

AP Physics 2: Summer Assignment – Answer Sheet

Part 1: Problem Solving Skills

1)

Picture	Knowns	Unknowns	Calculation	Conclusion

Part 2: SI Units, Prefixes and Significant Figures

2) _____

3) _____

4) _____

5) _____

6) _____

7) _____

8) _____

9) _____

10) _____

11) _____

Part 3: Electricity

12) ____

17) ____

21) ____

25) ____

13) ____

18) ____

22) ____

26) ____

14) ____

19) ____

23) ____

27) ____

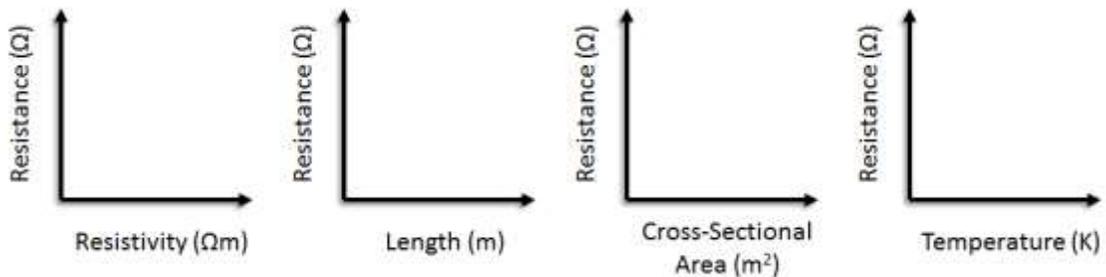
15) ____

20) ____

24) ____

28) ____

16)



Hello and welcome to AP Physics 2! This course will delve deep into the study of motion, everything from floating boats to electrons to light. We will hit the ground running and build upon what you did in Honors Physics or AP Physics 1 last year. This course is more challenging than those 2 classes and your effort outside of class will have a large impact on your success. Let's start that effort outside of class now. You will be given a quiz on this material shortly after your return to school, and you will need to score **higher than an 80%** on that to remain in this class. To be prepared, master all of the material given in this packet.

Please put all answers on the answer sheet provided and submit this on the first day of school.

Looking forward to seeing you on the first day of school!



Sincerely,

Mr. Templin

Part 1: Problem Solving Skills

The best physics students follow a 5 step process for problem solving. It helps to have an approach to problem solving because poor students will just randomly throw equations at a problem with no real strategy as to what they are doing. Here is the strategy that the best students use:

Picture: In order to make sense of a complex situation, a picture helps to set the stage of what is happening. Include any information that will help the problem get into your head in a different way than simply reading.

Knowns: When you are solving a new problem, you need to take inventory of what you know. In this step, write down every piece of information that the problem gives you. Not every piece of given information will be obvious. For example, if a particle is released from rest you need to know that $v_0 = 0$.

Unknowns: We need to figure out what we don't know. This helps us strategize and develop relationships between what we know and our eventual goal for the problem.

Calculations: The math is secondary in AP Physics. I can't stress that enough. This course is so much more about the concepts and principles of how the world moves than it is about algebra. Your algebra skills need to be 100% good because it is assumed you can do that perfectly, but don't start with this step. Here we choose a physics principle to apply to this problem. If it is a math problem we calculate, if it is a conceptual problem we analyze.

Conclusion: Make sure you found an answer to the problem you were asked here and box it with units.

Try it out! Show all 5 steps for solving this problem on the answer sheet.

- 1) An electron is traveling at 95% of the speed of light. Determine the kinetic energy of the electron. Show your steps for solving this problem on the answer key.

Part 2: SI Units, Prefixes and Significant Figures

[SI Base Units](#)

[SI Prefixes](#)

[Significant Figures](#)

An AP Physics student needs to be perfect at converting SI prefixes, Significant Figures, and getting values into their base SI unit. You'll need to do these with no issue. Click on the links above for a refresher!

Rewrite the following sentences by using the base unit of the item in question.

