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| CENTRAL FLORIDA ASSESSMENT COLLABORATIVE |
| Individual Test Item Specifications |
| Forensic Science 1 |
| 2014 |

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I. Guide to the Individual Benchmark Specifications

Content specific guidelines are given in the *Individual Benchmark Specifications* for each course. The *Specifications* contains specific information about the alignment of items with the NGSSS and the Florida Standards. It identifies the manner in which each benchmark is assessed, provides content limits and stimulus attributes for each benchmark, and gives specific information about content, item types, and response attributes.

## Benchmark Classification System

Each NGSSS benchmark is labeled with a system of letters and numbers.

* The two letters in the *first position* of the label identify the **Subject Area**.
* The number(s) in the *second position* represents the **Grade Level**.
* The letter in the *third position* represents the **Strand** or **Body of Knowledge.**
* The number in the *fourth position* represents the **Standard**.
* The number in the *last position* identifies the specific **Benchmark**.



Each MAFS benchmark is labeled with a system of letters and numbers.

* The four letters in the *first position* of the label identify the **Subject**.
* The number(s) in the *second position* represents the **Grade Level**.
* The letter(s) in the *third position* represents the **Category**.
* The number in the *fourth position* shows the **Domain**.
* The number in the *fifth position* identifies the **Cluster**.
* The number in the *last position* identifies the specific **Benchmark**.



**Definitions of Benchmark Specifications**

The *Individual Benchmark Specifications* provides standard-specific guidance for assessment item development for CFAC item banks. The following information is provided for each benchmark assessed.

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| **Reporting Category** | is a grouping of related benchmarks that can be used to summarize and report achievement. |
| **Standard** | refers to the standard statement presented in the NGSSS or in the Florida Standards. |
| **Benchmark****Also Assesses** | refers to the benchmark statement presented in the NGSSS or standard statement in the Florida Standards. In some cases, two or more related benchmarks are grouped together because the assessment of one benchmark addresses another benchmark. Such groupings are indicated in the Also Assesses statement.refers to the benchmarks that are closely related to the benchmark (see description above) |
| **Item Types****Cognitive****Complexity** | are used to assess the benchmark or group of benchmark.ideal level at which item should be assessed. |
| **Benchmark Clarifications** | explain how achievement of the benchmark will be demonstrated by students. In other words, the clarification statements explain what the student will do when responding to questions. |
| **Content Limits** | define the range of content knowledge and that should be assessed in the items for the benchmark.  |
| **Stimulus Attributes** | define the types of stimulus materials that should be used in the items, including the appropriate use of graphic materials and item context or content. |
| **Response Attributes****Content Focus** | define the characteristics of the answers that a student must choose or provide.defines the content measured by each test item. Content focus addresses the broad content and skills associated with the examples found in the standards, benchmarks, or benchmark clarifications.  |
| **Sample Items** | are provided for each type of question assessed. The correct answer for all sample items is provided.  |

# II. Individual Benchmark Specifications

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| **Reporting Category** | Physics |
| **Standard** | Earth in Space & Time |
| **Benchmark Number** | SC.912.E.5.8 |
| **Benchmark** | Connect the concepts of radiation and the electromagnetic spectrum to the use of historical and newly-developed observational tools. |
| **Also Assesses** | N/A |
| **Item Types** | Multiple Choice |
| **Benchmark Clarification** | Students will demonstrate knowledge of applications and the development offorensic techniques based on concepts of radiation and electromagnetic properties.   |
| **Content Limits** | Specific technical details of methodologies are not assessed. The appropriate applications of said methods are assessed. |
| **Stimulus Attributes** | Forensic case scenario, data table, graph or chart |
| **Response Attributes** | None Specified |
| **Sample Item** | A forensic scientist needs to determine whether or not a fragment of a bullet recovered from the body of a victim matches a spent bullet found near the crime scene.  Which of the following methods would be best to accomplish this task?  A) X-Ray diffraction analysis   B) Positron emission tomography analysis     C) Neutron activation analysis D) Carbon-14 dating analysis Correct Answer: A |

