Long

Hentz

PROBLEM EXERCISES FOR GENERAL CHEMISTRY

$$PV = nRT$$

$$K = \frac{[H_2][I_2]}{[HI]^2}$$

$$Rate = k[A]^n$$

Problem Exercises For General Chemistry

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JOHN WILEY AND SONS

New York Santa Barbara Chichester Brisbane Toronto

Library of Congress Cataloging in Publication Data:

Long, Georege Gilbert, 1929-
Problem exercises for general chemistry.

Includes index.
1. Chemistry—Problems, exercises, etc. I. Hentz, Forrest C., 1933- joint author. II. Title.
OD42.L59 540'.76 77-13372
ISBN 0-471-03076-7

Printed in the United States of America

10 9 8 7 6 5 4 3 2 1

1 H 1.008																1 H 1.008	2 He 4.002
3 Li 6.941	4 Be 9.012											5 B 10.81	6 C 12.011	7 N 14.007	8 O 15.9994	9 F 18.998	10 Ne 20.179
11 Na 22.990	12 Mg 24.305											13 Al 26.9815	14 Si 28.086	15 P 30.974	16 S 32.06	17 Cl 35.453	18 Ar 39.948
19 K 39.098	20 Ca 40.08	21 Sc 44.96	22 Ti 47.90	23 V 50.941	24 Cr 52.00	25 Mn 54.938	26 Fe 55.847	27 Co 58.933	28 Ni 58.70	29 Cu 63.546	30 Zn 65.38	31 Ga 69.72	32 Ge 72.59	33 As 74.922	34 Se 78.96	35 Br 79.904	36 Kr 83.80
37 Rb 85.468	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.906	42 Mo 95.94	43 Tc 98.906	44 Ru 101.07	45 Rh 102.906	46 Pd 106.4	47 Ag 107.868	48 Cd 112.40	49 In 114.82	50 Sn 118.69	51 Sb 121.75	52 Te 127.60	53 I 126.904	54 Xe 131.30
55 Cs 132.905	56 Ba 137.34	57 La* 138.91	72 Hf 178.49	73 Ta 180.948	74 W 183.85	75 Re 186.207	76 Os 190.2	77 Ir 192.22	78 Pt 195.09	79 Au 196.967	80 Hg 200.59	81 Tl 204.37	82 Pb 207.2	83 Bi 208.980	84 Po (210)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra 226.025	89 Ac† (227)	104 Ku (257)	105 Ha (260)													
			*	58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm (145)	62 Sm 150.4	63 Eu 151.96	64 Gd 157.25	65 Tb 158.92	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.04	71 Lu 174.97
			†	90 Th 232.04	91 Pa 231.04	92 U 238.03	93 Np 237.05	94 Pu (242)	95 Am (243)	96 Cm (247)	97 Bk (249)	98 Cf (251)	99 Es (254)	100 Fm (253)	101 Md (256)	102 No (254)	103 Lr (257)

The atomic weights are based on ^{12}C = exactly 12 amu. Parentheses indicate that the value is the mass number of the longest-lived or best-known isotope.

Problem Exercises For General Chemistry

Preface

This collection of over a thousand problems and questions in general chemistry is to be used in conjunction with a standard textbook. It has been written with several purposes in mind:

1. To provide exercises similar in format to that used for examinations in large general chemistry programs, thereby bridging the gap between the textbook style of exercise and that encountered by students on quizzes and examinations.
2. To encourage students to set up numerical problems in an orderly, uniform style, and then to *estimate* numerical answers *before* blindly pressing calculator buttons—many errors occur even when the student knows how to do a problem, but happens to enter an incorrect number or operation on the calculator.
3. To stimulate students to report numerical answers that are *realistic* rather than indiscriminately reporting all of the figures that a calculator is capable of generating.
4. To provide students with an organized series of exercises on those topics normally encountered in general chemistry. These exercises show the variety of ways in which numerical problems may be asked, and the variety of pertinent definitions, notations, and symbolism that should be mastered.
5. To provide within each unit a variety of exercises, most of which are mid-range in level of difficulty.
6. To emphasize the importance of problem solving and to give the opportunity for extra practice in what seems to be the perennial problem of college chemistry students: the serious lack of facility in applying arithmetic and simple algebra to chemistry "word" problems.

