

# EARTH SCIENCE

## INTRODUCTION

### COMPONENTS OF STUDY

1. **Geology:** Both physical & historical
2. **Meteorology:** Weather & climate
3. **Oceanography:** The oceans
4. **Astronomy:** What is external to the atmosphere

**THE FOUR SCHEMES** (See The Water Conflict

1. Lithosphere: The solid earth.
2. Hydrosphere: The liquid earth.
3. Atmosphere: The gaseous earth.
4. Biosphere: Where life exists.

## CONCERNS IN OUR PHYSICAL ENVIRONMENT

1. Resources: Water, soil, metallic & non-metallic elements, sunlight, wind, etc.
2. Per-capita use of metallic and non-metallic elements is 11 tons per year
3. Renewable vs. non-renewable resources
4. Environmental and population problems

## MINERALS

- A mineral is a naturally occurring, inorganic, solid material with a definite atomic structure.
- An ore is a useful metallic mineral.

[illegible]

1. Atoms, in ancient Greek, means "small," i.e., the Ancients believed that atoms to be the smallest particle of matter.
2. Atoms are composed of neutrons, protons and electrons.
  - a. Atomic number: Number of protons in nucleus.
  - b. Atomic weight: Average weight of an atom.
  - c. Isotopes: Forms of an element with identical atomic number but different numbers of neutrons in the nucleus.

### III. Properties of Minerals

1. Luster: Appearance or quality of light from surface
2. Color: Nature of light and cause of color
3. Streak: Color of material in powdered form
4. Hardness: Moh's Scale (See Figure below)
5. Scratch Test: Higher numbered materials can scratch lower numbered materials
6. Shape is determined by cleavage, crystal form and fracture

6. **Specific Gravity:**
- The ratio of the weight of a mineral to the weight of an equal volume of water.
  - Density of water = 1 gm/cm<sup>3</sup> = 1 gm/ml.  
 i.e., Gold = 19.3, aluminium = 2.7, zinc = 7.2



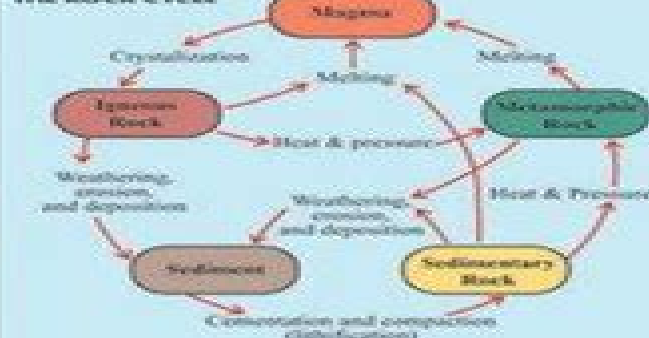
MOH'S SCALE		MINERAL
Standard	10	Diamond
	9	Corundum
	8	Topaz
	7	Quartz
	6	Orthoclase
	5	Apatite
	4	Fluorite
	3	Calcite
	2	Gypsum
Softest	1	Talc

**Figure 1**

1. **Silicates:** Minerals with silicic acid and oxygen.
  - a. Silicic acid is a weak acid which forms a pyramid-shaped structure with oxygen.
  - b. Other forms include single tetrahedrons (olivine), chains (singles, sheets, chains), 2-D structures (feldspar and quartz).
2. **Non-silicates:**
  - a. Make up one-fourth of continental crust.
  - b. **Carbonates:** Minerals with carbon and oxygen including calcite, from which we process limestone (rocks) and marble (decorative slabs).
  - c. **Oxides:** Oxygen based solids, i.e., iron.
  - d. **Sulfides (S):** sulfides (FeS), **Sulfates (SO<sub>4</sub>),** **Halides (Cl, F)**
  - e. **Native:** Natural form of self.
  - f. **Elemental:** carbon, calcium.
  - g. **Native metals:** iron, zinc, gold without rock.

