

SUMMER PACKET FOR GENERAL CHEMISTRY

NAME:

Note on Collaboration: Authentic collaboration where students discuss the skills, contents, and processes required to complete the following questions is not only permitted but encouraged and very much in keeping with the practice of science as implemented in academia and industry.

Students are cautioned however that there is a *significant* difference in both ethical behavior, adherence to the Honor Code, and benefit derived from work done between authentic collaboration and either simply seeking the answers from or providing the answers to a peer.

Multiple Choice: Read Carefully, Select the BEST Response.

Lab Safety

1. Long hair in the laboratory must be
 - a. Cut short
 - b. Held away from the experiment in one hand
 - c. Always neatly groomed
 - d. Tied back or kept entirely out of the way with a hair band, hair pins, or other device.
2. If you do not understand a direction or part of a lab procedure, you should
 - a. Figure it out as you do the lab
 - b. Try several methods until something works
 - c. Ask the instructor before proceeding
 - d. Skip it and move on.
3. If you wear contact lenses into a school laboratory class, you should
 - a. Take them out before starting the lab
 - b. Not worry about wearing goggles for the lab
 - c. Advise your science instructor that you wear contacts.
 - d. Keep the information to yourself.

Unit 1: The Process of Science & Scientific Thinking

4. You want to see if the amount of fertilizer given to a plant affects how tall it grows. The height of the plant would be the
 - a. Independent variable
 - b. Dependent variable
 - c. Control group
 - d. Manipulated variable
5. All of the following are examples of good laboratory preparation EXCEPT
 - a. Knowing the safety and first aid procedures
 - b. Reading through the entire lab before starting it
 - c. Always following the teacher's instructions
 - d. Reading through the procedure the first time while completing the lab in class

Sam wished to investigate how fertilizer run-off affects the growth of algae in freshwater lakes and streams. He set his experiment up in this way. He placed 900 mL of water into each of five 1000 mL glass beakers. To each beaker he added 5 mL of water from an aquarium which contained a large concentration of algae. The beakers were placed under a grow light which was timed to provide 12 hours of light each day. Liquid fertilizer was added to the beakers in the following amounts: Beaker A-8 mL fertilizer, Beaker B-6 mL fertilizer, Beaker C-4 mL fertilizer, Beaker D-2 mL fertilizer, and Beaker E-no fertilizer. Each week a random sample from each of the beakers was examined under a microscope to get a count of the number of algal cells present.

6. What is the independent variable in this experiment?

- a. Amount of water
- b. Amount of fertilizer
- c. Number of algal cells
- d. Hours of daylight

7. What is the dependent variable in this experiment?

- a. Hours of daylight
- b. Size of the beakers
- c. Number of algal cells
- d. Amount of fertilizer

8. Which of the following is not a controlled variable in this setup?

- a. Amount of fertilizer
- b. Amount of light
- c. Amount of aquarium water
- d. Size of the beakers

9. Which of the following is the control group in this experiment?

- a. Beaker A
- b. Beaker B
- c. Beaker C
- d. Beaker D
- e. Beaker E

10. Is the following argument best classified as deductive or inductive?

The overwhelming majority of mutations are not beneficial to an organism's survival. So the odds are that no mutation is going to give an organism super powers.

- a. Deductive
- b. Inductive

11. Is the following argument best classified as deductive or inductive?

All dogs bark. Fido is a dog, so he barks.

- a. Deductive
- b. Inductive

12. Classify the following statement, "*Bald Eagle eggs in northern Maine will have thinner shells than those from birds in southern Alaska due to increased levels of pesticides in the water*".

- a. Theory
- b. Fact
- c. Law
- d. Hypothesis

13. Classify the following statement, "*Ancient human like species existed 2 million years ago*".

- a. Theory
- b. Fact
- c. Law
- d. Hypothesis

14. Which one of the following is not a hypothesis?

- a. The foraging patterns of *S. carpocapsae*, as measured by directional response, are affected by electrical fields.
- b. If I give a plant an unlimited amount of sunlight, then the plant will grow to its largest possible size.
- c. Marsh grass growth is limited by available nitrogen
- d. Prairie fires replenish the nutrients in the soil.

