Chemistry A: Form TR1-9A Name _____

REVIEW Date _____ Period _____

Test Review № 1

Scientific Method. The scientific method is a systematic approach to solving problems. Observation or data collection occurs at all points in the scientific method. Initial observations raise questions, for which scientists propose explanations or **theories**. The work of the scientist proceeds in an orderly fashion through a series of steps: [1] Observations lead to a **question**; [2] Scientists form a **hypothesis** or a testable prediction that fits with the theory; [3] An **experiment** is done to test the hypothesis. An experiment must be controlled. A **control** is a standard for comparison. This means the test group is identical to the control group in all respects except for the variable being tested. [4] After an experiment a **conclusion** can be formed as to whether or not the hypothesis is supported.

Lab Safety. There are many precautions one must take in order to work safely ith chemicals and fire. Following are some important safety guidelines: [1]Follow all instructions carefully. Use special care when you see the word CAUTION in your laboratory instructions. Follow safety instructions given by your teacher. [2] Never eat or drink in the science laboratory. [3] Approach laboratory work with maturity. Never run, push, or engage in horseplay or practical jokes of any kind in the laboratory. [4] Report all accidents or injuries and any breakage or spills to your teacher immediately. [5] Keep your work area clean and uncluttered. [6] Never perform unauthorized experiments. Do not mix together left over materials to see what happens. [7] Roll long sleeves up above the wrist. [8] Don't wear loose fitting sleeves or bulky outer wear. [9] Tie back long hair. [10] Wear safety goggles when using dangerous chemicals, hot liquids, or burners.

Metric Units and Prefixes. The metric system uses a system of prefixes to show fractions and multiples of the basic units. The basic units are meters (m) to measure distance, grams (g) to measure mass, and liters (L) to measure volume. Some of the important prefixes are shown to the right.

Kilo (k)	=	1,000	=	10^{3}
Deci (d)	=	0.1	=	10^{-1}
Centi (c)	=	0.01	=	10^{-2}
Milli (m)	=	0.001	=	10^{-3}
micro (μ)	=	0.000001	=	10^{-6}
nano (n)	=	0.000000001	=	10^{-9}
pico (p)	=	0.000000000001	=	10^{-12}

Factor Label Conversions. Any mathematical problem that has units lends itself to solution by"Unit Analysis" or the "Factor Label Method." Using definitions, it is possible to convert one unit to another. Every definition can be turned into two conversion factors with a numerical value of one. Multiplying by a factor equal to one does not change the value, but selecting the correct factor causes units to cancel giving the desired result. See the sample problem to the right.

Sample Problem: How many meters are 1,472 ft

Definitions 1 ft = 12 in; 1 in = 2.54 cm; 1 cm = 0.01 m

$$1{,}472\ ft \times \frac{12in}{1ft} \times \frac{2.54cm}{1in} \times \frac{0.01m}{1cm} = 449m$$

Scientific Notation. When numbers are very large or very small, they are easier to interpret when written in scientific notation. Scientific notation also makes it easier to show the number of significant digits. Numbers written in scientific notation have two parts: the first part is a number between 1 and 10; the second part is 10 raised to any whole number exponent. The two parts are multiplied by each other. Numbers are converted to scientific notation by moving the decimal point of the original number to get a number between 1 and 10. Keep track of the number of places the decimal has been moved and the direction to get the exponent. Addition and subtraction in scientific notation follow a few simple rules: (1) numbers must be a multiple of the same power of 10; (2) the first factor can then be added or subtracted; and (3) the power of 10 is not affected. Multiplication follows a different set of rules: (1) multiply the first factors; and (2) add the exponents. Division follows still a third set of rules: (1) divide the first factors; and (2) subtract exponents. See the examples on the next page.