Throughout this book we have emphasized the use of the "tools of the chemical trade" that we consider absolutely fundamental. Each chapter contains an introduction that emphasizes a certain text topic(s) and at times includes amplification of certain pertinent topics that are neglected by some texts. Most chapters contain several illustrative examples showing a detailed setup in factor-label format and a *realistic, reportable* answer. The examples in the first half of the book show how to estimate an answer so that the student, in many instances, does not need to use a calculator to select the correct multiple-choice answer; more importantly, estimation allows the student to have a feeling as to whether the answer on the calculator is correct. Finally, there is a series of multiple-choice questions (sometimes two series), and in chapters dealing with equation writing there are a number of equations for the student to write (not in a multiple-choice format). Starred problems are somewhat more difficult, but should not be avoided; doubly starred problems are considerably involved or contain a subtle point.

An acid-base table, along with acid dissociation constants, and a table of electrode potentials have been included in appropriate chapters; thermodynamic data have been tabulated in the appendix. This has been done not only for convenience in the use of the book, but because values do vary somewhat from one book to another. Answers to the exercises are consistent with these tabulated data. Answers are given for all multiple-choice exercises and for a few of the equations.

We wish to thank our colleagues at North Carolina State University and, particularly, Dr. Joseph P. Mitchener, Goldsboro High School East, Goldsboro, N. C., for their comments and corrections. We also appreciate the help of Professors B. Donald Compton, Barbara D. Lalancette, and Jack E. Powell, who reviewed the manuscript, and of Wiley Chemistry Editor, Gary Carlson. We would be amiss if we did not acknowledge the contribution of many of the thousands of general chemistry students who have class-tested preliminary versions of this book. Finally, we welcome comments from other students and teachers as to the usefulness of this book, and regarding errors or ambiguities that we have inadvertently overlooked.

G. G. Long and F. C. Hentz, Jr.

May 17, 1977

Contents

1. Introductory Concepts

Chemistry involves the study of *matter* and the transformations that matter undergoes. Such a study requires numerous measurements that usually are made in *metric units* [or in a modification of the metric system, which is known as the *International System of Units (SI)*], as distinguished from our commonly used English System. In the metric (and SI) system, *mass* is measured in *grams* (*g*), *length* in *meters* (*m*), and *time* in *seconds* (*s* or *sec*). Small and large quantities are indicated by adding a variety of prefixes, the most common of which are *kilo* (*k*) meaning 1000 times, *centi* (*c*) meaning 1/100, and *milli* (*m*) meaning 1/1000. Thus, *msec* would stand for a millisecond, 1/1000th of a second; *kg* would be a kilogram, 1000 grams; and *km* would be a kilometer, 1000 meters. Other units, such as *volume*, can be derived from these basic units. The volume of a cube having 1-cm edges is 1 cm^3 [sometimes referred to as a *cubic centimeter* (*cc*)]. One thousand cubic centimeters is defined as a *liter* (ℓ). It is convenient to remember the following conversion factors between the metric and English systems:

Mass	453.6	g/lb
Length	2.540	cm/in.
Volume	0.9461	ℓ/qt

A wide variety of conversions can then be made on the basis of these three factors and your knowledge of the metric and English systems. Various *derived units* are used to measure particular properties of matter. For instance, in comparing "heaviness" of substances, *density* (*d*) is defined as weight per unit volume, which for solids and liquids in the metric system is usually expressed in g/cm^3. Thus, a cube of wood, 2.0 cm on an edge, weighing 6.0131 g would have a density of

$$\frac{6.0131 \text{ g}}{(2.0 \text{ cm})^3} = 0.75 \text{ g/cm}^3$$

If the above arithmetic had been carried out on a calculator, one would readily obtain additional decimal places, *i.e.*, 0.751638, but it is necessary to *round* *off* this number to two *significant figures,* 0.75 g/cm^3 (or, equivalently, using *exponential notation,* to 7.5×10^{-1}), so that the *precision* of the answer agrees with that of the least precise measurement. See Appendix, p. 00.