Use the following information for questions 15-17

		actors				dates			
		Evan	Harold	Vernon	Zachary	September 15th	September 22nd	October 6th	October 13th
fees	\$85,000								
	\$100,000								
	\$115,000								
	\$130,000								
dates	September 15th								
	September 22nd								
	October 6th								
	October 13th								

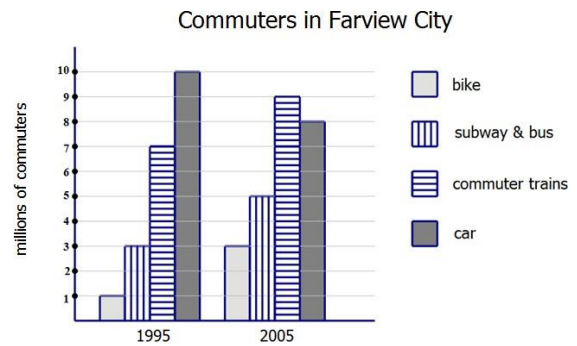
Clues for Puzzle:

- The person filming on October 13th is either the actor making \$130,000 or Vernon.
- Evan will make \$85,000.
- The person making \$130,000 will film on September 22nd.
- The four people are the man making \$100,000, the person filming on October 13th, Harold and the man filming on October 6th.

- The actor that earns \$130,000 is
 - Evan
 - Harold
 - Vernon
 - Zachary
- The actor filming on October 13th is
 - Evan
 - Harold
 - Vernon
 - Zachary
- The actor filming on September 15th earns
 - \$85,000
 - \$100,000
 - \$115,000
 - \$130,000

Unit 2: The Mathematics of Science

The graph below shows the different commuting options chosen by commuters in the Farview City metropolitan region in 1995 and in 2005. Use this information for questions 18 & 19.



18. The commuting mode whose ridership increased by approximately 29% from 1995 to 2005 is _____.

- Bike
- Subway & bus
- Commuter train
- Car

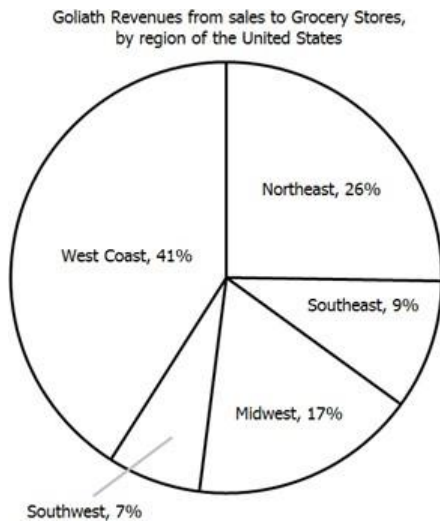
19. Assume the graph above shows all commuters in the two relevant years. In 2005, the car commuters were _____ percent of all commuters.

- 25
- 32
- 48
- 60

The charts below show the breakdown for the 2010 revenues for Goliath Corporation, a major supplier of food and food preparation materials. The pie chart shows the breakdown of sales to grocery stores. Assume these two charts contain all the revenue for Goliath Corporation. Use this information for questions 20 & 21.

Revenue of Goliath Corporation

Source of revenue	thousands of dollars
Sales to hotels & restaurants	1,278
Sales to grocery stores	793
Foreign export sales	124
Governmental contracts	67
TOTAL	2,262



20. The revenue from foreign export sales is _____ the revenue from grocery stores in the Northeast.

- a. Greater than
- b. Less than
- c. Equal to
- d. Cannot determine

21. Revenue from governmental contracts would have to increase by _____% to equal the revenue from grocery sales in the Midwest

- a. 68
- b. 101
- c. 135

d. 226

Use the following information and data table to answer question 22.

