

(b) Oxygen gas is sold for lecture purposes at 15 cents per cubic foot at, say, 15°C . and atmospheric pressure. A steel circular cylinder containing the oxygen is 5 feet high and 14 inches in diameter, and the gas is under a pressure of 10 atmospheres, temperature 15°C . After being used at a lecture, the pressure was found to be 6 atmospheres, but the temperature was 21°C . How much should be charged? [$\pi = \frac{22}{7}$]

6. (a) Give full explanation of a method of finding the latent heat of fusion of ice. Deduce the formula required, allowance being made for calorimeter, and state where errors will likely appear.

(b) If the latent heat, using the centigrade scale, is 80, what is it on the Fahrenheit scale?

7. A thermometer (such as is used by physicians) is graduated only from 95° to 110°F ., and you wish to find the temperature of some water, but it is somewhat lower than the lowest graduation, which is just above the bulb. How could you determine its temperature? Illustrate your method numerically.

8. What is meant by the *polarization* of a common voltaic cell (copper and zinc in dilute acid)? Show how you would demonstrate experimentally that there is a back electromotive force?

9. Describe either a copper, a silver, or a hydrogen voltmeter. Give composition of liquid, size of vessel, of electrodes and what current you would expect to measure. Describe how you would prepare the voltmeter for use, and if the hydrogen apparatus is taken, how you would determine the temperature and then allow for it in working out the result.

10. Six similar cells are arranged in series, and the circuit completed through a coil of wire and a galvanometer. The resistance of the battery,

coil and galvanometer are 10, 50, and 20 ohms respectively. If the difference of potential between the terminals of the galvanometer be 2 volts, what is the E. M. F. of each cell of the battery?

ARITHMETIC, PRIMARY.

PROF. N. F. DUPUIS, Queen's.

BY MISS ETTA REID, M.A., KINGSTON.

1. (a) Find, to the nearest cent, the value of $\$100 \times (1.03)^8$.

If $\$100$ be multiplied by the most nearly exact value of $(1.03)^8$ taken to four decimals it will give the answer to the nearest cent. To get $(1.03)^8$ to this degree of accuracy it will be best to keep five places of decimals, and employ contracted multiplication. This gives 1.26677, and the answer to the nearest cent is $\$126.68$.

(b) Find, within one inch, the side of a square whose area is 5 acres.

Reduce 5 acres to sq. in., and, to find the result within one inch, extract the square root without decimals. This gives 5600 inches or 155 yd. 1 ft. 8 in. To find the result to the nearest inch extract the square root to the first decimal. This gives 5600.2 inches, and the answer to the nearest inch is 5600 inches or 155 yds. 1 ft. 8 in.

2. (a) Find; by contracted methods, the value of $(1.23456)^3 \div (.23456)$, to the fourth decimal place.

1.23456	1.5241
65 4321	65 4321
1 2346	1 5241
2469	3048
370	457
49	61
6	8
1	1
1.5241	1.8816