

Experiments on melting and solidifying points (paraffin wax, butter, water), on boiling-points (water, salt solution). Effect of pressure on the boiling-point (digester). Change of volume on solidification (water, paraffin). Change of volume on vaporization and applications (steam-pressure). Distillation and fractional distillation (water, alcohol, mineral oil).

Distinction between temperature and heat quantity. Units of heat. Measurement of specific heats of solids and liquids by method of mixtures. Absorption of heat during fusion and vaporization (treated simply) and applications thereof.

Heat transference (very elementary). Safety-lamp, hay-box, ventilation, winds, hot-water heating-system, cooling system of petrol-engine, thermos flask.

Nature and propagation of light. Pinhole images. Shadows and eclipses. Intensity of illumination. Candle-power photometry.

Laws of reflection of light at plane surfaces. Images in plane mirrors.

Laws of refraction of light at plane surfaces. Passage of light through a plate, a prism, and a lens. Formation of images by single convex lenses. Simple magnifying-glass. Camera. Astronomical telescope. Periscope.

Dispersion of light. The spectrum. The rainbow. Colour of bodies.

The candidate will be expected to show that he has acquired by actual experiment, observation, and measurement his knowledge of the matters set forth in the above syllabus; but he will not be expected to show that he is familiar with other than the simple apparatus and appliances commonly used in connection with elementary instruction in practical physics in primary or secondary schools. He will be required to forward, before the date of examination, a certificate in the prescribed form that he has carried out satisfactorily a course of practical work based on the syllabus.

(8) *Heat-engines.*

Expansion by heat of solids, liquids, and gases. Expansion joints. Thermometers, mercurial and water-tube. Fahrenheit and centigrade scales (the former to be used in all calculations involving practical applications).

A simple study of Boyle's and Charles's laws and of isothermal and adiabatic expansion (the latter treated only with the aid of steam tables).

Specific heat of water, copper, iron. The British thermal unit. Calorific values of various fuels, including coal-gas and petroleum products.

Latent heat and total heat of steam at various temperatures. Wet, dry, and superheated steam. Simple calculations on mixtures of water at various temperatures; mixtures of steam and water; evaporative power of fuels.

Transference of heat by conduction, convection, and radiation. Heat-insulation. Simple studies of common types of boilers and condensers.

A very elementary study of Joule's equivalent in connection with the conversion of heat into work in cylinders of simple steam-engine, gas-engine, petrol-engine. Indicator-diagrams for the above, and their use in practice. Principles underlying impulse and reaction steam turbines.

Simple studies in design of cylinder, piston, slide-valve and poppet-valve, steam-valve, water-gauge, pressure-gauge, injector, feed-pump, carburettor.

The candidate will be expected to show that he has acquired by actual experiment, observation, and measurement his knowledge of the matters set forth in the above syllabus. He will be required to forward, before the date of examination, a certificate in the prescribed form that he has carried out satisfactorily a course of practical work based on the syllabus.

(9) *Home Science.*

Simple experiments and investigations bearing on the following:—

1. Expansion of solids, liquids, and gases. Conduction, convection, and radiation treated simply, and especially in their relation to household appliances and operations.

2. The chief properties of carbohydrates, fats, proteins, and mineral matter.

3. The composition and structure of milk, eggs, meat, root and green vegetables and fruit, and of wheat in comparison with other common cereals.

4. Principles on which are based the various methods of preparing and cooking foods, including the use of baking-powders and yeast.

5. Changes in weight and character of foods in cooking.

6. Changes in food due to the agents of digestion.

The candidate will be required to forward before the date of the examination a certificate in the prescribed form that she has carried out satisfactorily a course of practical work based on the above syllabus.