Two New York City island cruise companies, Happy Sailing and Sunny Waters, make six trips around Manhattan every day of the week except Sunday. The total number of passengers per day for each company is shown in the table below.

Weekday	Total number of passengers	
	Happy Sailings	Sunny Waters
Monday	240	200
Tuesday	235	180
Wednesday	210	195
Thursday	190	185
Friday	200	220
Saturday	260	240

22. In a plot analyzing number of passengers per trip by weekday, what would be the best option for scaling the dependent variable axis?

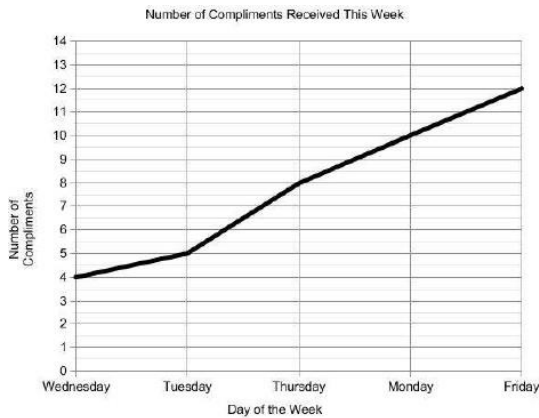
- a. A continuous data axis scaled from 0 to 260
- b. A continuous data axis scaled from 180 to 260
- c. A continuous data axis scaled from 30 to 50
- d. A discrete data axis labeled with the days of the week

Use the following information and data table to answer question 23.

Roberta's class keeps a record of the number of compliments they receive from other teacher's throughout the week. The chart below is the data that was collected.

Number of Compliments Received This Week					
Day of The Week	Monday	Tuesday	Wednesday	Thursday	Friday
Number of Compliments	10	5	4	8	12

Roberta used the chart to make the following graph.



23. Roberta made an error when plotting her graph, where was the error made?

- In the type of graph chosen to be plotted.
- In how the line was plotted on the graph
- On the dependent variable axis
- On the independent variable axis

24. Scientists all over the world use the metric system as the standard system of measurement (SI). Why is it important for scientists to use a common system of measurement?

- it allows scientists to repeat experiments, compare data, and communicate results
- it helps scientists to create data charts and graphs from observations
- it encourages scientists to use lab safety while doing scientific investigations
- None of the above

25. Thomas climbed up a mountain to 12,000 feet above sea level on Saturday. The following week, he went to the Gulf of Mexico and went scuba diving. He dove to a depth of 30 feet below sea level. What range in feet did Thomas ascend and descend during that week?

- 11,970 feet
- 12,300 feet
- 1,230 feet
- 1,197 feet
- 12,030 feet

26. What is the median of the following set of data? **16, 98, 62, 31, 56, 51, 53, 27, 17, 43, 30**

- 64
- 44
- 43
- 51

27. Choose the correct standard form for $6.24 \times 10^5 6.24 \times 10^5$

- 6240
- 62,400
- 624,000
- none of these

28. The amount of mustard dispensed from a machine at The Hotdog Emporium is normally distributed with a mean of 0.9 ounce and a standard deviation of 0.1 ounce. If the machine is used 500 times, approximately how many times will it be expected to dispense 1 or more ounces of mustard.

- 5
- 16
- 80
- 100

29. Dylan has 0.5 liters of water. He needs to find out how many milliliters of water he has so he can complete his science experiment. How many milliliters (mL) of water does Dylan have?