Example Question: The glass jar has a mass of 305 g

Example Response: The glass jar has a mass of 0.305 kg

- 2) The red light has a wavelength of 760 nm
- 3) The balloon has a mass of 3.0 g
- 4) The temperature of that room is 40°C
- 5) The toaster took 2 minutes and 30 seconds to make my toast
- 6) The current in that tungsten wire is 0.2 μA
- 7) The current in that tungsten wire is 20 nA
- 8) The focal length of that concave mirror is 15 cm
- 9) The speed of light is approximately 1.08×10^9 km/hr
- 10) The stack of paper is 12 mm tall
- 11) The dots are 6 cm apart

Part 3: Electricity

The most important lesson you will learn this year is that you can learn really challenging material if you want to. If you were sick all year and missed every single class you could still teach yourself every single topic in AP Physics 2 by using online materials such as the videos posted here:

Video 1: [Current, Resistance, and Power](#)

Video 2: [Electric Circuits](#)

Watch these videos and know that you have the ability to teach yourself and/or review every topic we cover in AP Physics 2. This is a challenging class and you'll be expected to work outside of class for a 3+ hours each week to stay on top of the material.

Video 1 Questions:

[Questions 12-15](#)

A 4.0 meter long piece of silver wire ([Free Electron Densities](#), [Resistivities](#)) has a radius of 0.04 cm. 2.0×10^{19} electrons pass by a point in the wire in 5.0 seconds. Assume STP and determine the following values.

- 12) The current that flows through the wire.

- (A) 0.64 A (B) 3.2 A (C) -3.2 A (D) 4.0×10^{18} A

13) The current density

- (A) 1.27×10^6 A/m² (B) 127 A/m² (C) 509 A/m² (D) 5.09 A/m²

14) The drift velocity of the electrons in the wire.

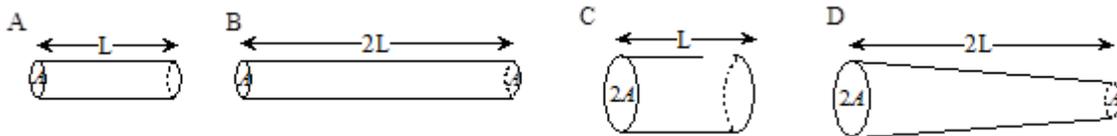
- (A) 4470 m/s (B) 2.24×10^{-4} m/s (C) 1.36×10^{-4} m/s (D) 6.82×10^{-11} m/s

15) The resistance of the wire

- (A) 0.127 Ω (B) 5.02×10^{-5} Ω (C) 5.02×10^{-7} Ω (D) 2.00×10^{-15} Ω

16) On the answer sheet, sketch the graphs on the answer sheet showing the relationship between resistivity, length, cross-sectional area, temperature, and resistance for a metal wire.

17) The five resistors shown below have the lengths and cross-sectional areas indicated and are all made of the same material. Which has the greatest resistance?



18) What is the resistance of a 60-Watt lightbulb at 120 V?

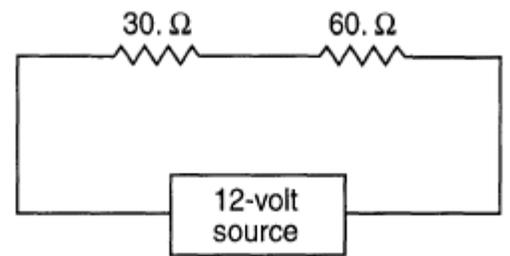
- (A) 2.0 Ω (B) 240 Ω (C) 7200 Ω (D) 432,000 Ω

19) How much thermal energy is generated when a 6.0 Ω resistor has 500 mA of current through it for 1 minute?

