**Science 10 Review**

Bolded numbers are textbook reference pages.

**CHEMISTRY:**

* WHMIS – Workplace Hazardous Materials Information System; symbols used to identify dangerous materials (**xiii, 8**)
* Classifying Matter – matter is anything with mass and volume and could be either solid liquid or gas. Matter can be further divided into either a mixture or a pure substance. See page **10**.
* Atomic Theories –Early Chemists devised theories about the structure of an “atom”.
	+ Dalton’s Atomic Theory (**12**):
		- All matter is made up of small particles called atoms
		- Atoms cannot be created, destroyed or divided into smaller parts
		- All atoms of the same element have the same mass but different elements have different masses
		- Put two elements together and you get a *compound*
		- Chemical reactions change the way atoms are grouped but atoms themselves do not change
		- Looks like a billiard ball (solid, uniform, sphere)
	+ J.J. Thomson (**15**):
		- Thought atoms might be made up of smaller particles
		- Proved that negatively charged *electrons* were part of an atom
		- Viewed atom as a “raisin bun”
	+ Rutherford (**16**):
		- Using alpha particle streams showed that positively charged *protons* and neutral *neutrons* existed within an atom’s *nucleus*.
		- A volume of empty space surrounded the nucleus
		- Atomic model looks like a “solar system”
	+ Bohr (**19**):
		- Thought electrons were associated with certain *energy levels*

|  |  |
| --- | --- |
| **Energy level** | **Maximum # of electrons** |
| 1 | 2 |
| 2 | 8 |
| 3 | 8 |

* What element is the drawing of? \_\_\_\_\_\_Al
	+ Working Model of the Atom (**22**):

|  |  |  |
| --- | --- | --- |
| **Subatomic** **particle** | **Charge** | **Symbol** |
| Proton | 1 + | p+ |
| Neutron | 0 | n0 |
| electron | 1 - | e- |



* Nuclear Notation (**22**) using the periodic table -
	+ Atomic Number = number of protons
	+ Mass Number = number of protons + number of neutrons
	+ Number of neutrons = mass # - atomic #
		- How many neutrons in magnesium? \_\_\_\_\_\_12
* Periodic Table (**25**):
	+ Organizes elements to help us predict their *properties*
	+ Three major sections:
		- Metals - left side
		- Non-metals – right side
		- Metalloids – border the “staircase line” that separates metals and non-metals
		- Read about each sections properties in the text book.
	+ Elements arranged into **periods** (horizontal rows) and **groups** (vertical columns)
		- Periods – elements are in order of their atomic number, each period has the same number of energy levels for electrons. Eg. Elements with 3 energy levels (more than 10 electrons) are found in period (row) 3.
		- Groups – elements have similar properties as those found above and below them. Sometimes called “families” eg. Group 1 is the Alkali Metals (look on page 25 for the name of the rest). Main groups have the same number of *valence electrons* (electrons on the outer most shell).
		- Valence Electrons – If the outer shell of an atom is full this is called a “stable octet”. Atoms want their valence shell to be full so they gain or lose electrons.
			* Once the atom no longer has the same number of electrons as protons the atom has a *charge*. It is now called an **ion** instead.
	+ Formation of Ions (**29**):
		- Positive Ions are called CATIONS – they have *lost* electrons (metals do this)
		- Negative Ions are called ANIONS – they have *gained* electrons (non-metals do this)
		- Ions form when atoms collide and their valence electrons interact. Since they both want to have full outer electrons shells like the nearest noble gas they negotiate electrons.
			* Compounds made of Ions are called  **Ionic Compounds** – Positive + Negative
				+ Held together by ionic bonds forming a *crystal lattice*
				+ ELECTRICALLY NEUTRAL – the compound has no net charge!!
	+ Naming Ions (**44**)
		- The 1st element in the name and the formula is the metal
		- The 2nd element, the non-metal named as an ion (add suffix “-ide” ) fluorine = fluoride
		- Eg. LiCl \_\_\_\_lithium chloride\_\_\_\_\_\_\_\_\_\_ KBr \_\_\_\_pottasium bromide\_\_\_\_\_\_\_\_\_\_\_ CaCl2 \_\_\_\_\_calcium chloride\_\_\_\_\_\_\_\_\_\_\_
	+ Formulas (**45**):
		- Use ion charges from you periodic table to decide the charge of each
		- Decide how many of each ion is required to create a neutral compound
		- If more than one, denote the number with a subscript beside the element symbol
			* Eg. Potassium Oxide = K+ and O2- we need two potassium to make neutral = K2O (s)
		- Eg. Potassium sulfide \_\_\_\_\_\_\_\_\_\_ (K2S) Beryllium fluoride \_\_\_\_\_\_\_\_\_\_\_ (BeF2)
	+ Multivalent Elements -The Stock System (**46**):
		- Some metals have more than one cation. The stock system determines the charge to use.
		- Cation ion charge is written in brackets as a roman numeral after the metal name
			* Eg. Ni2+ is nickel (II) and Ni3+ is nickel (III)
	+ Polyatomic Ions (**51**):
		- A group of different atoms joined by a covalent bond with an *overall* charge or + or -.
		- You will find the names, formulas and charges of these on the back of your periodic table
		- To name use the name of the cation followed by the name of the anion – no suffix change
			* Eg. NO3- is called nitrate. It has an overall charge of 1-. When bonded with Zn2+ we get – Zn (NO3)2 or zinc nitrate.
	+ Acids – read about the properties of acids on pages **63-66**
		- An acid contains hydrogen as the cation (the first element in a formula)
		- Name first as an ionic compound and *then* apply the acid rules depending on the result
		- **hydrogen \_\_\_\_ide = hydro\_\_\_\_ic acid** HCl = hydrogen chloride = hydrochloric acid
		- **hydrogen\_\_\_\_­\_ate = \_\_\_\_\_\_\_\_\_ic acid** HClO3 = hydrogen chlorate = chloric acid
		- **hydrogen\_\_\_\_\_ite = \_\_\_\_\_\_\_ous acid** HClO2 = hydrogen chlorite = chlorous acid
* Molecular Compounds (**31**):
	+ - Groups of atoms with no charge called *molecules* – not ions
		- Contains only *non-metal* atoms
		- Atoms of the same element can from bonds so elements can exist as molecules
			* Diatomic molecules (aka the Special Seven –MEMORIZE!!)
				+ O2(g) - H2(g) - N2(g) - F2(g) - Cl2(g)  - Br2(g) - I2(g) & P4(s)  -S8(s)
	+ Elements joined by *covalent* bonds – sharing electrons not exchanging them
	+ Naming Molecular Compounds (**43**): 2 or more non-metals together
		- First element in the name is the one farther to the left on the periodic table
		- The suffix “-ide” is added to the name of the second element
		- *Prefixes* are used to tell how many atoms are of each type are in the molecule (prefixes can be found on the back of the periodic table) \* *mono* is used only for the 2nd element \*
			* Eg. CO2 = carbon *di*oxide, CCl4 = carbon *tetra*chloride
		- Some molecular compounds do not follow simple naming rules – MEMORIZE them

|  |  |
| --- | --- |
| H2O(l) water  | H2O2(1) hydrogen peroxide |
| NH3(g) ammonia | C12H22O11(s) sucrose |
| CH4(g) methane | C3H8(g) propane |
| CH3OH(l) methanol | C2H5OH(l) ethanol |
| C6H12O6(s) glucose | O3(g) ozone |

* + Molecular and Ionic compounds have specific properties. Refer to **section 2.2** of text.
	+ For a summary of naming ionic and molecular compounds turn to **table 2.6 on page 54**
* Chemical Reactions (**85**)
	+ Occurs when one or more substances change to form different substances
	+ Substances that undergo change are called *reactants* substance that result are called *products*
		- Reactants → Products: all chemical reactions involve a change in energy
	+ Evidence a chemical reaction has occurred may include:
		- Energy change
		- Odor Change
		- Color Change
		- Formation of Gas
		- Formation of a solid (Precipitate) in solution
	+ A precipitate is an insoluble solid formed out of solution. (**88**) We can predict if a cation and an anion will mix to form a precipitate using the Solubility chart on the back of your periodic table
		- High Solubility = (aq)
		- Low Solubility = (s)
		- *Everything is soluble if NH4+, NO3-, or Group 1 is involved*
	+ Reactions release or absorb energy (**90**)
		- Release energy = *exothermic reaction* eg. Combustion of gasoline
		- Require energy = *endothermic reaction* eg. Photosynthesis needs the sun’s energy
		- The Law of Conservation of Energy states that energy cannot be create or destroyed only transferred. Breaking chemical bond = endothermic; forming new bonds = exothermic.
	+ Writing Reactions (**94**)

Arrow means “produce”

Products on right side of arrow

Reactants on left side of arrow

***Zn(s) + AgNO3(aq) Zn(NO3)2(aq) + Ag(s)***

Plus sign means “reacts with”

* + Balanced Equations (**97**):
		- There needs to be the same number of atoms on one side of the equation as the other
		- Called the *Law of Conservation of Mass*. We use *Coefficients* (big numbers in front of formulas) to balance atoms on either side.
1. Write out formulas for all compounds and elements, add arrow and plus signs if needed
2. Identify unbalanced atoms and polyatomic ions & add coefficients where necessary.
3. Check balancing at the end
* \_\_\_Li(s) + \_\_\_HOH(l) → \_\_\_LiOH(aq) + \_\_\_H2g) – Hydrogen appears by itself, balance that first
* \_\_\_Li(s) + \_2\_HOH(l) → \_\_\_LiOH(aq) + \_\_\_H2g) – Now there are two hydroxide molecules, balance LiOH
* \_\_\_Li(s) + \_2\_HOH(l) → \_2\_LiOH(aq) + \_\_\_H2g) – Now there are two Li atoms, balance Li (s) next
* \_2\_Li(s) + \_2\_HOH(l) → \_2\_LiOH(aq) + \_\_\_H2g)  - Check and we’re done
* Types of Reactions (**103**)
	+ Reactions are classified to help predict the products
		- **Formation**– two or more reactants combine to make a new compound (product) A+B→AB
		- **Decomposition**– a compound breaks into simpler compounds or elements
			* AB→A+B
		- **Single Replacement** – one element replaces another in a compound
			* A + BX → AX + B
		- **Double Replacement** – cations & anions exchange partners to form new compounds
			* AX + BY → AY + BX
			* These reactions may form a precipitate so check solubility chart
		- **Combustion**- adding oxygen to form most common oxide
			* X + O2 → XO?
			* Often involves hydrocarbons (compounds containing hydrogen and carbon)
			* Balance carbon first, then hydrogen and balance oxygen last.
* The Mole (**116**)
	+ Avagadro’s number is 6.02 x 1023 – called a **Mole** (symbol **mol**)
	+ The mass of 1 mol of all the isotope of a substance is called its **atomic molar mass** and is listed on the periodic table for each element. Eg. Iron – 55.85g, Sodium 22.99g
	+ The **molar mass (M)** has the units g/mol is the mass of 1 mol of any pure substance
		- Molar mass of compound is found using formula – CO2 = 1(12.01g/mol)+ 2(16.00g/mol)
			* 44.01 g/mol
* Converting between mass and molar mass (**121**)
	+ *n* = *m* / M
	+ *n =* amount (mol)
	+ *m =* mass (g)
	+ *M =* molar mass (g/mol)
* Coefficients of a balanced equation refer to the number of moles of each atom, molecule or formula unit (**124)**

**Atoms and Ions Review:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Name | Symbol  | # protons  | # electrons | # neutrons | Charge |
| arsenic atom | As | 33 | 33 | 42 | 0 |
| Chlorine atom  | Cl | 17 | 17 | 18 | 0 |
| Antimony ion | Sb5+ | 51 | 46 | 71 | 5+ |
| Xenon atom | Xe | 54 | 54 | 77 | 0 |
| Magnesium ion | Mg2+ | 12 | 10 | 12 | 2+ |
| hydride | H- | 1 | 2 | 1 | -1 |
| Sulphide ion | S2- | 16 | 18 | 16 | 2- |
| Aluminum ion | Al3+ | 13 | 10 | 14 | 3+ |
| Nitride ion | N3- | 7 | 10 | 7 | 3- |

**Naming Review -** Use subscripts to indicate the state at room temperature

|  |  |  |  |
| --- | --- | --- | --- |
|  | I, M, or A | **Name** | **Chemical Formula** |
| 1. | I | sodium chloride | **NaCl** |
| 2. | I | **Calcium carbonate** | CaCO3 |
| 4. | I | sodium hydroxide | **NaOH** |
| 5. | I | **Calcium oxide** | CaO |
| 6. | I | **Magnesium sulfate hepta hydrate** | MgSO4•7H2O |
| 7. | M | carbon dioxide | **CO2** |
| 8. | A | acetic acid | **CH3COOH** |
| 9. | M | carbon | C |
| 10. | I | calcium sulfate | CaSO4 |
| 11. | I | **Sodium silicate** | Na2SiO3 |
| 12. | I | **Calcium hydrogen carbonate** | Ca(HCO3)2 |
| 13. | I | magnesium hydroxide | **MgOH2** |
| 14. | I | potassium chloride | **KCl** |
| 15. | I | sodium thiosulfate pentahydrate | **Na2S2O3∙5H2O** |
| 16. | I | sodium hypochlorite | **NaClO** |
| 17. | I | **Sodium carbonate** | Na2CO3 |
| 18. | A | **Hydrochloric acid** | HCl(aq) |
| 19. | I | potassium nitrate | **KNO3** |
| 20. | I | **Copper sulfate penta hydrate** | CuSO4•5H2O |
| 21. |  | magnesium oxide | **MgO** |
| 22. | I | **Potassium iodide** | KI |
| 23. | A | **Sulfuric acid** | H2SO4(aq) |
| 24. |  | **Calcium hydroxide** | Ca(OH)2 |

**Balance the following equations.**

1. \_\_\_K(s) + \_\_\_ Cl2(g) 🡪 \_\_\_ KCl(s)
2. 2,1,2
3. 8,1,8
4. 2,2,1
5. 2,2,1
6. 2,3,1,6
7. 1,1,5
8. 4,1,2
9. 1,2,2,1
10. 3,4,4,1
11. \_\_\_Fe(s) + \_\_\_S8(s) 🡪 \_\_\_FeS(s)
12. \_\_\_H2O(l) 🡪 \_\_\_H2(g) + \_\_\_O2(g)
13. \_\_\_NaCl(s) 🡪 \_\_\_Na(s) + \_\_\_Cl2(g)
14. \_\_\_AsCl3(aq) + \_\_\_H2S(aq) 🡪 \_\_\_As2S3(s) + \_\_\_HCl(aq)
15. \_\_\_CuSO4 •5H2O(s) 🡪 \_\_\_CuSO4(s) + \_\_\_H2O(aq)
16. 2,3,3,1
17. 1,3,1,3
18. 1,2,2,1,1
19. 2,3,3,1
20. 1,2,2,1
21. 2,3,2,2
22. 1,5,3,4
23. 1,2,1,2
24. 1,3,3,1
25. \_\_\_Na(s) + \_\_\_O2(g) 🡪 \_\_\_Na2O(s)
26. \_\_\_H2S(aq) + \_\_\_KOH(aq) 🡪 \_\_\_HOH(l) + \_\_\_K2S(aq)
27. \_\_\_Fe(s) + \_\_\_H2O(g) 🡪 \_\_\_H2(g) + \_\_\_Fe3O4(s)
28. \_\_\_Al(s) + \_\_\_H2SO4(aq) 🡪 \_\_\_H2(g) + \_\_\_Al2(SO4)3(aq)
29. \_\_\_AlCl3(aq) + \_\_\_NaOH(aq) 🡪 \_\_\_Al(OH)3(s) + \_\_\_NaCl(aq)
30. \_\_\_Na2CO3(aq) + \_\_\_HCl(aq) 🡪 \_\_\_NaCl(aq) + \_\_\_H2O(l) + \_\_\_CO2(g)
31. \_\_\_Fe(s) + \_\_\_CuSO4(aq) 🡪 \_\_\_Cu(s) + \_\_\_Fe2(SO4)3(aq)
32. \_\_\_H2SO4(aq) + \_\_\_KOH(aq) 🡪 \_\_\_HOH(l) + \_\_\_K2SO4(aq)
33. \_\_\_ZnS(s) + \_\_\_O2(g) 🡪 \_\_\_ZnO(s) + \_\_\_SO2(g)

Balance the following two reactions doing C, then H then O last.

1. \_\_\_C3H8(g) + \_\_\_O2(g) 🡪 \_\_\_CO2(g) + \_\_\_H2O(g)
2. \_\_\_CH4(g) + \_\_\_O2(g) 🡪 \_\_\_CO2(g) + \_\_\_H2O(g)
3. \_\_\_H3PO4(aq) + \_\_\_NH4OH(aq) 🡪 \_\_\_HOH(l) + \_\_\_(NH4)3PO4(aq)

**Write and Balance the following Word Problems:**

1. Exothermic reaction between aqueous sodium hydroxide and sulphuric acid.

2 NaOH(aq) + H2SO4 (aq) → Na2SO4 (aq) + 2 HOH (l)

1. Formation of a precipitate by reacting sodium carbonate and calcium chloride.

Na2CO3 (aq) + CaCl2 → 2NaCl (aq)  + CaCO3 (s)

1. Adding aqueous chlorine to aqueous sodium bromide.

Cl2 (aq) + 2NaBr (aq) → 2NaCl (aq) + Br2 (l)

1. Adding a drop of lead (II) nitrate to a sliver of zinc metal

Pb(NO3)2 (aq) + Zn(s) → Zn(NO3)2 (aq) + Pb(s)

1. Adding a drop of tin nitrate to a sliver of zinc metal

Sn(NO3)4 (aq) + 2 Zn(s) → 2 Zn(NO3)2 (aq) + Sn(s)

1. There was a terrible accident in the lab! Someone took all the labels off and you need to help Ms. Williams re-label. The following is data collected from the unlabeled chemicals:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Unknown | State at SATP | Solubility | Blue Litmus Test | Red Litmus Test | Conductivity |
| A | Solid | High | Blue | Blue | High |
| B | Liquid | - | Red | Red | High |
| C | Solid | High | Blue | Red | High |
| D | Liquid | - | Blue | Red | None |
| E | Solid | Low | Blue | Red | High |
| F | Solid | High | Blue | Red | None |

Using your knowledge of ionic, molecular, acid and base properties and the data above, fill in the chart below and identify the unknown compounds. You have the following chemicals to choose from:

C6H12O6, Ba(OH)2, CaCO3, HF, LiCl, CH3OH,

|  |  |  |
| --- | --- | --- |
| Unknown | IUPAC Name | Formula (including state in the presence of water) |
| A | Barium hydroxide | Ba(OH)2 (aq) |
| B | Hydrofluoric acid | HF(aq) |
| C | Lithium chloride | LiCl (aq) |
| D | methanol | CH3OH(l) |
| E | Calcium carbonate | CaCO3 (s) |
| F | glucose | C6H12O6 (s) or (aq) |

**BIOLOGY - The Cell (page 227)**

The smallest functional unit of life & all living things are composed of cells

All Cells:

• Need energy

• Produce wastes

• Respond and adapt to their environment

• Reproduce

• Grow

•Development of Cell Theory

–1590 – compound microscope invented

–1665 – Robert Hooke noticed structures while viewing slices of cork – cells

–1700 – Anton van Leeuwenhoek observes living cells with a microscope

–1700 + - more structures identified as technology gets better

–1838 – Schwann and Schleiden proposed that plant and animal tissue are made of cells

# The Cell Theory

## All organisms are composed of one or more cells.

## The cell is the smallest function unit of life.

## All cells are produced from other cells.

# Types of Cells

## All living things are composed of one of two types of cells:

## *Prokaryotic & Eukaryotic*

# Prokaryotic Cells

## No organized nucleus-genetic material in the cytoplasm

## Chromosome may be in a circular shape called a plasmid

## No organized organelles except for ribosomes (for making protein)

## Smaller than eukaryotic cells

## Oldest known form of life

# Eukaryotic Cells

## Organized nucleus & Organized organelles (in membrane)

## Chk_celllightpltTwo types Plant vs. Animals

**PLANT Cells**

## 1) Only plant cells contain chloroplasts

## 2) LARGE central vacuole & contain a cell wall

##  **ANIMAL Cells**

## Only animal cells contain lysosomes & Animal cells have centrioles Organelles Structure & Function - You must know all the organelles and their function. Refer to page **279 & 281 in your text**

**The Microscope (Section 7.2 & 508 – 510 in text)**

|  |  |  |  |
| --- | --- | --- | --- |
|  | TRANSMISSION LIGHT MICROSCOPE | TRANSMISSION ELECTRON MICROSCOPE (TEM) | SCANNING ELECTRON MICROSCOPE (SEM) |
| GREATEST MAGNIFICATION | 1 000 | 100 000(to 1 million) | 20 000 |
| IMAGE PRODUCED BY | light passing through the material | electrons passing through the material | electrons reflected from the material |
| FOCUSING DONE BY | ground glass lenses | electromagnets | electromagnets |
| IMAGE PRODUCED ON | retina in the eye/monitor | monitor | monitor |
| QUALITY OF IMAGE PRODUCED | colour, two-dimensional, internal structure, low resolving power | black & white, two-dimensional, internal structure, high resolving power | black & white, three-dimensional, surface detail, high resolving power |
| ADVANTAGES | colour image, living material can be viewed | very great magnification, details of internal structure | great magnification, images can be easily understood |
| DISADVANTAGES | low magnification, 2-dimensional image | material must be dead (dried), image difficult to interpret | material must be dried (dead) |

 

1. Convert the following to the indicated units:

|  |  |
| --- | --- |
| **250 μm** | **0.250 mm.** |
| **0.0018 μm** | **0.0000018 mm.** |
| **0.0087 mm** | **8.7 μm.** |
| **3456.7 mm** | **3456700 μm.** |
| **56.4 mm** | **56400 μm.** |
| **0.1111 μm** | **0.0001111 mm.** |
| **23.4 mm** | **23400 μm.** |
| **0.1023 μm** | **0.0001023 mm.** |
| **22 500 μm** | **22.5 mm.** |
| **13 μm** |  **0.013 mm.** |

1. Fill in the values for the missing magnifications.

|  |  |  |
| --- | --- | --- |
| Ocular | Objective | Total |
| 1x | 4.5x | 4.5x |
| 10x | 4x | 40x |
| 3x | 5x | 15x |
| 10x | 225x | 2250x |
| 40x | 600x |  |
| 2x | 5x | 10x |
| 10x | 100x | 1000x |
| 5x | 10x | 50x |
| 2x | 20x | 40x |

1. At 40x the field of view is measured to be 0.55 mm. What would the FOV be at 300x? Give your answer in μm. (73μm)
2. Name the of the cell structure that fits the statement.
3. produces ATP \_\_\_\_\_\_Mito\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. produces proteins \_\_\_\_\_\_ribosomes\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. stores food, water, or wastes \_\_\_\_vacuole\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
6. contains DNA \_\_\_\_nucleus\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
7. converts solar energy to chemical energy \_\_\_\_chloroplast\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
8. is used to digest material inside the cell \_\_\_\_Lysosome\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
9. protects the cell membrane \_\_\_\_cell wall\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
10. packages substances for secretion \_\_\_\_golgi Body\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
11. intracellular transport. \_ER\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
12. "gatekeeper" of the cell \_ membrane\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
13. the "powerhouse" of the cell \_\_ Mitochondria \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Label the following Diagram



1. Estimate the length of the following organisms given that the FOV is = 500 μm.

a

c

b

a =

b =

c =

1. Define the following terms:
2. isotonic -
3. hypertonic -
4. hypotonic -
5. osmosis -
6. diffusion -
7. semi-permeable -
8. concentration gradient -
9. equilibrium –
10. Write the balanced chemical equation for the reaction that occurs in the chloroplast of a plant cell.
11. Write the balanced chemical equation for the reaction that occurs in the mitochondria of a cell.
12. What would happen to an animal cell that is placed in a :
13. hypotonic solution?
14. hypertonic solution
15. isotonic solution
16. Discuss what would occur if plants had no hormones called auxins. Include the effects from gravity, the sun and from water.
17. What are the specialized cells that move water from the roots to the leaves of a plant?
	1. phloem tissue cells
	2. xylem tissue cells \*
	3. water pump cells
	4. water tubules
18. The transport of water up the plant is aided by root pressure. How is this pressure created?
	1. The weight of the surrounding dirt on the roots of the plant.
	2. Root pressure is created when water flows into the root system, trying to dilute the solutes inside. \*
	3. Tiny pump cells within the roots create this pressure.
	4. The cambium of the root creates this pressure.
19. Many plants have adaptations to help them survive in certain climates. The cactus is one such plant. Its leaves have been modified into spines in an effort to:
	1. increase the amount of surface area for photosynthesis.
	2. reduce the amount of shade produced by the plant.
	3. reduce the amount of water lost by transpiration. \*
	4. increase the surface area for dew to collect.
20. One major difference between xylem cells and phloem cells is:
	1. Xylem cells are very square in shape while phloem cells are not.
	2. Phloem cells are covered in tiny hair-like projections to increase absorption while xylem cells are not.
	3. Phloem cells are dead while xylem cells are alive.
	4. Xylem cells are dead while phloem cells are alive. \*
21. Water has two special properties that make it possible for plants to transport water up great distances within their vascular tissues. One property is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, which is a tendency of water molecules to stick to each other, and the other is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, which is a tendency for water molecules to stick to other surfaces.
	1. cohesion, adhesion\*
	2. cohesion, attraction
	3. adhesion, cohesion
	4. adhesion, attraction
22. A number of processes and forces are necessary for moving water and nutrients from the soil around the plant to the leaves. In order, these processes are:
	1. adhesion/cohesion, osmosis/diffusion, transpiration
	2. adhesion/cohesion, transpiration, osmosis/diffusion
	3. osmosis/diffusion, adhesion/cohesion, transpiration\*
	4. osmosis/diffusion, transpiration, adhesion/cohesion
23. Why do trees that have their outer bark and xylem damaged quite often die?
	1. They are no longer able to move food from the leaves to the roots of the plant, and once the roots die, the plant dies. \*
	2. They are no longer able to move water from the roots to the leaves, and once the leaves die, the plant dies.
	3. The damaged area allows disease to get into the tree and kill it.
	4. The tree dries out as a result of the damaged area.
24. Plants are able to respond to stimuli from around them. What are these responses called?
	1. reactions
	2. tropisms\*
	3. controls
	4. auxins
25. In 1880, Charles Darwin and his son devised an experiment in which they used oat seedlings. They set up four treatment groups of developing seedlings. In the first group, they removed the tip, in the second, they covered the tip with foil, in the third, they covered the base of each seedling with foil, and they left the fourth group untouched. What were they trying to test?
	1. phototropism\*
	2. gravitropism
	3. oilotropism
	4. nastic response
26. There are many reasons that a plant might need to be able to sense where "up" is. Which of the following is NOT one of the potential reasons?
	1. to make the developing seed grow in the correct direction
	2. to make the plant out compete neighbouring plants for sunlight
	3. to ensure that the plant transports water in the correct direction\*
	4. to make the roots grow in the correct direction
27. In the early 1900s, a Dutch researcher named Frits Went confirmed that there was a chemical produced in the stem tips of growing seedlings that stimulated growth. He named this chemical:

* 1. SGH (seedling growth hormone)
	2. GH (growth hormone)
	3. agar
	4. auxin\*

Color the following structures. Then create a legend matching the color to the structures name.

* Xylem
* Chloroplast
* Nucleus
* Vacuole
* Cytoplasm
* Phloem
* Cuticle
* Epidermis
* Palisade Tissue
* Spongy Tissue
* Stoma
* Guard cell
* Cell wall



**Physics Final Review**

1. The number 10.060 contains how many significant digits?
	1. 3
	2. 4
	3. 5**☺**
	4. 6
2. The value of 1275 written correctly as two significant digits would be
	1. 12
	2. 13
	3. 1.2 x 103
	4. 1.3 x 103**☺**

1. The symbol ∆ (delta) means that you must
	1. multiply two values
	2. divide one value by another
	3. subtract to find the difference between two values**☺**
	4. add to find the sum of two values
2. Which of the following quantities is a scalar quantity?
	1. speed**☺**
	2. velocity
	3. acceleration
	4. displacement
3. Which of the following quantities is a vector quantity?
	1. time interval
	2. distance
	3. work
	4. velocity**☺**
4. Which statement correctly describes the relationship between distance and displacement between two specific points?
	1. Distance is always equal to the magnitude of the displacement.
	2. Distance is always greater than the magnitude of the displacement.
	3. Distance is never equal to the magnitude of the displacement.
	4. Distance is sometimes equal to the magnitude of the displacement**☺**.
5. Which quantity depends on the path that is taken between two points?
	1. distance**☺**
	2. displacement
	3. velocity
	4. acceleration

*Use the information below to answer the following question*

The *Galileo* spacecraft that reached Jupiter in 1995 sent back a wealth of information about the giant planet. Galileo launched a probe into the atmosphere of Jupiter. Before it was eventually crushed by the immense pressure of Jupiter’s lower atmospheric layers, the probe relayed information back to Earth. *Galileo* used the gravitational forces between Venus and Earth to accelerate to a speed of 39 km/s

Numerical Response 1

The distance Galileo travelled in one minute at a speed of 39 m/s, expressed in scientific notation, is ***b*** x 10 *w* m.The value of ***b*** is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_m.**2.34x103**

*(Round and record your answer to three digits)*

*Use the following graph to answer the next two questions*

1. From t=1 s until t=2 s, the car is
	1. stopped
	2. accelerating uniformly
	3. negatively accelerating uniformly
	4. travelling at uniform speed**☺**
2. The distance that the car travelled from t =0 s to 1 s and from t = 1 s to 2s are, respectively,
	1. 5.0 m and 0 m
	2. 5.0 m and 10.0 m**☺**
	3. 10.0 m and 5.0 m
	4. 10.0 m and 10.0 m

Wayne Gretzky is arguably the greatest hockey player of all time. He holds many individual including the NHL career record for points scored.

Numerical Response 2

If Gretzky shoots the puck at a speed of 90 km/h from the top of the offensive face-off circle 15 m from the net, how long will the puck take to reach the net? \_\_\_\_\_\_\_\_\_ s **0.60**

*(Round and record your answer to two significant digits)*

*Use the following information to answer the next two questions*

Some of the fastest moving arachnids are the long-legged Sun spiders (genus *Solpuga)* found in semi-desert areas throughout the world. These spiders are capable of moving up to 16 km/h.

1. Moving at maximum speed, what is the shortest time it would take a Sun Spider to run between two fig trees that are 3.6 m apart?
	1. 0.23 s
	2. 14 s
	3. 1.5 s
	4. 0.81 s**☺**

*Use the following information to answer the next question.*



1. Which velocity-time graph describes the same motion as the displacement-time graph shown above?

|  |  |
| --- | --- |
| **A.** | **B. ☺** |
|  |  |
| **C.** | **D.** |
|  | v |
|  |  |

1. Which statement about a graph of position versus time is **not** true?
	1. A horizontal line indicates that the object was standing still.
	2. A downward slope of a straight line indicates that the object was slowing down**☺**.
	3. An upward slope of a straight line indicates that the object was moving at a constant velocity.
	4. An upward curving line (a changing slope) indicates that the object was accelerating.
2. What force is needed to lift a 4.54 kg bag of sugar at constant speed?
	1. 4.54 N
	2. 44.5 N**☺**
	3. 0.463 N
	4. The force cannot be calculated unless you know the distance the sugar is lifted.
3. The weight of an object is
	1. the same as its mass
	2. the force of gravity acting on its mass**☺**
	3. not related to its mass
	4. any force acting on its mass

Numerical Response 3

Imagine that you carry a box of books, weighing 67.8 N, up a flight of stairs. If each step is 15.0 cm high, and there are 22.0 steps in the flight of stairs, how much work do you do on the box of books? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ J**224**

*(Round and record your answer to three significant digits)*

1. According to the formula for kinetic energy, what combination of units is the same as a joule? [Hint: consider what you use to calculate potential energy]

|  |  |
| --- | --- |
| **A http://highered.mcgraw-hill.com/sites/dl/free/0070890862/141729/SF10_Ch05_Q7d.jpg** | **C.**  |
| **B☺.**  | **D.**  |

1. When you **throw** a ball into the air and it reaches its maximum height
	1. the ball would contain only kinetic energy
	2. the ball would contain half potential and half kinetic energy
	3. the ball would be moving at it maximum velocity
	4. the ball would contain all potential energy**☺**
2. A soccer goalie catches and holds the fast-moving ball. What happens to the kinetic energy of the ball?
	1. Kinetic energy stays the same because energy is conserved.
	2. Kinetic energy is destroyed because the ball stops moving.
	3. Kinetic energy is transformed into potential energy. **☺**
	4. Kinetic energy is transformed into heat.
3. How can you increase the kinetic energy of a person moving on a playground swing?
	1. Push in the same direction as the swing is moving. **☺**
	2. Push in the direction opposite to the motion of the swing.
	3. Push sideways to change the direction the swing is moving.
	4. Kinetic energy cannot be increased because energy is conserved.

*Use the following information to answer the next three questions*

Pierre Lueders from Edmonton, Alberta, is a world and Olympic champion in the two-man bobsled event. Lueders trains at one of the world’s most challenging runs located in Calgary Alberta. The bobsled run at the Calgary Olympic Park has a length of 1500 m and a height of 121 m.

1. A bobsled including its riders, has a mass of 250 kg, how much potential energy doe the bobsled have as it is about to start its run?
	1. 297 MJ**☺**
	2. 297 kJ
	3. 29.7 MJ
	4. 297 J
2. If all the potential energy from the bobsled is converted into kinetic energy as the bobsled speeds past the finish line, what is the bobsled’s velocity?
	1. 2374.0 m/s
	2. 97.4 m/s
	3. 48.7 m/s**☺**
	4. 1187.0 m/s
3. Although this potential energy is converted into kinetic energy, some potential energy is
	1. Evaporated into the atmosphere
	2. Converted to mass
	3. Conserved as potential energy
	4. Lost through friction**☺**
4. A race car races a 100 m sprint track at an average speed of 9.50 m/s. If the car's kinetic energy is 9.40 x 103J what is its mass?
	1. 1.98 x 103 m/s
	2. 208 kg**☺**
	3. 104 kg
	4. 52.1 kg
5. Which statement about the relationship between work and kinetic energy is **not** true?
	1. When a force does work on an object, the object might gain kinetic energy.
	2. When a force does work on an object, the object might lose kinetic energy.
	3. When a force does work on an object, the object always gains kinetic energy. **☺**
	4. When a force does work on an object, the object might have no change in its kinetic energy.
6. Which statement about the motion of a pendulum is *not* true?
	1. All the energy is gravitational potential energy at the top of the swing.
	2. All the energy is gravitational potential energy at the bottom of the swing. **☺**
	3. All the energy is kinetic energy at the bottom of the swing.
	4. The energy is partly gravitational potential energy and partly kinetic energy between the top and bottom of the swing.
7. The useful output energy of a motor is
	1. sound
	2. heat
	3. light
	4. kinetic energy**☺**

*Use the following information to answer the next 2 questions.*

|  |
| --- |
| Electric motors are between 50% and 90% efficient at converting electrical energy to useful energy, which causes the motion of the motor shaft. Suppose that a particular motor is measured to be 73% efficient. |

1. The motor described above is 73% efficient. What does this mean?
	1. 73% of the input energy is wasted.
	2. 73% of the input energy is converted to heat.
	3. 73% of the input energy is converted to kinetic energy. **☺**
	4. 73% of the input energy is **not** converted to some other form.
2. For every 100 J of input energy supplied to the motor, how much energy is wasted?
	1. 27 J**☺**
	2. 46 J
	3. 73 J
	4. 100 J

*Use the following information to answer the next question*.

The process of photosynthesis allows green plants to produce glucose, C6H12O6. Glucose is used as a food source. The chemical equation for photosynthesis is:

6CO2(g) + 6H2O(l) → C6H12O6(aq) + 6O2(g)

1. The process of photosynthesis results in an increase in
	1. kinetic energy
	2. potential energy**☺**
	3. light energy
	4. thermal energy

Numerical Response 4

Approximately 4.2 X 104 kJ of energy from sunlight strikes the leaves of a plant in one day. Of this energy 4 200 kJ is converted into useful energy by the plant. The efficiency of photosynthesis in this plant is \_\_\_\_\_ % **10**

*(Round and record your answer correct to two significant digits)*

 **Part II Matching:**

|  |
| --- |
| Match each of the following descriptions to the correct quantity. You may use each answer once, more than once, or not at all. |
| 1. \_\_\_\_ any form of stored energy **M**
2. \_\_\_\_ change in velocity during a unit time interval **A**
3. \_\_\_\_ describes size and direction **P**
4. \_\_\_\_ describes size but not direction **N**
5. \_\_\_\_ difference between two times **I**
6. \_\_\_\_ displacement in a unit time (for example, one second or one hour) **Q**
7. \_\_\_\_ distance traveled in a unit time (for example, one second or one hour) **O**
8. \_\_\_\_ energy stored in a material that is bent, compressed, or stretched and will return to its original shape when released. **F**
9. \_\_\_\_ energy stored in the bonds which hold atoms, ions, and molecules together **B**
10. \_\_\_\_ energy stored in the inner core of an atom **K**
11. \_\_\_\_ length of a path from one point to another **E**
12. \_\_\_\_ location relative to a particular reference point **L**
13. \_\_\_\_ size or amount **J**
14. \_\_\_\_ stored energy associated with the force of gravity between two objects **H**
15. \_\_\_\_ straight line distance and direction from one point to another **D**
 | * 1. Acceleration
	2. Chemical potential energy
	3. Conservation
	4. Displacement
	5. Distance
	6. Elastic potential energy
	7. Force
	8. Gravitational potential energy
	9. Interval
	10. Magnitude
	11. Nuclear potential energy
	12. Position
	13. Potential energy
	14. Scalar
	15. Speed
	16. Vector
	17. Velocity
	18. Work
 |

**Part III Long Answer:**

A jackrabbit can reach a velocity of +18.5 m/s from a resting position in 1.25 s. What is the rabbit’s acceleration? **14.8 m/s**

While riding up a chair lift, a 54.8 kg skier gains 4.22 × 105 J of gravitational potential energy. The top of the ski lift is what vertical distance above its base? **785m**

In a toy, a 92.4 g ball rolls into a spring and compresses the spring. If the ball is rolling at 4.28 m/s when it collides with the spring and, at maximum compression, the spring is storing 0.560 J of elastic potential energy, with what efficiency is the ball’s kinetic energy converted into elastic potential energy of the spring? **66.2%**

Fill in the following chart, the first example is done for you:

|  |  |  |
| --- | --- | --- |
|  | Graph Sketch | Calculations obtained from graph |
| Distance vs. Time (uniform motion) |  | Slope of graph = velocity |
| Distance vs. Time(at rest) |  | **Slope of graph = velocity****Slope = 0** |
| Velocity vs. Time(uniform velocity) |  | **Area under graph = distance****A=bh** |
| Velocity vs. Time(positive acceleration) |  | **Area under graph = distance****A=1/2bh** |

Answer Key:

1. C
2. D
3. C
4. A
5. D
6. D
7. A
8. D
9. B
10. D
11. B
12. B
13. B
14. B
15. B
16. D
17. C
18. A
19. A
20. C
21. D

|  |  |  |
| --- | --- | --- |
|  | Graph Sketch | Calculations obtained from graph |
| Distance vs. Time (uniform motion) |  | Slope of graph = velocity |
| Distance vs. Time(at rest) |  t d  | **Slope of graph = velocity****Slope = 0** |
| Velocity vs. Time(uniform velocity) |  t v  | **Area under graph = distance****A=bh** |
| Velocity vs. Time(positive acceleration) |  t v  | **Area under graph = distance****A=1/2bh** |

1. B
2. C
3. B
4. D
5. C
6. A
7. B

NR1: 2.34

NR2: 0.60

NR3: 224

NR4: 10

PARTII:

1. M
2. A
3. P
4. N
5. I
6. Q
7. O
8. F
9. B
10. K
11. E
12. L
13. J
14. H
15. D

PART III:

1. 14.8 m/s2
2. 785 m
3. 66.2%