

3. Describe the construction of the gold-leaf electroscope. How may the instrument be employed to determine the nature of the electrification of a charged body?

4. State the laws of electrical attraction and repulsion. How can these laws be experimentally verified?

Two similar small spheres are respectively charged with + 30 and - 10 units of electricity, and are placed 10 centimetres apart. What will be the force acting between them before and after they are put into communication by a thin wire?

5. Define electrical potential at a point. What quantity of electricity must be given to an insulated sphere 5 centimetres in diameter, so that its potential may be raised from zero to 15?

6. Describe the construction of Daniell's cell and of Leclanché's cell, and point out the relative advantages and disadvantages of each.

7. State Ohm's law. How would you attempt to prove the law experimentally?

8. Explain the construction of the metre bridge. How would you use the instrument to compare the specific resistances of iron and of copper?

9. State the fundamental laws of electrolysis. How would you compare the electro-chemical equivalents of hydrogen and of silver.

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

1. Explain clearly how the composition of atmospheric air has been accurately ascertained. Why is air regarded as a mixture and not as a compound?

2. How is sulphuretted hydrogen commonly prepared? What are its properties? What happens when the gas is passed into a solution of (1) nitric acid, (2) copper sulphate, (3) caustic soda?

3. In what forms is phosphorus capable of existence? Contrast the properties of the different forms, and explain how it can be proved that both forms consist of the same element.

4. By what characters could you distinguish between (a) Epsom salts and white vitriol (b) common salt and nitre, (c) chalk and white lead?

5. Explain the statement that 32.5 grams of zinc are *chemically equivalent* to 1 gram of hydrogen. How would you proceed to test the proof of the statement experimentally?

6. What weight of soda crystals would be required to neutralise 100 grains of 10-per-cent. sulphuric acid? What volume would the resulting gas occupy at 0° C. and 760 mm. pressure?

7. Compare the properties of the oxides of carbon, and describe carefully how you would prepare each of the oxides in a pure and dry state.

8. How are lime and caustic soda prepared? Mention any commercial uses of these compounds.

Biology.—For Class D, and for Civil Service Senior (Old Regulations) and Junior. Time allowed : 3 hours.

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

ANIMAL PHYSIOLOGY.

1. Give an account of the process of digestion, and describe the principal organs which are employed in the process.

2. Draw a diagram of the bones of the arm, and give their names.

3. State what you know about the structure of the brain.

4. Explain the cause of the circulation of the blood, and describe its course through the body.

5. Explain what is meant by reflex action of the nerves, and give examples.

6. Draw a diagram showing the structure of the eye; state the functions of the different parts.

7. Describe the nature of blood, and explain what occurs when blood coagulates.

8. What are hairs, and how do they grow?

BOTANY.

1. Describe the circulation of fluids in a plant, and explain as well as you can how this circulation is caused.

2. What is the difference between respiration and transpiration in plants?

3. Describe the structure of the stem in a dicotyledonous tree, and explain what is meant by bark.

4. How is it that some plants are able to twine round a stick and others to climb by means of tendrils?

5. Describe the different forms of leaf-venation found in plants.

6. State the different ways in which plants secure cross-fertilisation.

7. What plants are included in the Gymnosperms? Explain how you distinguish them from Angiosperms.

8. Give the characters of the flower and fruit in the following orders: Compositae, Liliaceae, Scrophulariaceae, and Ranunculaceae.