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| **Reporting Category** | Life Science |
| **Standard** | Organization & Development of Living Organisms |
| **Benchmark Number** | SC.912.L.14.6 |
| **Benchmark** | Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health. |
| **Also Assesses** | N/A |
| **Item Types** | Multiple Choice |
| **Benchmark Clarification** | Students will be able to explain/identify how genetic factors, environmental factors or pathogenic agents cause diseases. |
| **Content Limits** | None Specified |
| **Stimulus Attributes** | None Specified |
| **Response Attributes** | None Specified |
| **Sample Item** | For which of the following conditions would an individual **not** have a heterozygous advantage? 1. Cystic fibrosis
2. Down Syndrome

 C) sickle-cell disease  D) Tay-Sachs disease  Correct Answer: B |

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| **Reporting Category** | Life Science |
| **Standard** | Organization & Development of Living Organisms |
| **Benchmark Number** | SC.912.L.14.34  |
| **Benchmark** | Describe the composition and physiology of blood, including that of the plasma and the formed elements. |
| **Also Assesses** | N/A |
| **Item Types** | Multiple Choice |
| **Benchmark Clarification** | Students will describe the components of blood and the role they play in the human body. Students will recognize these components include red blood cells, white blood cells, plasma, and platelets. Students will explain how blood carries oxygen, carbon dioxide and other elements essential to the proper functioning of the human organs and tissues.  |
| **Content Limits** | Items will not assess the specific proteins found in plasma. Items will not assess the percentage of plasma or elements of blood. Items will not assess blood as a connective tissue or the making of blood in bones. |
| **Stimulus Attributes** | May contain graphics, charts, data tables. |
| **Response Attributes** | None Specified |
| **Sample Item** | Because carbon monoxide binds easily to hemoglobin, replacing oxygen in the blood. An autopsy of a victim found in a burned building reveals normal levels of dissolved oxygen in the blood. What conclusion can be made based on this evidence? A) The victim died in the fire.1. The fire was intentionally started.
2. The victim died before the fire started.
3. The victim was murdered and the fire set to conceal the crime.

Correct Answer: A |

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| **Reporting Category** | Life Science |
| **Standard** | Organization & Development of Living Organisms |
| **Benchmark Number** | SC.912.L.14.35  |
| **Benchmark** | Describe the steps in hemostasis, including the mechanism of coagulation. Include the basis for blood typing and transfusion reactions. |
| **Also Assesses** | N/A |
| **Item Types** | Multiple Choice |
| **Benchmark Clarification** | Students will be able to describe the heritable factors that determine ABO and Rh blood types (relevant RBC antigens). Students will be able to describe the relevant plasma proteins (antibodies) related to ABO blood typing and the significance in transfusion reactions. Students will describe the significance of Rh antigens and the formation of Rh antibodies as related to transfusion and pregnancy. Students will describe the role of coagulation, including the role of platelets, as an immediate response to injury. |
| **Content Limits** | None Specified |
| **Stimulus Attributes** | May contain graphics, charts, data tables. |
| **Response Attributes** | None Specified |
| **Sample Item** | A person who has Type B blood would presumably have which of the following? A) B agglutinins in their plasma  B) B agglutinins on their Red Blood Cells  C) A agglutinins in their plasma  D) A agglutinins on their Red Blood CellsCorrect Answer: C |

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| **Reporting Category** | Life Science |
| **Standard** | Organization & Development of Living Organisms |
| **Benchmark Number** | SC.912.L.14.51 |
| **Benchmark** | Describe the function of the vertebrate integumentary system. |
| **Also Assesses** | N/A |
| **Item Types** | Multiple Choice; Short Answer |
| **Benchmark Clarification** | Students will describe functions of the various components that make up the skin. Students will explain the role of hair and nails as a part of the integumentary system. |
| **Content Limits** | None Specified |
| **Stimulus Attributes** | Diagram or illustration. |
| **Response Attributes** | None Specified |
| **Sample Item** | The condition of cutis anserina can be attributed to which set of stimuli?  A) dehydration and abrasion  B) fear and reduced temperatures  C) increased salinity and elevated temperatures  D) pain and swelling Correct Answer: B  |

