

Instructor(s): *Detweiler*PHYSICS DEPARTMENT  
Test#4

PHY 2020

December 16, 2015

Name (print, last first): \_\_\_\_\_ Signature: \_\_\_\_\_

*On my honor, I have neither given nor received unauthorized aid on this examination.***YOUR TEST NUMBER IS THE 5-DIGIT NUMBER AT THE TOP OF EACH PAGE.**

- (1) **Code your test number on your answer sheet (use lines 76–80 on the answer sheet for the 5-digit number).** Code your name on your answer sheet. **DARKEN CIRCLES COMPLETELY.** Code your UFID number on your answer sheet.
- (2) Print your name on this sheet and sign it also.
- (3) Do all scratch work anywhere on this exam that you like. **Circle your answers on the test form.** At the end of the test, this exam printout is to be turned in. No credit will be given without both answer sheet and printout.
- (4) **Blacken the circle of your intended answer completely, using a #2 pencil or blue or black ink.** Do not make any stray marks or some answers may be counted as incorrect.
- (5) **The answers are rounded off. Choose the closest to exact. There is no penalty for guessing. If you believe that no listed answer is correct, leave the form blank.**
- (6) Hand in the answer sheet separately.

1. On your pink answer sheet, did you correctly bubble in your test number in rows 76–80, and also bubble in your name and your UF ID number? Also, did you print and sign your name at the top of your test, and will you hand in the “white sheets?” before leaving the room? This question counts, and the correct answer should be “Yes”.

(1) Yes                      (2) No                      (3) X                      (4) X                      (5) X

2. An atom has a very small nucleus, with much smaller electrons a great distance away (a great distance when compared with the size of the nucleus), so the atoms and molecules of our hands are almost all vacuum. But, if our hands are almost all vacuum, how can we clap? What keeps our hands from just passing through each other?

(1) the electric force      (2) the gravitational force      (3) the nuclear force      (4) light      (5) temperature

3. Which has the biggest size?

(1) The diameter of an atom.  
 (2) The diameter of the nucleus of an atom.  
 (3) The diameter of an electron.  
 (4) X  
 (5) X

4. Which has the smallest size?

(1) The diameter of an electron.  
 (2) The diameter of an atom.  
 (3) The diameter of the nucleus of an atom.  
 (4) X  
 (5) X

5. This problem is not easy. I suggest that you solve the other problems first, and then come back to this one last. This problem involves “charging an object via induction.” (Look at diagram #1 on the blackboard). Assume that you have a metallic conducting sphere, with no net electrical charge, which is hanging on a string. You are holding a white plastic tube in your left hand which you have rubbed with wool so that the plastic tube has a net charge of electrons. Now you hold the charged tube in your left hand close to the sphere, BUT THE TUBE DOES NOT TOUCH THE SPHERE! Then you briefly touch the SPHERE with a FINGER on your right hand. Finally you move away from the sphere. After this process is completed, which statement accurately describes the conducting sphere?

(1) It has a net positive electric charge.  
 (2) It has a net negative electric charge.  
 (3) It has no net electric charge.  
 (4) half of the sphere has a net negative charge, and the other half has a net positive charge.  
 (5) X

6. How does the electric charge of an electron compare with the electric charge of a proton?
- (1) The charge of an electron is the negative of the charge of a proton.
  - (2) They have the same charge.
  - (3) The proton has  $-2$  times the charge of the electron.
  - (4) The proton has  $+2$  times the charge of an electron.
  - (5) X
7. A proton is at the center of the of a Hydrogen atom, and it attracts the electron that orbits it (sort of like gravity). Relative to this force, the electron attracts the proton with
- (1) the same force.
  - (2) more force.
  - (3) less force.
  - (4) a repulsive force.
  - (5) X
8. A proton, at a particular distance  $d$  away from a spherical charged object, is repelled away from the charged object by a force  $F$ . If the distance  $d$  is now made two times larger, then by what number does the magnitude of the force change?
- (1)  $1/4$
  - (2)  $1/2$
  - (3) No change
  - (4) 4
  - (5) 2
9. Look at diagram #2 on the blackboard. A total charge  $Q$  is uniformly distributed around a nonconducting plastic ring of radius  $R$  — the charges do not move. A second piece of plastic is only a semicircle but has the same radius and has a total charge of  $Q/2$  uniformly distributed on the semi-circle. Which piece of plastic has the largest electric field at the center of the circle or the center of the semi-circle?
- (1) the semi-circle
  - (2) the ring
  - (3) They have the same electric field at the center.
  - (4) X
  - (5) X
10. A proton has a mass which is about 1,600 times the mass of an electron, and it exerts an attractive electrical force on a nearby electron. How does the magnitude of the proton's force on the electron compare to the magnitude of the electron's force on the proton?
- (1) The magnitudes of the forces are the same.
  - (2) The magnitude of the force on the electron from the proton is largest.
  - (3) The magnitude of the force on the proton from the electron is largest.
  - (4) X
  - (5) X
11. A length of wire is attached to the two ends of a battery of 100 Volts. The wire has a total resistance of 50 Ohms. What is the current that flows in the wire?
- (1) 2 Amps
  - (2) 1 Amp
  - (3) 0.1 Amps
  - (4) 0.2 Amps
  - (5) No current
12. What is the current that flows in the same length of wire if the battery gives 200 Volts, and the resistance of the wire is 100 Ohms?
- (1) 2 Amps
  - (2) 1 Amp
  - (3) 0.1 Amps
  - (4) 0.2 Amps
  - (5) No current
13. How much energy is given to 1 Coulomb of electric charge which passes through a 6 Volt battery?
- (1) 6 J
  - (2) 1 J
  - (3)  $1/6$  J
  - (4) 3 J
  - (5) 2 J
14. In diagram #3, how much current goes through the 10 Ohm resistor?
- (1) 0.4 Amps
  - (2) 1.2 Amps
  - (3) 0.6 Amps
  - (4) 1.0 Amps
  - (5) 2.0 Amps
15. In diagram #3, how much current goes through the 20 Ohm resistor?
- (1) 0.4 Amps
  - (2) 1.2 Amps
  - (3) 0.6 Amps
  - (4) 1.0 Amps
  - (5) 2.0 Amps

THE FOLLOWING QUESTIONS, NUMBERED IN THE ORDER OF THEIR APPEARANCE ON THE ABOVE LIST, HAVE BEEN FLAGGED AS CONTINUATION QUESTIONS: 4 12 15