

Physical Science EOCT Study Guide – Domain 1

Chemistry: Atomic and Nuclear Theory and the Periodic Table

Standards: SPS 1, 3-5

I. Students will investigate our current understanding of the atom.

a. The Atom (pg 507)

- An element is matter that is composed of only one type of atom
- Protons and neutrons are found in the nucleus of an atom. electrons surround the nucleus in the electron cloud.
- ~~Protons~~ have a positive charge, electrons have a negative charge, and neutrons are neutral.
- In the space below, draw a diagram of an atom and label the protons, neutrons and electrons:

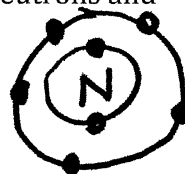
□ protons
• neutrons
+ electrons



Oxygen



Nitrogen



b. Atomic mass and Atomic number

- The Atomic Number equals the number of Protons and electrons in a neutrally charged atom. $A = P = E$
- The number of neutrons can be calculated by subtracting the atomic # from the atomic mass. $M - A = N$
- If an atom has 14 protons and 14 neutrons, what is this atom's atomic mass?
28 g/mol
- If an neutral atom has 33 electrons and has a mass of 60, how many neutrons does it have?
27
- Atoms have the same element that have different numbers of neutrons are called isotopes.

c. Chemical Bonds

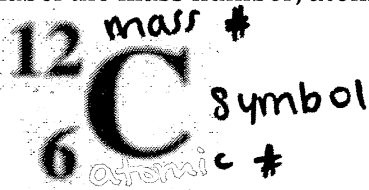
- In an ionic bond, electrons are transferred from a metal to a nonmetal.
- But in a covalent bond, electrons are shared between two nonmetals.
- In it's outermost electron energy level, atoms want 8 electrons. This is known as the octet rule.
- What is an oxidation number?
+ or - # that indicates how many electrons an atom will gain, lose, or share to become stable
- What are valence electrons?
the electrons in the outer most shell

II. Students will distinguish the characteristics of radioactivity

a. Define radioactivity:

process that occurs when a nucleus decays and emits alpha, beta, or gamma radiation

b. Label the mass number, atomic number and element symbol in the following:



c. What does the 12 in "Carbon-12" tell us?

mass is 12

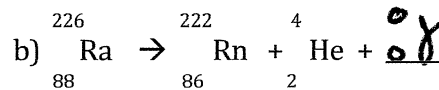
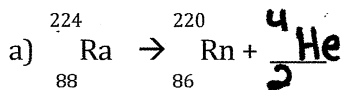
d. Explain alpha and beta particles and a gamma ray (pg 541-543)

alpha:

beta:

gamma:

e. Solve:



f. Explain what half-life is.

the time it takes for half an element to decay

g. Explain fission and fusion. How are they different? Give a real world example of where each takes place.

Fission: elements separate (atomic bomb, nuclear plant)

Fusion: elements come together (sun)

h. What are some problems for using nuclear power as a source of energy?

radiation, pollution to environment

III. Students will compare and contrast the phases of matter as they related to atomic and molecular motion

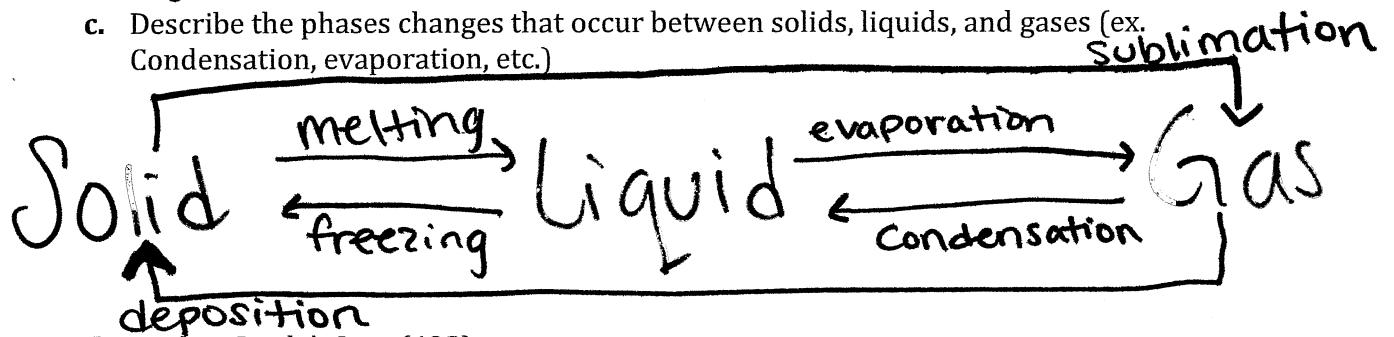
a. Draw a diagram of how molecules are arranged in a solid, liquid and a gas (pg 477-478)



b. Compare and contrast the motion of atoms in solids, liquids and gases.

