QUESTIONS ON GENERAL PHYSICS IN FOUR PARTS. PART I: STATICS INCLUDING MECHANICS, HYDROSTATICS AND PNEUMATICS, PP. 2-80

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HAROLD WHITING

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QUESTIONS

ON

GENERAL PHYSICS

IN FOUR PARTS

Based on the tenth edition of Everett's Translation of
DESCHANEL'S NATURAL PHILOSOPHY

PART I

STATICS

INCLUDING

MECHANICS, HYDROSTATICS AND PNEUMATICS

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4. Explain the principles upon which Natural (or Physical) Science has been divided broadly into Natural History and Natural Philosophy. In which of these divisions does classification, and in which does the study of cause and effect receive the relatively greater amount of attention? D. 1.

5. Upon what farther principles has Natural Philosophy been divided into Astronomy, Biology, Chemistry, and Physics, (or Natural Philosophy in its more restricted sense)? D. 2.

6.† To which of the above divisions is the Experimental Method virtually restricted, and in what does the Experimental Method consist?

7. Should the descriptive portions of Astronomy, Biology, and Chemistry (*e.g.*, Mineralogy) be included under Natural Philosophy or under Natural History? Q. I. 4.

8.† Distinguish ordinary descriptive physics, whether studied in the class-room or in the laboratory, from general physics (whether mathematical or simply deductive), on the one hand and from truly experimental (inductive) physics, including physical investigation and measurement, on the other hand.

9.† Show that, from the nature of the subjects allotted to Physics, this science is able to carry both inductive and deductive methods farther than any other science.

10.† What faculty is particularly trained by quantitative experiments or measurements?

11.† State some of the advantages of a course in general and experimental physics. Show that such a course trains the faculties of expression, observation, classification, experimentation, inference, explanation, and judgment (the last three being the most important branches of reasoning, viz., inductive, deductive, and quantitative).

12.*†Name the principal branches of Physics. Explain the following terms and their mutual relations: Dynamics, Kinetics, Statics, Mechanics, Hydrostatics, Pneumatics, Thermics, Optics, Acoustics, Electricity and Magnetism. D. 3 and 9.

1.* Define the foot and the metre.

2.* Explain the use of a graduated scale for measuring length.

3.* Define the pound and the gram as units of mass. D. 160.

4.* Explain the construction and use of a set of weights (with the method of substitution).

5.* Define the (mean solar) second.

6.* Explain the use and construction of a clock.

7.* Define velocity, and state in what units it is expressed.

8.* Define the area of a surface, and name different units of area.

9.* Find the area of a plane rectangular surface of length, l, and breadth, b.

10.* Define volume, and state in what units it is expressed.

11.* Find the volume of a block of length, l, breadth, b, and thickness, t.

12.* Define density, and give an example. D. 160.

13.* Distinguish absolute and relative density. D. 160.

14.* Find the density, d, of a body of mass, m, and volume, v. (D. 160.)

15.* Find the mass, m, of a body of density, d, and volume, v. D. 160.

16.* Find the volume, v, of a body of mass, m, and density, d. (D. 160.)

17.*‡ Discuss the experimental determination of the density (1) of a solid, (2) of a liquid, and (3) of a gas, by direct measurements of mass and linear dimensions, and show that the same fundamental principles apply to each case. (D. 162.)

18.* Define the pound weight and the gram weight as units of force (in latitude 45°). D. 161.

19.* Explain the signification and use of the prefixes, mega-, kilo-, hekto-, deka-, deci-, centi-, milli-, and micro-.

20.* Explain the signification of the hyphen in such words as foot-pound, kilogram-metre, etc.

21.* Explain the signification of "per" in such expressions as pounds per square inch, or centimetres per second.

II.

CRUDE IDEAS OF FORCE.

1.† Show that the sense of touch is closely connected with our ideas of force.

2. What connection exists, in general, between force and the muscular effort necessary to produce or to resist it? D. 7.

3.† Name certain cases in which the maintenance of a force, like continued muscular effort, requires the continuous expenditure of energy of some sort; and where, if the source of energy be cut off, exhaustion ensues, and the force ceases.

4.† What is meant by the "fatigue" of metals, etc., under continued strain? Would a perfect solid exhibit such effects?

5.† Are we justified in supposing that the maintenance of inanimate forces in general, like the maintenance of muscular tension, in the absence of a fresh supply of energy, necessarily involves fatigue or exhaustion to any considerable extent? Illustrate by the force of gravity upon the moon.

6.† What misconception is likely to arise from the use of muscular tension as the type of a force?

7.† Does the modern idea of force contain any reference to the supply of energy by which it may happen to be maintained?

8.† What restriction, not observed by earlier writers, exists in the modern use of the word force?

9.† Criticise the expressions, force of a waterfall, force of the wind, force of gravity.

10.† Consider a "push," a "pull," or a "shove" as instances of a force. What does each imply as to the direction of the force with respect to the agent; as to the point of application of the force, and as to the state of tension or compression produced?

11.† Criticise the definition of a force as a "push or a pull." (HALL'S Elementary Ideas.) To what extent is it supposed that molecular forces can be so classified? Is it thought that electromagnetic forces fall into either category?