Addition	***Multiplication***	**Division**
Example $1.35 \times 10^5 + 2.9 \times 10^4$ *Procedure* ① $2.9 \times 10^4 = 0.29 \times 10^5$ ② 0.29×10^5 $+ 1.35 \times 10^5$ 1.64×10^5	*Example* $(2.0 \times 10^4) \times (1.5 \times 10^3)$ *Result* 3.0×10^7	*Example* $\frac{3.0 \times 10^5}{2.0 \times 10^3}$ *Result* 1.5×10^2

Answer the questions below by circling the number of the correct response

1. Hot materials can be safely moved from your lab station (1) with tongs, (2) with forceps, (3) only after they cool, (4) only if they're covered.

2. Acid can be safely diluted by adding (1) acid to water, (2) water to acid, (3) either choice 1 or choice 2.

3. A student dropped a mercury thermometer, scattering splinters of glass and droplets of mercury around the lab table. The safest course of action would be to (1) pick up and discard the broken pieces of glass and the mercury immediately, (2) kick the material under the lab table and out of the way, (3) leave the material for the custodial staff, (4) notify the teacher.

4. A test tube can be safely removed from a hot water bath using (1) tongs, (2) a test tube holder, (3) forceps, (4) a test tube clamp.

5. A student heated a crucible containing copper sulfate crystals for about 10 minutes and noticed it was time to clean up and store the crucible in the cabinet at the far side of the room. The safest way to transfer the crucible is to (1) carry the hot crucible with tongs, (2) wait until the crucible is cool, (3) balance the hot crucible on a wire gauze, (4) using tongs, place the hot crucible in a beaker and carry the beaker across the room.

6. A student connected a Bunsen burner to a gas jet and opened the jet all the way. Then she lit the burner with a striker. The flame was so large, it almost singed her hair. What should the student do in the future in order to avoid such mishaps? (1) Tie back her hair. (2) Open the gas jet only partway. (3) Adjust the valve on the Bunsen burner before lighting it. (4) Pay careful attention to the location of fire extinguishers and fire blankets

7. When working with acids, bases, or heat, you should always wear (1) safety goggles, (2) gloves, (3) loose fitting sleeves, (4) all of these.

8. Under which of the following circumstances is it acceptable to eat in the science laboratory? (1) at the completion of the lab work (2) prior to starting lab work (3) any time as long as precautions are taken (4) never

9. When instructed to smell a chemical, the appropriate procedure to use is to (1) wave the air above the substance towards your nose and sniff carefully (2) inhale fumes directly (3) enclose the material in cotton before sniffing (4) give the sample to your lab partner

10. Which of the following is NOT good safety advice? (1) Roll long sleeves up above the wrist. (2) Wear loose fitting sleeves or bulky outer wear. (3) Tie back long hair. (4) Wear safety goggles when using dangerous chemicals, hot liquids, or burners. (5) Wear lab aprons when working with chemicals, hot material, or preserved specimens.

11. A scientist tested the hypothesis that rats become aggressive when they are crowded together by counting the number of fights per rat that occurred in a week in a crowded cage. How can this experiment be made into a controlled experiment? (1) Compare the crowded rats to less crowded rats. (2) Compare the experimental group of rats to friendlier rats. (3) Count the number of friendly encounters between rats too. (4) Train the rats to control their aggressive tendencies.

12. An experiment is successful only if (1) its hypothesis is correct, (2) its hypothesis is incorrect, (3) it results in a new scientific law, (4) it indicates clearly whether or not its hypothesis is supported.

13. Which is not an acceptable technique for solving scientific problems? (1) hypothesis formation (2) observation (3) experimentation (4) rationalization

14. A scientist wanted to determine if plants grow better when they are talked to regularly. The scientist placed a tape recording of people talking in a room where plants were growing and measured their growth every day for a month. What is missing in this experiment? (1) a hypothesis (2) a test variable (3) a control (4) observations

15. Which of the following lists some of the key steps of the scientific method in the correct order? (1) experiment, hypothesis, conclusion (2) hypothesis, experiment, conclusion (3) conclusion, experiment, hypothesis (4) experiment, conclusion, hypothesis