Solid : vibrate + collide a lot
 liquid : move slowly + collide some
 gas : move quickly + collide randomly

c. Describe the phases changes that occur between solids, liquids, and gases (ex. Condensation, evaporation, etc.)



d. Explain Boyle's Law (492):

with temperature is ~~constant~~ constant,
 ↑ volume ↓ Pressure or ↓ volume ↑ Pressure

e. Explain Charles's Law(494):

↑ T, ↑ V or ↓ T, ↓ V with constant pressure

f. What is Bernoulli's Principle (488)?

as velocity increases, pressure decreases
 ex) blowing over top of paper + the paper rises
 because the pressure pushing down decreases

g. What is Pascal's principle (486)?

Pressure transmitted through a fluid

h. Define Viscosity (489):

a fluids resistance to flow

P, T, V

Students will investigate the arrangement of the Periodic Table

a. On your periodic table:

- i. Write in the valence electrons for groups 1-2, 13-18 above each column
- ii. Write the oxidation numbers for groups 1-2, 13-18 above each column in a different color than you used for writing the valence electrons
- iii. **Outline** the metals in blue, the nonmetals in red and metalloids in purple
- iv. **Shade/color** in the following:
 1. Alkali metals = light blue,
 2. Alkaline Earth metals = green
 3. Halogens = yellow
 4. Noble gases = orange

b. Questions about the periodic table:

- i. Metals are typical Solid at room temperature where as non-metals are typically gases or brittle solids at room temperature.
- ii. How many valence electrons do the following elements have?
Lithium - 1 ii. Phosphorus - 5 iii. Calcium - 2
- iii. How many electrons will calcium lose in order to bond with a nonmetal? (think oxidation #) 2
- iv. How many electrons will Nitrogen gain in order to bond with a metal? (think oxidation #) 3
- v. What is the atomic number of the following elements?
Silicon - 14 Sodium - 11 Lithium - 3 Beryllium - 4
- vi. How many protons do the following elements have:
Oxygen - 8 Magnesium - 12 Sodium - 11 Neon - 10
- vii. How many electrons do the following elements have (they are neutral):
Carbon - 6 Sulfur - 16 Fluorine - 9 Helium - 2
- viii. What is the mass of the following elements?
Bromine - 79.90 Chlorine - 35.45 Carbon - 12.01 Aluminum - 26.98
- ix. How many neutrons do the following elements have?
Hydrogen - 0 Boron - 5 Fluorine - 10 Neon - 10

Valence: 1 2
 6xi dation: +1 +2

Georgia Physical Science End-of-Course Test 3 4 5 6 7 8
 swr -3 -2 -1 0

Periodic Table

Key

- Atomic number — 29
- Element symbol — Cu
- Element name — Copper
- Average atomic mass — 63.55