All matter is made up of *atoms* of ~100 different *elemental substances.* The elements have different *chemical* and *physical properties,* and the atoms of different elements have different masses (*atomic weights*). As a shorthand notation, each element is assigned a *symbol. Compounds* are *pure substances* that are made up of two or more elements combined in explicit whole-number ratios of atoms and are assigned *formulas* by designating the relative numbers of each type of atom present, *e.g.,* NH_4Cl indicates that (in the compound ammonium chloride) for every nitrogen atom there are combined 4 hydrogen atoms and 1 chlorine atom; $Ca(NO_3)_2$ is the formula for calcium nitrate and shows that for every calcium atom there are 2 nitrogen atoms and 6 oxygen atoms. Sometimes formulas are written by considering a compound as consisting of units of other compounds. The units are separated from one another in the formula by a dot (or period) with a numerical multiplier preceding the unit (the multiplier one is omitted). The most common instance of this use today is with compounds that contain water of crystallization. Thus, $CuSO_4 \cdot 5H_2O$ indicates a compound containing one $CuSO_4$ unit and five H_2O units; it represents a combination of 1 copper, 1 sulfur, 9 oxygen, and 10 hydrogen atoms. Chemical changes are shown by writing formulas of *reactants* (compounds and/or elements) followed by an arrow (indicating change) and the formulas of the *products.* In a chemical change compounds may be destroyed and new ones formed, but individual atoms retain their identity (*law of conservation of matter*); this means that every atom that is present in a reactant must also appear in a product and *vice versa, i.e.,* the equation must be *balanced.*

Simultaneously with changes in matter, *energy* is released or absorbed. The basic SI unit of energy is the *joule,* J (10^7 *ergs* = 1 J), but commonly the *calorie* (4.18 J) is still used. One form of energy is *heat.* Associated with heat energy is an intensity factor called *temperature.* On the still commonly used *Fahrenheit scale* the freezing point of water is assigned as 32°F, and the normal boiling point of water is 212°F, which means there are 180 Fahrenheit degrees between these two points. The *Celsius scale* (*centigrade*) is more commonly used in science; on this scale the freezing point of water is defined as 0°C, and the normal boiling point as 100°C. This means that the centigrade degree is the larger of the two; in fact, the number of Fahrenheit degrees required to cover a given temperature range will be 1.8 times the number of centigrade degrees required. Also, it is convenient to be able to convert from a temperature on one scale to the corresponding temperature on the other. From the above definitions,

$$\text{Celsius temperature} = \left(\frac{100}{180}\right)(\text{Fahrenheit temperature} - 32)$$

The *heat capacity* is the amount of heat needed (usually in calories) to change the temperature of a sample by one degree centigrade. If the amount of substance specified is one gram, then this is called the *specific heat.* For a substance of mass m grams with a specific heat of $C \frac{\text{cal}}{\text{g-}^\circ\text{C}}$ undergoing a temperature change $\Delta T\,^\circ$C (where $\Delta T = T_{final} - T_{initial}$), the number of calories absorbed ($q > 0$) or liberated ($q < 0$) is given by

$$q = mC\,\Delta T$$

It is convenient to remember that the specific heat of water is very near 1 $\frac{\text{cal}}{\text{g-}^\circ\text{C}}$ at any temperature, as long as the water remains in the liquid state.

Illustrative Examples

1-A. Mileage-Volume of Gasoline Required: The "Factor-Label" Method

A car is rated with a highway mileage of 41 miles per gallon of gasoline. Given that 1 mile = 1.6093 kilometers, how many liters of gasoline will be needed for a highway trip of 500. kilometers?

(a) 74 (b) 3.0×10^3 (c) 2.0 (d) 5.2 (e) 29

Solution

In the factor-label method of problem-solving, one should first write down the numerical value and the unit(s) of the given condition, here 500. km. Then write down the unit(s) required by the answer. Compare these two sets of units and from other data available look for one or more *factors* that through multiplication allow conversion of the given condition to the required answer. Thus, for our problem the setup would take the form:

$$(500.\ \text{km}) \left(\text{Factor A}\right) \left(\text{Factor B}\right) \left(\text{Factor C}\right) \cdots = \underline{\quad}\ \ell\ (\textit{Ans.})$$

Each of the multiplying factors is in actuality a ratio in which the numerator and denominator are equivalent. The numerator and denominator frequently have different numerical values but always differ in units. Each factor cancels one unit previously present and introduces a new unit. In this problem the required factors are:

$$\left(\frac{1\ \text{mi}}{1.6093\ \text{km}}\right),\quad \left(\frac{41\ \text{mi}}{1\ \text{gal}}\right),\quad \left(\frac{1\ \text{gal}}{4\ \text{qt}}\right),\quad \text{and} \quad \left(\frac{1\ \text{qt}}{0.9461\ \ell}\right)$$