16. Which is the equivalent of 750. calories? (1) 0.750 kcal (2) 7.50 kcal (3) 75.0 kcal (4) 750. kcal

17. Which of the following could represent an object's mass? (1) 2.54 cm (2) 9.50 L (3) 8.46 kg (4) 0.95 ps

18. Which is the equivalent of 1250. microliters? (1) 1.250 L (2) 1.250 kL (3) 1.250 cL (4) 1.250 mL

19. Which of the following could represent the space an object occupies? (1) 3.4 cm (2) 4.2 L (3) 4.6 kg (4) 6.3 ps

20. Which is the equivalent of 0.500 ks? (1) 500. s (2) 50.0 s (3) 0.000500 s (4) 5.00 s

21. Which of the following conversions could be used to determine the number of μL in 1.25L?

(1) $1.25L \times \frac{1\mu L}{0.000001L}$ (2) $1.25L \times \frac{0.000001L}{1\mu L}$

(3) $0.000001L \times \frac{1\mu L}{1.25L}$ (4) $1\mu L \times \frac{0.000001L}{1.25L}$

22. Based on the fact that the density of water is 1 g/mL, what does the following expression show?

$$3.0L \times \frac{1{,}000mL}{1L} \times \frac{1g}{1mL} \times \frac{1kg}{1{,}000g}$$

(1) the number of liters in 3.0 g of water
(2) the number of grams in 3.0 L of water
(3) the number of liters in 3.0 kg of water
(4) the number of kilograms in 3.0 L of water

23. Which of the following conversions could be used to determine the number of centimeters in 15 mm?

(1) $\frac{1}{15mm} \times \frac{0.001m}{1mm} \times \frac{1cm}{0.01m}$

(2) $15mm \times \frac{1mm}{0.001m} \times \frac{0.01m}{1cm}$

(3) $15mm \times \frac{0.001m}{1mm} \times \frac{0.01m}{1cm}$

(4) $15mm \times \frac{0.001m}{1mm} \times \frac{1cm}{0.01m}$

24. What is the numerical value of the conversion factor $\frac{1km}{1{,}000m}$?

(1) 1 (2) 0.001 (3) There is no way to tell (4) 1,000

25. Which of the following is written in proper scientific notation? (1) 0.25×10^3 (2) 2.5×10^2 (3) 25×10^1 (4) 250

26. What is the value of the expression below in proper scientific notation?

$$\frac{1.3 \times 10^3}{6.5 \times 10^4}$$

(1) 0.2×10^{-1} (2) 2.0×10^{-2} (3) 0.2×10^7 (4) 2.0×10^6

27. What is the product of 1.5×10^2 and 2.0×10^3? (1) 3.0×10^5 (2) 3.5×10^5 (3) 3.0×10^6 (4) 3.5×10^6

28. What is the sum of 1.5×10^4 and 1.0×10^3? (1) 1.5×10^7 (2) 2.5×10^7 (3) 1.6×10^7 (4) 1.6×10^4

29. What is the difference between 4.1×10^3 and 2.1×10^2? (1) 2.0×10^1 (2) 3.9×10^1 (3) 2.0×10^3 (4) 3.9×10^3

30. Light travels at 186,000 mi/s. If a mile is 5,280 ft, there are 12 in in a foot, and 2.54 cm in an inch, what is the speed of light in meters per second?

31. How many millimeters are in 2,450 nm?

32. What is 34,553,291 in scientific notation?

33. What is 2.56×10^{-4} in standard notation?

Answers

1. 3	13. 4	25. 2
2. 1	14. 3	26. 2
3. 4	15. 2	27. 1
4. 2	16. 1	28. 4
5. 2	17. 3	29. 4
6. 3	18. 4	30. 299,337,984 m/s
7. 1	19. 2	31. 0.00245 mm
8. 4	20. 1	32. 3.45532291×10^7
9. 1	21. 1	33. 0.000256
10. 2	22. 4	
11. 1	23. 4	
12. 4	24. 1	