DUE: _____ Mods:_____ Name: _____

Mr. Forrest: AP Physics 2019

Mysteries and Questions O' Physics (Fact or Crap?)

For you to present to the class. You should be able to face a verbal challenge from your classmates to defend your explanation. Each student will be assigned one of these. You may trade with another student if both of you agree and if I agree. You may also choose an 'open' question with my approval.

Requirements: By the due date, you will need a typed one-page written abstract of your explanation, and you will need to verbally present the information. Your grade (50 points) will be divided equally between the two - you are expected to have a correct and thorough written explanation as well as a convincing presentation. The write-up must be in your own words, there's really no need to plagiarize a one-page paper! *Include at least one non-Wiki reference cited, and appropriate pictures/diagrams if possible.* **NOTE: You may wish to check the physics with me ahead of time, as some students have been horribly wrong in the past (since Mythbusters is often well, a bust).**

ASSIGNED TO:

1) How does a cellular phone work? How does your phone get the specific signal that's calling to you, and not everyone else?

2) Why is a woofer so much larger than the tweeter in hi-hi speakers? There are two reasons which you should explain.

3) Why do high and low tides occur twice each day? Where is the moon when these occur?

4) Why does your voice on an audiotape sound different to you but sounds normal to others? Which one is the 'real' you, and why?

5) Why are golf balls dimpled? What does this do? IS there a way to improve on the design?

6) The military is interested in developing camouflage that would render someone invisible (really). Is it possible that a human could be made completely invisible? Explain.

7) If you are stuck outside in a rainstorm, to stay as dry as possible should you run to shelter or just walk? Note if the direction of the rain influences your decision.

8) Why does dust (or grain dust or flour) explode? This is actually a large danger in farm silos! Does this make the dust dangerous to breathe?

9) What's the most common way 'smart' traffic sensors work (those that trigger a light to change)? {Mr. F maintains that if they were really smart they'd make all lights green for him}

10) Why does toilet paper on some rolls not tear (allow long pieces) when the roll is fat, but tears into short pieces when the roll is nearly used up? Why on other rolls does the exact opposite occur? **NOTE: This may require some research at home.**

11) How do CT (Cat) Scans work?

12) How do ultrasounds work? Why are these used on developing fetuses instead of X-rays?

13) How do MRI's in hospitals work?

14) What is a transistor and how does it work? How does this compare to vacuum tubes?

15) How do flat screen LED TV's work?

16) How do old style (cathode ray tube) TV's work?

17) How does a radio receiver work? How can you 'tune' to a specific frequency?

ASSIGNED TO:

18) Why do most helicopters need a tail rotor, yet others (usually large ones) do not? How does the tail rotor know how 'fast' it must spin?

19) Release two cans of soda pop down an incline - how will they roll? Now shake one up, and roll it against a non-shaken can. Which one rolls faster? Why?

20) What is meant by the term bandwidth? How does this relate to things (a) on the Internet, and (b) on a molecular level?

21) Does a flame have charge? If so, how can you tell?

22) Why does plastic that's stressed show a pattern of colors between polarizing films and why when one of the films is rotated does the color change?

23) How do optical fibers transmit information? How does the capacity of fiber optics compare with that of copper wire - why is there a difference?

24) When you take a nice hot shower, the shower curtain tends to blow 'in' at the bottom - why? There are at least two reasons that should come up in your explanation.

25) Why does the pitch of wind instruments, such as oboes, increase as an orchestra warms up, yet that of stringed instruments decreases?

26) Why do waves in closed tubes resonate at 1/4 wavelength instead of 1/2 wavelength like in open tubes?

27) When a string is tightened even a little bit (such as on a guitar) the pitch distinctly increases, yet this happens minimally or not at all in a rubber band until it's almost stretched to its limit - Why?

28) What really causes the 'ocean sound' when you listen to a seashell?

29) Which has a greater effect on tides on the earth - the sun or the moon? Which has a greater gravitational effect on the earth? Why is there a difference?

30) How do 'one way' mirrors work? Are they really one way? Also, how does glass that can be electrically induced caused something to appear opaque instead of transparent?

31) When two high speed trains pass each other they must slow down so that their windows won't be broken (even the best made trains). Why? Will their windows explode or implode?

32) How does wireless internet work? How can people 'steal' bandwidth from their neighbors and how can outsiders see what you're doing on your wireless internet connection and ... what's a cantenna?

33) When a tall chimney falls, it usually breaks into 2 pieces. Why doesn't it fall in one piece? Also, will the chimney bend toward or away from the ground after the break?

34) Why does the valve on a bike tire hand pump get hot when you pump up a tire? Note that it isn't friction, as a gas station's compressed air supply doesn't make the valve get hot. Explain both these phenomena.

35) Do NOT try this at home, but why does a stream of cigarette smoke suddenly form swirls after raising smoothly for a few centimeters?

