

QUESTION DEPARTMENT.

Questions and Answers.

Y. S. F. 1.—As it is impossible to see the entire half of a sphere, what answer should be given to question 3, page 7, Calkin's General Geography: "At what elevation above the earth would one be able to see half its surface?"

The earth is a spheroid, surrounded by an atmospheric film which refracts light. The mean refraction of this film is such that a ray of light proceeding from an object on the earth's equator parallel to the earth's axis would be refracted towards the earth's axis 33 minutes of an arc after leaving the air. This ray would meet the axis of the earth produced about 412,725 miles from the earth's centre. This may be shortly found as follows: Semi-diameter of earth = 3,962 miles, multiplied by co-tangent of the angle of refraction $0^{\circ} 33' = 104 17094 \times 3,962 = 412,725 +$ miles. An eye, therefore, placed at this distance from the centre of the earth in the line of its axis would have its terrestrial view exactly bounded by the equator. A correct answer to your question would, therefore, be: *At an elevation of about 408,763 miles above the earth's surface.* Were the refraction of the air not taken into account, the answer would be: *At an infinite distance.*

2.—Why is the ice formed on sea-water fresh?

The molecules of water are strongly attracted to each other, but are kept apart within certain limits by the heat vibrations of the molecules. When these vibrations are lowered to what we call the freezing temperature the molecular attractive force prevails, drawing the water molecules into a more fixed and rigid connection with each other and pressing out into the liquid water the less strongly attracted molecules of the sodium chloride. The water molecules in freezing are strongly drawn in to the ice-forming surface, while the salt molecules, not being strongly attracted by this surface, are crowded back into the liquid water.

3.—Are the enclosed specimens of *Viola cucullata*?

No. It has a stem with leaves and branches, which, with its pale purple corolla with bearded lateral petals, and its fringe-toothed stipules, show it to be *Viola canina*, var. *sylvestris* (the Forest Dog Violet). Sometimes it is called Muhlenburg's Violet, from a name given it by Torrey before it was decided to be a variety of *V. canina*.

4.—What difference is there between the appearance of Land and Water Salamanders?

The tails of Water Salamanders are strongly flattened, vertically, sometimes with a ridge or crest running along the back of the animal. Land Salamanders like moist, wet places, but are not adapted for swimming.

J. A. V.—Will you kindly inform me if insects, including the various kinds of winged flies, moths, house flies, butterflies, wasps, beetles, etc., come from the pupa in the size they are seen and known, or do they improve and develop in size as other orders in Natural History?

The insects you specify develop in size during the larval stage. The imago is the adult stage and growth is complete. Ametabolian insects, that is those which do not pass through the three distinct changes of larva, pupa, and imago, increase in size while they have the adult form, as the *aptera* (lice and springtails). Hemimetabolian insects have the larval forms very much like the imago, and therefore appear to grow in size from moult to moult, as the grasshopper, for instance. The full-winged grasshopper, however, is the imago, and develops no more in size.

LITERARY NOTES.

Mr. C. Powell Karr, a graduate of School of Mines, Columbia College, has in preparation a manual of American Colleges, which proposes to give in classified form all the leading Colleges, Universities, Technical and Professional Schools, their requirements for admission, courses of study, cost of tuition and living expenses, and, in a word, a systematic *resumé* of all the information needed by parents, guardians and students to enable them to decide intelligently what college or institution of learning it is best to attend. It is to be issued from the press of William T. Comstock, New York.

Dr. J. G. Bourinot, clerk of the Dominion House of Commons, is about to publish a "Short Constitutional History of Canada," as one of the "English Citizen" series.

D. C. Heath & Co., Boston, will publish at once Compayre's "Lectures on Pedagogy: Theoretical and Practical," a companion volume to their Compayre's "History of Pedagogy." It is translated and annotated by Professor Payne, of the University of Michigan. Supt. MacAllister of Philadelphia, says: "I have known the book ever since it appeared, and regard it as the best work in existence on the theory and practice of education. It will be a much more valuable manual for the average teacher's use than any we now have."

BOOK REVIEWS.

THE HANDY REFERENCE ATLAS OF THE WORLD, by John Bartholomew, F. R. G. S., etc.; containing 100 maps and plans, as well as a complete index and geographical statistics; size, $7\frac{1}{2}$ by 5 inches. Price, \$2.50. For sale by J. & A. McMillan, St John.

It is doubtful whether a book more useful to the geographical student has ever been published. It contains, in a neat and handy volume of convenient library size representations of general and particular geography. Opening the volume we find a series of maps illustrating many astronomical and physical features. This is followed by a map of Europe, then several of the British Isles, one showing the depths of the surrounding seas, another its railway sys-