

Equations and Formulas of Interest

For all waves:

$$\text{velocity } \left(\frac{m}{s}\right) = \text{frequency (Hz)} \times \text{wavelength } (\lambda)$$

$$\text{period (s)} = 1 \div \text{frequency (Hz)} \quad (\text{period and frequency are reciprocals of each other})$$

Practice Problems

16. What factors influence the speed of a wave through a medium?
17. Compare and contrast transverse and longitudinal (compression) waves.
18. What is the definition of a wave?
19. Describe what you hear as an object making noise approaches you and then passes you and goes away from you again.
20. What is the name for the phenomenon at play in the previous question?
21. A wave has a frequency of 16 Hz and a velocity of $22 \frac{m}{s}$. What is the wavelength? What is the period?
22. What is the difference between wave velocity and wave frequency?
23. Sound travels at $334 \frac{m}{s}$. The frequency of a sound is 440 Hz. What is the wavelength?

Answers to Practice Problems

16. The medium itself (type and shape of particles) and the temperature of the medium.
17. **Transverse:** vibrations of the wave are perpendicular to the direction of wave travel, may be mechanical (needs medium) or EM (does not need medium).
Longitudinal: vibration of the wave is in the same direction as the wave movement, must be mechanical (needs medium). **Both:** both carry energy from one place to another; both can be reflected, refracted, or diffracted; both can use $v = \lambda \times f$ equation.
18. Wave: a rhythmic disturbance that carries **energy** through matter or space.
19. The frequency of the noise being made by the approaching object will increase as it comes toward me, and the frequency of the noise will decrease as it moves past and away from me.
20. The Doppler effect
21. 1.375 m
22. Wave velocity is how fast the wave is moving through space or a medium; wave frequency is how often the crests of a wave pass a certain point per second.
23. 0.759 m

Electromagnetic Radiation, Light, and Color

Terms related to EM Radiation, Light, and Color

Planck's constant, photon, EM spectrum, reflection, refraction, ROYGBIV, light, pigment, primary colors of light/pigments, secondary colors of light/pigments. absorbed, modulation, polarization.

Special Notes

Please review math using scientific notation numbers.

Equations and Formulas of Interest

Wave energy equation: $E = hv$

Planck's constant = $6.626 \times 10^{-34} \text{ J} \cdot \text{s}$

velocity of EM waves in vacuum = $3.0 \times 10^8 \frac{\text{m}}{\text{s}}$.

Practice Problems

24. List the six major regions of the EM spectrum in order, beginning with the EM waves that have the greatest wavelengths and ending with those that have the shortest wavelengths.
25. An EM wave has a frequency of $9.5 \times 10^{18} \text{ Hz}$. How much energy does a photon of this wave have?
26. Green light has a wavelength of $4.9 \times 10^{-7} \text{ m}$. How much energy does a photon of this wave have?

	Incident Light Shined on Object	Pigment Color on Object	Reflected Color of Light
27.	magenta	blue	
28.	yellow		black
29.		yellow	red

Answers to Practice Problems

24. radio, infrared, visible light, ultraviolet, x-rays, gamma rays.
25. $E = 6.29 \times 10^{-15} \text{ J}$
26. $E = 4.06 \times 10^{-19} \text{ J}$
27. blue
28. blue or black
29. red, magenta,

Electricity

Terms related to Electricity

static electricity, electroscope, charging by friction/conduction/induction/polarization, coulomb, magnitude, grounding, factors affecting resistance of materials, circuit, series, voltage drop, parallel, branch, junction/branch point, resistor, ammeter, voltmeter, ohmmeter, ohm (resistance), volt (voltage), ampere (current), power, energy (kilowatt-hour),

Special Notes

Understanding conceptually what happens with charges in static electricity is more heavily stressed on this exam than being able to do the actual math with Coulomb's Law. (Remember those multiple choice questions on the static electricity quiz?)

Review your circuit diagram symbols.

Equations and Formulas of Interest

Coulomb's Law: $F_e = k \cdot \frac{q_1 q_2}{d^2}$

Coulomb's constant (electrostatic constant): $9 \times 10^9 \frac{N \cdot m^2}{C^2}$

Ohm's Law: $V = IR$

In series circuits: $R_{total} = R_1 + R_2 + R_3 + \dots$

In parallel circuits: $\frac{1}{R_{total}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \dots$

Practice Problems

30. What happens to the magnitude of the force between two charged objects as the distance increases?

31. In a series circuit, the current is 3.5 A. The total resistance of the circuit is 12 Ω . What is the total voltage in the circuit?

For questions 32 through 34: In a parallel circuit, there are three devices: a red bulb (0.5 Ω), a resistor (11 Ω), and a blue bulb (3 Ω). The voltage across the circuit is 12 V.

32. Calculate the total resistance of the circuit

33. Calculate the total current in the circuit.

34. How much current is flowing through just the blue bulb?

Answers to Practice Problems

30. it decreases.

31. 42 V

32. 2.42 Ω

33. 4.96 A (depending on how you solve this, you might get slightly different answers, but any answer should be close to this)

34. 4 A