Summer Review Packet - 2017

AP Physics 2

Objective: Welcome to the exciting and challenging World of year 2 in AP Physics. There are five parts to your summer assignment. They are all easy tasks that are usually taken care of during the first couple of weeks of school. By completing these tasks over the summer we will be able to start doing physics on day 1. The first assignment requires you to join the Google Classroom group. The next two assignments require you to read something, sign it, have the adult responsible for you sign it, and turn it in the first day of school. The last two assignments give you a chance to review skills from last year before ask you to build on them in the coming year.

AP Physics 2 is equivalent to a one semester College course in algebra-based physics. These topics are usually covered after a semester course on Classical Mechanics. In AP Physics 2, students will engage in topics beyond Classical Mechanics including principles of fluids, thermodynamics, electricity, magnetism, optics, and topics in modern physics. In addition to the chance to earn College Credit, the Course is designed to prepare you for calculus-based physics courses. You must be fully committed to the course. Most students will need to invest an average of one hour each day outside of class Working on physics. Many students taking AP Physics, accustomed to earning "A's" without too much work, find they are challenged just to earn a "B." AP Physics 2 is a rewarding Course, and will prepare you well for college.

I recommend working through this packet with NO assistance to see where you stand regarding the material. After you work through it once, you are encouraged to seek assistance to review/re-learn. There are a lot of great resources online to help you. Here are a few that I recommend:

The Physics Classroom http://www.physicsclassroom.com

APlus Physics http://www.aplus.physics.com

MIT Open Courseware http://oCW.mit.edu/high-School/physics

Learn AP Physics WWW.learnapphysics.com/apphysicsb/index.html

Dolores Gende http://apphysicsb.Homestead.com

Hippo Campus Physics http://classic.hippocampus.org/

Physics Bowles Physics: http://bowlesphysics.com/apphysicsb.htm

You are expected to complete this packet prior to the first day of your AP class. Please bring Parts 1-5 on the first day of class. If you have any questions you can post to me on Google Classroom or email me at mdipaolo@twpunionschools.org

I am looking forward to a great year in AP Physics 2 - Mr. DiPaolo

Summer Assignment Checklist:

1. **Part 1**: Join Google Classroom-page 3
    - O Login to your School account
    - O Join with Code: **6octsl**
2. **Part 2**: Syllabus-page 5
    - O Read syllabus
    - O Sign Syllabus Receipt Form on page 5
    - O Have the adult responsible for you sign and fill in their contact information.
3. **Part 3**: Safety Contract-page 7
    - O Read safety contract
    - O Sign safety contract on page 8
    - O Have the adult responsible for you sign and fill in their contact information
4. **Part 4**: Math Review — pages 11-12
    - O Complete the math review
    - O Complete the Mechanics Review

Union High School: AP Physics 2 Syllabus 2017-2018

GENERAL INFORMATION

Instructor: Michael DiPaolo Room: D220

Textbooks:

o Giancoli Physics, 6th ed.

Course Web Site: Enrolling in our Google Classroom Site is in step 2. All proprietary work including class notes will be posted on our Google Classroom Page. Curricular resources, reminders, and due dates will be posted on these resources, please use them.

COURSE OVERVIEW

Goals: Course goals include developing each student's intuition, creativity, and investigative skills to do the following (abbreviated from the 2014 College Board AP Physics 2 Course Description):

- Develop a high level understanding of AP Physics 2 foundational physics principles in the context of the Eight Big Ideas (see below).
- Relate and apply physics knowledge to real world scenarios to become scientifically literate citizens
- Work in the laboratory to implement, design, and analyze laboratory-based experiments for at least 25 percent of instructional time
- Engage in inquiry-based laboratory investigations a Develop communication skills by recording evidence of research (laboratory and literature based) in verbal, written, and graphic presentations
- Develop written and oral scientific argumentation skills
- And of course...pass the College Board AP Physics 2 exam with a "3" or better

Teaching Methodologies:

Students working both individually and collaboratively are required to synthesize information, formulate hypotheses, plan and implement data collection strategies, interpret and analyze data, develop and implement models, engage in scientific questioning, evaluate arguments, reach conclusions, present and defend their conclusions through multiple forms of communication, and connect and relate knowledge across domains. Readings from the textbook are supplemented with online resources. Homework reinforces concepts covered in class and prepares students for laboratory experiences. The course consists of 7 units (see outline below) with at least one summative assessment per unit. The class normally meets five days per week, for 42 minutes each session. Generally, one to two class periods per week are allotted to laboratory or laboratory-related activities.

