

would take up the study of the animal types in zoology. State reasons for your arrangement.

(b) Outline your method of conducting a series of lessons on the grass hopper.

(c) Conduct a first lesson on any fish you may select.

(d) State clearly your ideas with regard to the relative importance to be attached to (i) Dissections, (ii) Oral Descriptions, (iii) Written Descriptions.

3. "Many parts of Physics can best be introduced by means of carefully reasoned and fully illustrated experiments by the teacher."

(a) In general when should the method indicated above be followed, and when should individual experimental work take precedence? Give examples.

(b) Outline your method of introducing the subject of Induced Currents.

(c) Write a sample-page of a pupil's

note-book filled out to your satisfaction on the topic in (b).

(d) By what means would you (i) emphasize and fix important laws and facts, (ii) satisfy yourself that the proper observations had been made?

4. "From the educational point of view the important results to be attained from the study of Botany are

(i) the awakening of sympathy with natural objects,

(ii) the sharpening of the powers of observation, and

(iii) the strengthening of the faculty of reasoning from the object to laws and principles."

(a) Outline your method of presenting the subject of germination of seeds, having in mind "the important results to be attained."

(b) What topics would you take up after germination? Give reasons.

(c) Your pupils have studied only the fern among the cryptogams; how would you present the subject of "alternation of generation"?

TRIGONOMETRY, 1898, FORM IV.

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1. Define an angle, a degree, and a radian. From your definition of a radian deduce and explain the formula; $\text{angle} = \frac{\text{arc}}{\text{radius}}$.

Show that there are nearly 206,265 seconds in a radian.

$$(b) 1 \text{ radian} = \frac{360^\circ}{2\pi} = \frac{180 \times 60 \times 60}{3.14159}'' = 206264.5 + "$$

2. (a) Give a careful definition of the trigonometrical ratios that will apply to angles of any magnitude; and trace the changes in the values of $\sin \theta$ and $\cos \theta$, as θ increases from 0 to 2π . Show also that $\sin^2 \theta + \cos^2 \theta = 1$ is a formula true for all angles.

3. If A and B are two angles whose sum is less than 90° , prove that $\cos(A+B) = \cos A \cos B - \sin A \sin B$. Write down the corresponding values for $\sin(A+B)$, $\sin(A-B)$ and $\cos(A-B)$.

4. From the four formulæ of question 3 deduce formulæ expressing the sum or difference of two sines or two cosines as a product, also formulæ expressing $\sin A$ and $\cos A$ in terms of $\cos 2A$.

5. Prove:

$$(a) 2 \sin \frac{A}{2} = \pm \sqrt{1 + \sin A} \pm \sqrt{1 - \sin A}.$$