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
H Hydrogen 1.01	He Helium 4.00	Li Lithium 6.94	Be Beryllium 9.01	B Boron 10.81	C Carbon 12.01	N Nitrogen 14.01	O Oxygen 16.00	F Fluorine 19.00	Ne Neon 20.18	Na Sodium 22.99	Mg Magnesium 24.31	Al Aluminum 26.98	Si Silicon 28.09	P Phosphorus 30.97	S Sulfur 32.07	Cl Chlorine 35.45	Ar Argon 39.95
K Potassium 39.10	Ca Calcium 40.08	Sc Scandium 44.96	Ti Titanium 47.87	V Vanadium 50.94	Cr Chromium 52.00	Mn Manganese 54.94	Fe Iron 55.85	Co Cobalt 58.93	Ni Nickel 58.69	Cu Copper 63.55	Zn Zinc 65.39	Ga Gallium 69.72	Ge Germanium 72.61	As Arsenic 74.92	Se Selenium 78.96	Br Bromine 79.90	Kr Krypton 83.80
Rb Rubidium 85.47	Sr Strontium 87.62	Y Yttrium 88.91	Zr Zirconium 91.22	Nb Niobium 92.91	Mo Molybdenum 95.94	Tc Technetium (98)	Ru Ruthenium 101.07	Rh Rhodium 102.91	Pd Palladium 106.42	Ag Silver 107.87	Cd Cadmium 112.41	In Indium 114.82	Sn Tin 118.71	Sb Antimony 121.76	Te Tellurium 127.60	I Iodine 126.90	Xe Xenon 131.29
Cs Cesium 132.91	Ba Barium 137.33	La Lanthanum 138.91	Hf Hafnium 178.49	Ta Tantalum 180.95	W Tungsten 183.84	Re Rhenium 186.21	Os Osmium 190.23	Ir Iridium 192.22	Pt Platinum 195.08	Au Gold 196.97	Hg Mercury 200.59	Tl Thallium 204.38	Pb Lead 207.2	Bi Bismuth 208.98	Po Polonium (209)	At Astatine (210)	Rn Radon (222)
Fr Francium (223)	Ra Radium (226)	Ac Actinium (227)	Rf Rutherfordium (261)	Db Dubnium (262)	Sg Seaborgium (266)	Bh Bohrium (264)	Hs Hassium (265)	Mt Meitnerium (268)	Ds Darmstadtium (261)	Rg Roentgenium (262)	Uub Ununbium (285)	Uut Ununtrium (284)	Uuq Ununquadium (289)	Uup Ununpentium (288)			
		Th Thorium 232.04															
		Pa Protactinium 231.04															
		U Uranium 238.03															
		Np Neptunium (237)															
		Pu Plutonium (244)															
		Am Americium (243)															
		Cm Curium (247)															
		Bk Berkelium (247)															
		Cf Californium (251)															
		Es Einsteinium (252)															
		Fm Fermium (257)															
		Md Mendelevium (258)															
		No Nobelium (259)															
		Lr Lawrencium (262)															
		La Lanthanum 138.91															
		Ce Cerium 140.12															
		Pr Praseodymium 140.91															
		Nd Neodymium 144.24															
		Pm Promethium (145)															
		Sm Samarium 150.36															
		Eu Europium 151.96															
		Gd Gadolinium 157.25															
		Tb Terbium 158.93															
		Dy Dysprosium 162.50															
		Ho Holmium 164.93															
		Er Erbium 167.26															
		Tm Thulium 168.93															
		Yb Ytterbium 173.04															
		Lu Lutetium 174.97															

alkali
 Alkaline earth
 Lanthanide series
 Actinide series

metals

non-metals
 noble gas
 halogen

EOCT practice Questions

Answer the following questions out of the
"Master the Georgia End of Course Test" books

Page 57 - SPS1a

1. ____
2. ____
3. ____
4. ____
5. ____

Page 58 - SPS1b

1. ____
2. ____
3. ____
4. ____
5. ____

Page 64 - SPS 3a

1. ____
2. ____
3. ____
4. ____
5. ____

Page 65 - SPS 3b

1. ____
2. ____
3. ____
4. ____
5. ____
6. ____

Page 66 - SPS 3c

1. ____
2. ____
3. ____
4. ____

Page 67 - SPS 3d

1. ____
2. ____
3. ____

Page 68 - SPS 4a

1. ____
2. ____
3. ____
4. ____
5. ____
6. ____

Page 69 - SPS 4b

1. ____
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3. ____
4. ____
5. ____

Page 70 - SPS 5a

1. ____
2. ____
3. ____
4. ____
5. ____

Page 71 - SPS 5b

1. ____
2. ____
3. ____
4. ____

Physical Science EOCT Study Guide – Domain 2

Chemistry: Chemical Reactions and Properties of Matter

Standards: SPS 2 and 6

- I. Students will explore the nature of matter, its classifications, and the system for naming types of matter

a. Define density:

mass per unit volume of material

- b. If a substance has a mass of 40 Kg and a volume of 20 L, what is this object's density?

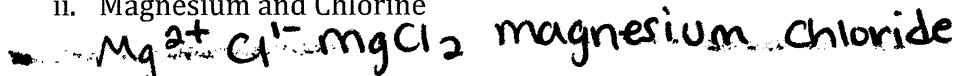
$$\frac{40\text{kg}}{20\text{L}} = 2\text{kg/L}$$

- c. Write the formula and the name of the following ionic compounds:

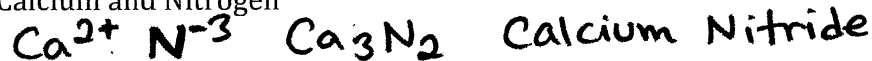
i. Lithium and Oxygen



ii. Magnesium and Chlorine



iii. Calcium and Nitrogen



- d. Write the formula for the following covalent compounds:

i. Tetranitrogen pentoxide



ii. Disulfur Trifluoride



- e. Name the following covalent compounds

i. C_3O

tricarbon monoxide

ii. SF_4

Sulfur tetrafluoride

- f. Determine if the following compounds are ionic or covalent:

i. CO_2 Covalent

ii. NaCl ionic

iii. SCl_3 Covalent

g. Explain the Law of Conservation of Matter

matter can not be created or destroyed

h. When balancing equations, we can only adjust the Coefficients not the subscript

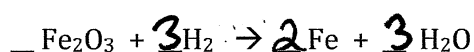
i. Circle the coefficient and put a square around the subscript: $3CO_2$

j. How many of each element do you have in this: $3CO_2$ C = 3 O = 6

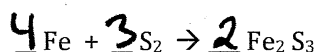
k. **Balance** the following equations and determine what **type of reaction** they are:



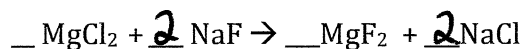
decomposition



Single displacement

~~Combustion~~

Synthesis



double displacement

l. Give an analogy for each type of reaction:

i. Synthesis:

cheese + bread \rightarrow grilled cheese

ii. Decomposition:

pen \rightarrow pen + cap

iii. Single displacement:

2 people dancing + 1 single \rightarrow single switches places with one of the dancers

iv. Double Displacement:

2 kids switch one thing from their lunch

II. Students will investigate properties of solutions (664-685)

a. What is a solution?

homogeneous mixture that remains mixed + particles can not be seen

b. Explain the difference between a homogeneous mixture and a heterogeneous mixture. Provide examples of each.

homogenous: evenly mixed: colloid

heterogeneous: unevenly mixed + easy to identify: mixed nuts

c. Explain what a solute and solvent is. Give an example.

solute: thing dissolving in a solvent: salt

solvent: does the dissolving: water

- d. Explain the difference between electrolytes and nonelectrolytes
 electrolyte ionizes in water and conducts electricity,
 nonelectrolytes do not
- e. What are 3 things you can do to increase the speed of dissolving of a solid in a liquid?
 Stir, heat, crush to increase surface area

- f. How do you increase the speed of dissolving of a gas in a liquid?

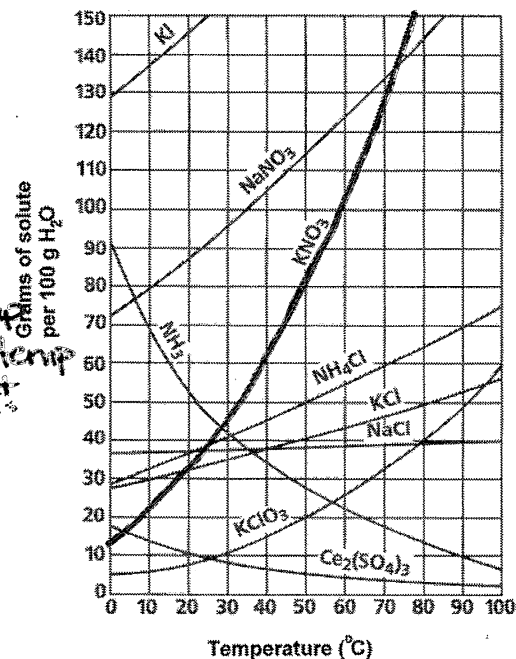
↑ pressure ↓ temp

- g. Explain unsaturated solutions, saturated solutions, and supersaturated solutions.

Unsaturated: can dissolve more at temp
 Saturated: all solute it can hold at temp
 Supersaturated: contains more solute at that temp

- h. Using the solubility curve, what type of solution do you have if you dissolve 90 grams of KNO_3 into 100 grams of water at 60°C ?

Saturated



- i. Which solute is least affected by temperature? change in the solubility graph?

NaCl

III. Students will compare and contrast the components and properties of acids and bases (696 - .

- a. Define acid: any substance that produces hydrogen ions, H^+ , in solution

- b. Define bases: any substance that produces hydroxide ions, OH^- , in solution

- c. What range on the pH scale are acids found?

0 - 6

7 = neutral

- d. What range on the pH scale are bases found?

8 - 14

- e. What are some properties of acids?