- (A) 90 J (B) 1.5 J (C) 90 W (D) 1.5 W

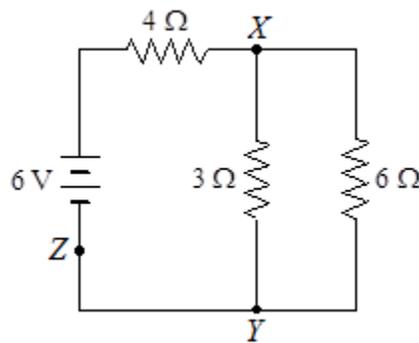
Video 2 Questions:

20) A 30 ohm resistor and a 60 ohm resistor are connected in an electric circuit as shown below. Compared to the electric current through the 30 ohm resistor, the electric current through the 60 ohm resistor is



- (a) Can't be determined (b) smaller (c) larger (d) the same

Questions 21-22



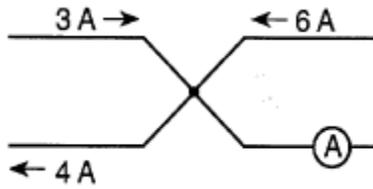
21) In the circuit shown above, what is the value of the potential difference between points X and Y if the 6-volt battery has no internal resistance?

- (A) 1 V (B) 2 V (C) 3 V (D) 4 V

22) Which of the following graphs could represent the electric potential of a charge as it begins at point Z, travels clockwise through the entire circuit and returns to point Z?

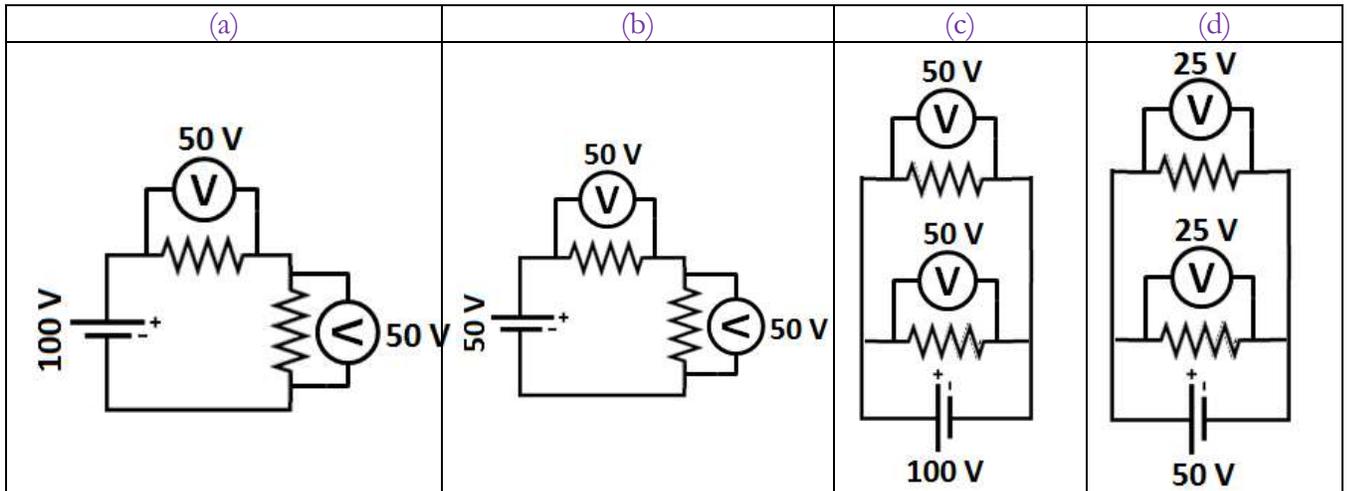
(A)	<p>A graph with potential on the y-axis (0V to 6V) and position on the x-axis. The potential starts at 6V, remains constant for a short distance, then drops sharply to 2V, remains constant for a longer distance, and finally drops to 0V.</p>	(C)	<p>A graph with potential on the y-axis (0V to 6V) and position on the x-axis. The potential starts at 0V, rises linearly to 6V, and then decreases linearly back to 0V.</p>
(B)	<p>A graph with potential on the y-axis (0V to 6V) and position on the x-axis. The potential starts at 0V, rises linearly to 6V, remains constant for a short distance, then drops sharply to 2V, remains constant for a longer distance, and finally drops to 0V.</p>	(D)	<p>It is impossible to graph the electric potential because you don't know if the charge will travel through the 3 Ω resistor or the 6 Ω resistor.</p>

23) The diagram below shows the current in a segment of a direct current circuit. What is the reading of ammeter A?