- 0.005 mL
- 0.0005 mL
- 500 mL
- 5000 mL

30. Given that 1 mi = 1760 yd, determine what conversion factor is appropriate to convert 1849 yd to miles.

- a. 1849 yd / 1 mi
- b. 1760 yd / 1 mi
- c. 1 mi / 1760 yd
- d. 1 mi / 1849 yd

31. Using the rules for adding/subtracting significant figures, complete the following question: **2.7 + 8.3289**

- a. 11.028900
- b. 11.0
- c. 11.029
- d. 11.03

32. Using the correct rules for significant figures solve: **334.54 grams + 198 grams =**

- a. 532.54 grams
- b. 532.5 grams
- c. 533 grams
- d. 530 grams

33. Using the correct rules for significant figures solve: **34.1 grams / 1.1 mL =**

- a. 30 gmL
- b. 30 g/mL
- c. 31 gmL
- d. 31 g/mL

34. Using the correct rules for significant figures solve: **2.11 x 10³ joules / 34 seconds =**

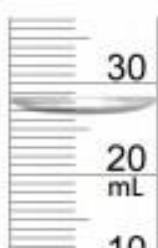
- a. 6.21 x 10¹ joule seconds
- b. 6.21 x 10¹ joule/seconds
- c. 6.2 x 10¹ joule seconds
- d. 6.2 x 10¹ joule/seconds

35. Using the correct rules for significant figures solve: **0.0010 meters – 0.11 meters =**

- a. -0.11
- b. -0.11 meters
- c. -0.11 meters/meters
- d. -0.11 meters²

36. What would be an acceptable value to report for the measurement shown to the right?

- a. 26 mL



- b. 26.7 mL
- c. 33 mL
- d. 33.3 mL

37. Which of the following is an exact number?

- a. 10.25 g
- b. 4.000 kg
- c. 7 bananas
- d. 60 seconds

38. What is the mass of 20.0 mL solution if its density is 1.84 g/mL?

- a. 10.8 g
- b. 21.8 g
- c. 10.9 g
- d. 36.8 g

39. A student buys a rope at the store. The label on the packaging says that the rope is 2.15 m in length. The student measures the rope as 1.85 m. What is the student's percent error?

- a. 16 %
- b. 14%
- c. 14.0%
- d. 10.5%

40. A student is given a rock that is known to have a mass of 436.8 grams. She measures the mass of the rock three different times with the following results: **460.9 g, 461.4g, 459.0 g**.

What can be said about her precision and accuracy?

- a. Her measurements are accurate, but not precise
- b. Her measurements are precise, but not accurate
- c. Her measurements are both precise and accurate
- d. Her measurements are neither precise nor accurate

Unit 3: Chemistry

41. Which of the following is an intensive property?
- Mass
 - Volume
 - Density
 - Heat given off by a combustion reaction
42. The chemical symbol for strontium is?
- St
 - Sn
 - Sr
 - W
43. Which of the following is **not** indicative of a chemical reaction?
- Color change
 - Formation of a precipitate
 - Substances dissolving
 - Gas is produced
44. You go to the beach and dig up some wet sand. Which method would be the **best** for determining the amount of salt present in your sample:
- Put the wet sand in filter paper, wash it 3x with distilled water, evaporate out all of the collected water, and then mass the residue.
 - Dry the wet sand in an oven, then sift out the salt.
 - Distill the mixture; salt will come out second
 - Use a separatory funnel; salt will come out second
45. Which of the following is **incorrect / false**:
- Compounds and homogeneous mixtures are uniform throughout.
 - The concentration of compounds and homogeneous mixtures are fixed.
 - Heterogeneous mixtures must have two or more phases.
 - Compounds can only be separated by chemical means.
46. Which of the following is a homogeneous mixture?
- Melted gold
 - Melted brass
 - Melted zinc
 - Melted copper
47. How would you separate a miscible mixture of ethanol alcohol and water?
- Separatory funnel
 - Distillation
 - Filtration
 - Chromatography
48. Which of the following is a physical change?
- A leaf changing color
 - A nail rusting
 - A pond freezing
 - A candle burning
49. Which of the following is a homogeneous mixture?
- Water
 - Carbon dioxide
 - Air
 - soil
50. Which of the following is a heterogeneous mixture?
- Sugar dissolved in alcohol
 - Bronze alloy
 - Rusty pipe
 - Air
51. What type of matter has an indefinite shape and a definite volume?
- Solid
 - Liquid
 - Gas
 - Plasma
52. Which sample of aluminum has the highest density?
- Solid aluminum rod: 1m long; 1cm diameter