Course Description and Sequence:

AP Physics 2 is the result of a substantial course redesign splitting the formerly offered AP Physics B Course into a two year Course. AP Physics 2 is suitable for a second year physics student who was proficient in all standards taught in AP Physics 1 and is equivalent to a one semester Course in algebra based physics that explores fluids, thermodynamics, PV diagrams, probability, electrostatics, electric circuits, magnetic fields, electromagnetism, physical and geometric optics, and quantum, atomic, and nuclear physics. The course scope and sequence is outlined in the table on the following page.

Course Sequence:

First Half	Second Half
- **Review of AP 1 (~ 1 week)** - **Fluids (~3 weeks)** - **Thermodynamics (~4 weeks)** - **Electrostatics (~4 weeks)** - **Circuits DC (~1 week)**	- **Circuits RC (~2 weeks)** - **Electromagnetism (~ 5 weeks)** - **Optics (~ 5 weeks)** - **Atomic and Nuclear (~4 weeks)** - **Review (~ 2 weeks)**

The timing of the units will depend on student progress. Our class is structured to ensure that students have some ability to self pace. Students striving for a 5 should plan to be proficient in DC Circuits before winter break.

Materials:

1. Notebook with folder/ or a binder
2. Pencils
3. Pens
4. Calculator (graphing recommended)

Grading Policy:

AP Physics 2 is on a points based grading system. This means that all assignments, quizzes, tests, and labs have the same weight. A 50 point test will be worth the same as two 20 point labs or five 10 point homework assignments. This gives students a chance to not have to rely on a single assignment or test to pass the class.

Late/incomplete

The ultimate goal of this class is for students to master College level algebra-based physics. Multiple opportunities for demonstrating mastery are available in class with the final grade to reflect mastery of course objectives. If a student does not master the material before the class moves on to a new topic, these opportunities remain available in tutoring. Late work is accepted for reduced points.

Class Expectations:

We Will all Work hard together and pursue learning with passion. We are accountable to each other to be prepared, to participate fully, to take risks and ask questions, to listen and consider, and to debate with reason and reasonableness. While maintaining academic integrity at all times, we will encourage and aid each other appropriately. Our goal is for everyone to be prepared to pass the AP Exam. To help us succeed, here are my expectations:

1. Be respectful - Respect yourself, others, and all property. Remember that the goal of our environment is to learn as a community.
2. Do your best every day - Come to class prepared with materials, complete homework, and a mind ready to learn. While in the classroom, do your best to be collaborative, diligent, and engaged every day. Follow classroom routines to minimize lost or disrupted

learning time.

3. Maintain Our "safe Zone" for learning - Learning occurs through experience that often includes mistakes, questions, misconceptions, and misunderstandings. Please remember that Our class room is a safe environment for everyone physically, mentally, and emotionally. Hold everyone in our class to a high standard with regard to Support and Collegiality.

Further advice:

Ask questions and study. Please don't fall behind. I recommend you form study groups to help each other stay accountable. Seek help and attend tutorials for individual assistance. Remember that everyone learns at a different pace; come see me if you feel over or under whelmed at any point in time.

Consequences:

Maintaining a learning environment conducive to learning is critical, and consequences will be assigned as needed in accordance with UHS policy when a student's actions disrupt this environment. Consequences will correlate with undesirable behavior and may include: verbal warning, seat change, possible detention, parent/guardian contact, discipline referral, counselor/assistant principal conference, or alternative forms as needed.

Technology:

Technology: Physics students are expected to care for all technologies utilized in the room. Please do not download without permission or change settings on classroom computers or other technologies. Cell Phones, PDA's, and other personal electronic devices are often used in class when appropriate and to enhance learning. Personal electronic devices that are distracting to the student or class will be taken up in accordance with district and school policy.

