8. Explain how you would determine whether a piece of glass was plane, convex, or concave, by the appearances presented by its shadow. Under what circumstances would the shadows of the concave and convex lenses appear the same?

9. Give a description of a chemical spectroscope; describe how two spectra are compared in it; and state the appearance presented by a bright light shining through a sodium flame when examined by a spectroscope.

10. How does a beam of yellow polarized light (such as polarized sodium light) differ from a beam of common white light?

CLASS D.—HEAT (Optional).

Time allowed: Three hours.

1. How is the coefficient of absolute expansion of mercury determined? What is meant by the term *coefficient of apparent expansion?*

2. Describe the chief uses made of the property of expansion of solids, liquids, and gases, respectively.

3. Define the coefficient of conductivity. How has the relative conductivity of bodies been determined?

4. State some of the effects of convection in liquids and gases, in nature.

5. What is the meaning of the terms *specific* and *latent heat?* What is the actual state of the energy in the so-called latent heat? and how has specific heat been determined?

6. If 1 lb. of steam at 100° C., 10 lb. of water at 50° C., and 4 lb. of ice at 0° C., are mixed, what will be the resultant temperature?

7. What is meant by the terms *dry and wet air* and *dew-point?* How is the dew-point determined, and what purpose does its determination serve?

8. How are the freezing and boiling points affected by pressure? Describe the action of a geyser.

9. A piece of platinum foil has an ink-spot on one side: it is made red-hot. Describe and explain the appearance of the spot, and also its effect on the back of the foil.

10. Explain what will happen if two pieces of metal be coated, one with lamp-black, and the other with white-lead, and exposed to the sun's rays. Will the same thing happen if both be exposed to the rays from a red-hot ball, or from a vessel filled with boiling water?

CLASS D.—BOTANY (Optional).

Time allowed: Three hours.

1. What is meant by the terms "annual," "biennial," and "perennial," as applied to plants? Give examples of each.

2. Describe the root-cap, and root-hairs, in flowering plants, and state the function of each.

3. What is meant by "adventitious" stems and roots?

4. Define the following kinds of fruit: Nut, drupe, legume, berry, capsule, achene.

5. Describe the flowers of the daisy, the buttercup, the apple, and the cabbage.

6. Describe the structure of a fibro-vascular bundle from the stem of a dicotyledonous plant.

7. State all you know about gymnospermous plants.

8. What is starch? How is it formed? and what part does it play in the nourishment of plants?

9. Explain the advantages obtained by a rotation of crops.

CLASS D.—GEOLOGY (Optional).

Time allowed: Three hours.

1. Define the term "rock," as used by geologists.

2. Describe the following minerals: Quartz, felspar, mica, hornblende.

3. How is ordinary compact limestone formed? Give reasons for your opinion.

4. What is the difference between jointing and cleavage in rock-masses? Explain the origin of each.

5. What are synclinal and anticlinal curves? Illustrate your answer with diagrams.

6. Define the terms "dyke" and "mineral-vein," and give the names of some of the commoner rocks and minerals which fill them.

7. What are the proofs that the rocks forming the earth's crust have been moved from the positions they originally occupied?

8. Explain the origin of the terraces found in many river-valleys.

9. What are artesian wells, and to what causes are they due? Illustrate your answer with diagrams.

CLASS D.—FRENCH (Optional).

Time allowed: Three hours.

1. In what words is *eu* sounded as *u* (French)?

2. By what various expedients is hiatus avoided without having recourse to elision?

3. Give the feminine of the following adjectives: *Heureux, vieux, faux, doux, préfix.*

4. Enumerate the nouns ending in *ou* which take an *s* in the plural.

5. Give the meaning and feminine of *gendre, parrain, bélier, élève, loup.*

6. Give the two meanings of each of the following words, which are masculine in one sense and feminine in the other: *Aune, somme, pendule, mémoire, couple.*

7. Give the French for the half, the third, the quarter, the fifth.

8. Account for the unusual form of the compound nouns *hôtel-Dieu, bain-marie.*