

5. Describe the process for the manufacture of one of the following substances: Chloride of lime, phosphorus, sulphuric acid.
6. Write down the names and symbols of all the acids that contain (a) chlorine, (b) phosphorus, (c) nitrogen.
7. Explain how nitric acid is made (giving equations).
8. In what respects do chlorine, bromine, and iodine resemble each other?
9. What are the products of the complete combustion of the following substances: Hydrogen, carbon, phosphorus, marsh gas (CH_4)?
10. What becomes of the substance of a diamond when it is being burnt?
11. In what way could you show that in breathing we exhale carbonic acid and the vapour of water?
12. In what different ways could you remove the oxygen from atmospheric air? What are the properties of the gas that would then be left?

CLASS D.—ELECTRICITY (Optional).

Time allowed: Three hours.

1. Describe how to imitate the phenomena of magnetism by means of a copper spiral carrying an electric current.
2. Describe Faraday's apparatus for investigating specific inductive capacity.
3. Describe and explain an ordinary frictional electric machine.
4. Describe how to charge two Leyden jars by "cascade" so that one is negative and the other positive.
5. Describe Sir William Thomson's quadrant or portable electrometer.
6. What are the reactions of a Grove's cell and a Daniell's cell? What experiments are these cells respectively suitable for?
7. Describe the telephone and the microphone.
8. Give an account of one form of arc and one form of incandescent electric light.
9. Give an account of one form of telegraph in which the letters of the alphabet are either printed or indicated on a dial.
10. Describe the thermo-electric pile and galvanometer.

CLASS D.—SOUND AND LIGHT (Optional).

Time allowed: Three hours.

1. Give an account of the organ of hearing.
2. What are the laws of the vibrations of strings? If a vibrating string be stretched with four times its original weight, what length must it be to make the same number of vibrations as it did before the tension was increased?
3. Describe two methods for determining the velocity of sound in air.
4. Describe all the essentially different modes of producing interference of sound.
5. Draw a diagram illustrating an annular eclipse of the sun.
6. Draw a diagram illustrating how it is that a stick dipped obliquely in water appears bent.
7. A beam of white light is made up of green and red colours only, and is polarized. Describe how you would analyse the beam to show fully its composition.
8. Describe a camera lucida and a camera obscura.
9. Draw a diagram illustrating the formation of the image in a compound microscope.
10. Describe either Clerk Maxwell's or Helmholtz's apparatus for investigating the synthesis of colour.
11. Show how an image is produced in a silvered ball.

CLASS D.—HEAT (Optional).

Time allowed: Three hours.

1. What is the coefficient of expansion of a perfect gas? How has it been determined?
2. What is the usual method of determining the specific heat of a substance? Describe Bunsen's calorimeter.
3. Define the coefficient of conductivity. How has the absolute coefficient of conductivity of metals been determined?
4. State generally the effect of heat upon water. Commence the description with the water in the condition of ice at a temperature of -20°C .
5. How would you make experiments to show that water is a very bad conductor of heat?
6. Give an account of all the essentially different methods used for the reduction of temperature.
7. Give a full account of the formation of clouds.
8. Describe the apparatus by which the heat of combustion of coal and other substances has been determined.
9. If ten pounds of iron at $1,000^\circ\text{C}$., twenty pounds of water at 10°C ., two pounds of ice at 0°C ., and one pound of steam at 100°C ., were placed together, what would be the final temperature?
10. Describe Melloni's apparatus used in the investigation of radiant heat.

CLASS D.—BOTANY (Optional).

Time allowed: Three hours.

1. State the differences between a rhizome, a corm, a bulb, and a tuber.
2. Describe the different forms of venation found in leaves, giving diagrams.
3. Describe the different parts of the embryo of a flowering plant.
4. Of what elements are cellulose and protoplasm formed, and how does each of these substances occur in plants?