AP Physics 2 Syllabus Receipt Form

Please sign and return on the first day of school

Student Name:_____

Parents'/Guardians' Name(s):_____

Best Contact Information (phone/e-mail):_____

I have received and read the syllabus for AP Physics 1:

Parent Signature:_____

Student Signature:_____

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Student Safety Contract

School Name _____ **Teacher** _____

PURPOSE

Science is a hands-on laboratory class. You will be doing many laboratory activities which require the use of hazardous chemicals. Safety in the science classroom is the #1 priority for students, teachers, and parents. To ensure a safe science classroom, a list of rules has been developed and provided to you in this student safety contract. These rules must be followed at all times. Two copies of the contract are provided. One copy must be signed by both you and a parent or guardian before you can participate in the laboratory. The second copy is to be kept in your science notebook as a constant reminder of the safety rules.

GENERAL RULES

1. Conduct yourself in a responsible manner at all times in the laboratory.
2. Follow all written and verbal instructions carefully. If you do not understand a direction or part of a procedure, ask the instructor before proceeding.
3. Never work alone. No student may work in the laboratory without an instructor present.
4. When first entering a science room, do not touch any equipment, chemicals, or other materials in the laboratory area until you are instructed to do so.
5. Do not eat food, drink beverages, or chew gum in the laboratory. Do not use laboratory glassware as containers for food or beverages.
6. Perform only those experiments authorized by the instructor. Never do anything in the laboratory that is not called for in the laboratory procedures or by your instructor. Carefully follow all instructions, both written and oral. Unauthorized experiments are prohibited.
7. Be prepared for your work in the laboratory. Read all procedures thoroughly before entering the laboratory.
8. Never fool around in the laboratory. Horseplay, practical jokes, and pranks are dangerous and prohibited.
9. Observe good housekeeping practices. Work areas should be kept clean and tidy at all times. Bring only your laboratory instructions, worksheets, and/or reports to the work area. Other materials (books, purses, backpacks, etc.) should be stored in the classroom area.
10. Keep aisles clear. Push your chair under the desk when not in use.
11. Know the locations and operating procedures, where appropriate, for all safety equipment including first aid kit, eyewash station, safety shower, fire extinguisher, and fire blanket. Know where the fire alarm and exits are located.
12. Always work in a well-ventilated area. Use the fume hood when working with volatile substances or poisonous vapors. Never place your head into the fume hood.
13. Be alert and proceed with caution at all times in the laboratory. Notify the instructor immediately of any unsafe conditions you observe.
14. Dispose of all chemical waste properly. Never mix chemicals in sink drains. Sinks are to be used only for water and those solutions designated by the instructor. Solid chemicals, metals, matches, filter paper, and all other insoluble materials are to be disposed of in the proper waste containers, not in the sink. Check the label of all waste containers twice before adding your chemical waste to the container.
15. Labels and equipment instructions must be read carefully before use. Set up and use the prescribed apparatus as directed in the laboratory instructions or by your instructor.
16. Keep hands away from face, eyes, mouth and body while using chemicals or preserved specimens. Wash your hands with soap and water after performing all experiments. Clean all work surfaces and apparatus at the end of the experiment. Return all equipment clean and in working order to the proper storage area.
17. Experiments must be personally monitored at all times. You will be assigned a laboratory station at which to work. Do not wander around the room, distract other students, or interfere with the laboratory experiments of others.
18. Students are never permitted in the science storage rooms or preparation areas unless given specific permission by their instructor.
19. Know what to do if there is a fire drill during a laboratory period; containers must be closed, gas valves turned off, fume hoods turned off, and any electrical equipment turned off.
20. Handle all living organisms used in a laboratory activity in a humane manner. Preserved biological materials are to be treated with respect and disposed of properly.
21. When using knives and other sharp instruments, always carry with tips and points pointing down and away. Always cut away from your body. Never try to catch falling sharp instruments. Grasp sharp instruments only by the handles.
22. If you have a medical condition (e.g., allergies, pregnancy, etc.), check with your physician prior to working in lab.

