

COMMON FORMATIVE ASSESSMENT PLANNING TEMPLATE

--FIRST DRAFT--

Grade Level or Course: Biology Grade Level 11

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This is an initial draft designed to be a common formative POST-assessment that would be administered at the end of a two-week instructional unit in Biology.

Assessment Topic: Periodicity and the Periodic Table

Selected Power Standards: List standards by number and include the full text here. Then “unwrap” to identify what students need to know and be able to do. Underline the concepts (important nouns or noun phrases) and circle the skills (verbs).

Read and interpret the periodic table, recognizing relationships between element position on the periodic table and their physical and chemical properties.

Graphic Organizer of “Unwrapped” Concepts and Skills

Concepts: Periodicity and the periodic table

- Patterns
- Families/groups
- Periods/rows
- Metals versus non-metals
- Symbols on the periodic table
- Octet rule and valency
- Atoms versus ions
- Physical and chemical properties of elements

Skills: Be able to

(Next to each skill, write number in parentheses indicating approximate level of Bloom’s Taxonomy of thinking skills. Refer to Bloom’s Taxonomy resource in supporting documents.)

- (1) *recognize* periodic patterns
- (1) *recognize* relationship between group members and period members
- (4-5) *interpret* atomic number and mass number
- (3) *predict* valency
- (2) *identify* ionization number

- (5) *create* ionic compounds
- (4) *Examine* the physical and chemical properties of the elements

Big Ideas from “Unwrapped” Power Standard

1. The periodic table is organized purposefully into families and periods that allow the prediction of atomic behavior.
2. Metallic and non-metallic elements and ionization states are reflected in the periodicity of valence electrons and the octet rule.
3. Atomic structure can be determined from atomic mass and atomic number.

Essential Questions Matched to Big Ideas

1. What is periodicity and how is it reflected in the periodic table?
2. How does the organization of the periodic table relate to element type and reactivity?
3. How is atomic structure related to atomic number and atomic mass?
4. What is the greatest source of general information in chemistry? Explain how it is the greatest source and why you think so.

SECTION 1: Selected-Response Items—Design multiple choice, matching, true-false, and/or fill-in items to assess student understanding of the following “unwrapped” concepts and skills represented on your graphic organizer. Indicate approximate level of thinking skill in parentheses. *Match assessment items to rigor of skill level.* (Use additional space as needed.)

Patterns in the periodic table

Match the following letter to corresponding number. Each letter may be used more than once and might not be used at all.

- | | |
|--------------|--|
| a. Family 1 | 1. Contains Ca. _____ |
| b. Family 2 | 2. Forms ions with charge of +1. _____ |
| c. Family 3A | 3. Generally does not form ions. _____ |
| d. Family 4A | 4. Consist of the alkaline-earth metals. _____ |
| e. Family 5A | 5. Are highly reactive with the metals. _____ |
| f. Family 6A | 6. Forms ions with a charge of 2-. _____ |
| g. Family 7A | 7. Are found as gases with a charge of -1. _____ |
| h. Family 8A | 8. Has 5 valence electrons. _____ |

Compare and contrast groups and periods

Select the best answer from the given choices.

9. Elements in a period
- have the same properties.
 - have similar properties.
 - have predictable changes to their properties.
 - have no predictable organization.
10. Elements in a family
- have the same properties.
 - have similar properties.
 - have predictable changes to their properties.
 - have no predictable organization.
11. The rule that describes the number of valence electrons an atom has is called the
- the atomic rule.
 - the electron rule.
 - the periodic rule.
 - the octet rule.

Interpret atomic number and mass number

12. Answer the following about the element Carbon:

- How many protons does it have?
 - How many electrons does it have?
 - What is the mass number of its most common isotope?
13. How many neutrons are there in its most common isotope?
14. What is one of its other isotopes, and how many neutrons does it have?

Predict
valency

How many valence electrons do each of the following have:

15. Ca _____

16. Cs _____

17. Br _____

18. C _____

Determine
ionization
number

19. What is the ionization number of chromium in CrO_2 ?

a) +2

b) +4

c) -2

d) -4

Form ionic
compounds

20. What is the formula for the compound formed by calcium ions and chloride ions?

a) CaCl

b) Ca_2Cl

c) CaCl_3

d) CaCl_2

Answer Key:

1) b

2) a

3) h

4) b

5) g

6) f

7) g

8) e

9) c

10) b

11) d

12) 6

13) 6

14) 12

15) 6

16) C-13, C-14+2

17) 2

18) 1

19) 7

20) 4

21) b

22) d

SECTION 2: Extended Constructed-Response—Design an extended-response item to evaluate student understanding of the following “unwrapped” concepts and skills represented on your graphic organizer. Include approximate level of thinking skill in parentheses. *Match item to rigor of skill level.* Evaluate student work using the Task-Specific Scoring Guide below (to be completed).

You are a member on the newly inhabited space station Alpha, and are given the task of organizing information on newly discovered elements as it comes in from the laboratory. To date, five elements have been discovered and have been assigned names and symbols from the Greek alphabet. An analysis of the new elements has yielded the following data:

Element name	Atomic Number	Atomic Mass	Properties
Epsilon ϵ	23	47.33	Nonmetal, very reactive, produces a salt when combined with a metal, gaseous state
Beta β	13	27.01	Metal, very reactive, soft solid, low melting point
Gamma γ	12	25.35	Nonmetal, gaseous element, extremely unreactive
Delta Δ	4	7.98	Nonmetal, very abundant, forms compounds with most other elements
Lambda λ	9	16.17	Metal solid state, good conductor, high luster, hard and dense

Use the above table to answer questions 1-4 below:

- Using the data on the five new elements, create a periodic table based on their properties.
- Using your newly created periodic table, predict the atomic number of an element with an atomic mass of 11.29 that has nonmetallic properties and is very reactive. Explain what information you used to make your prediction.
- Analyze your periodic table for periodic trends and describe the trends that you identify.
- Draw a Bohr model of the atom for element Lambda (λ) based on your understanding of atomic structure.

Extended-Response Scoring Guide:

Exemplary

- All “Proficient” criteria *plus*:
- Describes the inter-elemental relationships in terms of periods and groups
-
-

Proficient

- Describes element relationships in terms of the three sources of data (atomic number, atomic mass and properties)
- Demonstrates understanding of periodic table patterns
- Shows understanding of physical properties of elements in groups
- Conveys knowledge of atomic structure, including protons, neutrons and electrons
-
-

Progressing

- Meets 3 of the “Proficient” criteria

Beginning

- Meets fewer than 3 of the “Proficient” criteria
- Task to be repeated after remediation

Teacher’s Evaluation _____

Comments regarding student’s performance:

SECTION 3: Short Constructed-Response

Note to Teachers: This portion of the common formative assessment requires students to demonstrate their *integrated* understanding of all the “unwrapped” concepts and skills from the targeted Power Standards by expressing their understanding of the Big Ideas in their own words. Copy your planned Essential Questions (and corresponding Big Idea responses) for your own reference here. Then write each Essential Question only beneath the student directions below. Provide space for students to write their Big Idea responses.

Big Ideas from “Unwrapped” Power Standard

1. The periodic table is organized purposefully into families and periods that allows the prediction of atomic behavior.
2. Metallic and non-metallic elements and ionization states are reflected in the periodicity of valence electrons and the octet rule.
3. Atomic structure can be determined from atomic mass and atomic number.

Student Directions: Write a Big Idea response for each of the following Essential Questions. Include supporting details and any vocabulary terms from the “unwrapped” concepts you have been learning for each response. Your responses will be evaluated using the Generic Scoring Guide below.

Essential Questions

1. What is periodicity and how is it reflected in the periodic table?
2. How does the organization of the periodic table relate to element type and reactivity?
3. How is atomic structure related to atomic number and atomic mass?
4. What is the greatest source of general information in chemistry? Explain how it is the greatest source and why you think so.

Generic Scoring Guide:

Exemplary

- All “Proficient” criteria *plus*:
- Makes connections to other areas of school or life
- Provides example(s) as part of explanation

Proficient

- States Big Ideas correctly in own words
- Provides supporting details for each one
- Includes vocabulary of “unwrapped” concepts in explanation

Progressing

- Meets 2 of the “Proficient” criteria

Beginning

- Meets fewer than 2 of the “Proficient” criteria
- Task to be repeated after remediation

Teacher’s Evaluation _____

Comments regarding student’s performance:

Design Team Reflections after Administration of Assessment to Students

1. Which assessment items produced the results we intended?
2. Which items do we need to revise?
3. Regarding the design, administration, scoring, and analysis of the assessment, what worked? What didn't?
4. What do we need to do differently next time?
5. What should we again do the same?