These are used directly or are inverted so that concellations leave only liters (ℓ) as the final unit. It is worth noting that the horizontal line in each factor indicates the word "per," *e.g.*, 1 mi per 1.6093 km. Applying the factor-label method to this problem gives the setup:

$$(500.\ \cancel{km})\left(\frac{1\ \cancel{mi}}{1.6093\ \cancel{km}}\right)\left(\frac{1\ \cancel{gal}}{41\ \cancel{mi}}\right)\left(\frac{4\ \cancel{qt}}{1\ \cancel{gal}}\right)\left(\frac{0.9461\ \ell}{1\ \cancel{qt}}\right) =$$

Estimation

$$\frac{\overset{50}{\cancel{500}}}{1.6} \times \frac{\cancel{4}}{\underset{10}{\cancel{40}}} \times 1 \simeq 30\ \ell \qquad \text{(e)}$$

Calculator

28.67782235 ℓ

Answer

29 ℓ (rounded off to 2 significant figures). The reported answer must agree in accuracy with the data used in the calculation. See the section in the Appendix (p. 00) entitled "Reporting Numerical Results" for a discussion of significant figures and rounding off numbers. Here, the factor, 4 qt/1 gal, is exact to any desired accuracy, *i.e.*, a "defined number," as opposed to a "measured number."

1-B. Volume-Unit Conversion

Alcoholic beverages are often sold in "fifths" (meaning volumes of one-fifth of a gallon). How many cubic decimeters (dm^3) are in 1.00 fifth of "Old Snort"?

(a) 0.757 (b) 1.18 (c) 0.846 (d) 3.78 (e) 0.211

Solution

"fifths" → gal → qt → ℓ → ml → cm^3 → dm^3

$$\left(1.00\ \cancel{fifth}\right)\left(\frac{1\ \cancel{gal}}{5\ \cancel{fifths}}\right)\left(\frac{4\ \cancel{qt}}{1\ \cancel{gal}}\right)\left(\frac{0.946\ \cancel{\ell}}{1\ \cancel{qt}}\right)\left(\frac{1000\ \cancel{ml}}{1\ \cancel{\ell}}\right)\left(\frac{1\ cm^3}{1\ \cancel{ml}}\right)\left(\frac{1\ dm}{10\ cm}\right)^3 =$$

Estimation

$$\frac{4}{\cancel{5}} \times \overset{0.19}{\cancel{0.95}} \simeq 0.76x\ \ dm^{3\dagger} \qquad \text{(a)}$$

---

† We will use the convention that an "x" immediately trailing an estimated answer indicates a significant figure to be carried, which is yet to be determined.

Calculator

0.75680··· dm^3

Answer

0.757 dm^3 (rounded off to 3 significant figures. This answer is consistent with that of the "1.00-fifth" basis for the calculation; also consistent with this answer is the use of 3 significant figures in the ℓ → qt conversion factor, 0.946 ℓ/qt. All other terms are exact.)

1-C. Mass- and Volume-Unit Conversion

The density of lead, 11.2 g/cm^3, when expressed in lb/ft^3 is:

(a) 2.60 (b) 699 (c) 11.2 (d) 0.179 (e) 0.753

Solution

$g/cm^3 \rightarrow lb/cm^3 \rightarrow lb/in.^3 \rightarrow lb/ft^3$

$$\left(\frac{11.2 \not{g}}{1 \not{cm^3}}\right)\left(\frac{1 \text{ lb}}{453.6 \not{g}}\right)\left(\frac{2.540 \not{cm}}{1 \not{in.}}\right)^3\left(\frac{12 \not{in}}{1 \text{ ft}}\right)^3 =$$

Estimation

$$\frac{11}{\not{450}\ 3} \times \overbrace{\frac{\not{5}}{\not{2}} \times \frac{\not{5}}{\not{2}} \times \frac{\not{5}}{\not{2}}}^{\not{40}\ 5} \times \not{144} \times 12 \simeq 660 \text{ lb/ft}^3 \quad \text{(b)}$$

Because of the cubic terms, the above estimation is not a particularly simple one.

Calculator

699.1813973 lb/ft^3

Answer

699 lb/ft^3 (It is rounded off to 3 significant figures, since the original density was given to 3 significant figures.)