CLOTHING

23. Any time chemicals, heat, or glassware are used, students will wear laboratory goggles. There will be no exceptions to this rule!
24. Contact lenses may be worn provided adequate face and eye protection is provided by specially marked, non-vented safety goggles. The instructor should know which students are wearing contact lenses in the event of eye exposure to hazardous chemicals.
25. Dress properly for lab activities. Long hair, dangling jewelry, and loose or baggy clothing are hazardous. Long hair must be tied back and dangling jewelry and loose or baggy clothing must be secured. Shoes must completely cover the foot. No sandals allowed.
26. Lab aprons have been provided for your use and should be worn during laboratory activities.

ACCIDENTS AND INJURIES

27. Report any accident (spill, breakage, etc.) or injury (cut, burn, etc.) to the instructor immediately, no matter how trivial it may appear.
28. If you or your lab partner are hurt, immediately yell out "Code one, Code one" to get the instructor's attention.
29. If a chemical splashes in your eye(s) or on your skin, immediately flush with running water from the eyewash station or safety shower for at least 20 minutes. Notify the instructor immediately.
30. When mercury thermometers are broken, mercury must not be touched. Notify the instructor immediately.

HANDLING CHEMICALS

31. All chemicals in the laboratory are to be considered dangerous. Do not touch, taste, or smell any chemicals unless specifically instructed to do so. The proper technique for wafting chemical vapors will be demonstrated to you.
32. Check the label on chemical bottles twice before removing any of the contents. Take only as much chemical as you need.

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Student Safety Contract
Continued

33. Never return unused chemicals to their original containers.
34. Never use mouth suction to fill a pipet. Use a rubber bulb or pipet pump.
35. When transferring reagents from one container to another, hold the containers away from your body.
36. Acids must be handled with extreme care. You will be shown the proper method for diluting strong acids. Always add acid to water, swirl or stir the solution and be careful of the heat produced, particularly with sulfuric acid.
37. Handle flammable hazardous liquids over a pan to contain spills. Never dispense flammable liquids anywhere near an open flame or source of heat.
38. Never remove chemicals or other materials from the laboratory area.
39. Take great care when transporting acids and other chemicals from one part of the laboratory to another. Hold them securely and walk carefully.

HANDLING GLASSWARE AND EQUIPMENT

40. Carry glass tubing, especially long pieces, in a vertical position to minimize the likelihood of breakage and injury.
41. Never handle broken glass with your bare hands. Use a brush and dustpan to clean up broken glass. Place broken or waste glassware in the designated glass disposal container.
42. Inserting and removing glass tubing from rubber stoppers can be dangerous. Always lubricate glassware (tubing, thistle tubes, thermometers, etc.) before attempting to insert it in a stopper. Always protect your hands with towels or cotton gloves when inserting glass tubing into, or removing it from, a rubber stopper. If a piece of glassware becomes "frozen" in a stopper, take it to your instructor for removal.
43. Fill wash bottles only with distilled water and use only as intended, e.g., rinsing glassware and equipment, or adding water to a container.
44. When removing an electrical plug from its socket, grasp the plug, not the electrical cord. Hands must be completely dry before touching an electrical switch, plug, or outlet.
45. Examine glassware before each use. Never use chipped or cracked glassware. Never use dirty glassware.
46. Report damaged electrical equipment immediately. Look for things such as frayed cords, exposed wires, and loose connections. Do not use damaged electrical equipment.
47. If you do not understand how to use a piece of equipment, ask the instructor for help.
48. Do not immerse hot glassware in cold water; it may shatter.

HEATING SUBSTANCES

49. Exercise extreme caution when using a gas burner. Take care that hair, clothing and hands are a safe distance from the flame at all times. Do not put any substance into the flame unless specifically instructed to do so. Never reach over an exposed flame. Light gas (or alcohol) burners only as instructed by the teacher.
50. Never leave a lit burner unattended. Never leave anything that is being heated or is visibly reacting unattended. Always turn the burner or hot plate off when not in use.
51. You will be instructed in the proper method of heating and boiling liquids in test tubes. Do not point the open end of a test tube being heated at yourself or anyone else.
52. Heated metals and glass remain very hot for a long time. They should be set aside to cool and picked up with caution. Use tongs or heat-protective gloves if necessary.
53. Never look into a container that is being heated.
54. Do not place hot apparatus directly on the laboratory desk. Always use an insulating pad. Allow plenty of time for hot apparatus to cool before touching it.
55. When bending glass, allow time for the glass to cool before further handling. Hot and cold glass have the same visual appearance. Determine if an object is hot by bringing the back of your hand close to it prior to grasping it.

