LIFEPAC®

SCIENCE

TEACHER'S GUIDE

11th Grade

Alpha Omega
PUBLICATIONS

SCIENCE 1100

Teacher's Guide

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PUBLICATIONS

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INSTRUCTIONS FOR SCIENCE

The LIFEPAC curriculum from grades 2 through 12 is structured so that the daily instructional material is written directly into the LIFEPACs. The student is encouraged to read and follow this instructional material in order to develop independent study habits. The teacher should introduce the LIFEPAC to the student, set a required completion schedule, complete Teacher checks, be available for questions regarding both content and procedures, administer and grade tests, and develop additional learning activities as desired. Teachers working with several students may schedule their time so that students are assigned to a quiet work activity when it is necessary to spend instructional time with one particular student.

The Teacher Notes section of the Teacher's Guide lists the required or suggested materials for the LIFEPACs and provides additional learning activities for the students. The materials section refers only to LIFEPAC materials and does not include materials which may be needed for the additional activities. Additional learning activities provide a change from the daily school routine, encourage the student's interest in learning and may be used as a reward for good study habits.

If you have limited facilities and are not able to perform all the experiments contained in the LIFEPAC curriculum, the Science Project List may be a useful tool for you. This list prioritizes experiments into three categories: those essential to perform, those which should be performed as time and facilities permit, and those not essential for mastery of LIFEPACs. Of course, for complete understanding of concepts and student participation in the curriculum, all experiments should be performed whenever practical. Materials for the experiments are shown in Teacher Notes—Materials Needed. Videos of many of the labs may be available from online sources. These are useful as a demonstration of the lab procedure and for suggestions on alternate materials and equipment that can be used.

NOTE: Data tables can be found throughout the curriculum. They should be available to the student (where appropriate) anytime they are answering problems in section exercises, Self Tests, or LIFEPAC Tests.

LAB SAFETY

A few simple rules will guide your safe use of chemicals and equipment in a science laboratory.

1. Always wear safety goggles and a lab apron. Surgical gloves are also helpful.
2. Wipe up all spills immediately with a wet sponge. Wash out the sponge with lots of water.
3. Wash off any chemicals from hands or other body parts with lots of water.
4. Handle all equipment and chemicals with care and caution.
5. Keep focused on the task at hand. Distractions lead to accidents.
6. Plan ahead. Read through each experiment before you start. Be sure to have plenty of room to work.
7. Carry out the experiments on a level, hard, non-porous table top. This makes cleanup easy.
8. Wash and clean up all equipment exposed to chemicals as soon as the activity is completed. Dirty equipment can mean danger.
9. Be sure to use a well-ventilated room. Sometimes chemicals can have a very strong odor.
10. Have fun.

SCIENCE PROJECTS LIST

Key

(1) = Those essential to perform for basic understanding of scientific principles.

(2) = Those which should be performed as time permits.

(3) = Those not essential for mastery of LIFEPACs.

S = Equipment needed for homeschool or Christian school lab.

E = Explanation or demonstration by instructor may replace student or class lab work.

H = Suitable for homework or for homeschool students. (No lab equipment needed.)

