

6. Describe the chemical changes that take place when firedamp (methane or marsh-gas) explodes in a coal-mine; and compare the state of the atmosphere in the mine *before* and *after* the explosion.

7. What weight of oxygen is there in 100 grains of each of the following compounds: (a) water, (b) carbon-dioxide, (c) nitric acid, (d) sulphur-dioxide, (e) sulphuric acid?

8. Describe (giving equations) the successive operations by which iodine is obtained from seaweeds.

9. Define the following terms, and give examples of their application: (a) atom, (b) molecule, (c) equivalent, (d) allotropic, (e) amorphous, (f) atomicity.

10. What is there exceptional about the atomic volume of phosphorus?

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

[Candidates are requested to answer questions in one subject only.]

ANIMAL PHYSIOLOGY.

1. What is the composition of bone? Describe what is seen in a longitudinal section of a thigh-bone, or any other long bone. How is a bone nourished, and how does it grow?

2. Describe the coagulation of the blood. What is the composition of the blood-plasma?

3. Why does the body waste away, and what are the chief waste products? How are they formed, and how are they eliminated from the system?

4. Give an account of the structure and functions of the liver. How is it supplied with blood?

5. Give an account of the microscopic structure of a muscle. What changes does a muscle undergo during contraction? Distinguish between voluntary and involuntary muscles.

6. What is the ordinary temperature of the body? What is the source of the heat, and how is the temperature regulated?

7. A man touches a hot iron with his hand, and immediately pulls it away. State what parts of the body are concerned in the action, and explain clearly their respective functions.

8. Give an account of the structure of the eye. How is it that with two eyes an object is seen single?

BOTANY.

1. Describe the chief kinds of underground stems, and show how they are distinguished from roots.

2. Give some account of the chief modes in which leaves are arranged on the stem. Give examples of natural groups of plants which are characterized by some particular mode of arrangement of the leaves.

3. Describe the characters of a typical vegetable cell. What are the chief forms of tissues found in plants, and how are they formed from primitive cells?

4. What is chlorophyll, and how does it occur in plants? Explain how it is connected with the nutrition of the plant, and describe experiments which illustrate your answer.

5. What is a seed? Describe the structure of a seed with endosperm and of one without it.

6. A flower is said to be a shoot modified for the purpose of reproduction. Explain this statement fully, and show that it is correct.

7. Describe the characters of the natural order of native plants that is most familiar to you. Mention as many distinct kinds of native plants belonging to the order as you can, and state briefly by what structural characters you could distinguish them.

8. Describe the process of fertilisation in any flower. What is cross-fertilisation, and what are its advantages? Describe flowers which possess modifications to insure cross-fertilisation.

Shorthand—Senior.—For Senior Civil Service. Time allowed: 3 hours. [Optional.]

INSTRUCTION TO SUPERVISORS.

1. Inform candidates before the time for taking up this subject that they may use pen or pencil as they please for taking notes, which should be written on ruled paper, but that they must transcribe those notes into longhand with pen and ink.

2. Inform candidates that when once you have commenced to dictate you cannot stop until the passage is finished.

3. Dictate the passages at the following rates of speed:—

(a.) 80 words per minute.

(b.) 120 " "

(c.) 150 " "

N.B.—It will be well to practise reading these aloud some time beforehand, looking at a watch or clock, so as to accustom yourself to reading at the exact rate indicated.*

4. Candidates are at liberty to take down one, two, or three passages, as they choose. All the passages required by candidates are to be dictated before any one begins to transcribe; and there should be as little delay as possible between readings.

* The matter to be read is marked off into sections, each of which is to occupy a minute. The Supervisor will perhaps find it advisable to mark it off into smaller sections, each containing the number of words to be read in fifteen seconds, and to read one section every quarter of a minute. As the candidates hear the passage read only once, the reader's articulation ought to be very clear, and the candidates ought to be so placed as to be able to hear well.