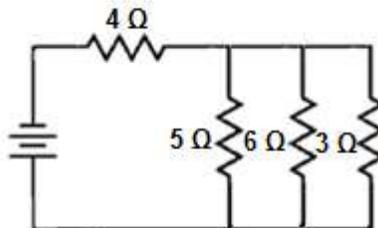


- (A) 8 amps (B) 7 amps (C) 5 amps (D) 1 amp

24) For the circuits shown below, the resistors within each circuit have the same value. In which circuit could the readings of voltmeters V_1 and V_2 be correct?



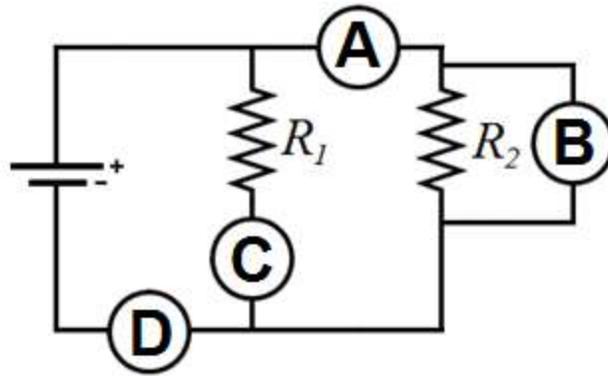
25) Find the equivalent resistance in the circuit below.



- (A) 4.1 Ω (B) 4.7 Ω (C) 5.4 Ω (D) 18 Ω

Questions 26-28

Answer the following questions regarding the circuit below.



- 26) In what position should an ammeter be placed to read only the current going across resistor 2?
- 27) In what position should an ammeter be placed to read the total current?
- 28) In what position should a voltmeter be placed to read the voltage across R_2 ?

Hello again and congratulations on working through your AP Physics 2 summer assignment. The solutions to this summer assignment are included on the next page. Check over your work and make sure that you have a deep understanding about each and every one of the questions listed on the summer assignment. Your entrance exam depends upon your deep understanding. See you on the first day of school!

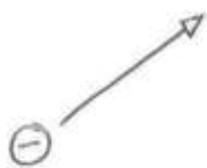
Sincerely,

Mr. Templin

AP Physics 2: Summer Assignment – Answer Sheet

Part 1: Problem Solving Skills

1)

Picture	Knowns	Unknowns	Calculation	Conclusion
	$v = .95c$ $m = 9.11 \times 10^{-31} \text{ kg}$	$K = ?$	$K = \frac{1}{2} mv^2$ $K = \frac{1}{2} (9.11 \times 10^{-31} \text{ kg}) (285 \times 10^6 \text{ m/s})^2$	$K = 3.7 \times 10^{-14} \text{ J}$

Part 2: SI Units, Prefixes and Significant Figures

- 2) The red light has a wavelength of $760 \times 10^{-7} \text{ m}$
- 3) The balloon has a mass of 0.003 kg
- 4) The temperature of that room is 313 K
- 5) The toaster took 150 seconds to make my toast
- 6) The current in that tungsten wire is $2 \times 10^{-7} \text{ A}$
- 7) The current in that tungsten wire is $2 \times 10^{-7} \text{ A}$
- 8) The focal length of that concave mirror is $.15 \text{ m}$
- 9) The speed of light is approximately $3 \times 10^8 \frac{\text{m}}{\text{s}}$
- 10) The stack of paper is 0.012 m tall
- 11) The dots are 0.06 m apart

Part 3: Electricity

- | | | | |
|--------------|--------------|--------------|--------------|
| 12) <u>A</u> | 17) <u>B</u> | 21) <u>B</u> | 25) <u>C</u> |
| 13) <u>A</u> | 18) <u>B</u> | 22) <u>B</u> | 26) <u>A</u> |
| 14) <u>C</u> | 19) <u>A</u> | 23) <u>C</u> | 27) <u>D</u> |
| 15) <u>A</u> | 20) <u>D</u> | 24) <u>A</u> | 28) <u>B</u> |

16)