- b. Hollow aluminum rod: 1m long; 1cm diameter
- c. Piece of aluminum foil: 2cm²
- d. They are all the same

- b. CO₂
- c. C₂H₆O
- d. CH₄

53. An element has a mass number of 50 and an atomic number of 23. Which of the following is an isotope of this element?

- a. $^{50}_{24}\text{X}$
- b. $^{60}_{23}\text{X}$
- c. $^{50}_{23}\text{X}$
- d. $^{23}_{50}\text{X}$

54. You mass an empty beaker and find its mass to be 22.575 g. You add some copper (II) chloride to this empty beaker until the mass reads 22.985 g. The mass of the copper (II) chloride is:

- a. 0.41 g
- b. 0.410 g
- c. 0.4100 g
- d. 0.41000 g

55. What is the correct name for the group Li is in on the Periodic Table:

- a. Alkali metals
- b. Alkali Earth metals
- c. Alkaline metals
- d. Alkaline Earth metals

56. Which scientist first described the atom as a small indivisible particle:

- a. Democritus
- b. Dalton
- c. Bohr
- d. Rutherford

57. Which of the following is an inorganic compound?

- a. C₃H₆

The remainder of this study packet covers topics that should be considered *enrichment* in preparation for your upcoming CP Chemistry course. As such you will *not* be held accountable for completing this material by your CP Chemistry teacher in regards to the assessments you *will* be receiving based on your completion of the earlier questions in this packet.

However, any independent research you elect to do towards understanding the following concepts will be extremely beneficial as you encounter these topics in your upcoming CP Chemistry course.

Topic 1: **Ions**

Core Concept/Application: *Understanding the development of the atomic structure throughout history and the development of using information regarding properties of subatomic particles to solve questions regarding attraction, charge, and atomic size.*

“Big Idea”: What is an atom? What are the pieces that make up an atom?

Recommended reading:

<https://tinyurl.com/yaslnb3w>

<https://tinyurl.com/yahbdmbc>

Topic 2: **Bonding**

Core Concept/Application: *Understanding the difference between metals and nonmetals and why they are classified as such. Identifying metalloids. The difference in bonding types dependent on ion and element interactions. Sharing electrons vs transfer of electrons and different bond nomenclature and diagrams dependent upon compound type.*

“Big Idea”: What is the difference between metals and nonmetals? How do bonds between metals and nonmetals (covalent vs ionic) differ?

Recommended reading:

<https://tinyurl.com/ybftiacg>

<https://tinyurl.com/y8xsytux>

<https://tinyurl.com/y9h6o3ar>

<https://tinyurl.com/yat3knnk>

Topic 3: **Chemical Formula Naming & Writing**

Core Concept/Application: *How to name molecular vs ionic compounds. Uses of suffixes, prefixes and roman numerals. Identifying binary compounds vs tertiary compounds and identifying polyatomic ions.*

“Big Idea”: What is the naming differences between ionic and covalent compounds? When to use prefixes for compounds? What is the correct ion suffix? How to identify and name polyatomic ions and write compounds containing polyatomics? When are charges used to determine compound names?

Recommended reading:

<https://tinyurl.com/yc7kbd5s>

<https://tinyurl.com/ybite2nu>

<https://tinyurl.com/y7lwx4xw>

<https://tinyurl.com/yczhlgl>

Topic 4: ***Writing and Balancing Chemical Equations***

Core Concept/Application: *How to write balanced chemical equations as a description of a chemical reaction.*
Application of the Law of the Conservation of Mass and Matter.

“Big Idea”: How to write chemical formulas? How to write formulas as short hand notation for chemical reactions? What is the Conservation of Mass and Matter and how is it applicable here?

Recommended reading:

<https://tinyurl.com/yancnkeq>

<https://tinyurl.com/v7ezx9f>

<https://tinyurl.com/y&zdv7zy>