and its resistance, and if all of the cells are alike the current will be the same through each. But if all the cells are joined to the external resistance then this external resistance has to carry all the current passing through each of the cells; or, putting it another way, the current is divided in the cells. But since the current is divided between the cells, less resistance is offered to it than if it all had to go through one cell, just as ten gallons of water a minute going through two one-inch pipes would have less fricton than if going through one one-inch pipe. In the case of the current of electricity the resistance is decreased just in proportion to the number of cells; two cells would have one-half and three cells one-third of the resistance of one cell.

Since the electromotive force of a number of cells in arc is the same as that of one, while the resistance is decreased just in proportion to the number of cells, Ohm's law leads us to the formula

$$c = \frac{E}{\frac{r}{n} + R}$$

the external resistance being of course unaffected by the arrangement of cells. Substituting the numbers given in the problem we have

$$c = \frac{1.8}{\frac{0.9}{8} + 10} = \frac{1.8}{10.1125} = 0.178 \text{ amperes.}$$

Question 6.—On a hot day, with the thermometer at 20° C., the flash of a gun is seen 21 seconds before the sound is heard, what is the distance of the gun?

This question involves two or three things. First, that light travels so fast that the time required for the flash to travel to the eye is inappreciable; second, the velocity of sound at the particular temperature, or a knowledge of its velocity at any other temperature, say 0° C., and the amount by which it varies for each degree in temperature.

Only a small number of candidates realized that the velocity depends upon the temperature. The velocity varies with the temperature because the density of air varies with temperature, and the velocity is a function of the density. The velocity increases nearly two feet for every rise in temperature of 1° C., and is at zero, if I remember rightly, 1,091 feet per second.

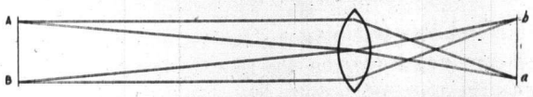
Question 7.—Explain, with the aid of a diagram, how a convex lens forms an image.

The study of lenses is a very interesting one, as is also that of mirrors.

Any point in an object sends out rays of light in all directions. A large number of rays must therefore go from any point of the object to the lens, and these rays pass through the lens and go on their course. Unless, however, these rays all come to one point, there can be no real image, and if the rays are intercepted by a screen at any place except where they meet, there is only a blur, and we say that the screen is not in focus.

In order then to determine where a screen should be put, we must calculate where all the rays will cross. Now, since all the rays cross at one point, if we find out where any two of the rays cross we know where they all cross. We might take any two of the infinite number of rays, and if we had sufficient mathematical ability, we might calculate where they meet. But there are two of the rays that is very easy to trace, the one from the point in the object passing through the centre of the lens, and the one from the point passing parallel to the principal axis. The first goes straight on, not being deviated by the lens; the second is bent down to the principal focus.

In the diagram this is shown clearly:



The two rays from A meet at *o*; the two from B meet at *b*, and so for all points between A and B.

When drawn to scale it is easy to see whether the image will be larger or smaller than the object.

I have drawn only one particular case. By varying the position of the object, interesting variations of the image may be noticed.

Question 8.—Describe in detail your best apparatus or experiment made by yourself for the demonstration of some principle or law in physics.

It is especially to be noticed that the description should be such as to show that the candidate really understands the principle.

The following description of an experiment written, however, by a Grade D candidate in answer to a similar question was not very successful in this respect, though interesting from another point of view.

"The only experiment I have tried in electricity was taking a cat into a room as dark as possible, and on firmly stroking her back streaks of light would issue from it, accompanied by a crackling noise. The cat did not enjoy it, so the experiment was short, but I was convinced of the powers that lay in the cat, and, although latent, could be, when proper measures were used, brought out effectively. If you doubt my statement, try it yourself; only take a kind cat and have some person hold its feet for you."

THURSDAY, Nov. 28th, has been appointed Thanksgiving Day for Canada, and is a public holiday. There is great cause for thanksgiving to the Bountiful Giver of all things—the beautiful season, the abundant crops and the peace and prosperity that we are enjoying.

THE King's birthday, November 9th, was not generally observed throughout Canada. As it is a school holiday and fell on Saturday this year, teachers may observe any other day agreed upon by them and their trustees.

THE fourth number, volume one, of *Acadiensis* is handsomely illustrated and printed, and the contents justify the hope that this excellent magazine is receiving that support which it has so well deserved. Its editor, Mr. D. Russell Jack, and a strong corps of talented contributors, have treated topics of local history and other matters of interest to the Maritime Provinces in a manner highly creditable to their literary taste and judgment. This number completes volume one. Mr. Jack is to be congratulated on the success of his venture which gives promise of increasing usefulness.