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| **Reporting Category** | Life Science |
| **Standard** | Diversity & Evolution of Living Organisms |
| **Benchmark Number** | SC.912.L.15.15 |
| **Benchmark** | Describe how mutation and genetic recombination increase genetic variation. |
| **Also Assesses** | SC.L.16.9 |
| **Item Types** | Multiple Choice |
| **Benchmark Clarification** | The student will be able to define mutation and explain its role in increasing genetic variation. The student will be able to define and explain the role of genetic recombination during mitosis or meiosis results in genetic variation. |
| **Content Limits** | The item does not require identifying specific mutations in regard to molecular or chromosomal mutations i.e. point mutations, translocation, etc.  |
| **Stimulus Attributes** | Chart, diagram, pedigree or text content. |
| **Response Attributes** | None Specified |
| **Sample Item** | Milkweed plants in Northern Indiana are eaten by a parasitic insect known as the milkweed worm. The worm has stripes on its back to help it blend in with the milkweed plant. This helps it escape being eaten by a predatory wasp. However, a scientist noticed that in one particular field of milkweed plants, the worms had suddenly lost those stripes. The two most likely explanations for this change in genetic variation are which of the following?  A) genetic drift and mutations  B) the founder effect and recombination  C) mutation and recombination  D) gene flow and immigrationCorrect Answer: C |

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| **Reporting Category** | Life Science |
| **Standard** | Heredity & Reproduction |
| **Benchmark Number** | SC.912.L.16.11 |
| **Benchmark** | Discuss the technologies associated with forensic medicine and DNA identification, including restriction fragment length polymorphism (RFLP) analysis. |
| **Also Assesses** | N/A |
| **Item Types** | Multiple Choice; Short Answer |
| **Benchmark Clarification** | Students will describe and discuss the processes of preparing specimens for electrophoresis using restriction enzymes. Students will describe and discuss the process of conducting electrophoresis. Students will be able to interpret the results of electrophoresis testing. |
| **Content Limits** | The test item is limited to those technologies and associated legal and ethical issues addressed in the normal content of forensic science. |
| **Stimulus Attributes** | Diagrams and scenarios related to the use in Forensic Science. |
| **Response Attributes** | None Specified |
| **Sample Item** | DNA fingerprinting has many applications in the legal world. Which of the following explains the banding pattern of a DNA fingerprint?  A) Restriction enzymes will cut DNA at restriction sites.  B) Smaller DNA fragments migrate farther on an electrophoresis gel.  C) Larger DNA fragments travel farther on and electrophoresis gel.  D) DNA is positively charged.Correct Answer: B |

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| **Reporting Category** | Life Science |
| **Standard** | Heredity & Reproduction |
| **Benchmark Number** | SC.912.L.16.12 |
| **Benchmark** | Describe how basic DNA technology (restriction digestion by endonucleases, gel electrophoresis, polymerase chain reaction, ligation, and transformation) is used to construct recombinant DNA molecules (DNA cloning). |
| **Also Assesses** | N/A |
| **Item Types** | Multiple Choice |
| **Benchmark Clarification** | The student will describe how recombinant DNA is constructed using the technologies of restriction digestion, gel electrophoresis, polymerase chain reaction, ligation, and transformation. Students will recognize examples of where rDNA is used in our society. |
| **Content Limits** | Test items do not require specific knowledge of the apparatus used in these technologies. Items assessing the various technologies used are limited to a conceptual understanding. |
| **Stimulus Attributes** | Diagram, chart or text. |
| **Response Attributes** | None Specified |
| **Sample Item** | Recombinant DNA technology is used for all of the following except which one?  A) amplification of DNA for microbe identification  B) inserting genes from humans or plants into bacteria or viruses  C) human insulin production by bacterial cells  D) growing cultures of unknown organismsCorrect Answer: D |

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| **Reporting Category** | Life Science |
| **Standard** | Interdependence |
| **Benchmark Number** | SC.912.L.17.1 |
| **Benchmark** | Discuss the characteristics of populations, such as number of individuals, age structure, density, and pattern of distribution. |
| **Also Assesses** | N/A |
| **Item Types** | Multiple Choice; Short Answer |
| **Benchmark Clarification** | Students will discuss the characteristics of populations, such as number of individuals, age structure, density, and pattern of distributions might pertain to crime or increase in crime patterns. |
| **Content Limits** | Items will assess how population dynamics affect the population and pattern of distribution of human life. Items will assess the types of population density. |
| **Stimulus Attributes** | Diagrams may be used. |
| **Response Attributes** | None Specified |
| **Sample Item** | Genetic diversity helps a population survive under variable environmental conditions. Which of the following statements will increase the ability for a population to survive? 1. A small population decreases in genetic diversity with each

generation. B) Immigration increases genetics diversity.  C) In a species of birds, only males with red heads will be selected  to reproduce.  D) In a specific environment, a species of bugs only survives if they  are all the same color.Correct Answer: B |

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| **Reporting Category** | Nature of Science |
| **Standard** | Practice of Science |
| **Benchmark Number** | SC.912.N.1.1 |
| **Benchmark** | Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following: 1. pose questions about the natural world, 2. conduct systematic observations, 3. examine books and other sources of information to see what is already known, 4. review what is known in light of empirical evidence, 5. plan investigations, 6. use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), 7. pose answers, explanations, or descriptions of events, 8. generate explanations that explicate or describe natural phenomena (inferences), 9. use appropriate evidence and reasoning to justify these explanations to others, 10. communicate results of scientific investigations, and 11. evaluate the merits of the explanations produced by others. |
| **Also Assesses** |  SC.912.N.1.4; SC.912.N.1.6  |
| **Item Types** | Multiple Choice with diagrams |
| **Benchmark Clarification** | Students will design and/or evaluate a scientific investigation using evidence of scientific thinking and/or problem solving.  Students will interpret and analyze data to make predictions and or defend conclusions. Students will evaluate the merits of scientific explanations produced by others. Students will assess the reliability of sources of information according to scientific standards. Students will describe how scientific inferences are made from observations/evidence/tests performed and identify examples in forensic science. |
| **Content Limits** | Items will test a forensic style scenario. |
| **Stimulus Attributes** | Scenarios will be placed in the context of experimental design, experiments, crime scene investigations, scientific investigations, science observations in the field of Forensic Science. |
| **Response Attributes** | Diagrams as answer choices |
| **Sample Item** | The next two questions relate to the following experiment. Sydney's science teacher slowly poured three different water solutions into a glass aquarium tank: (1) Warm fresh water colored red (2) Clear, room temperature fresh water(3) Cold fresh water colored blue. 1. Which diagram illustrates the most likely outcome of this experiment? A) Red water solution on top of the water column, blue water solution in the middle of water column, clear water solution at the bottom of the water column B) Red water on top of the water column, clear water solution in the middle of the water column, blue water solution at the bottom of the water columnC) Blue water solution on top of the water column, clear water solution at the middle of the water column, red water solution at the bottom of the water column D) Clear water solution at the top of the water column, red water solution at the middle of the water column, blue water solution at the bottom of the water column. Correct Answer: B2. Which of the following is the best example of the demonstration? A) Warm water is more dense than cold water B) Cold water is more dense than warm water  C) Blue water is more dense than red water  D) Red water is more dense than blue water Correct Answer: B   |

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| **Reporting Category** | Nature of Science |
| **Standard** | Practice of Science |
| **Benchmark Number** | SC.912.N.1.3 |
| **Benchmark** | Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented. |
| **Also Assesses** | SC.912.N.2.4  |
| **Item Types** | Multiple Choice |
| **Benchmark Clarification** | Students will be able to identify and explain the value of continuous testing of theories to determine validity and value of challenges to advance scientific understanding. Students will recognize and understand that data is not conclusive, comprehensive, and is interpreted. Students can explain how this leads to competing theories in science.  |
| **Content Limits** | Student will not be required to provide an example of advancement from previous interpretation. |
| **Stimulus Attributes** | Scenarios will be placed in the context of experimental design |
| **Response Attributes** | None Specified |
| **Sample Item** | A researcher states that there is a link between cell phone radiation and cancer. Another researcher contends another factor is responsible. What is the best method for resolving the issue?  A) Accept the original findings because they were first.  B) Decide based on which researcher has the best credentials.  C) Collaborate and gather additional data to find a factual conclusion.  D) Accept both as scientifically correct. Correct Answer: C |

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| **Reporting Category** | Nature of Science |
| **Standard** | Role of Theories, Laws, Hypotheses, and Models |
| **Benchmark Number** | SC.912.N.3.1 |
| **Benchmark** | Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer. |
| **Also Assesses** | SC.912.N.3.2  |
| **Item Types** | Multiple Choice |
| **Benchmark Clarification** | Students will explain that scientific theories are based on the results of many investigations as well as a consensus of many over a period of time. Students are able to relate that theories change over time and the current theory is the best explanation so far, but is subject to change in the future. |
| **Content Limits** | Items will assess the student’s ability to distinguish between supported scientific theories, and other forms of suppositions such as an unsupported hypothesis. |
| **Stimulus Attributes** | A case scenario may be presented for analysis. |
| **Response Attributes** | None Specified |
| **Sample Item** | In a murder case that pre-dated DNA analysis, defense lawyers attempted to explain blood found in the defendant’s house and car trunk using what came to be known as the ‘parrot defense’. The lawyers claim that the defendant was trimming the parrot’s claws and cut too deeply. The injured parrot flew all over the room spreading blood. Since the parrot could not be controlled, it was placed in the car trunk when being transported to the veterinarian. The defense lawyer’s explanation of the presence of the blood is best characterized by which one of the following?  A) Scientific Hypothesis  B) Scientific Theory  C) Scientific Law  D) Scientific ModelCorrect Answer: A |

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| **Reporting Category** | Nature of Science |
| **Standard** | Role of Theories, Laws, Hypotheses, and Models |
| **Benchmark Number** | SC.912.N.3.5 |
| **Benchmark** | Describe the function of models in science, and identify the wide range of models used in science. |
| **Also Assesses** | N/A |
| **Item Types** | Multiple Choice; Short Answer |
| **Benchmark Clarification** | Students will understand why science uses models to study a variety of phenomenon and appreciate the inherent weaknesses and limitations of such models.  |
| **Content Limits** | The student will be assessed on recognizing when a model can be used and distinguishing this method from other scientific processes. |
| **Stimulus Attributes** | A specific scenario may be described which may or may not require the application of models to investigate. Diagrams and charts may also apply. |
| **Response Attributes** | None Specified |
| **Sample Item** | For various reasons, scientists sometimes find that it is impractical to directly observe or test a particular phenomenon, such as a black hole. For a forensic scientist who is investigating the ballistics of a crime scene after the fact, which one of the following alternative methods is best to use?  A) Develop a hypothesis that fits the known facts. B) Apply well-established theories that best explains the known facts. C) Recreate the ballistics of the crime scene with computer models. D) Return to the actual crime scene and recreate the ballistics of the  crime using the actual weapon(s). Correct Answer: C |

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| **Reporting Category** | Nature of Science |
| **Standard** | Science & Society |
| **Benchmark Number** | SC.912.N.4.1 |
| **Benchmark** | Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making. |
| **Also Assesses** | N/A |
| **Item Types** | Multiple Choice; Short Answer |
| **Benchmark Clarification** | Students must understand that scientific ways of knowing can assist society in making informed decisions. |
| **Content Limits** | Items will assess knowing that there is a link between the scientific process and good decision making. They will not be assessed on specific decision outcomes. |
| **Stimulus Attributes** | A historic case study involving social change may be presented. |
| **Response Attributes** | None Specified |
| **Sample Item** | The percentage of Americans that regularly smoke cigarettes has generally declined since the 1960s. Which of the following best describes this trend? A) The price of cigarettes has steadily increased since the 1960s. B) Smokers generally have a shorter lifespan compared to non-smokers. C) Since the 1960s, tobacco advertising has significantly decreased.  D) Evidence of health problems caused by smoking has increased.Correct Answer: D |

