

Your semester one exam consists of 30 multiple-choice questions, 2 physics calculations, and 3 chemistry problems. The exam will count 10% of your final semester grade. This is enough for it to affect your grade, but not drastically change your grade.

On this side of the review guide, there are practice questions and sample problems. Solutions are on the reverse side: Practice questions are answered in paragraphs (in order) and answers to sample problems are in a table.

General Science:

What is science based on?
 What's the point of writing a lab report?

Physics:

What is physics?
 What do Newton's laws explain?
 What is experimental error?
 What do each of the letters in the following equations mean?

Equations bank		$Ke = \frac{1}{2} mv^2$
$v = d/t$	$F = ma$	<i>In freefall...</i> $t = \sqrt{2d/g}$
$a = \Delta v/t$	$g = 9.8m/s^2$	<i>In freefall...</i> $V_f = gt$

Sample Physics problems:

1. A brick is dropped from 15 meters up. It takes 1.7s to hit the ground. What is the average velocity of the brick?
2. A girl rides a bike 85meters in 40s. What is the average velocity of the girl?
3. A ball thrown up in the air comes back down. The ball is in the air for 8 sec. For how many seconds was it falling?
4. If you can walk 1 block in 4 minutes, and there are 10 blocks in a mile, how long does it take you to walk a mile?
5. Dan can bike 1 block in 18s. (10 blocks = 1 mile) How long does it take him to bike a mile?
6. A 5-newton force and an 8-newton force act on an object in opposite directions. What will it take to put the object into equilibrium? (Hint: draw a picture)
7. A bowling ball rolls at constant velocity. What is the net (total) force on the ball?
8. What is the acceleration on any falling object?
9. A 15 kg shopping cart gets a 50-N push. What will the acceleration be?
10. A 2000 kg boat receives a 100-N push. What will the acceleration be?
11. What is the kinetic energy of a 4kg bowling ball traveling at 6 m/s?
12. A 110kg person is running at 3m/s. What is the person's kinetic energy?
13. What is the acceleration of a car that goes from 0m/s to 30m/s in 6 seconds?

Chemistry:

What are the three parts of an atom?
 What is the difference between an element and a molecule?
 What are the three states of matter we studied?
 What are the properties for each state of matter (as per shape and volume... definite or indefinite)?
 How is the periodic table organized?
 Why are John Dalton's laws not completely accurate?

Sample Chemistry Problems:

14. How many atoms are in H_2SO_4 ?
15. How many atoms are in $CaCO_3$?
16. Add coefficients to balance this equation: $C + O_2 \rightarrow CO_2$
17. Add coefficients to balance this equation: $H_2 + O_2 \rightarrow H_2O$
18. Add coefficients to balance this equation: $NaOH + H_2SO_4 \rightarrow Na_2SO_4 + H_2O$
19. Add coefficients to balance this equation: $C_3H_4 + O_2 \rightarrow CO_2 + H_2O$
20. Add coefficients to balance this equation: $CH_4 + O_2 \rightarrow CO_2 + H_2O$
21. Add coefficients to balance this equation: $CO_2 + H_2O \rightarrow C_6H_{12}O_6 + O_2$

Lab Safety:

What is the first thing you must do in a laboratory activity?
 What do we do to protect ourselves during a laboratory activity?

Science is based entirely on observations. A scientist observes something, asks a question, and then makes more observations. The scientist then makes a hypothesis and devises an experiment to test the hypothesis. The scientist collects data and draws conclusions based on the data.

Scientists keep records of the experiments they conduct. They do this to show their work. The lab reports are detailed enough so someone else could re-do the experiment and see how the scientist drew her/his conclusions. Experimental error happens and scientists have to explain the errors they encounter (usually, humans make the errors)

Science is divided into subjects: Life sciences and physical sciences. Physical sciences include the subjects we have studied so far in this class: Physics (study of motion) and Chemistry (the study of matter and the changes it undergoes)

Physics is a very broad subject that begins with Newtonian principles: Isaac Newton's 3 laws about how matter moves on earth. These laws describe linear motion. The laws include principles like all objects at equilibrium (at rest or at a constant velocity) have a net force equal to zero.

There are many algebraic equations we used in class. When we made calculations together, students were able to follow along and arrive at the correct answers. On the exam, there are 8 questions where you will need to use equations to calculate an answer. You will have this bank of equations:

Equations bank		$Ke = \frac{1}{2} mv^2$
$v = d/t$	$F = ma$	<i>In freefall...</i> $t = \sqrt{(2d/g)}$
$a = \Delta v/t$	$g = 9.8m/s^2$	<i>In freefall...</i> $v_f = gt$

You will not have this information:

F = Force	a = Acceleration	V = Velocity	t = Time
m = Mass	Ke = Kinetic energy	d = Distance	g = Gravity

During the exam, first decide what the question is asking and then select the equation. Then plug in the information you know. Last, use arithmetic to calculate the answer. You may use a calculator.

Chemistry is the study of matter and the changes it undergoes. Matter can exist as a solid, liquid, gas, or plasma. (We didn't study plasma) Solids have definite volume and shape. Liquids have definite volume but indefinite shape. Gasses have indefinite volume and shape.

At the atomic level, matter is composed of protons, neutrons, and electrons. All atoms with the same number of protons are from the same element. An element is a pure substance made of one type of atom. A molecule is something made of 2 or more atoms. Elements are organized into the periodic table. The table holds loads of information, including atomic mass and number. Atomic mass and number increase from left to right and from top to bottom. The table also sorts elements into periods; meaning elements in the same vertical column are similar. Families of elements are also present; grouped into larger sections.

John Dalton wrote some laws of chemistry:

- 1: All matter is made of atoms.
- 2: Atoms of the same element are "identical."
- 3: Atoms are neither created nor destroyed.
- 4: Constant composition: in a compound, atoms always combine in the same whole number ratios. However, Dalton's laws are "more like a guideline" thanks to improvements in technology over the last 200 years.

Dalton's 2nd and 3rd laws work together. We use these laws to rationalize balancing chemical equations. Every atom must be accounted for and molecules combine in whole-number ratios (no fractions). To balance an equation, follow these steps when adding coefficients:

- Start with an atom that only appears once on each side of the equation
- Then balance atoms that appear twice
- Finish with H and O. Look for the loner... (the atom that is all alone. Balance that one last)
- Check your work!

When working in the laboratory, safety is the single most important thing. That is why we ALWAYS read ALL the directions first. Then we ask questions, put on safety gear, and secure loose clothing before collecting materials. We never dump anything down the drain because of environmental hazards. If there is an accident or an injury, always inform the teacher right away.

Answers to sample problems:

1) 8.82m/s	5) 3 min	8) 9.8 m/s ²	12) 495 Joules	16) $C + O_2 \rightarrow CO_2$	19) $C_3H_4 + 4O_2 \rightarrow 3CO_2 + 2H_2O$
2) 2.1m/s	6) 3N added to the 5N direction	9) 3.333 m/s ²	13) 5 m/s ²	17) $2H_2 + O_2 \rightarrow 2H_2O$	20) $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$
3) 4s		10) .05 m/s ²	14) 7	18) $2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$	21) $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$
4) 40 min	7) 0 Newton	11) 72 Joules	15) 5		