Sour taste, Corrosive,

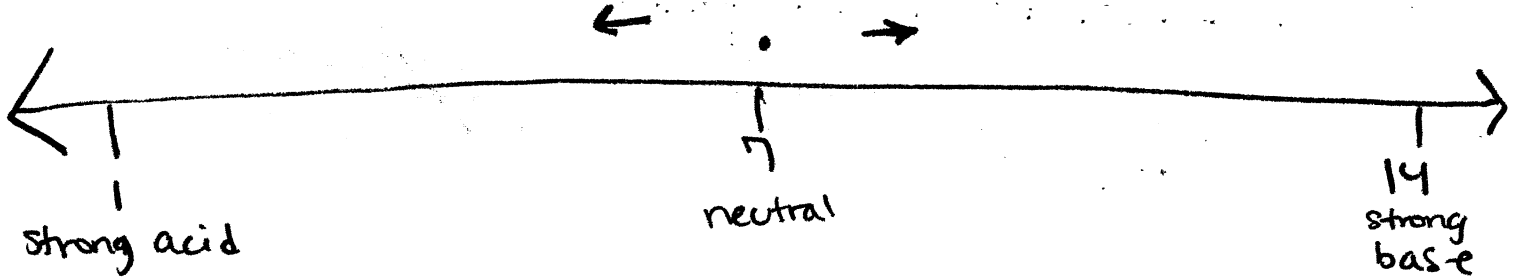
- f. What are some properties of bases?

Crystalline solids, slippery in solution, bitter, corrosive when strong

- g. In the space below, draw a pH scale and include the following information (pg 704)
- pH values (and which ones are acids and which are bases)

- Location of the following:

- ← Soft drinks
- ← Vinegar
- Milk •
- Milk of magnesia •
- Baking soda •
- Ammonia →
- Drain cleaner →
- Blood •
- Water •



- h. Determine if the following are an acid, base or neutral: A B N

- B. pH = 9
- A. reacts with a metal very easily to produce hydrogen gas
- A. vinegar
- B. cleaning products
- N. pH = 7
- A. pH = 3
- A. Sodas
- B. Ammonia
- A. Turns litmus paper red
- N. Pure water

EOCT practice Questions

Answer the following questions out of the
"Master the Georgia End of Course Test" books

Page 59 – SPS12a

1. ____
2. ____
3. ____
4. ____
5. ____

Page 60 – SPS2b

1. ____
2. ____
3. ____
4. ____

Page 61 – SPS 2c

1. ____
2. ____
3. ____
4. ____

Page 62 – SPS 2d

1. ____
2. ____
3. ____
4. ____
5. ____

Page 63 – SPS 2e

1. ____
2. ____
3. ____
4. ____
5. ____

Page 67 – SPS 3d

1. ____
2. ____
3. ____

Page 72 – SPS 6a

1. ____
2. ____
3. ____
4. ____
5. ____

Page 73 – SPS 6b

1. ____
2. ____
3. ____
4. ____
5. ____

Page 74 – SPS 6c

1. ____
2. ____
3. ____
4. ____

Page 75 – SPS 6d

1. ____
2. ____
3. ____
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5. ____
6. ____

Page 76 – SPS 6e

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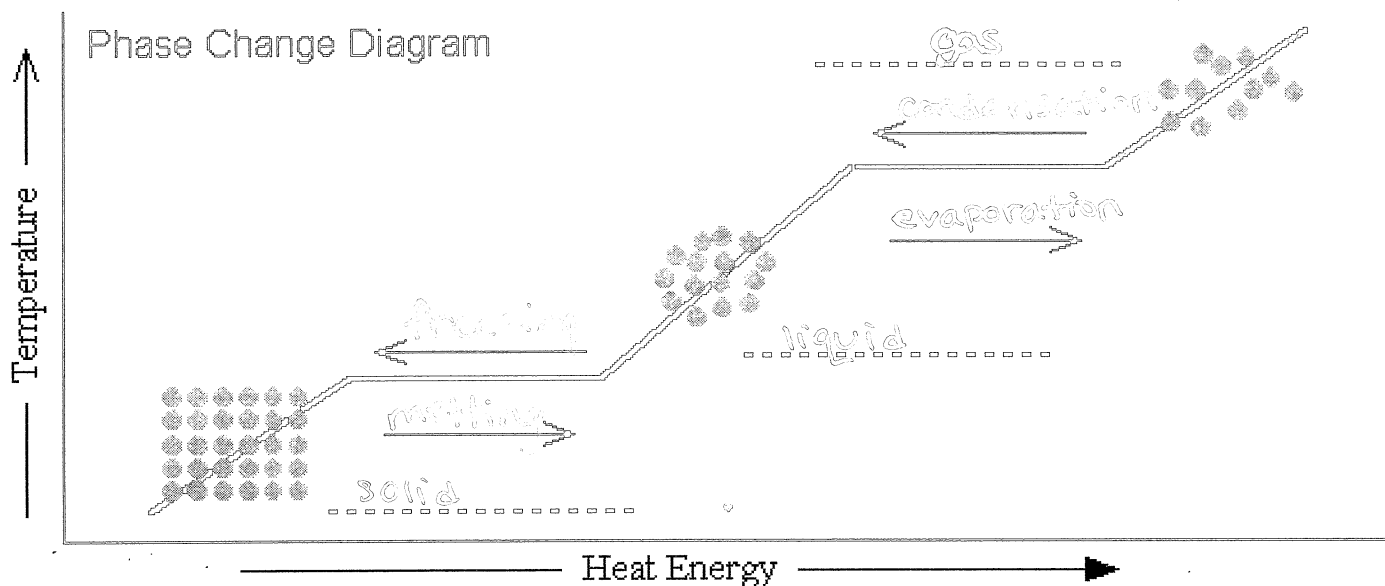


Physical Science EOCT Study Guide – Domain 3

Physics: Energy, Force and Motion

Standards: SPS 7 and 8

- I. Students will relate transformations and flow of energy within a system.
- Define thermal energy: **sum of the kinetic and potential energy of the particles in an object**
 - Define heat: **thermal energy that flows from a warmer material to a cooler material**
 - Define specific heat: **amount of thermal energy needed to raise the temp of 1kg of a material 1°C**
 - Explain conduction, convection and radiation. Provide examples of each.
Conduction: heat moving from direct contact between two materials from higher temp. to lower temp.
convection: transfer of heat in fluid by the movement of warmer and cooler fluid from one place to another
Radiation: transfer of heat by electromagnetic waves
- e. Label the following phase change diagram:



II. Students will determine relationships among force, mass and motion.

a. Explain the difference between distance and displacement.

distance is how far you go totally

displacement is distance away from original location

b. What is the difference between average speed and instantaneous speed?

Average speed is distance/time

instantaneous speed is at a particular moment

c. Define inertia:

resistance of an object to a change in its motion

d. What are Newton's 3 laws of motion?

1st Law: an object in motion stays in motion unless acted upon by an opposing force

2nd Law: acceleration is in the same direction as the force. $F=ma$

3rd Law: two objects exert force on each other in opposite directions

e. What is the difference between mass and weight (pg 77)?

mass is total amount of matter

weight is the force gravity puts on that mass

f. What is the difference between kinetic energy and potential energy?

kinetic energy is of a moving object

potential energy is stored

g. What are some different types of potential energy? Give specific examples for each. (You should list at least 3)

elastic potential energy: spring or rubber band

chemical potential energy: chemical bonds

gravitational potential energy: gravity

h. Name the 6 simple machines and give an example of each.

• lever: screw driver used to open paint can

• pulley: block + tackle

• wedge: knife blade

• wheel + axle: hand pencil sharpener

• inclined plane: hill

• screw: screw

EOCT practice Questions

Answer the following questions out of the
"Master the Georgia End of Course Test" books

