

PHYSICS.

NOTE.—In case only one-half year has been devoted to the study of this subject, the instructor should give any six of the twelve questions offered allowing the class to omit any two of the six questions selected. Students taking the entire examination may omit any four of the twelve questions.

1. Distinguish between mass and weight. How does the weight of a body vary (a) on going from the equator toward the poles? (b) on ascending above the earth's surface? (c) on descending below its surface?

2. A lead ball whose volume is 4 c.c. weighs 44 grams in air. What will it weigh under water? It weighs 38.8 grams under brine. What is the density of the lead and of the brine?

3. What is a compensating pendulum? Explain its construction. State the formula for the Ideal Simple Pendulum. What would you do to a pendulum to make it vibrate nine times faster?

4. A body whose mass is 40 kilograms falls from rest for 3 seconds. How far does it fall? What is its final velocity? Its kinetic energy in kilogram-meters? ($g=9.8$.)

5. State experiments illustrating (a) capillarity, (b) surface tension. State two laws of capillary action. Why are drops of free liquid spherical?

6. State the kinetic theory of heat. Account for the expansion of substances when heated. Name and illustrate three modes of heat transmission.

7. A metal ball (specific heat .032; weight 69 gms.) is put in a furnace until it has attained its temperature; it is then suddenly plunged into 400 grams of water at 10 deg. C. and the temperature of the water rises to 15 deg. C. How hot was the furnace?

8. Make a diagram showing the relative position of an object and its image, when the former is three times the focal length from a double convex lens.

9. What is meant by chromatic aberration? Spherical aberration? How may these defects in lenses be corrected?

10. Explain the electro-chemical action in a voltaic cell. What is meant by local action? How may it be prevented?

11. State three laws about vibrating strings showing the relation between the vibration rate of the string and its length, mass, diameter, tension, etc.? Make and solve a problem illustrating the law of length.

12. The internal resistance of a cell is two ohms. Its E. M. F. on open circuit is 1.4 volts. How much current would 40 such cells,

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arranged in series, send through a telegraph line of 400 ohms resistance?