36) What's the main difference between fractals and other types of patterns and why is this related to math/physics?

37) The moon appears to be much larger as it rises above the horizon than when it's high in the night sky? Why? Is this an illusion, does it involve the atmosphere, or does the moon really move closer and farther that quickly?

ASSIGNED TO:

38) How do the lines on a TV broadcast of a football game (1st down mark) know when to show and when somebody goes in front of them?

39) A person wants to mail a box of hornets to a nemesis in Michigan. To save money, she shakes up the box so the hornets are all angry and flying around inside. Will this in fact save her money? If so, explain the reasoning and if not why not?

40) Assume you are taking some helium balloons to your graduation party. Unfortunately an old person walks in front of you and you have to slam on the brakes. Do the balloons shift forward (like the car's passengers) or back?

41) Programmable or Wi-Fi thermostats let you leave the temperature of your house cooler in the winter (or warmer in the summer) when you are away at work or school and automatically turn the temperature back to a comfortable level at a preset time. Does lowering the temperature in your house really save any money during the work day, after all, the furnace has to heat the house back up when you get home?

42) You cool off lemonade by putting ice in it. Your refrigerator works by using a compressor and then expanding (and cooling) a refrigerant. How is it possible to cool things that are very, very cold, say only a couple of degrees above absolute zero?

43) Do neutrinos have mass? If so, how was this detected experimentally and how are they able to pass through the earth if they have matter?? If not, what experiment(s) showed they did NOT have mass.

44) Why exactly is the Higgs boson? Why was it so difficult to detect?

45) Why does beating egg whites change them from a fluid to a thick foam? Similarly, why does an egg white change from a clear liquid to a white solid when it's fried or cooked?

46) If you discover yourself stuck in quicksand why is it best to lie down on your back? Also, if one is pulled from quicksand, why is it best to pull slowly? (Does the viscosity change if you pull faster?!)

47) How does a flush toilet work? What forces the water and fecal matter to enter the pipes? Is it merely falling water from above? Also, why do most toilets have a smaller, second hole in the bowl?
This may also require some research at home

48) While one might think that caves are full of stagnant air, some (called 'blow holes') have a strong wind blow constantly. Even stranger are "breathing caves" where the air blows in for a moment and then out. What causes the air currents to begin with and what causes air to move back and forth?

49) What's the difference between 3G and 4G cellular networks? Why are 4G systems so much faster (how do they do this?) ?

50) In recent years swimmers broke all kinds of record by wearing special 'sharkskin' suits, which have now been banned. How do these suits work and why did they give swimmer an advantage?

51) How is a pressure cooker supposed to work? Why do people use this to cook food and does a pressure cooker really work effectively?

52) There are Nobel prizes for Physics, Peace, etc. What is the **Ig Nobel prize** and how does it relate to science? What was last year's Ig Nobel Prize in Physics?

53) How does a pinhole camera create a focused image without using a lens?

54) How do scientists get (or isolate) the 'particles' to use in particle colliders such as the LHC at CERN?

Just one more thing:

To help ameliorate certain scores during this grading period due to things not being turned in or due to difficult tests (and help you end physics on a high note), it's time for 'To Tell the Truth'. ***Although I expect the true explanation on the written page (with a non-Wiki reference, although that's a good place to start) you turn in to me***, you have the option of lying to the class. After your verbal presentation, the class will be asked to vote on whether you are telling the truth or not. If you are, you will be awarded a 0.5 or 1.0 point bonus for each person who voted that you were 'lying'. If you were lying, you will be awarded a 0.5 or 1.0 point bonus for each person who voted that you were telling the truth.

As an audience member (remember you are **encouraged** to ask questions during and after the presentation, but before you 'vote') you will be awarded a 0.5 or 1.0 point bonus for each presentation where you correctly figure out whether the presenter was telling the truth or lying.

Be careful. If you lie, it must be a fundamental flaw in the way things work, not just a minor technicality (got it, **Noah?? Danny??**). Also, you do have to answer questions from (potentially) knowledgeable audience members and teacher, so it may not be wise to try and switch to an 'easy' topic. It may also not be wise to share information with classmates. In a way, to maximize your potential bonus (which could be as large as ~20 points!), you may wish to think about a mathematical concept called 'game theory'.

Make this as fun as it should be. (By the way, I get to pick the order of who presents to the class - insert evil laugh here)

A. P. Question O' Physics (Fact or Crap) Grading rubric

Your name: _____ *Forrest: AP Physics / 2019*

Topic: _____

	Your points	Points possible
1) Grade on write-up of topic. Was your research correct and complete including a non-Wiki reference?		25
2) Grade on your presentation. Did you clearly explain things? Did you speak with enthusiasm and interest?		25
3) Total Bonus (based on your presentation and your response to others' presentations (truthful or false)		

Comments: Overall score: