**Physical Science NCFE Study Guide**

**1.1 Understand motion in terms of speed, velocity, acceleration, and momentum.**

1. What does displacement depend on?
2. What are 2 ways the velocity of an object can be changed?
3. List some (3) examples of instantaneous speed.
4. What are 2 ways acceleration can be changed?
5. Describe the slope of the line for an object with constant speed.
6. Describe the slope of the line for an object at rest.
7. Describe the slope of the line for an object with positive acceleration (on a distance time graph).
8. Describe the slope of the line for an object with negative acceleration (on a distance-time graph).

**1.2 Understand the relationship between forces and motion.**

1. Give an example for each of Newton’s Laws of Motion.
2. What does inertia depend on?
3. What 3 things will happen to an object if the object has a large amount of inertia due to mass?
4. In terms of Newton’s 2nd law, what happens to acceleration if your net force is large?
5. In terms of Newton’s 2nd law, what happens to acceleration if your mass is large?
6. What 2 things does gravitational force depend on?

**2.1 Understand the types, properties, and structures of matter.**

1. What are the 3 assumptions of the kinetic theory?
2. List 3 characteristics each of a solid, a liquid, and a gas.
3. Draw a phase change graph and label the solid, liquid, gas phases and the melting/freezing and boiling/condensing points.
4. What is the difference between evaporating and boiling?
5. List 5 different ways mixtures can be formed.
6. List 7 ways to separate a mixture.
7. What are 3 things that affect the rate of dissolving? Explain how each affects it.
8. Describe the process of dissolving in your own words.
9. What is the difference between physical properties and chemical properties?
10. What is the difference between a property and a change?
11. What kinds of materials have high conductivity?
12. What determines the identity of an atom?
13. What determines the reactivity of an atom?
14. What does not change during a chemical reaction?
15. Where is the atomic number found on the periodic table? Which particle is it determined by?
16. How do you determine the number of neutrons in an atom?
17. Give an example of an isotope symbol, label the mass number and atomic number.
18. Give 3 general properties of metals, nonmetals, and metalloids.
19. Where are metals located on the periodic table? Where are the nonmetals?
20. What do elements in the same group have in common?

**2.2 Understand chemical bonding and chemical interactions.**

1. How many electrons must an atom have in its valence shell to be considered stable?
2. What kind of ions do metals create?
3. What kind of ions do nonmetals create?
4. Sketch a periodic table and label the number of valence electrons and oxidation numbers.
5. What is the difference between ionic bonds and covalent bonds?
6. Draw an electron dot diagram to show an ionic bond between sodium and chlorine.
7. Draw an electron dot diagram to show a covalent bond between chlorine and chlorine.
8. What are 2 things a chemical formula can tell you? What are the steps in writing a chemical formula for an ionic bond?
9. What do the names of covalent bonds contain that ionic bonds do not?
10. List and give the general equation for the 4 types of reactions (synthesis, decomposition, single replacement, double replacement)
11. What is the difference between exothermic reactions and endothermic reactions?
12. Describe in your own words how to balance an equation.
13. What are some of the indicators that a chemical reaction has occurred?
14. What are the 4 factors that affect reaction rate? How do they affect it?
15. Compare/Contrast acids and bases.
16. Draw a pH scale and label the strong acids, weak acids, strong bases, weak bases, and neutral point.
17. What does a neutralization reaction produce? Which type of reaction is it?

**2.3 Understand the role of the nucleus in radiation and radioactivity.**

1. What is the difference between a nuclear reaction and a chemical reaction?
2. What must happen in order for a nucleus to be stable?
3. What are the 3 types of radiation? List them in order of weakest/least penetrating to strongest/most penetrating.
4. Compare/Contrast fission and fusion.

**3.1 Understand the types of energy, energy transfer, and energy conservation.**

1. Describe the energy transformation between an electric circuit and a light bulb.
2. Describe the energy transformation between a baseball being thrown and a caught.
3. Why are most energy transformations not 100% efficient?
4. What factors affect gravitational potential energy?
5. What facts affect kinetic energy?
6. Describe the energy transformation between gravitational potential energy and kinetic energy when swinging on a swing set.
7. What 2 things must be applied in order for an object to do work?

**3.2 Understand the nature of waves.**

1. Draw and label the parts of a transverse wave.
2. Draw and label the parts of a compressional/longitudinal wave.
3. How are wavelength and frequency related?
4. How are amplitude and energy related?
5. How are period and frequency related?
6. What does changing a medium do to the speed of wave?
7. Describe the Doppler effect and what an observer would hear. Why?
8. List the electromagnetic spectrum from lowest to highest frequency.
9. Why are higher frequency waves more damaging to humans?
10. Illustrate reflection, refraction, and diffraction.
11. What happens to light and sound during constructive interference?
12. What happens to light and sound during destructive interference?

**3.3 Understand electricity and magnetism and their relationship.**

1. What are the 3 ways to create a charge on an object?
2. What are 3 ways to create a voltage difference?
3. Explain how electrons move around a series circuit.
4. What 3 things affect the resistance in a wire?
5. Draw and label the circuit symbols.
6. Compare/contrast series and parallel circuits.
7. What will batteries do to the voltage when wired in a series circuit? In a parallel?
8. What are 3 ways to strengthen an electromagnet?
9. Explain how generators create electrical energy.