## ROCK TYPES

## THE RIVER CYCLE



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1. **Extrusive** igneous rocks are formed in volcanic eruptions at surface.
2. **Intrusive** (or **plutonic**) igneous rocks are produced within the earth.
3. **Magma**
  - a. Consists mainly of silicate materials
  - b. Has gases, such as water vapor
  - c. Originates from as deep as 290 km
  - d. Differs in rate of cooling, chemical composition, and amount of gases.
  - e. Produces intrusive (plutonic) igneous rocks
4. **Lava**
  - a. Similar to magma
  - b. Most gaseous elements have escaped
  - c. Produces extrusive (volcanic) igneous rocks

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- 1. **Crystallization** (ordered pattern of ions)
  - a. the rate of cooling strongly affects crystal size
  - b. slow cooling = large crystals
  - c. quick cooling = small crystals
- 2. **Amorphous** (unordered pattern of ions)
  - a. occurs with instant cooling (quenching)
  - b. produces rocks referred to as glass

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1. By texture, we use arrangement of interlocking crystals.
  - a. **fine-grained**
    - i. forms at surface or within upper crust
    - ii. openings left by gas bubbles are called **vesicles**
    - iii. **conglomerate** - small drops of magma in matrix
    - iv. **porphyritic** - large crystals embedded in matrix of smaller crystals
2. By mineral composition
  - a. Depends on composition of magma and cooling
  - b. Some magma can create rocks of varying mineral content.
  - c. As magma cools, certain minerals crystallize first (b)

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2. **Metamorphic:** To change form.
3. **Regional metamorphism:** Material under intense stresses, high temperatures.
3. **Contact (thermal) metamorphism:** Changes caused by proximity to magma.
4. **Low grade metamorphism:** Shale becomes slate.
5. **High grade metamorphism:** Gneiss becomes rock.
6. **Often forms during mountain building.**
7. **Most metamorphic rocks are harder than sedimentary rocks.**
8. **Metamorphism changes texture.**
9. **Low-grade metamorphism makes material more compact, more dense.**
10. **Foliated texture:** Particles of material are brought into line with one another.

### III. Aggregates and Well-posedness

1. **Heat**
  - a. most important agent
  - b. provides energy for chemical reactions
  - c. For example: clay pottery shatters into a million at great temperature
2. **Pressure**
3. **Chemical Activity:** Most common chemical agent in water

### C. Types of Metamorphic Rocks

1. **Hornfels:** Fine grained, dark bluish rock with randomly arranged minerals
2. **Slate:** Fine grained, often gray, foliated rock, split easily along cleavage, planes of weak weakness aligned by pressure
3. **Mylonite:** Dark, fine grained, foliated rock, formed from brecciated or irregularly fractured rock
4. **Phyllite:** Silty, foliated rock, more coarsely grained than slate
5. **Schist:** Foliated rock, more coarsely grained and of higher metamorphic grade than Phyllite
6. **Gneiss:** Foliated, banded rock of the highest metamorphic grade
7. **Quartzite:** Very hard, granular rock, formed from sandstone

## RELATIONSHIPS BETWEEN THE TWO GROUPS

If a numeral, which has already formed, occurs in the magma, it will react with the remaining magma to produce the next numeral in the sequence. For example, silver forms first; silver then reacts with remaining magma to form mercury.

#### 18. Identifying Similar and Other Dissimilar Numbers

1. Calcium-rich parts of the magmas form small crystals of feldspar.
2. These react with sodium in the magma to form more sodium-rich.

Fig. 1. Model of the system.

1. When everything is almost cool, combine the sugar with the high altitude corn meal, and pour it all over.
2. When cooking is complete, everything that cooked in the same time will be done by the time the corn is cooked (different times and quantities could mean one another's ruin).



