

2019 Academic Super Bowl - Fertile Crescent & Levant

Outline for Biology and Earth & Environmental Sciences

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(Biology & Earth/Environmental Sciences comprise about 1/3 of the overall Science topics for this competition. Percentages listed in the outline are for the division WITHIN the Biology & Earth/Environmental Science subtopic.)

(50%) I. **Biology: Birth & Development of Agriculture**

A. Development of agricultural crop plants: basic (essential) classification, history/life history, plant characteristics and uses; especially as associated with importance as a “domesticated” agricultural plant. There are 8 Founder Crops from the Fertile Crescent:

1. Grains

- a. Emmer
- b. Barley
- c. Einkorn

2. Pulses/Legumes

- a. Chick Peas
- b. Peas
- c. Lentils
- d. (Bitter) Vetch

3. Other

- a. Flax

B. Domestication of Animals; basic (essential) classification, history/life history, and animal characteristics and uses, especially as associated with importance as a domesticated animal

1. Ruminant Ungulates:

- a. Characteristics of ruminant ungulates
 ruminants & monogastric animals compared
- b. cow
- c. goat
- d. sheep

2. Other:

- a. pig
- b. cat

C. Genetics (as generally applied to and associated with organisms in the competition)

1. chromosomal inheritance
2. ploidy
3. Basics (essentials) of agriculture plant breeding
 - a. fertilization in plants
 - b. Elementary Mendelian genetics (single-factor crosses only)

(50%) II. **Earth & Environmental Sciences: Rivers of the Fertile Crescent**

A. Structure & Physical Characteristics

1. Physical characteristics of rivers
 - a. Shapes & Structure
 - b. Flow: direction, velocities & flow rates, power of moving waters
 - i. Concepts of Erosion, Transportation, & Deposition
 - ii. Seasonality, floods, & fertility
 - c. Basics (essentials) of water quality; pH, dissolved oxygen (DO), clarity/turbidity, temperature, hardness (DH), nitrates, & phosphates
2. Environment & Ecology
 - a. riparian ecosystem
 - b. Common or typical organisms in (and on or associated with) the Fertile Crescent rivers

B. The Seas around the Fertile Crescent- Mediterranean & Persian Gulf

1. Ecological impact and influence of these bodies of water on local/regional environment

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Biology and Earth & Environmental Sciences

Annotated Coaches' Outline for Coaches Conference

(Biology & Earth/Environmental Sciences comprise about 1/3 (~33%) of the overall Science topics for this competition. Percentages listed in the outline are for the division WITHIN the Biology & Earth/Environmental Science subtopic.)

(50%) I. Biology: Birth & Development of Agriculture

A. Development of agricultural crop plants: basic (essential) classification, history/life history, plant characteristics and uses; especially as associated with importance as a “domesticated” agricultural plant.

[NOTE: Students should know the scientific names of the various plants, their general characteristics, any specific characteristics that made them valuable and suitable for domestication, the generally accepted place (local region) of origin, the approximate time of first use and/or domestication, and whether they are still in current agricultural use.]

1. Grains [grasses]

a. Emmer

b. Barley [Two-row and Six-row varieties]

c. Einkorn

2. Pulses/Legumes - (Family: Fabaceae; aka Leguminosae)

[Note: “What constitutes a ‘legume’?” is a question students need to answer. We will not be using the French usage of the term where *legume* simply means “vegetable,” but the common English usage for members of the bean family. Students should know why legumes are important to agriculture, both from an agricultural and dietary point of view.]

a. Chick Peas

b. Peas

c. Lentils

d. (Bitter) Vetch

3. Other

a. Flax

[NOTE: more “modern” products, such as linseed oil, linoleum, and various extracted omega-n fatty acids will also be mentioned or asked about. Traditional harvest and preparation methods may be covered.]

B. Domestication of Animals; basic (essential) classification, history/life history, and animal characteristics and uses, especially as associated with importance as a domesticated animal

[NOTE: Students should know the scientific names of the various animals, their general characteristics, any specific characteristics that made them valuable and suitable for domestication, the generally accepted place (local region) of origin, the approximate time of first use and/or domestication, and whether they are still in current agricultural use.]

1. Ruminant Ungulates:

a. Characteristics of ruminant ungulates?

ruminants and monogastric animals compared

[NOTE: The 4-chambered stomach of the ruminants will be covered during the competition. The basic structures (and names/terms) of the stomach will be used for both ruminants and mono-gastric animals.]

b. cow

c. goat

d. sheep

2. Other: [monogastric animals domesticated in the Fertile Crescent]

a. pig

b. cat

C. Genetics (as generally applied to and associated with organisms in the competition)

1. chromosomal inheritance

2. ploidy

[NOTE: Students should know the construction of a chromosome, their importance, and the chromosome numbers of the organisms explored in this competition (as well the “ploidy” of the organisms).]

