

Summer Assignment for AP Physics 2

Google Classroom Join Code for AP Physics 2 2026-27: **idjqvaxm**

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Welcome to AP Physics 2! In this course, we will explore topics that are usually covered in the second semester of college physics: thermodynamics, electrostatics, circuits, magnetism, optics, waves, sound, and atomic & nuclear physics. Here is the College Board website for this course:

<https://apstudents.collegeboard.org/courses/ap-physics-2-algebra-based>

1. **Notebook and Calculator:** Each student will need a bound notebook and a handheld scientific calculator for this course.
 - Graphing calculators are allowed but not required.
 - Number each page of your notebook (front and back).
 - Please have these items ready for the first day of class.
2. **The Language of Physics:** A good way to learn about a new topic is to become familiar with its vocabulary. This will help you understand concepts and communicate your ideas clearly.
 - Please review the Unit 9 Vocabulary List on the following pages. It contains 50 vocabulary terms related to our first unit – Thermodynamics.
 - Record entries 1-25 in your AP Physics 2 notebook. The remaining entries (26-50) will be assigned after the course begins, but you are welcome to complete them ahead of time.
 - Write in pen, and leave a blank space after each entry. Your work must be neat and clear so that it is easy to read.
3. **Khan Academy (OPTIONAL):** This is a great resource for self-paced learning. It has videos, practice problems, and quizzes for AP Physics 2.
 - If you want to start learning over the summer, here is the link:
<https://www.khanacademy.org/science/ap-physics-2>
 - You are not required to complete any work on Khan Academy prior to the start of the course in September.

Summer Contact Info: If you need to contact me over the summer and don't receive a reply within 48 hours, please contact the Science Department Supervisor using the following:

Email: psullivan@oceanschools.org or *Phone:* 732-531-5600 ext. 1008

AP Physics 2

Unit 9 Vocabulary List

1. Kinetic molecular theory – matter is made of tiny particles (atoms, molecules) that are in constant motion.
2. Thermal expansion – the increase in a material's size, length, or volume when its temperature rises.
3. Internal energy – the total microscopic energy of a system, including the random kinetic energy of its particles and the potential energy from interactions between them. *Sometimes this is called thermal energy.
4. Ideal gas model – a set of assumptions intended to simplify the analysis of a gas: Constant motion; Negligible volume; No intermolecular forces; Elastic collisions.
5. Temperature – the quantity measured by a thermometer; it is a measure of the average translational kinetic energy of particles in a system.
6. Celsius scale – a relative temperature scale in which the freezing point of water is 0 °C and the boiling point of water is 100 °C.
7. Fahrenheit scale – a relative temperature scale in which the freezing point of water is 32 °F and the boiling point of water is 212 °F.
8. Kelvin scale – an absolute temperature scale in which zero represents the lowest possible temperature. The conversion between Celsius and Kelvin is $T(K) = T(^{\circ}C) + 273$.
9. Pressure – force per unit area, where the force is perpendicular to the surface.
10. Pascal – the SI unit of pressure; $1 \text{ Pa} = 1 \text{ N/m}^2$
11. Atomic mass unit – a unit of mass for expressing the masses of particles;
 $1 \text{ u} = 1.66 \times 10^{-27} \text{ kg}$
12. Mole – the SI unit of amount of substance.
13. Avogadro's number – the number of particles in one mole of a substance;
 $N_A = 6.02 \times 10^{23} \text{ mol}^{-1}$

14. Molar mass – the mass of one mole of a substance; its value in [g/mol] is equal to the particle mass in [u].
15. Boltzmann constant – relates energy per particle to temperature; $k_B = 1.38 \times 10^{-23} \text{ J/K}$
16. Maxwell-Boltzmann distribution – a probability distribution that shows the speeds of particles in a gas.
17. RMS speed – the speed of a typical gas particle in a system; RMS stands for “root-mean-square”
18. Ideal gas law – relates the pressure and volume of a gas to the number of moles (or particles) and the temperature of the gas; $PV = nRT$ or $PV = Nk_B T$
19. Universal gas constant – relates energy per mole to temperature; $R = 8.31 \text{ J/mol}\cdot\text{K}$
20. Absolute pressure – total pressure; the sum of gauge pressure and atmospheric pressure.
21. Gauge pressure – the reading on a pressure gauge; pressure measured relative to atmospheric pressure.
22. Volume – the amount of space occupied by a substance.
23. PV diagram – a graph of pressure versus volume.
24. State – the pressure, volume, temperature, and internal energy of a system at a given moment. On a PV diagram, each point represents one state of the system.
25. Isothermal – a process that occurs at a constant temperature.
26. Isochoric – a process that occurs at a constant volume.
27. Isobaric – a process that occurs at a constant pressure.
28. Adiabatic – a process in which no heat is transferred.
29. Cyclical process – a process that returns the system to its original state; represented by a closed loop on a PV diagram.

30. Thermal equilibrium is when two objects that are in contact have reached the same temperature and there is no net heat flow between them.
31. Zeroth law of thermodynamics - If two systems are each in thermal equilibrium with a third system, then they are in thermal equilibrium with each other.
32. Heat – a process in which energy is transferred due to a temperature difference. A heating process transfers energy into a system, and a cooling process transfers energy out of a system.
33. Conduction – the transfer of energy by collisions between particles within a material, or between two different materials that are in contact.
34. Convection – the transfer of energy by the movement of a fluid.
35. Radiation – the transfer of energy by electromagnetic (EM) waves are emitted and absorbed by objects.
36. Emissivity – measure of how well an object emits and absorbs radiation.
37. First law of thermodynamics: The change in internal energy of a system is equal to the sum of the energy transferred by heat and the energy transferred by work; also known as the law of conservation of energy.
38. Work – a process in which energy is transferred by a force through displacement, often through the compression or expansion of a gas.
39. Thermal conductivity – a measure of a material's intrinsic ability to conduct heat.
40. Specific heat (c) is the amount of energy required to raise the temperature of 1 kg of a substance by 1 °C.
41. Heat capacity is the amount of energy required to raise the temperature of an object by 1 °C.
42. Latent heat is energy required for a substance to undergo a phase change without changing its temperature.
43. Calorimetry – a measurement of the energy transferred between substances when they are mixed together.

- 44. Heat engine – a machine that uses heat transfer to do work; converts internal energy to mechanical energy.
- 45. Heat pump – a machine that moves heat from cold to hot (opposite the direction that heat flows on its own).
- 46. Efficiency – the ratio of mechanical work output to heat energy input.
- 47. Carnot efficiency – the theoretical maximum efficiency of a heat engine.
- 48. Second law of thermodynamics: An isolated system evolves until the internal energy is maximally dispersed among all the particles; heat transfer occurs spontaneously from hot to cold.
- 49. Entropy – a measure of how spread out the energy is within a system.
- 50. Second law of thermodynamics (entropy version): The entropy of an isolated system either increases or remains constant; it never decreases.