3. What is meant by *acceleration?* When is a body said to be uniformly accelerated? Establish the formula $h = \frac{1}{2}gt^2$.

4. A stone is let fall from a certain height at the same instant that another is projected vertically upwards from a point immediately below the first: if the two stones meet half-way prove that the second stone comes to rest at the instant the other stone meets it.

5. Enunciate and prove the proposition called the "triangle of forces."

6. A hundredweight is hanging by a rope, and it is drawn aside by a horizontal force till the rope makes an angle of 30° with the vertical: find the magnitude of the horizontal force and the tension of the string.

7. Weights of 3lb., 4lb., 5lb. are placed at the angular points of a triangular plate which itself weighs 3lb.: find the centre of gravity of the whole system.

8. Find what force acting up an inclined plane which makes an angle of 30° with the horizon will support a weight of 50lb.

9. Assuming that the specific gravity of sea-water is 1·025, find the pressure per square foot at a depth of 40ft. in the sea, a cubic foot of fresh water being taken to weigh 1,000oz.

10. What are the conditions which must be satisfied if a body float freely in equilibrium?

11. Describe any mode of practically determining the specific gravity of a fluid, giving a description of the instrument you use.

Chemistry.—Optional for Class D and Junior and Senior Civil Service. Time allowed: 3 hours.

1. How many grammes of oxygen in each case are required to burn completely one hundred grammes of hydrogen, of carbon, of sulphur, of phosphorus?

2. Show, by equations, the action of heat on the following compounds: Manganese dioxide, potassic chlorate, mercuric oxide, ammonic nitrate.

3. From what considerations is atmospheric air supposed to be merely a mixture, and not a compound, of its constituents?

4. Arrange the non-metallic elements in the order of their atomicity (monads, dyads, triads, &c.); and assign to each its symbol and atomic weight.

5. What is meant by the following terms: Atom, molecules, element, compound, anhydride, allotropic, oxychloride? Give two examples of the application of each of these terms.

6. Write down the formulæ (symbols) of each of the following compounds: Nitrous oxide, carbonic oxide, ammonic nitrite, silicic acid, hydrosulphuric acid, metaphosphoric acid, pyrophosphoric acid.

7. In what respects does red phosphorus differ from common yellow phosphorus? How may each of these be converted into the other?

8. How may it be shown that diamond, plumbago, and wood-charcoal are merely different forms of the same elementary substance?

9. Write down as many equations as you can for making hydrogen, chlorine, carbon dioxide, and sulphur dioxide.

10. Given oxygen, chlorine, nitrogen, hydrogen, carbon dioxide, and sulphur dioxide in different bottles: how would you distinguish them from each other?

11. Explain, as fully as you can, all the changes that take place when a candle burns.

Elementary Biology.—Optional for Class D and Junior and Senior Civil Service. Time allowed: 3 hours.

ZOOLOGY.

1. What is bone composed of? Explain how a bone is nourished and grows. What are the chief uses of the skeleton?

2. Describe the structure and functions of the arteries, capillaries, and veins. What is the pulse, and why is there no pulse in the veins?

3. Describe the microscopic appearance of fresh blood, and explain the coagulation which the blood undergoes when drawn from the living body. What is the composition of the blood-plasma?

4. Describe and explain the action of the mechanism by which blood is drawn into the lungs and expelled from them. What changes does the blood undergo in the lungs?

5. Describe the structure of the liver. How is it supplied with blood, and what are its functions?

6. What are the different kinds of food necessary for health, and what is their composition? What are the advantages of a mixed diet for man?

7. What are the muscles? Describe the microscopic appearance of muscular tissue. Show how the locomotion of the body is effected by the contraction of the muscles.

8. What do you understand by nerves, nerve-fibres, and nerve-cells, and what are their general properties? What will be the condition of a man when his back is so injured that the spinal cord is practically broken across? Give the reasons for your answer.

9. Write an account of the structure of the ear, and explain how the different parts assist in hearing.

BOTANY.

1. Give the chief characters of roots. Describe the chief forms of underground stems, and explain how they are distinguished from roots.

2. Describe the form and structure of any typical simple leaf. Show how other forms of leaves may be derived by the modification of some part or parts of the typical leaf. What are compound leaves?