

of humanity"? this intrepid philosopher replies by tracing all motives and feelings to their ultimate cause. "This ultimate cause is the most powerful instinct implanted in human nature—the preservation of life, which includes our own life and that of our offspring."

"What a piece of work is man! How noble in reason! how infinite in faculties! in form and moving, how express and admirable! in action, how like an angel! in apprehension, how like a god! the beauty of the world, the paragon of animals! Ah, Shakespeare, you lived too soon! Had you come into the world three centuries later you would have learned that the highest inspiration of your paragon is the mere selfish instinct of self-preservation which he has in common with all other animals, and you would have scorned to liken to an angel a creature whose highest reasoning and noblest acting alike spring from so common and so lowly an origin."

Perhaps the reader who does not see the *Popular Science Monthly* would like some practical illustration to show how this grand, universal principle, this ultimate cause—the preservation of life—operates to produce our sense of what we call right and wrong. The author kindly furnishes it:

"Already long ages ago it was discovered by experience that a tribe or nation, and every member thereof, would better serve his own prosperity and success by generally telling the truth than by telling falsehoods; so nine times out of ten he would tell the truth." So simply was educated the silly scrupulosity which makes so many men and women whom we call "good" fear to tell a lie even though they should believe it would be an exception to the "general" rule, and better serve their own prosperity and success than the truth, to say nothing of the strange fanaticism which has made so many value the truth even more than the preservation of life itself and die for it. Of course all such enthusiasm for truth, or for any other so-called virtue, is not only egregious folly, but consummate wickedness, as it must be wrong as well as silly to subordinate the "most powerful instinct in human nature," and the "ultimate cause" in morals, to any inferior consideration.

The courage of Mr. Franklin in following his principle to its logical issue is admirable. Here is one of his "hences": "Hence, to commit murder is a greater wrong than to tell a lie, and a man would be perfectly justified in telling a lie in order to escape either becoming a murderer or being himself murdered." That is, in such a case, it is the truth that becomes the crime, and a lie the highest virtue.

If we had space to enter into the argument we might point out a grave practical difficulty which emerges just here. The principle is clearly that the end not only justifies the means, but gives it its only moral character. Hence, in order to know whether to believe a man, we should need to know in each case whether in the opinion of the speaker the obligation to speak the truth was or was not overborne by some more pressing outcome of the fundamental law of self-preservation.

But we do not mean to argue the question. We cannot but think the bold, ugly features of the utilitarian ethics as thus outlined are all the argument needed. Every reader can appeal to his own consciousness—which under any system must be the highest court of reference—to know how far such a system tallies with his own sense of right and wrong, to say nothing of that nobler teaching which declares the obligations of truth and righteousness to be universal and eternal.

Special.

ELEMENTARY CHEMISTRY.

CHAPTER IV.—Continued.

EXERCISE IV.

- Exactly 100 litres of oxygen, at the normal temperature and pressure were obtained by heating potassium chlorate: how much of this salt was used?
- How much potassium chlorate must be used to yield 100 litres of oxygen at 30°C. and 380 mm. pressure?
- How many litres of oxygen at 720 mm. pressure and 15°C. can be obtained by heating 261 grains of manganese dioxide (1 grain = .0648 grams)?
- What volume of hydrogen measured at 12°C. and 750mm. is disengaged when 100 grams of zinc dissolved in dilute sulphuric acid?
- A balloon requires 5 cubic metres of gas to inflate it. how many kilograms of sulphuric acid must be converted into zinc sulphate in order to evolve sufficient hydrogen to fill it?
- A rectangular india-rubber bag 1 metre long, 50 cm. broad and 30 cm. deep, is to be filled with hydrogen at 0° and 760 mm. pressure; how much zinc is required for the purpose?

Volume and Weight of Gases.

Since 1 litre of hydrogen = .0896 grams,
 $22.32 \text{ " } = 22.32 \times .0896 \text{ "}$
 $\phantom{22.32 \text{ " }} = 1.999 \text{ "}$

Therefore, 22.32 litres hydrogen = 2 grams approximately.
 $22.32 \text{ " oxygen } = 32 \text{ "}$
 $22.32 \text{ " carbon dioxide } = 44 \text{ "}$

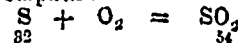
Hence, 22.32 litres of any gas at 0°C. and 760 mm. pressure weigh a number of grams equal to the number expressing the molecular weight of the gas.

If great accuracy is not required the more convenient number, 22.4 litres, may be used instead of 22.32 litres.

Ex. 10. Find the volume of 244 grams of carbon dioxide at 0°C. and 760 mm. pressure.

Vol. of 44 grams carbon dioxide = 22.4 litres.
 $\phantom{\text{Vol. of }} \frac{1}{44} \text{ " } = \frac{22.4}{44} \text{ "}$
 $\phantom{\text{Vol. of }} 244 \text{ " } = \frac{244 \times 22.4}{44} \text{ "}$
 $\phantom{\text{Vol. of }} \phantom{244 \text{ " }} = 123.2 \text{ "}$

Ex. 11. What volume of sulphur dioxide is formed on burning 8 grams of sulphur?



Sulphur dioxide formed from 32 grams sulphur = 64 grams.
 $\phantom{\text{Sulphur dioxide formed from }} \frac{1}{32} \text{ " } = \frac{64}{32} \text{ "}$
 $\phantom{\text{Sulphur dioxide formed from }} 8 \text{ " } = \frac{8 \times 64}{32} \text{ "}$
 $\phantom{\text{Sulphur dioxide formed from }} \phantom{8 \text{ " }} = 16 \text{ "}$

Volume occupied by 64 grams sulphur dioxide = 22.4 "
 $\therefore \phantom{\text{Volume occupied by }} \frac{16}{64} \text{ " } = \frac{22.4}{4} \text{ "}$
 $\phantom{\therefore \phantom{\text{Volume occupied by }}} \phantom{\frac{16}{64} \text{ " }} = 5.6 \text{ "}$

EXERCISE V.

- 10 grams of carbon are burnt; what volume of carbon dioxide at 30°C. and 380 mm. is formed?
- What volume of oxygen can be made from 100 grams of mercuric oxide?
- How much potassium chlorate is required to make 70 litres of oxygen?
- 174 grams of manganese dioxide are heated; what volume of oxygen is given off?