Page 77 – SPS7a

1. ____
2. ____
3. ____
4. ____

Page 83 – SPS 8c

1. ____
2. ____
3. ____
4. ____

Page 78 – SPS7b

1. ____
2. ____
3. ____
4. ____
5. ____

Page 84 – SPS 8d

1. ____
2. ____
3. ____
4. ____

Page 79 – SPS 7c

1. ____
2. ____
3. ____
4. ____

Page 85 – SPS 8e

1. ____
2. ____
3. ____
4. ____

Page 80 – SPS 7d

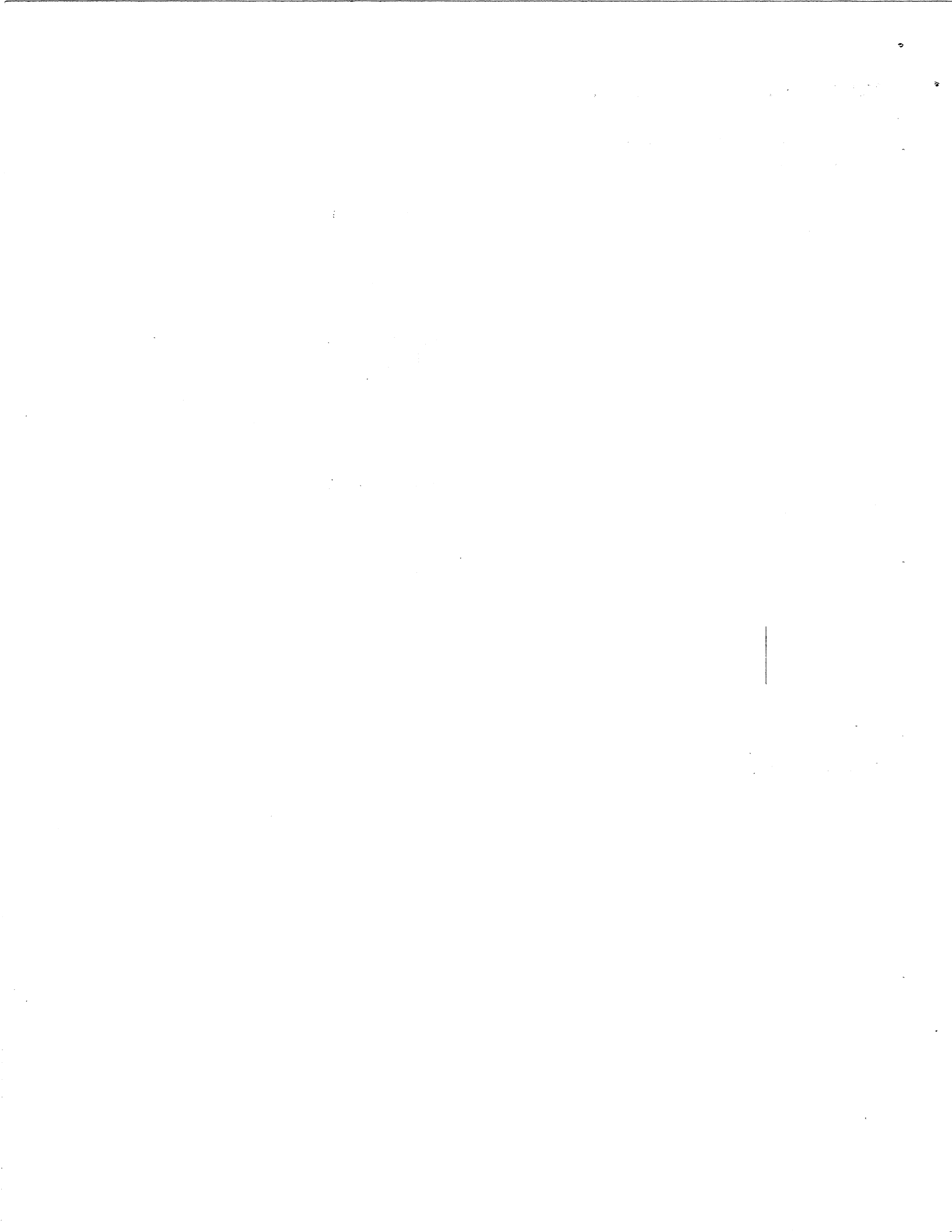
1. ____
2. ____
3. ____
4. ____

Page 81 – SPS 8a

1. ____
2. ____
3. ____
4. ____

Page 82 – SPS 8b

1. ____
2. ____
3. ____
4. ____



Physical Science EOCT Study Guide – Domain 4

Physics: Waves, Electricity, and Magnetism

Standards: SPS 9 and 10

I. Students will investigate the properties of waves.

a. All waves transfer energy, they do not transfer matter.

b. Define frequency:
the number of wavelengths

c. Define wavelength:
distance between one point on a wave and the nearest point just like it

d. How do you calculate the velocity of a wave?



$$V = f \cdot \lambda$$

f = frequency

λ = wavelength

e. Compare and contrast the characteristics of electromagnetic and mechanical waves.

electromagnetic

- waves created by vibrating electric charges
- travel through vacuum or matter
- variety of frequency + wavelengths

mechanical

f. Compare and contrast transverse and compressional waves.

Transverse

- move through medium at 90 degree angle to direction of wave

compressional

- matter moves back and forth in the direction of wave

g. Explain reflection. Provide an example.

a wave strikes a object and bounces off of it

h. Explain refraction. Provide an example.

the bending of a wave as it changes speed moving from one medium to another.

ex looking at a straw in and out of water

i. Explain interference (include both constructive and destructive). Draw a diagram to represent each type.