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| **Reporting Category** | Chemistry |
| **Standard** | Matter  |
| **Benchmark Number** | SC.912.P.8.1 |
| **Benchmark** | Differentiate among the four states of matter. |
| **Also Assesses** | N/A |
| **Item Types** | Multiple Choice |
| **Benchmark Clarification** | Students will identify the characteristics that define solids, liquids and gases. Students will differentiate particle movement in solids, liquids and gases. |
| **Content Limits** | Items would not refer to the plasma state. |
| **Stimulus Attributes** | Picture, chart, or text. |
| **Response Attributes** | None Specified |
| **Sample Item** | Three evidence samples are being analyzed in the crime lab. The samples and their corresponding volumes and shapes are listed in the chart above. Of the three samples, which one(s) are **not** a liquid? A) A and B  B) B and C  C) A and C  D) A onlyCorrect Answer: B |

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| **Reporting Category** | Chemistry |
| **Standard** | Matter  |
| **Benchmark Number** | SC.912.P.8.2 |
| **Benchmark** | Differentiate between physical and chemical properties and physical and chemical changes of matter. |
| **Also Assesses** | N/A |
| **Item Types** | Multiple Choice |
| **Benchmark Clarification** | Students will recognize physical and chemical properties. Students will recognize physical and chemical changes. |
| **Content Limits** | Items will not include reaction types or effects due to catalysts or lack of catalysts. |
| **Stimulus Attributes** | Text, chart or diagram |
| **Response Attributes** | None Specified |
| **Sample Item** | The melting of wax is a physical change, yet the burning of wax is a chemical change. What is the essential difference between a physical change and a chemical change of wax in a burning candle?  A) The burning of wax forms new compounds while the melting of wax does not.  B) A higher temperature is needed to burn wax than to melt wax.  C) Melted wax can be separated into other substances, while solid wax  cannot.  D) Melted wax is in a different phase of matter than solid wax.Correct Answer: A |

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| **Reporting Category** | Chemistry |
| **Standard** | Matter  |
| **Benchmark Number** | SC.912.P.8.7 |
| **Benchmark** | Interpret formula representations of molecules and compounds in terms of composition and structure. |
| **Also Assesses** | N/A |
| **Item Types** | Multiple Choice |
| **Benchmark Clarification** | Students will be able to read a formula representation of a molecule or compound and describe the elements in that compound, and the number of each atom in that compound. |
| **Content Limits** | The item does not require the formula weight or and knowledge of the molecule to solve the problem. The item does not require the student to distinguish the type of bonding between the atoms in a molecule or compound. The item does not require the student to predict what elements would bond to other elements and in what ratios. |
| **Stimulus Attributes** | Chemical formula and test. |
| **Response Attributes** | None Specified |

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| **Sample Item** | How many carbon atoms are in a single molecule of butane (C4H10)?  A) 4  B) 6  C) 10  D) 14Correct Answer: AWhich of the answer choices below best describes the components of trinitrotoluene (TNT) C6H2 (NO2)3CH3?  A) 1 Nitrogen, 5 Hydrogen, 2 Oxygen, 7 Carbon  B) 1 Nitrogen, 6 Hydrogen, 5 Oxygen , 2 Carbon  C) 3 Nitrogen, 5 Hydrogen, 6 Oxygen, 7 Carbon  D) 3 Nitrogen, 2 Hydrogen, 2 Oxygen, 2 CarbonCorrect Answer: C |

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| **Reporting Category** | Chemistry |
| **Standard** | Matter  |
| **Benchmark Number** | SC.912.P.8.11 |
| **Benchmark** | Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH. |
| **Also Assesses** | N/A |
| **Item Types** | Multiple Choice |
| **Benchmark Clarification** | Students will be able to relate the term pH to the acidity or alkalinity of a solution. Students will be able to define acidity of a solution in terms of the concentration of the hydronium ion. Students will be able to define basicity of a solution based on the concentration of the hydroxide ion.  |
| **Content Limits** | The item does not require the student to calculate the pH of a solution given the concentration of any ion. The item does not require the calculation of any ion given the pH of a solution.  |
| **Stimulus Attributes** | Text or chart |
| **Response Attributes** | None Specified |
| **Sample Item** | An autopsy determines the pH of a sample of blood to be 8.3. The pH of normal blood is 7.4. Compared to normal blood, what changes in hydroxide ion and hydronium ion concentration has occurred in the test blood sample? 1. The hydroxide ion concentration increased and the