1-D Volume to Area and Thickness Conversion

A latex semigloss enamel is advertised as having a coverage of 450 ft^2/gal when used on sealed surfaces. What is the average thickness of the coat of paint in millimeters?

(a) 10.1 (b) 188 (c) 0.0905 (d) 0.378 (e) 1.01

Solution

$$\text{Thickness} = \frac{\text{Vol}}{\text{Area}} = \frac{\text{gal} \rightarrow \text{qt} \rightarrow \ell \rightarrow \text{ml} \rightarrow \text{cm}^3 \rightarrow \text{mm}^3}{\text{ft}^2 \rightarrow \text{in.}^2 \rightarrow \text{cm}^2 \rightarrow \text{mm}^2}$$

$$\frac{\left(1\ \cancel{gal}\right)\left(4\ \frac{\cancel{qt}}{\cancel{gal}}\right)\left(0.946\ \frac{\cancel{\ell}}{\cancel{qt}}\right)\left(10^3\ \frac{\cancel{ml}}{\cancel{\ell}}\right)\left(1\ \frac{\cancel{cm^3}}{\cancel{ml}}\right)\left(10\ \frac{mm}{\cancel{cm}}\right)^3}{\left(450\ \cancel{ft^2}\right)\left(12\ \frac{\cancel{in.}}{\cancel{ft}}\right)^2\left(2.540\ \frac{\cancel{cm}}{\cancel{in.}}\right)^2\left(10\ \frac{mm}{\cancel{cm}}\right)^2} =$$

Estimation

$$\frac{4}{450} \times \frac{950}{150} \times \frac{1}{6} \times \frac{10^3}{10^2} \simeq \frac{40 \times \cancel{950}}{450 \times \cancel{900}} \simeq 0.09xx \text{ mm} \qquad \text{(c)}$$

Calculator

0.0905125267 mm

Answer

0.0905 mm (3 significant figures). The accuracy implied is 1 part in 905, or about 0.1%. This is comparable in order of magnitude to the accuracy indicated in the data, *i.e.*, the area (~0.2%) and in the qt → ℓ conversion factor (~0.1%).

1-E. Use of Percent by Weight

An ore contains 0.20% by weight of the mineral *calaverite*, $AuTe_2$, a gold compound containing 43.56% Au. How many tons of the ore would have to be processed to yield 1.0 lb of pure gold?

(a) 0.11 (b) 0.57 (c) 1.1 (d) 2.3 (e) 5.7

Solution

Percent by weight data may be read as parts of the component per 100 parts of the whole in <u>any</u> convenient mass units. Thus, 100 lb of the mineral $AuTe_2$ contains 43.56 lb of Au; about 2 1/3 lb of $AuTe_2$ will be needed to yield 1 lb of Au. Furthermore, since the mass of the ore is 500 times greater than the mass of *calaverite* it contains, a much greater mass of ore will be needed, as compared to the mass of $AuTe_2$ required. Therefore, the mass of ore required will be about 500 × 2 1/3, or ~1200 lb, or ~0.6 ton.

$$1.0\ \cancel{\text{lb Au}}\left(\frac{100\ \cancel{\text{lb AuTe}_2}}{43.56\ \cancel{\text{lb Au}}}\right)\left(\frac{100\ \cancel{\text{lb ore}}}{0.20\ \cancel{\text{lb AuTe}_2}}\right)\left(\frac{1\ \text{ton ore}}{2000\ \cancel{\text{lb ore}}}\right) =$$

Estimation

$$\frac{100}{45} \times \frac{\cancel{1000}}{2} \times \frac{1}{\underset{2}{\cancel{2000}}} \simeq \frac{100}{180} \simeq \frac{5}{9} \simeq 0.55 \text{ ton} \qquad \text{(b)}$$

Calculator

0.5739210285 ton

Answer

0.57 ton. (Our answer has 2 significant figures since the quantity of gold was specified, and the % composition of the ore was given only to 2 significant figures.)

