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Outline for Elementary Physics

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blood is largely coursing thru the muscles, carrying away accumulated waste products, and restocking the cells with a large supply of glycogen. As a result the athlete awakens in the morning feeling refreshed and full of vigor. Suppose tho, a person has retired late after a midnight lunch;—the opposite trend of events must take place with the result that morning brings only a bad taste in the mouth and a tired feeling. In the latter case the heart has had little chance to rest, waste products of the day before are still present in the muscles, and the muscle cells are not so well stocked with energy fuel for the day.

It is true that a person may accustom himself to the use of stimulants such as coffee, tea, and tobacco, so that he may not feel any very noticeable injurious effects. Space does not permit a full discussion of the matter but suppose we look at it this way for the present; a horse that is constantly goaded soon fails to respond to the goad, and should emergency arise there is no means of driving him faster. The person who uses stimulants is merely using a goad. In doing so he is taking chances that common sense would tell him to avoid.

Perfect physical condition is a thing that few persons possess not because it requires any great sacrifice to attain it, but because we thoughtlessly follow our whims or the whims of the crowd. The athlete who would attain the best of physical condition must play the game off the field as well as on it.

H. Earl Rath.

OUTLINE FOR ELEMENTARY PHYSICS

In the September number of the Science Bulletin will be found the outlines for the subjects of Mechanics and Heat. We submit in this number the remaining outlines of the principal subjects that should be presented in a high school course in Physics.

In following these outlines it would be well to provide several of each of the best high school texts for student reference. Physics teaching will be most effective when the teacher breaks away to a large extent from the habit of lesson assignments from some one text.

GROUP PROJECTS IN MAGNETISM AND STATIC ELECTRICITY

Ferro-Magnetic Phenomena

1. Natural Magnets. 2. Artificial Magnets. 3. Field of a Magnet. 4. Magnetic Induction. 5. Applications of Permanent Magnets. 6. The Earth and Its Magnetism.

Phenomena of Static Electricity

1. Nature of a Static Charge. 2. Experimental Methods of Producing a Static Charge. 3. Laws of Static Charges. 4. Static Field of Force. 5. Static Induction. 6. Difference between a Static and a Magnetic Field. 7. Constitution of Matter. 8. Earth and its Static Electricity.

APPARATUS FOR CLASS ILLUSTRATIONS IN MAGNETISM AND STATIC ELECTRICITY

Ferro-Magnetism

1. Piece of magnetic iron ore to illustrate a natural magnet.
2. Artificial magnets of tempered steel; bar and horse shoe.
3. Pieces of soft iron rod to illustrate magnetic induction.
4. Magnetic compass, declination and dipping needle to illustrate properties of earth's magnetism.
5. Miscellaneous: tacks, iron filings; card board.

Static Electricity

1. Electro-static machine of the induction type.
2. Electroscope.
3. Leyden jar; Leyden jar discharger.
4. Insulated hollow cylinder with suspended pith balls.
5. Rotating device to show the effect of charges on points.

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ty of oxygen provided, hence the increased oxidation. If the blowing were too vigorous, the heat would be blown away and the carbon cooled below its burning temperature and the fire extinguished, just as in the case of the candle.

O. B. Read.

Question:

Should static electricity be continued as a part of the high school physics course?

M. S.

Answer:

By all means. While it is true that electrostatics is of little importance in an elementary study of motors, dynamos and transformers, it is of the greatest importance in other connections, two of which will be mentioned.

In the first place there is nothing in nature more fundamental than an electrostatic charge. Science has reached the conclusion that matter itself, everything material in the universe, consists of nothing else—positive and negative electrons associated together. In the second place electrostatics has in recent years risen to a place of commanding importance in engineering. This has been due chiefly to the development of long distance telephony and radio, in which electrostatics assumes a major role.

W. H. Kadesch.

Outline for Elementary Physics

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6. Miscellaneous: glass rod or flask; hard rubber rod or sealing wax; silk cloth; woolen cloth; pieces of fur; corn pith; rectangular support for pith balls suspended from silk threads.

GROUP PROJECTS IN CURRENT ELECTRICITY

Methods of Producing Currents

1. By means of batteries. 2. By means of dynamos. 3. By means of thermocells.

Nature of an Electric Current

1. Units of measurement: ampere, volt and ohm. 2. Ohm's law. 3. Calculation of power from volts and amperes. 4. Problems.

Effects of an Electric Current

1. Chemical Effects: Electrolysis of Water and Chemical Salts, Electroplating. 2. Magnetic Effects: Electro-magnet; Applications of the Electro-magnet. 3. Heating and Lighting Effects. 4. Problems.