3. Basics (essentials) of agriculture plant breeding

a. fertilization in plants

b. Elementary Mendelian genetics (single-factor crosses only)

[NOTE: Students should understand the differences between self-pollination and cross-pollination and how that applies to the Founder Crops and their descendants.]

(50%) II. Earth & Environmental Sciences — Rivers of the Fertile Crescent

[NOTE: Concentrating, of course, on the rivers that essentially define the Fertile Crescent: Tigris, Euphrates, Nile.]

A. Structure & Physical Characteristics

1. Physical characteristics of rivers

a. Shapes & Structure

b. Flow: direction, velocities & flow rates, power of moving waters

i. Concepts of Erosion, Transportation, & Deposition

ii. Seasonality, floods, & fertility

c. Basics (essentials) of water quality; pH, dissolved oxygen (DO),

clarity/turbidity, temperature, hardness (DH), nitrates, & phosphates

2. Environment & Ecology

a. riparian ecosystem

b. Common or typical organisms in (and on or associated with) the

Fertile Crescent rivers

B. The Seas around the Fertile Crescent- Mediterranean & Persian Gulf

[NOTE: Minority of questions from this subtopic B]

1. Ecological impact and influence of these bodies of water on local/regional environment

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Selected & Suggested References or Resources

(not to be considered exhaustive)

About General Resources for the Topic Areas:

Wikipedia is an acceptable source for these biological, ecological, and agricultural topics. The information there is non-controversial, sufficiently supported and with citations and references to general resources. The information in Wikipedia is both sufficiently general and still comprehensive enough to be considered equivalent to material in an introductory text for high school or entry-level college. The outline/question writer referred to Wikipedia numerous times to look up general information and to find good summary reviews of moderately complex topics. Wikipedia is often more up to date than many textbooks.

A current general text in *Environmental Science* will contain *some* of the information about general principles and practices as they might apply to the origin of agricultural crops and animal domestication in the Fertile Crescent, but will in no-wise be complete. Such a text may also provide a brief introduction to the structure and habits of rivers and streams, but, again, will not provide the level of information required for the range and level in the competitions.

A current general text in *Biology*, especially one designated for *AP Biology* or any other advanced Biology course will likely be sufficient regarding the chromosomal nature of inheritance.

An *Introduction to Agriculture* (high school level or above) might serve as a general text regarding crop plants and domesticated animals on our competition's list. The range and depth of these texts varies greatly as to the history of agriculture—mostly merely mentioning that agriculturally domesticated plants got their start in the Fertile Crescent. Some texts omit discussion the Founder Crops, but do include information about wheat species, polyploidy in crop plants, and crop plants characteristics and culture.

The following suggested references offer deeper dives into some of the basics, but allow students (and coaches) to better synthesize their own knowledge as well as gain different slants on what might be considered the “commonly held view” of history.

Development of Agriculture

Monophyletic vs. polyphyletic origin of the crops on which agriculture was founded in the Near East.
Paper on phyletic origin of the Neolithic Founder Crops

<https://link.springer.com/article/10.1023%2FA%3A1008692912820>

Article on “Genetic Fingerprinting” on descendants of the Founder Crops to find relationships and confirm or adjust the timelines of domestication. This provides some good background and is an interesting, higher-level reading; but no specific *details* will be taken from this source to be used in the competition. <https://academic.oup.com/mbe/article/19/10/1797/1259152>

Domestication of Animals

The genetic prehistory of domesticated cattle from their origin to the spread across Europe. Access at:
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4445560/>

Free downloadable PDF available through NCBI's site.

Blog from Cambridge University Press:

<http://www.cambridgeblog.org/2016/02/cattle-domestication-from-aurochs-to-cow/>

Animal Structure & Function; the rumen & ruminant digestion.

<https://sci.waikato.ac.nz/farm/content/animalstructure.html>

Rivers

Chapter on *Rivers-Structure & Function*:

https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=2ahUKEwjHtO24iv_cAhUGbK0KHXfuDTEQFjAAegQIA-BAC&url=https%3A%2F%2Fwww.springer.com%2Fcd%2Fcontent%2Fdocument%2Fcd_downloaddocument%2F9789401791434-c2.pdf%3FSGWID%3D0-0-45-1462825-p176757777&usg=AOvVaw3h3pWVAiefYEcy7pv_dcc

Tip: It's easier to do a Google search for the PDF document using the file name:

9789401791434-c2.pdf

Meanders & Floodplains:

<http://www.coolgeography.co.uk/GCSE/AQA/Water%20on%20the%20Land/Meanders/Land-forms%20Meanders.htm>

From a Floodplain Management unit. Includes embedded YouTube links.

<http://www.geo41.com/floodplain-management/#stream-processes-landforms>