QUESTIONS

56. Do you wear contact lenses?
    ☐ YES ☐ NO
57. Are you color blind?
    ☐ YES ☐ NO
58. Do you have allergies?
    ☐ YES ☐ NO

    If so, list specific allergies _____

_____

AGREEMENT

I, _____
_____(student'sname)have read and agree to follow all of the safety rules set forth in this contract. I realize that I must obey these rules to ensure my own safety, and that of my fellow students and instructors. I will cooperate to the fullest extent with my instructor and fellow students to maintain a safe lab environment. I will also closely follow the oral and written instructions provided by the instructor. I am aware that any violation of this safety contract that results in unsafe conduct in the laboratory or misbehavior on my part, may result in being removed from the laboratory, detention, receiving a failing grade, and/or dismissal from the course.

_____
Student Signature

_____
Date

Dear Parent or Guardian:

We feel that you should be informed regarding the school's effort to create and maintain a safe science classroom/laboratory environment.

With the cooperation of the instructors, parents, and students, a safety instruction program can eliminate, prevent, and correct possible hazards.

You should be aware of the safety instructions your son/daughter will receive before engaging in any laboratory work. Please read the list of safety rules above. No student will be permitted to perform laboratory activities unless this contract is signed by both the student and parent/guardian and is on file with the teacher.

Your signature on this contract indicates that you have read this Student Safety Contract, are aware of the measures taken to ensure the safety of your son/daughter in the science laboratory, and will instruct your son/daughter to uphold his/her agreement to follow these rules and procedures in the laboratory.

_____
Parent/Guardian Signature

_____
Date

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Part IV: Math

Part 1

Solve the following equations for the quantity indicated.

1. $y=\frac{1}{2}at^2$

   a) Solve for *t*

   b) Sketch the graph of y vs t for this relationship and describe it as direct, inverse, squared, or square root.

   c) If t doubles, what happens to y?

2. $a=\frac{v_f-v_o}{t}$

   a) Solve for *t*

   b) Sketch the graph of a vs t for this relationship and describe it.

   c) If t doubles, what happens to a?

3. $F=k\frac{m_1m_2}{r^2}$

   a) Solve for *r*

   b) Sketch the graph of F vs r for this relationship and describe it.

   c) If r doubles, what happens to F?

4. $\frac{1}{f}=\frac{1}{d_o}+\frac{1}{d_i}$ Solve for d_i

5. $qV=\frac{1}{2}mv^2$ Solve for v

6. How many seconds are in a year?

7. Convert 28 km to cm.

8. Convert 45 kg to mg.

9. Convert 85 cm/min to m/s.

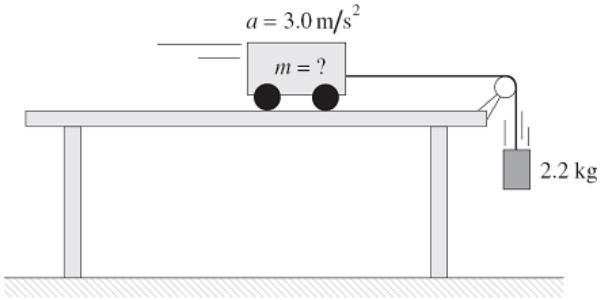
10. Convert 823 nm to m

11. 8.5 cm^3 to m^3

Part 2

Complete the following problems on a separate sheet of paper, showing ALL work for each question. These are challenging questions using Newton's Laws of Motion and the principles of uniform acceleration.

1. A cart of unknown mass is attached to a 2.2 kg mass hanging over the edge of a table as shown. The cart accelerates at 3.0 m/s2. (Ignore friction.) What is the mass of the cart?