- when 2 or more waves combine and overlap to form a new wave
- constructive: 2 smaller waves come together to form one big wave
- destructive: 2 equal waves run into each other + disipate/disappear

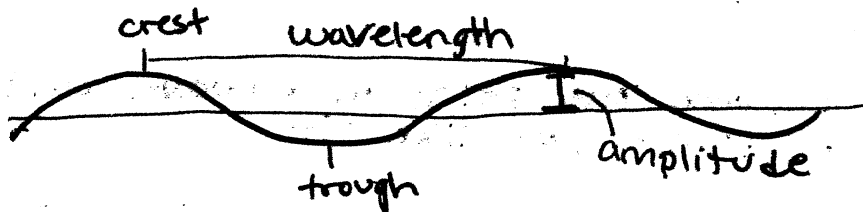
j. Explain diffraction. Provide an example.

- bending of waves around an obstacle or through a narrow opening
ex) a wave in the ocean going between 2 rocks

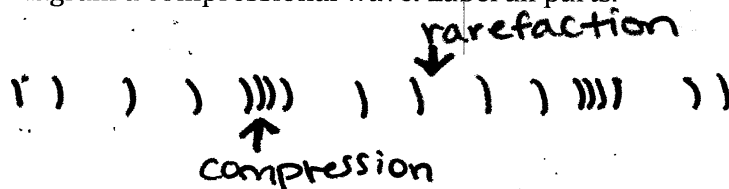
k. Explain the Doppler effect and provide a real world example of it.

- change in pitch or frequency that occurs when a source of a sound is moving relative to the listener
ex) ambulance

l. Diagram a transverse wave. Label all parts.



m. Diagram a compressional wave. Label all parts.



n. Explain how the amplitude of a wave relates to the amount of energy a wave has.

the greater the amplitude, the more energy the wave carries

o. Explain the relationship of wavelength and frequency on the electromagnetic spectrum.

longer the wavelength, the lower the frequency. Shorter wavelength, higher frequency

p. Explain how different mediums affect the speed of a wave. Include both electromagnetic waves and sound waves.

Mediums can affect the speed of a wave. In a vacuum, electromagnetic waves travel faster than solids and liquids. Sound waves travel through medium faster

II. Students will investigate the properties of electricity and magnetism.

a. Define friction:

force that opposes the sliding motion between two touching surfaces

b. Explain the difference between alternating and direct currents.

- direct currents go in one direction from a battery source

- alternating currents change direction and originate from a motor

EOCT practice Questions

Answer the following questions out of the
"Master the Georgia End of Course Test" books

Page 86 - SPS9a

1. ___
2. ___
3. ___
4. ___

Page 87 - SPS9b

1. ___
2. ___
3. ___
4. ___

Page 88 - SPS 9c

1. ___
2. ___
3. ___
4. ___

Page 89 - SPS 9d

1. ___
2. ___
3. ___
4. ___
5. ___

Page 90 - SPS 9e

1. ___
2. ___
3. ___
4. ___

Page 91 - SPS 9f

1. ___
2. ___
3. ___
4. ___

Page 92 - SPS 10a

1. ___
2. ___
3. ___
4. ___

Page 93 - SPS 10b

1. ___
2. ___
3. ___
4. ___

Page 94 - SPS 10c

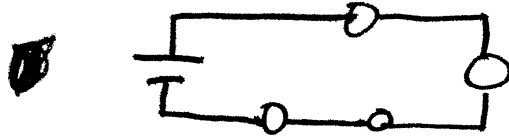
1. ___
2. ___
3. ___
4. ___

c. Compare and contrast series and parallel circuits.

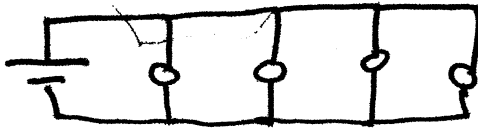
Series: all resistors are on the same path and the electricity only has one path to travel.

Parallel: electricity has more than one path to travel

d. Draw a series circuit with 1 battery and four light bulbs.



e. Draw a parallel circuit with 1 battery and four light bulbs.



f. Explain the relationship among voltage, resistance, and current (Ohm's Law).

$$V = IR \quad \text{or} \quad I = \frac{V}{R} \quad \text{or} \quad R = \frac{V}{I}$$

g. Explain how an electromagnet works.

a temporary magnet formed by wrapping a wire coil, carrying a current, around an iron core.

h. Compare and contrast permanent magnets and electromagnets.

Permanent magnet

- magnetic domains are permanent

electromagnet

- magnetic domains are temporary
- need electricity to create magnetic field