 hydronium ion concentration decreased. B) The hydroxide ion concentration increased and the  hydronium ion concentration increased.1. The hydroxide ion concentration decreased and the

 hydronium ion concentration decreased.1. The hydroxide ion concentration decreased and the

 hydronium ion concentration increased. Correct Answer: B |
| **Reporting Category** | Physics |
| **Standard** | Energy |
| **Benchmark Number** | SC.912.P.10.21 |
| **Benchmark** | Qualitatively describe the shift in frequency in sound or electromagnetic waves due to the relative motion of a source or a receiver. |
| **Also Assesses** | N/A |
| **Item Types** | Multiple Choice |
| **Benchmark Clarification** | Student will distinguish between electromagnetic and sound waves.Students will distinguish and/or determine the relationship between, wavelength and frequency. Students will recognize examples of sources and/or receivers of electromagnetic or sound waves. |
| **Content Limits** | Items will not include quantitative descriptions. Students will not be assessed on wave diagrams. |
| **Stimulus Attributes** | Case study scenario will be described. Items can include diagrams, charts or graphs. |
| **Response Attributes** | None Specified |
| **Sample Item** | A driver involved in a car accident claims to have activated the car horn at least 300 feet prior to the collision. The investigation determined that the driver was talking on a cell phone and thus the sound of the horn was recorded. At the time of the accident, several potential witnesses that were walking in the vicinity of the accident were also talking on their cell phones, also recording the sound of the car horn. The investigation determined the approximate location, within 10 square feet, of each of these potential witnesses. Which one of the following groups of witnesses would be the best to select to compare the car horn recordings in order to determine the validity of the driver’s assertion?  A) Witnesses that were as close to the 300 foot mark as possible. B) Witnesses that were as close to the accident site as possible. C) Witnesses that were evenly dispersed between the 300 foot mark  and the accident site. D) Witnesses that were dispersed both in front and behind the 300  foot mark.Correct Answer: D |

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| **Reporting Category** | Physics |
| **Standard** | Motion |
| **Benchmark Number** | SC.912.P.12.1 |
| **Benchmark** | Distinguish between scalar and vector quantities and assess which should be used to describe an event. |
| **Also Assesses** | N/A |
| **Item Types** | Multiple Choice; Short Answer |
| **Benchmark Clarification** | Students will properly use and identify examples of scalar and vector quantities. |
| **Content Limits** | Items can include math computations derived from given information. |
| **Stimulus Attributes** | Crime scene diagram may include blood spatter pattern. |
| **Response Attributes** | None Specified |
| **Sample Item** | Which of the following would not be considered a vector measurement?  A) the force applied to a bullet while shooting it  B) the velocity of a bullet as it travels through the air  C) the momentum of a bullet  D) the mass of a bulletCorrect Answer: D |

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| **Reporting Category** | Physics |
| **Standard** | Motion |
| **Benchmark Number** | SC.912.P.12.2 |
| **Benchmark** | Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time. |
| **Also Assesses** | N/A |
| **Item Types** | Multiple Choice; Short Answer |
| **Benchmark Clarification** | Students will properly use and identify examples of position, velocity, acceleration and frames of reference. Students will analyze the motion of an object and interpret the relationship between position, velocity, and acceleration as it relates to the time interval involved. |
| **Content Limits** | Items may include scenarios that describe or compare the motion of objects. Items can require simple calculations for velocity, position or acceleration. |
| **Stimulus Attributes** | Formula/reference sheet will be provided. |
| **Response Attributes** | None Specified |
| **Sample Item** | A motorcycle accelerates from a stop at a rate of 4m/s2 for 20 seconds. It then continues at a constant speed for 40 seconds. You may use the blank graph below to plot the speed vs. time of the motorcycle. What is the motorcycle’s speed at 15 seconds? 60m/s What is the motorcycle’s speed at 45 seconds? 80 m/s |