Science 1101

pp	12	(2)	S & H
	14	(2)	S & H
	16	(2)	S & H
	18	(2)	S & H
	25	(1)	S & H

Science 1102

pp	9	(1)	S & H
	16-19	(1)	S & H
	25	(2)	H
	35	(1)	H
	40	(1)	S

Science 1103

pp	17	(1)	S
	28	(1)	S
	60	(1)	S

Science 1104

pp	9	(1)	S
	10	(1)	S
	11	(2)	S
	31	(1)	S or H
	33	(1)	S

Science 1105

pp	27	(1)	S

Science 1106

pp	6	(1)	S
	7	(1)	S
	9	(1)	S
	11	(1)	S
	35	(1)	S
	38	(2)	S
	45	(1)	S

Science 1107

pp	26	(1)	S
	36	(1)	S
	45	(1)	S
	72	(1)	H

Science 1108-10

none

SCIENCE 1101

Unit 1: Introduction to Chemistry

TEACHER NOTES

MATERIALS NEEDED FOR LIFEPAC	
Required	Suggested
• metric rulers or meter sticks • small beakers or glass jars • 10 ml, 50 ml, and 100 ml graduated cylinders • balance • 125 ml and 250 ml Erlenmeyer flasks (two bottles, like ketchup bottles, with lids can be used for Erlenmeyer flasks) • candles (birthday and household will work) • soda straws • Limewater: To make limewater, secure a medium-sized jar with tight-fitting lid. Add water (preferably distilled or purified water) until $^{2}/_{3}$ full. Add a teaspoon of lime to the jar, replace the lid and shake. Let the mixture set for 24 hours. The clear liquid on top is the limewater, so when used pour off the clear liquid and leave the solid in the jar. To replenish the lime-water, just add more water, shake, and let stand. Lime can be purchased from a hard-ware, garden, or lumber supply store as lime or whitewash.	(none)

ADDITIONAL LEARNING ACTIVITIES

Section 1: Metric Units

None.

Section 2: Instrumentation

1. Provide materials for students to measure using metric rulers, triple-beam balance, and graduated cylinders.
2. Measure distances and objects with friends.
   Average these measurements.
   Measure again those that vary greatly.
3. Make a 1,000 cm^3 box of cardboard or wood with a friend.
4. Make a box that is 10 cm on each side. Compare this box with one of 1,000 cm^3.

5. In a world almanac or online resource, look up units of measurement.
   Determine the advantages of the metric system over others.
6. In a math book or online resource, find a list of metric prefixes and their decimal numerals.
   Make a chart.
7. Make a meter wheel from cardboard.
   Cut a piece of cardboard with a circumference of one meter.
   Make a line on the edge of the wheel.
   Use a nail for an axle and mount the wheel on a handle.
   Count revolutions to measure distance.
8. Check merchandise in the grocery store.
   List those that have metric units.

Section 3: Observation and Hypothesizing

1. Provide students with graphs to determine direct and inverse relationships.
   Any algebra book will have examples.
2. View graphs of seismic or heart activity that can be found online. Make observations on the information that is plotted on the graphs.
3. Graph the hourly temperature and humidity for your area as reported in the newspaper, by online weather channels, or as determined by your own instruments.
   Are these two factors independent of each other?

Section 4: Scientific Notation

None.

Section 5: Careers in Chemistry

1. Invite guest speakers to visit the class to talk about careers in chemistry.
2. Visit a site where chemistry is part of the operation.
   These range from water and sewer plants to cosmetics labs.
3. With a friend, visit places listed in telephone and online directories and ask several people how they use chemistry.
4. Talk to neighbors, friends, and students and determine the amount of chemistry they need to function at work or school.
5. Visit a police department and ask how they use chemistry.

ANSWER KEY

SECTION 1

1.1 Reports will vary.

1.2 **kilometer:**

a. 0.1
b. 0.0012
c. 0.000001
d. 0.063
e. 0.0001263
f. 0.0315
h. 0.0000192
i. 0.00684
j. 0.0000093
l. 0.0001516
m. 0.000000031
n. 0.1234
p. 0.00366

meter:

b. 1.2
c. 0.001
e. 0.1263
g. 536
h. 0.0192
j. 0.0093
k. 61,390
m. 0.000031
n. 123.4
o. 0.00036
p. 3.66

centimeter:

a. 10,000
d. 6,300
e. 12.63
f. 3,150
g. 53,600
i. 684
j. 0.93
k. 6,139,000
l. 15.16
n. 12,340
o. 0.036
p. 366

millimeter:

a. 100,000
b. 1,200
c. 1
d. 63,000
f. 31,500
g. 536,000
h. 19.2
i. 6,840
k. 61,390,000
l. 151.6
m. 0.031
o. 0.36