1-F. Thermal Energy and Temperature Change

A coffee cup containing 100. cm^3 of pure water at 100.°F is heated to a final temperature of 180.°F. The number of ergs absorbed by the water is:

(a) 6.02×10^{11} (b) 1.9×10^{11} (c) 6.0×10^{-3}
(d) 1.1×10^{10} (c) 1.86×10^{-3}

Solution

$(T_f - T_i)$,°F → $(T_f - T_i)$,°C → cal → joules → ergs

$$\left(100\ \cancel{cm^3}\right)\left(1.00\ \frac{\cancel{g}}{\cancel{cm^3}}\right)\left(1.00\ \frac{\cancel{cal}}{\cancel{g}\,\cancel{°C}}\right)\left(80°\cancel{F}\right)\left(\frac{5°\cancel{C}}{9°\cancel{F}}\right)\left(4.184\ \frac{\cancel{joule}}{\cancel{cal}}\right)\left(10^7\ \frac{erg}{\cancel{joule}}\right) =$$

Estimation

$$\frac{100 \times \overset{9}{\cancel{80}} \times 20 \times 10^7}{\cancel{9}} \simeq 18 \times 10^{10}\ \text{ergs} \qquad \text{(b)}$$

Calculator

$1.859555556 \times 10^{11}$ ergs

Answer

1.9×10^{11} ergs (2 significant figures). Note that although the volume and the temperatures are given to 3 significant figures, a significant figure is lost in the subtraction, 180°F - 100°F = 80°F. Thus, the answer must be rounded off to 1.9×10^{11} ergs.

1-G. Relative Atomic Weights

Element X reacts with oxygen to produce a pure sample of X_6O_{11}. In an experiment it is found that 1.0000 g of X produces 1.2082 g of X_6O_{11}. If we take the atomic weight of oxygen to be 16.00 amu, what is the atomic weight of X?

(a) 41.92 (b) 219.9 (c) 140.9 (d) 1.817 (e) 170.2

Solution

Assume that the 1.2082 g sample contains N X_6O_{11} molecules. Find the mass of each atom, *i.e.*, g/atom, in terms of N. Since atomic weights are *proportional* to the absolute atomic masses, the ratio AW_X/AW_O, and then AW_X, may be calculated;

$$\text{mass of X-atom} = \frac{1.0000\text{ g}}{6\underline{N}\text{ atoms}}; \quad \text{mass of O-atom} = \frac{0.2082\text{ g}}{11\underline{N}\text{ atoms}};$$

$$\frac{\text{mass of X-atom}}{\text{mass of O-atom}} = \frac{AW_X}{AW_O} = \frac{1.0000\text{ g}}{6\underline{N}} \times \frac{11\underline{N}}{0.2082\text{ g}} =$$

Estimation

$$\frac{AW_X}{AW_O} \simeq \frac{1}{6} \times \frac{11}{0.2} \simeq 9.\text{xxx}; \quad AW_X \simeq 144.\text{x} \qquad \text{(c)}$$

Calculator

AW_X/AW_O = 8.805635607; AW_X = 140.8901697

Answer

AW_X = 140.9 (Here we have 4 significant figures, limited by the mass of the combined oxygen and the atomic weight of oxygen, which had been rounded off to 16.00.

1-H. Equation Balancing

In the balanced equation for the oxidation of ammonia,

$$\_\_\_\_ NH_3 + \_\_\_\_ O_2 \rightarrow \_\_\_\_ N_2O + \_\_\_\_ H_2O,$$

the coefficient for H_2O is:

(a) 1 (b) 2 (c) 3 (d) 4 (e) 5

Solution

Many equations can readily be balanced by inspection, *i.e.*, spot balanced. Start with an atom that appears only in one reactant and one product, *e.g.*, N, and balance the "equation" with respect to N by inserting tentative coefficients in front of the two substances containing this atom. Thus,

$$\underline{\ 2\ } NH_3 + \_\_\_\_ O_2 \rightarrow \underline{\ 1\ } N_2O + \_\_\_\_ H_2O$$

Then adjust coefficients for the next atom, H, so that the "equation" is balanced with respect to H,

$$\underline{\ 2\ } NH_3 + \_\_\_\_ O_2 \rightarrow \underline{\ 1\ } N_2O + \underline{\ 3\ } H_2O$$

Tentative coefficients have now been determined for all of the products, and all that remains is to add up the number of oxygen atoms in the products to determine the coefficient for O_2,

$$\underline{\ 2\ } NH_3 + \underline{\ 2\ } O_2 \rightarrow \underline{\ 1\ } N_2O + \underline{\ 3\ } H_2O \qquad \text{(c)}$$

Answer

$2\ NH_3 + 2\ O_2 \rightarrow N_2O + 3\ H_2O$. The coefficient 1 is understood; hence, it is not necessary to write it in the final equation.