

Chemistry.—For Class D, and for Senior and Junior Civil Service. Time allowed ; 3 hours.

1. Define the terms—equivalent weight, valency, compound radicle, dibasic acid, and illustrate their meaning.
2. How can the composition of water be accurately ascertained? Do you consider that the evidence is absolutely conclusive? Give reasons for your answers.
3. Give a short account of the allotropic forms of sulphur and of phosphorus.
4. What do you understand by oxidizing agents and reducing agents? Show by typical reactions to which class each of the following substances is to be referred: nitric acid, chlorine, hydriodic acid, sulphur-dioxide, hydrogen-peroxide, arsenious oxide.
5. Give a list of three gases that are readily soluble, three that are moderately soluble, and three that are only sparingly soluble in water. Describe the preparation of any one of the readily soluble gases in a pure dry state.
6. What weight of sulphur-dioxide can be prepared from eight grams of sulphur? How much sulphuric acid will the gas thus prepared yield by oxidation in the presence of water? What volume of hydrogen measured at 0° C. and 760 mm. will be liberated if the acid thus yielded is acted on by metallic zinc, and what weight of zinc-sulphate will remain in solution?

(Zn = 65; S = 32; O = 16; H = 1.)

7. In what forms does silica occur in nature? How is silicon fluoride obtained, and how does it react with water?

Biology.—For Class D, and for Senior and Junior Civil Service. Time allowed ; 3 hours.

[N.B.—Candidates must answer questions in one branch of the subject only. All answers should be illustrated, when possible, by diagrams.]

ANIMAL PHYSIOLOGY.

1. Name and briefly describe the various organs found in the cavity of the thorax. How are they kept in position?
2. Describe the character of the blood and of any bodies found in it. What evidence have we of the circulation of the blood?
3. Describe the general characters of the vertebral column. Draw a single vertebra, naming its parts and stating the region to which the vertebra belongs.
4. What are the structure and properties of muscle? What do you know of any relation between muscles and nerves?
5. What is a proteid? State how a proteid is digested and absorbed. Give examples of common articles of food (a) in which proteids are abundant, (b) in which they are present in small quantity, (c) from which they are absent.
6. Why does the body waste away? What are the chief waste products, and how are they eliminated? Describe the structure of any one excretory organ.
7. Show how the spinal nerves arise, giving a diagram of a cross-section of the cord. How is the medulla oblongata (spinal bulb) connected with the rest of the nervous system? Show that the spinal bulb exercises important functions in regulating processes that go on in the body.
8. Describe the structure of the organ of hearing. How would hearing be affected (a) if the auditory nerve were cut, (b) if the tympanic membrane were removed? Give the reasons for your answer.

BOTANY.

1. Describe the structure of the leaf of any typical dicotyledon, giving a diagram of a section across the blade of the leaf. Account for the form of the leaf, and the mode of arrangement of the tissues.
2. What is chlorophyll, and in what parts of the plant is it found? What is its function? Describe experiments illustrating your answer.
3. What food do plants obtain from the ground, and how do they absorb and utilise it?
4. What is the difference between pollination and fertilisation? Describe both as exhibited in some flowering plant.
5. Show that it is advantageous for plants to have some method of dispersing their seeds. Describe the chief contrivances for securing the dispersion of seeds.
6. Describe the structure of two seeds, one with and one without endosperm, and show how they germinate.
7. Describe fully the structure of a flower in which the corolla is highly specialised for insect pollination. State the order to which the flower selected belongs.
8. Describe the chief kinds of fruits found in the Rosaceæ, and show how they are related to one another.

Music. Time allowed : 3 hours.

INSTRUCTIONS TO CANDIDATES.

- (a.) For the sake of uniformity it is requested that the notes of the scale be referred to by their Tonic Sol-fa names—Dob, Ray, Me, Fah, Soh, Lah, To—or their initial letters.
- (b.) The Tonic Sol-fa terminology is used throughout this paper as being the more generally known among school teachers; but, where it is considered necessary, explanations in ordinary musical language are given in brackets, thus: "Three pulse measure [Triple time]."
- (c.) Answers requiring the use of the Staff notation may be written in their proper place in the body of the paper, candidates ruling their own staves.
- (d.) All candidates are expected to attempt the practical work (Question 13).