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| **Reporting Category** | Physics |
| **Standard** | Motion |
| **Benchmark Number** | SC.912.P.12.3 |
| **Benchmark** | Interpret and apply Newton's three laws of motion. |
| **Also Assesses** | N/A |
| **Item Types** | Multiple Choice; Short Answer |
| **Benchmark Clarification** | Students will be able to explain Newton's three laws of motion. Students will be able to relate terms such as force, mass, acceleration, velocity, and momentum. Students will recognize that Newton’s three laws govern an object's behavior in a given scenario.  |
| **Content Limits** | Items may include scenarios that describe or compare the motion of objects. Items can require simple calculations to determine force, mass, acceleration, velocity, or momentum. |
| **Stimulus Attributes** | Formula/reference sheet will be provided. |
| **Response Attributes** | None Specified |
| **Sample Item** | A diagram shows a balloon that is moving in one direction while escaping air is moving in the opposite direction. Which best explains what causes the balloon to move? A) Action reaction forces B) Inertia C) Friction forces D) Gravitational forcesCorrect Answer: A |

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| **Reporting Category** | Physics |
| **Standard** | Motion |
| **Benchmark Number** | SC.912.P.12.5 |
| **Benchmark** | Apply the law of conservation of linear momentum to interactions, such as collisions between objects. |
| **Also Assesses** | N/A |
| **Item Types** | Multiple Choice; Short Answer |
| **Benchmark Clarification** | Students will recognize that linear momentum is conserved only in collisions between objects. Students will recognize this is Newton's third law. |
| **Content Limits** | Items include simple calculations of mass and velocity. Items may include the mass and velocity of objects before and after collisions. |
| **Stimulus Attributes** | Reference/formula sheet will be provided. Questions can include diagrams and visual queues. |
| **Response Attributes** | None Specified |
| **Sample Item** | A bullet is fired into a 3 kg wood block that is sitting on top of the ice of a frozen lake. The bullet has a momentum of 450 kg m/s. The bullet enters the wood block and stops. If we assume the ice is a frictionless surface, what should happen to the momentum of the wood block after the bullet enters it? 1. The wood block will have a larger momentum than the bullet did

 and move in the same direction as the bullet was moving  B) The block will have nearly the same momentum as the bullet did  and move in the same direction the bullet was moving 1. The wood block would have a much smaller momentum then the

 bullet had and will barely move  D) The block will not change its momentum at all and will not move  |

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| **Reporting Category** | Chemistry |
| **Standard** | Matter |
| **Benchmark Number** | SC.912.P.12.12 |
| **Benchmark** | Explain how various factors, such as concentration, temperature, and presence of a catalyst affect the rate of a chemical reaction. |
| **Also Assesses** | N/A |
| **Item Types** | Multiple Choice |
| **Benchmark Clarification** | Students will be able to explain how the concentration of reactants affects the rate of a reaction. Students will be able to explain how the temperature affects the rate of a chemical reaction. Students will be able to explain how the presence of a catalyst lowers the activation energy of a reaction and thus increases the rate of the reaction. |
| **Content Limits** | The student will not be required to quantify relationships. |
| **Stimulus Attributes** | A case study scenario will be presented. Graphs, data tables, and charts may also be used. |
| **Response Attributes** | None Specified |
| **Sample Item** | A driver is pulled over by law enforcement on suspicion of drunk-driving. The driver fails the field sobriety test and is arrested. A few hours later the suspect is transported to a hospital for blood alcohol content testing. Are the results from the blood alcohol test valid even though it was done several hours after the time of arrest? 1. No: The blood alcohol content has since decreased due to

the oxidation of alcohol to carbon dioxide.1. No: The blood alcohol content has since decreased because

the alcohol has had more time to spread throughout the bloodstream, thus being diluted.1. Yes: The blood alcohol content remains constant for several

hours since the temperature of the blood has also remained constant. D) Yes: Since the rate of alcohol oxidation is known, the original blood alcohol content can be determined at the time of arrest. Correct Answer: D |