# Earth Science High School Essential Question

**D Siedentop**



## **Earth Science High School Essential Question:**

**Teaching Discipline-Specific Literacies in Grades 6-12** Vicky I. Zygmouris-Coe, 2014-10-30 Comprehensive timely and relevant this text offers an approach to discipline specific literacy instruction that is aligned with the Common Core State Standards and the needs of teachers students and secondary schools across the nation It is essential that teachers know how to provide instruction that both develops content and literacy knowledge and skills and aims at reducing student achievement gaps Building on the research supported premise that discipline specific reading instruction is key to achieving these goals this text provides practical guidance and strategies for prospective and practicing content area teachers and other educators on how to prepare all students to succeed in college and the workforce Pedagogical features in each chapter engage readers in digging deeper and in applying the ideas and strategies presented in their own contexts Classroom Life real 6 12 classroom scenarios and interviews with content area teachers Common Core State Standards Connections College Career and Workforce Connections Applying Discipline Specific Literacies Think Like an Expert habits of thinking and learning specific to each discipline Digital Literacies Differentiating Instruction Reflect and Apply Questions Extending Learning Activities The Companion Website includes Lesson plan resources Annotated links to video files Annotated links to additional resources and information Glossary Flashcards For Instructors All images and figures used in the text provided in an easily downloadable format For Instructors PowerPoint lecture slides *The Mastery Learning Handbook* Jonathan Bergmann, 2022-10-14 Mastery learning is an instructional approach that empowers every student to progress with confidence Using flexible pacing and targeted supports teachers guide students through a cyclic process of preparation demonstration and formative feedback until there is a mutual agreement between teacher and student that the student is ready to advance In this book educator Jonathan Bergmann a pioneer of the flipped classroom movement walks you step by step through the mastery learning cycle explaining what it entails and providing the templates models and rubrics you need to start using it in your own classroom You ll learn how to Set meaningful measurable and transferable learning objectives that target essential knowledge skills and dispositions Develop a mastery rubric to check for student levels of proficiency Create an assessment plan that ensures positive learning experiences for all Plan and deliver units that incorporate both time shifted direct instruction and collaborative application activities within the classroom space Provide timely differentiated support based on students individual learning needs Informed by trial and error in his own classroom and by discussions with other expert practitioners Bergmann shares commonsense solutions to the major challenges of mastery learning implementation everything from how to manage pacing to how to create multiple versions of tests determine grades and get stakeholder buy in *The Mastery Learning Handbook* is both an introduction to this exciting instructional approach and a practical resource that K 12 teachers can turn to again and again See for yourself just how effective enjoyable and transformative mastery learning can be *Resources in Education* ,1992 Serves as an index to Eric reports microform

**Strategies for Teaching Boys and Girls -- Secondary Level** Michael Gurian, Kathy Stevens, Kelley King, 2011-01-06 In his best selling classic *Boys and Girls Learn Differently* Michael Gurian explained the origin and nature of gender differences in the classroom His important book explored the behavior teachers observed and the challenges they faced with both boys and girls in their classrooms Taking the next step *Strategies for Teaching Boys and Girls Secondary level A Workbook for Educators* offers teachers a hands on resource that draws on the Gurian Institute s research and training with secondary schools and school districts The workbook presents practical strategies lessons and activities that have been field tested in real classrooms and developed to harness boys and girls unique strengths The workbook is designed to help teachers build a solid foundation of learning and study habits that their students can use in the classroom and at home It covers the key curricular areas and offers proven techniques to make learning no matter what the subject more engaging for all students The workbook is an essential resource for all teachers who want to improve their practice and get the most from all students whatever their gender

*Developing Learning Communities Through Teacher Expertise* Giselle O. Martin-Kniep, 2003-10-14 Learn practical methods for developing a collaborative environment where teachers and administrators work together to enhance teachers practices increase student learning and produce valuable school processes

**Science Curriculum Resource Handbook** ,1992 **Intersections of Formal and Informal Science** Lucy Avraamidou, Wolff-Michael Roth, 2016-03-10 Science learning that takes place between and at the intersections of formal and informal science environments has not been systematically reviewed to offer a comprehensive understanding of the existing knowledge base Bringing together theory and research this volume describes the various ways in which learning science in various settings has been conceptualized as well as empirical evidence to illustrate how science learning in these settings can be supported

Sg Essentials Geology Wicander, 2001-09 Manual of Standards and Suggestions on Organization for the High Schools of Ohio Ohio. Department of Education, 1921 *Resources in Education* ,1992 *The Lincoln Library of Essential Information an Up to Date Manual for Daily Reference, for Self Instruction, and for General Culture Named in Appreciative Remembrance of Abraham Lincoln, the Foremost American Exemplar of Self Education* ,1924 Proceedings of the Department of Superintendence of the National Educational Association ... National Education Association of the United States. Department of Superintendence, 1909 Interdisciplinary Approaches to Teaching Art in High School Pamela G. Taylor, 2006 The authors present works of art artmaking skills and ways of knowing as catalysts for learning across the traditional disciplinary boundaries in high school Both timely and enduring this is the book that will inspire and support the work of veteran new and pre service high school art teachers The book includes issues theories and practices related to high school curriculum advocacy classroom management assessment cultural understanding idea based instructional strategies team teaching technology visual culture and student initiated learning The authors draw upon their own experiences and those of other high school art teachers to create a motivating and provocative text that challenges readers to critically and

continually reflect collaborate read and research their own interdisciplinary thinking teaching and learning processes

Publisher     **Proceedings of the ... Annual Conference** Science Teachers Association of New York State,1904

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