

What volume of Oxygen will 8 ounces of Potassium Chlorate yield; a cubic foot of Hydrogen at 60° F. and 30 ins. Bar. weighing 37 grains? ($K=39$, 1.)

3. How may Nitrogen, Nitric Oxide (NO), Nitrous Anhydride (N_2O_3), and Nitrogen Peroxide (NO_2) be severally obtained from Nitric Acid or a Nitrate?

4. How could you distinguish Carbon Dioxide from Nitrogen?

The gas that sometimes collects at the bottom of deep wells is said to be Carbon Dioxide. By what experiments could you test the correctness of this statement?

How could you distinguish between Marsh Gas and Hydrogen?

Between Olefiant Gas and Carbon Monoxide.

5. In what respects does Sulphur resemble Oxygen?

By what other means, besides burning Sulphur, can Sulphur Dioxide be prepared?

Explain its action with solutions (1) of Potash, (2) of Chlorine.

6. How much Phosphorus is contained in 120 lbs. of bone-ash consisting of 88.4 per cent. of $Ca_3(PO_4)_2$ and 11.5 per cent. of $CaCO_3$? ($Ca=40$.)

What volume of Hydrogen is contained in one ounce of Microcosmic Salt $NaNH_4HPO_4 \cdot 4H_2O$? (37 grains of hydrogen to the cubic foot; $Na=23$.)

7. What is the simplest formula that can be assigned to a substance containing

Carbon, 54.5 }
Hydrogen, 9.2 } per cent ?
Oxygen, 36.3 }

8. The chimney-glass increases the brightness of the flame of the common coal-oil lamp; why does it do so?

If you drive a current of air *into* the flame of an ordinary candle, the flame appears less bright than it did before the introduction of the air. Explain why this is the case.

THIRD-CLASS TEACHERS.

ARITHMETIC.

1. Shew that $\frac{3}{4} = \frac{1}{\frac{4}{3}}$ and that $\frac{4}{5} = 9 \div 5$. Simplify

$\left\{ 2\frac{1}{2} \times 4.75 \div \frac{1}{2} \text{ of } (4\frac{1}{2} - 3\frac{1}{2}) + \frac{1.75}{3\frac{1}{2}} + \frac{4\frac{1}{2} \times}{21.5 \times} \right\}$ of $(3\frac{1}{2} \times \frac{1}{2} \div .9)$ of $(\text{£}5 \text{ 16s. 8d.})$

2. Explain the rule for "pointing" in division of decimal numbers.

Divide 31.47 by 839.2765 correct to five decimal places, and find the product of 3.706205 by .0034005 correct to six decimal places. [20 marks if done by contracted methods, otherwise 10 marks.]

3. Extract the square root of .097199881 to six decimal places.

Simplify $(\frac{3}{4} \cdot 54 - 23\frac{3}{4} \cdot .0000390625) \div (\frac{3}{4} \cdot 16 + \frac{3}{4} \cdot .02)$.

4. A rectangular courtyard, 180 feet long and 135 feet wide, has a path running round it of the uniform width of 10 feet 6 inches; the path is covered with gravel at a cost of 22½ cents a square yard, and the remainder of the courtyard is covered with turf at a cost of 17½ cents per 100 square feet: find the entire cost.

5. The amount at simple interest, of a sum of money at a certain rate per cent. is \$693.33 for 8 years, and \$640.80½ for 5½ years: find the principal and the rate per cent.

6. A grocer mixed two kinds of wine, worth, respectively, \$2.40 and \$3.20 a gallon, in such proportion that by selling the mixture at \$2.80 a gallon he made a profit of 10%: find the proportion in which the wines were mixed.

7. A merchant invested a sum of money in Federal Bank stock at 112, and after receiving a half-year's dividend at 4 per cent., he immediately sold out at 115¾; he received altogether (*i.e.* from dividend and profit on sale of stock) \$310 more than he had invested. Find the amount originally invested.

8. A and B form a partnership, A's capital being to B's as 5:8; at the end of 6½ months A withdraws 20 per cent. of his capital, and a month after, B withdraws 33½% of his capital; at the end of the year the profits are found to be \$3047: how should this be divided?