Current Induction

1. Faraday's law. 2. Lenz's law. 3. Applications of current induction in dynamos, induction coils and transformers. 4. Nature and production of an alternating current. 5. Problems.

Modern Advances

1. X-rays. 2. Radium. 3. Wireless telegraphy. 4. Radio receivers and transmitters.

APPARATUS FOR CLASS INSTRUCTIONS IN CURRENT ELECTRICITY

1. Tumblers; carbon and zinc rods; sulphuric acid; potassium bichromate to illustrate acid voltaic cells; keys.

2. Section of old dry cell to show its structure.

3. Bent glass tube with platinum electrodes to illustrate electrolysis; electroplating.

4. Potassium sulphate solution colored blue with litmus; silver cyanide solution for electroplating.

5. Sections of electrotypes and linotypes to illustrate various ways of printing books and newspapers.

6. Sheet lead for lead plate of a simple storage cell; tumblers and holders for plates with wire terminals.

7. Apparatus and iron filings to show the magnetic field of a current.

8. Solenoid with loose iron core to show the construction of an electro-magnet.

9. Apparatus to show the interaction of parallel currents.

10. Electric bells; relay; sounder, keys.

11. Current induction apparatus and a simple sensitive galvanometer or D'Arsonval galvanometer.

12. High voltage induction coil.

13. Telephone receiver; transmitter.

14. Small dynamo attached to rotating device.

15. St. Louis motors; small fan motor.

16. Radio materials for a simple receiving set.

GROUP PROJECTS IN SOUND

Production of Sound

1. Sound Vibrations. 2. Sound Vibrators. 3. Properties of a Sound Vibration; Amplitude, Period, Frequency. 4. Limits of Sound Vibrations.

Propagation of Sound

1. Sound waves. 2. Velocity of Sound Waves. 3. Methods of Measuring the Velocity of a Sound Wave.

Phenomena of Sound Waves

1. Reflection, Echoes. 2. Refraction of Sound Waves. 3. Interference of Sound Waves, Beats.

Properties of a Musical Sound

1. Pitch. 2. Quality. 3. Intensity. 4. The Musical Scales, Natural, Tempered.

APPARATUS FOR CLASS ILLUSTRATIONS IN SOUND

1. Rope and coiled brass spring to illustrate transverse and longitudinal waves.

2. Sonometer to illustrate phenomena and laws of vibrating strings; resin and fiddle-bow.

3. Tuning forks; frequencies 512 and 256 with tall jar to illustrate resonance and interference.

4. Two mounted tuning forks with same frequencies to illustrate beats and resonance.

5. Organ pipe and plunger to illustrate the principles of open and closed pipes.

6. Lantern slides of reflected and refracted sound waves; projection lantern.

7. Miscellaneous: meter sticks; wide mouthed bottles; brass rods; clamps.

GROUP PROJECTS IN LIGHT

Nature of Light

1. Ether Waves. 2. Light Waves. 3. Historic Theories of Light.

Reflection of Light

1. Regular. 2. Diffused. 3. Mirrors, Plane and Spherical. 4. Phenomena of Mirrors. 5. Problems.

Refraction of Light

1. Nature of Refraction. 2. Cause of Refraction. 3. Index of Refraction. 4. Illustrations. 5. Problems.

Applications of Refraction

1. Lenses. 2. Phenomena of Lenses. 3. Problems. 4. Applications of Lenses, Microscope, Telescope, Spectacles, Camera. 5. Problems.

Dispersion of Light

1. Dispersion by a Prism. 2. Colors of White Light. 3. Natural Illustrations, Rainbow.

Color

1. Primary Colors. 2. Complementary Colors. 3. Colors in Nature and Art.

APPARATUS FOR CLASS INSTRUCTIONS IN LIGHT

1. Optical disc with accessories.

2. Plane mirrors.

3. Spherical and convex mirrors mounted in wooden frame.

4. Box of six lenses; convex and concave.

5. Several ordinary glass prisms to illustrate dispersion.

6. Large hand reading lens to illustrate image production of a convex lens.

7. A small motor with a set of color discs.

8. Miscellaneous: Newton's ring apparatus; diffraction grating; spectroscope; screens.

L. Begeman.

INSTINCT OR INTELLIGENCE IN THE GREAT GOLDEN DIGGER

"To know everything and to know nothing according as it acts under normal or exceptional conditions: that is the strange antithesis presented by the insect race." So said that profound