A. 1.2 kg

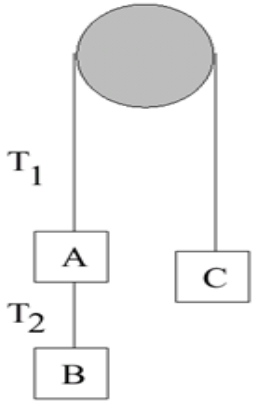
B. 5.0 kg

C. 6.6 kg

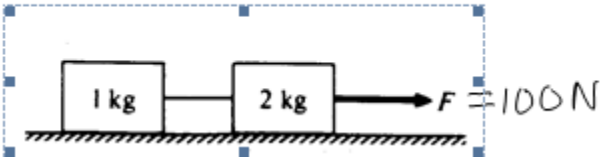
D. 7.2 kg

E. 8.4 kg

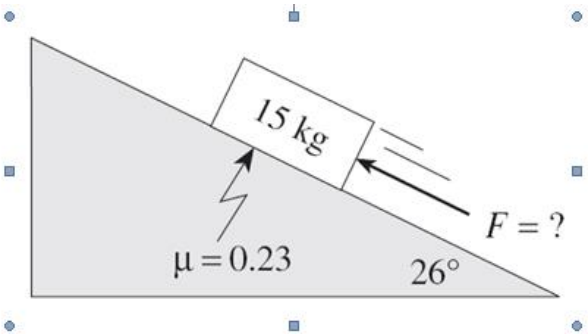
2. Three blocks, A, B and C, each of the same mass, m = 3 kg, are suspended from a frictionless pulley, by a light string, as shown. Find the acceleration of the system and the values of the tensions T1 and T2.



3. When the frictionless system shown right is accelerated by an applied force of magnitude 100 N, what is the tension in the string between the blocks?



4. What force F applied parallel to the incline would make the 15 kg block shown below move at a constant speed up the incline?

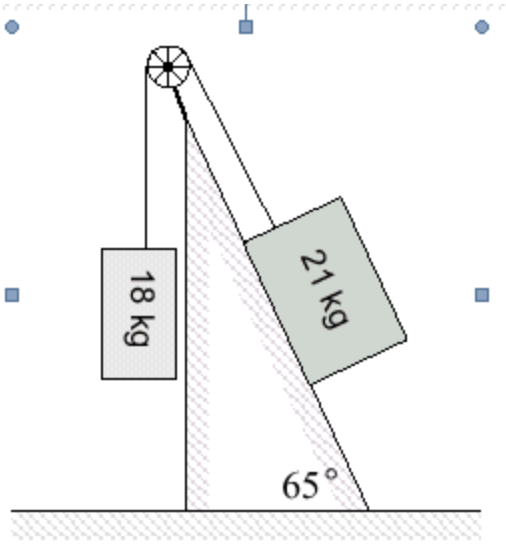


5. A worker pulls horizontally on a rope that is attached to a 10-kg crate resting on a rough floor. The coefficients of static and kinetic friction are 0.5 and 0.3, respectively. The worker pulls with a force of 40 N. What is the frictional force exerted by the surface on the crate?

6. A 300-kg box rests on a platform attached to a forklift, shown above. Starting from rest at time = 0, the box is lowered with a downward acceleration of 1.5 m/s2.
(a) Determine the upward force exerted by the horizontal platform on the box as it is lowered.

At time t = 0, the forklift also begins to move forward with an acceleration of 2 m/s2 while lowering the box as described above. The box does not slip or tip over.
(b) Determine the frictional force on the box.
(c) Given that the box does not slip, determine the minimum possible coefficient of friction between the box and the platform.

7. Two masses are connected together by a rope and pulley on a frictionless inclined plane as shown to the right. When the system is released, what is the initial acceleration of the 21 kg mass?



8. A 65 N force is applied to a 5.0 kg object as shown. The coefficient of kinetic friction between the object and the horizontal surface is 0.25. (a) Draw and label a free body diagram showing the forces acting on the object. (b) What is the normal force (c) force of kinetic friction? (d) What is the acceleration of the object?