1.3 **cm^3:**

b. 2,100
c. 1.05
d. 941
e. 100.5
f. 10,300
g. 0.025
h. 22,400
i. 12.86
j. 321
k. 22.4
l. 25

ml:

b. 2,100
c. 1.05
e. 100.5
h. 22,400
j. 321
l. 25

L:

d. 0.941
f. 10.30
g. 0.000025
i. 0.01286
k. 0.0224

1.4 **kg:**

a. 0.1
b. 0.00000134
c. 0.00001011
e. 0.0854
f. 0.0000379
g. 0.01084
h. 0.00905

g:

b. 0.00134
d. 6.84
e. 85.4
g. 10.84
h. 9.05
i. 0.00165

cg:

a. 10,000
b. 0.134
c. 1.011
d. 684
f. 3.79
g. 1,084
i. 0.165

mg:

a. 100,000
c. 10.11
d. 6.840
e. 85,400
f. 37. 9
h. 9,050
i. 1.65

SELF TEST 1

1.01 b. kilo
1.02 e. kilogram
1.03 a. milli
1.04 d. meter
1.05 c. centi
1.06 **kg:**

b. 0.0001056
d. 0.00563
e. 0.00000297

g:

b. 0.1056
c. 953
e. 0.00297

mg:

c. 953,000
d. 5,630

ml:

h. 32
j. 856

L:

g. 0.0136
i. 0.00733

km:

l. 0.00001
m. 0.0000125
o. 0.00169

m:

m. 0.0125
n. 180

cm:

l. 1
m. 1.25
n. 18,000
o. 169

mm:

l. 10
n. 180,000
o. 1,690

1.07 kilogram; It is equal to a standard in France. The mass is approximately that of one liter of water.
1.08 one liter; 1/1000 cubic meter which equals 1000cm^3
1.09 meter; It equals the length of a standard bar in France. or It equals 1,650,763.73 times the wavelength of the orange-red spectral line in an isotope of Krypton 86. or The meter was defined as the distance light travels in a vacuum in 1/299,792,458 seconds.

SECTION 2

2.1 Answers will vary.
2.2 width:
21.3 cm = 213 mm
length:
27.6 cm = 276 mm
2.3 a. length
b. mass
c. mass
d. mass
e. volume
f. volume
g. volume
h. volume
i. volume
j. volume
k. temperature
l. length
2.4 a. 21.30 cm
b. 0.01 cm
c. 27.6 cm
d. 0.01 cm
2.5 Answers may vary.
2.6 Measurements will vary.
2.7 Answers will vary.
Examples:
a. 50 ml burette ± 0.01 ml
b. gas measuring tube ± 0.1 ml
c. 10 ml pipette ± 0.01 ml
d. 10 ml cylinder ± 0.01 ml
e. 50 ml cylinder ± 0.1 ml
f. 100 ml cylinder ± 0.1 ml
2.8 Answers will vary.
2.9 Teacher check
2.10 Summaries will vary.
2.11 Choices will vary.

SELF TEST 2

2.01 e. 1/1000
2.02 f. curved surface of a liquid
2.03 k. precision of a 50 ml grad. cyl.
2.04 b. 1/100
2.05 g. unit of mass
2.06 d. unit of length
2.07 h. 1000
2.08 a. unit of volume
2.09 j. precision of a metric ruler
2.010 c. uncertainty of measurement
2.011 a. 8.80 ± 0.01 ml
b. 5.50 ± 0.01 ml
c. 6.82 ± 0.01 ml
d. 2.20 ± 0.01 ml
2.012 76.0 ± 0.1mm
2.013 35.0 ± 0.1mm
2.014 104.0 ± 0.1mm
2.015 13.0 ± 0.1mm
2.016 Teacher check
2.017 Teacher check
2.018 Teacher check
2.019 Teacher check

SECTION 3

3.1 Hint:
The observations of each person must be evaluated separately. Different people will draw different conclusions.

3.2 Hint:
Include the wind factor as part of your answer.

3.3 Observations will vary.

3.4 Answers will vary, but must match with 3.3.

3.5 a. There is no specific answer.
Observations will vary.
b. Answers will vary, but must be consistent with facts observed.
c. Hint:
Hypothesis must be logical and reasonable.

3.6 The flask with the candle gases should change the limewater to a cloudy white mixture. The control should remain colorless and unchanged.

3.7 The control is the standard of comparison and is used to check to see what a change in the experiment does to the experiment.

3.8 A cloudy film forms on top. When swirled, the liquid becomes cloudy as did the candle gases but with less intensity.

3.9 The results are the same as the candle, but less in amount

3.10 yes; the reactions were the same.

3.11 The candle container;
Example:
Candle produced something that is in the air.

3.12 candle; the reaction was greater and faster.

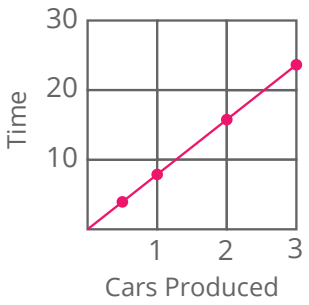
3.13 Some results occur.

3.14 water and carbon dioxide; carbon dioxide; of course; carbon dioxide

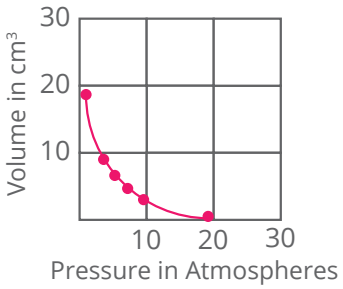
3.15 The candle is burning and produces carbon dioxide as a product.

3.16 k = 65.6

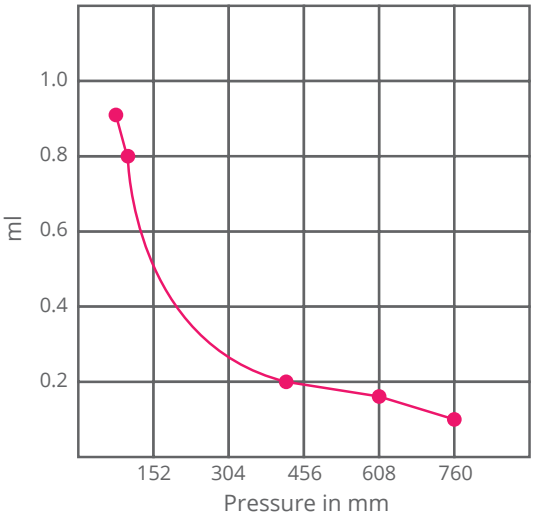
3.17 a. 0.5; 4
b. 1; 8
c. 2; 16
d. 3; 24



3.18 a. 18
b. 9
c. 6
d. 3
e. 2
f. 1



3.19



3.20 81.4

SELF TEST 3

3.01 g. theory
3.02 h. inverse
3.03 a. qualitative
3.04 b. hypothesis
3.05 f. control
3.06 k. best fit
3.07 c. direct
3.08 j. law
3.09 e. quantitative
3.010 d. limewater
3.011 Any order:
- a. Unit and title for each axis
- b. Title for each graph
- c. Name of experimenter
- d. A legend when needed

3.012 a. $y/x = k$
3.013 c. quantitative
3.014 b. $xy = k$
3.015 c. ⊙
3.016 a. law
3.017 d. milli

SECTION 4

4.1 a. 3
b. 3
c. 3
d. 5
e. 3
f. 4
g. 4
h. 2
i. 4
j. 6

4.2 23.46
4.3 0.064
4.4 0.095
4.5 6.36
4.6 a. 3.24×10^{4}
b. 5.43×10^{-4}
c. 1.3×10^{-13}
d. 1.8×10^{1}

4.7 a. .00897
b. 3
c. 34,000
d. 602,000,000,000,000,000,000,000

4.8 a. 9.6×10^{14}
b. 1.2×10^{28}
c. 2×10^{8}
d. 2.0×10^{8}
e. 6.9×10^{10}
f. 2.0×10^{27}
g. 4.7×10^{-18} or 5×10^{-18}

SELF TEST 4

4.01 f. 1/1000
4.02 c. uncertainty value of measurement
4.03 g. straight line data graph
4.04 a. 1000
4.05 l. instrument to measure volume
4.06 k. numerical observation
4.07 e. instrument to measure distance
4.08 b. educated guess
4.09 h. correctness of a measurement
4.010 i. 1/100
4.011 a. cm
4.012 b. kg
4.013 c. m
4.014 a. balance
4.015 d. 1790
4.016 6.1103×10^{4}
4.017 1.325×10^{-2}
4.018 0.00385
4.019 69,830
4.020 1.86×10^{4} or 2×10^{4}
4.021 2×10^{-5}
4.022 4
4.023 5
4.024 7.32
4.025 $89.7 = 8.97 \times 10^{1}$

SECTION 5

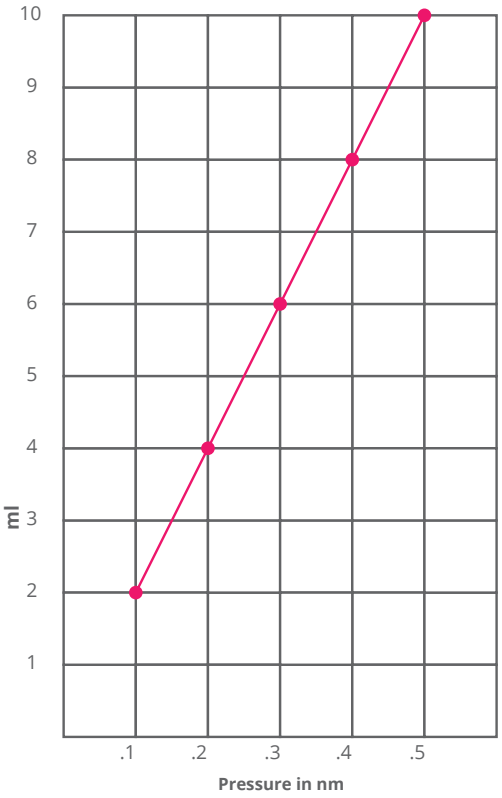
5.1 Articles will vary.
5.2 research, develop new chemicals, quality control
5.3 synthetic fibers, paints, drugs, cosmetics, lubricants
5.4 offices and laboratories
5.5 manufacturing and research firms
5.6 extensive education, Ph.D. level work is expected
5.7 average
5.8 They work in manufacturing.
5.9 design equipment and process to mass-produce chemicals
5.10 offices, laboratories, and manufacturing plants
5.11 chemical production facilities and government
5.12 extensive education in science and mathematics
5.13 average
5.14 Many of the tests, models, and data are run through computers.
5.15 This is a growth industry with many available jobs for people who are willing to relocate.

SELF TEST 5

5.01 j. 1/100
5.02 h. primary unit of mass
5.03 g. 10 mm
5.04 i. instrument of length
5.05 c. educated guess
5.06 e. symbol for volume measurement
5.07 l. instrument of volume
5.08 b. instrument of mass
5.09 d. descriptive observation
5.010 k. symbol of temperature
5.011 cm or mm
5.012 kg
5.013 10 ml
5.014 triple-beam; platform
5.015 a. The primary unit of mass is the kilogram, a standard mass kept in France.
b. The primary unit of volume is the liter, which is 1000 cm^3
c. The primary unit of distance is the meter, which we use as a standard in France.
5.016 1.6456×10^3
5.017 5.00×10^{-5}
5.018 a. 9.2 ± 0.01 ml
b. 3.2 ± 0.01 ml
c. 74.0 ± 0.1 ml
d. 33.8 ± 0.1 ml

5.019 Example:

	x	*y*	*k*
a.	.1	2	20
b.	.2	4	20
c.	.3	6	20
d.	.4	8	20
e.	.5	10	20

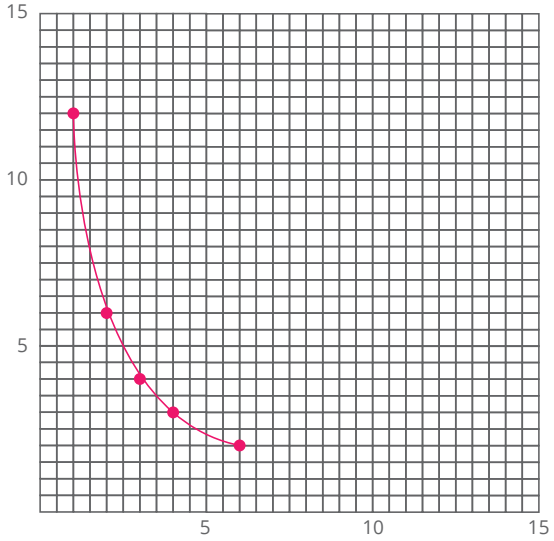


5.020 a. 3.5 ± 0.01 cm
b. 5.6 ± 0.01 cm
c. 2.9 ± 0.01 cm
d. 7.6 ± 0.01 cm
5.021 Teacher check
5.022 Accuracy is a term used to describe the correctness with which a measurement can be determined with a given measuring instrument. It is recorded as a ± value with each measurement.
5.023 This answer depends on the specific careers chosen but should reflect Section 5 contents.
5.024 The examples will vary, but the definitions should indicate that qualitative is a general description while a quantitative involves a "how much" determination.

LIFEPAC TEST

1. f. ml
2. h. ± 0.2
3. i. quantitative
4. a. milli
5. j. hypothesis
6. k. kilogram
7. b. cm
8. c. instrument of volume
9. g. $xy = k$
10. d. centi
11. c. mm
12. a. ± 0.1 ml
13. a. 6.02×10^{6}
14. a. law
15. d. 0.000391
16. b. ml
17. d. 
18. d. ml
19. c. ± 0.05
20. c. ml
21. inverse
22. hypothesis
23. law
24. ± 0.1 mm
25. accuracy
26. 1.386×10^{-2} or 1.4×10^{-2}
27. $6.528 \times 10^{7} = 6.5 \times 10^{7}$
28. 1.697×10^{-1}
29. $7.8744 \times 10^{4} = 7.87 \times 10^{4}$
30. 4.802×10^{1}
31. Teacher check

32. Sample data:
a. 1; 12
b. 2; 6
c. 3; 4
d. 4; 3
e. 6; 2



33. Hint:
Comparisons should clearly show that quantitative observations involve a "how much" while a quantitative does not.

34. Example:
The chemical technician is responsible for the laboratory tests, analysis, and quality checks on products and production of a product. This career links the theoretical with the practical application.

35. A hypothesis is an "educated" guess as an explanation to a set of data or phenomena. A hypothesis may or may not be true, and several hypotheses may explain the same observations.
Example:
My hypothesis is that the drought caused this tree to die.

ALTERNATE LIFEPAC TEST

1. g. inverse relationship
2. k. kilogram
3. h. accuracy
4. j. type of observation
5. a. 1/100
6. i. well accepted explanation
7. c. unit of distance
8. d. milliliter
9. b. direct relationship
10. e. 1/1000 kg
11. b. 9.602×10^5
12. c. precision
13. b. 0.602
14. c. qualitative
15. a. balance
16. d. 
17. a. a burette
18. a. 5
19. d. ml
20. d. 10
21. Examples:
a. production
b. research and development
c. product development or marketing, management, safety engineers, environmental engineers, information chemists, or chemical technicians
22. direct
23. 1.6648×10^{-2}
24. 3.19×10^{-4}
25. ±0.01 ml
26. Answer depends on objects chosen by teacher.
27. 3.58×10^0
28. 1.746×10^2
29. Sample answers:
a. 3, 3
b. 6, $^3/_2$
c. $^3/_2$, 6
d. 9, 1
e. 1, 9

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ALTERNATE LIFEPAC TEST

NAME _____

DATE _____

SCORE _____

64
81

Match these items (each answer, 2 points).

1. _____ $xy = k$
2. _____ primary unit of mass
3. _____ ±
4. _____ qualitative
5. _____ centi
6. _____ theory
7. _____ mm
8. _____ ml
9. _____ straight-line graph
10. _____ g

a. 1/100
b. direct relationship
c. unit of distance
d. milliliter
e. 1/1000 kg
f. explanation accepted without question
g. inverse relationship
h. accuracy
i. well accepted explanation
j. type of observation
k. kilogram

Write the letter for the correct answer on each line (each answer, 2 points).

11. The best way to write 960,200 in scientific notation is _____ .

a. 9.60200×10^5
b. 9.602×10^5
c. 9.6×10^4
d. $9{,}602 \times 10^2$

12. The accuracy of an instrument is the _____ of the instrument.

a. quality
b. cost
c. precision
d. size

13. The number 6.02×10^{-1} can be written as _____ .

a. 0.0602 b. 0.602 c. 0.0062 d. 6.02

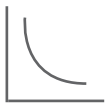
14. Observations describing the color of a substance are most likely _____ .

a. quantitative
b. too general
c. qualitative
d. inaccurate

15. The instrument that could best be used to measure mass is a _____ .

a. balance
b. graduated cylinder
c. pipette
d. ruler

16. Which graph best illustrates an $^{y}/_{x} = k$ relationship? _____

a. 

b. 

c. 

d. 

17. The instrument you would use for the most accurate volume measurement is _____ .

a. a burette
b. an Erlenmeyer flask
c. a graduated cylinder
d. a beaker

18. The number 16,694,000, has _____ significant numbers.

a. 5 b. 8 c. 3 d. 2

19. Which of the following is a unit of volume?

a. mg b. km c. g d. ml

20. The number, 9,876,444,001, has _____ significant numbers.

a. 1 b. 7 c. 5 d. 10

Complete these activities (each answer, 3 points).

21. List three careers in chemistry you have studied.

a. _____

b. _____

c. _____

22. The equation $^{y}/_{x} = k$ is a(n) _____ relationship.

23. Write 0.016648 in scientific notation. _____

24. Express 0.000319001 to 3 significant numbers. _____

25. The accuracy value for a 10 ml graduated cylinder is _____ .

26. Secure three unknowns from your teacher. Perform the appropriate measurements to determine the mass, length, and volume of the three quantities.

a. mass _____ b. mass _____ c. mass _____

volume _____ volume _____ volume _____

length _____ length _____ length _____

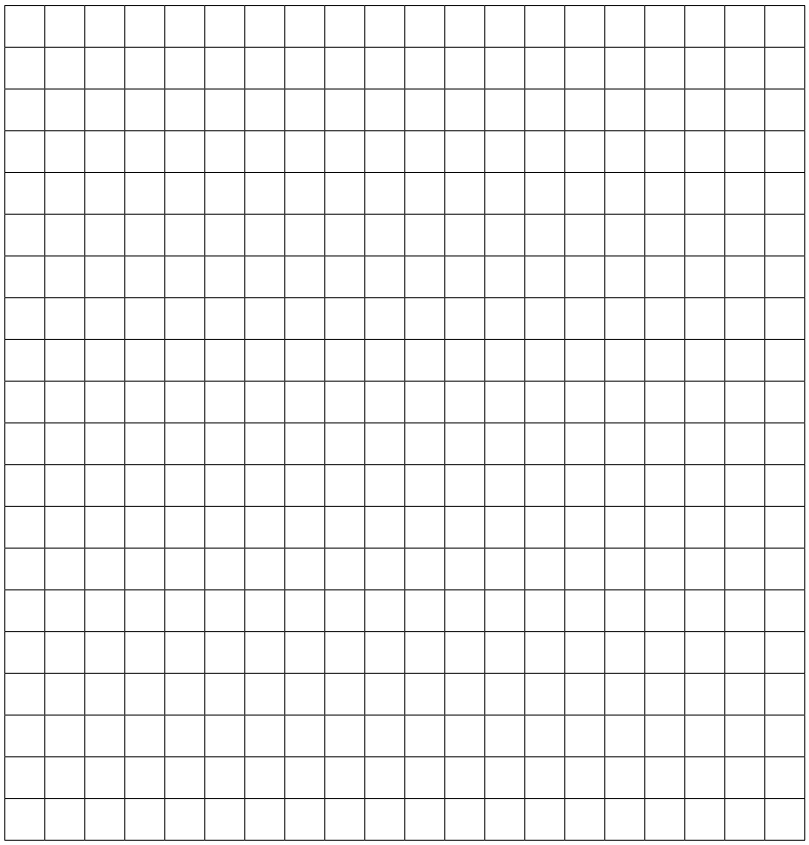
27. Express $(7.16 \times 10^1) \div (2.00 \times 10^1)$ in scientific notation. _____

28. (9.094)(19.20) = _____ (express in scientific notation).

Complete this activity (this answer, 5 points).

29. Develop a set of data and plot the data for an equation showing an inverse relationship when $k = 9$.

	x	*y*	*k*
a.			9
b.			9
c.			9
d.			9
e.			9



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