

Physics 7 sample midterm #1

This is intended as an illustration of the types of questions students can expect. The actual examinations also contain short answer questions, no samples of those are provided, but the statements are similar to those of the multiple-choice questions. Though the answer key is at the end of this sample, students are encouraged to attempt questions before looking at the answers

1. Galileo found that the Moon had mountains and this distressed Aristotle's followers because
 - A) This could only happen if the Earth circled the Moon
 - B) This contradicted the idea that the Moon was a perfect sphere
 - C) This showed that the Sun moves around the Earth
 - D) The Moon was supposed to be made of cheese
 - E) This meant that the moon did not move

2. According to Copernicus
 - A) All planets and the Sun run in ellipses about each other.
 - B) All the planets move in circles around the Sun.
 - C) The Earth is fixed but it is seen to move due to an optical illusion.
 - D) All planets except the Earth move in circles around the Sun.
 - E) The Sun is not fixed but it is seen to be fixed due to an optical illusion.

3. Among the many observations of Tycho Brahe, one that did *not* support Aristotle's model of the Cosmos was
 - A) The variation in the orbit of Mars.
 - B) The position of the planet Jupiter which behaved very strangely in 1582.
 - C) The position of the planets
 - D) The phases of the Moon.
 - E) The appearance of a supernova (exploding star) in 1572.

4. The speed of light is always 299,792km/s this means that the speed of light
 - A) Decreases with the speed of the source
 - B) Is infinite
 - C) Is absolute
 - D) Is relative
 - E) Increases with the speed of the source

5. While a train is moving at 1 m/s in a straight line, the conductor throws his key-ring towards the *back* of the train; the speed of the key-ring, as measured inside the train, is also 1 m/s. As seen from the platform the speed of the key-ring (ignore the effects of gravity on the key-ring)
- A) Cannot be determined
 - B) Equals 2 m/s
 - C) Equals 0 m/s
 - D) Equals 1 m/s
 - E) Would be infinite
6. Newton's showed that the gravitational force
- A) Increases with the distance
 - B) Depended on the speed of the bodies
 - C) Had a different form for every planet
 - D) Decreases as the square of the distance
 - E) Is independent of the distance
7. The ether wind was supposed to be
- A) A phenomenon that would always make light speed up.
 - B) The movement of the ether with respect to the Earth as the latter moves along its orbit.
 - C) A phenomenon that would always make light slow down.
 - D) An emanation from the Sun.
 - E) The movement of the ether as it is blown about by strong winds.
8. Conservation of charge
- A) Means that the total positive charge minus the total negative charge never changes in a closed system
 - B) Is only approximate: charge changes a very small bit with time, but is very hard to observe
 - C) Was an old concept proved wrong by Maxwell
 - D) Is a program of the Environmental Protection Agency
 - E) Holds only in absolute vacuum
9. The number 10^7 equals
- A) 10000000
 - B) None of the choices presented
 - C) 0.0000001
 - D) 0.001
 - E) 107

10. One peculiarity of Maxwell's equations is
- A) That some of its solutions represent waves moving at a speed independent of the observer
 - B) That some of its solutions represent waves moving at a speed which strongly depends on the observer
 - C) That the solutions imply that all charged objects move at the speed of light
 - D) That they show that light is a stream of corpuscles.
 - E) That they are perfectly consistent with Newton's theory in all respects
11. One property of waves is that
- A) They all have the same amplitude, frequency and wavelength
 - B) They move with the speed of sound
 - C) They cannot go around objects
 - D) They travel at infinite speed
 - E) They can go around objects
12. Two observers perform identical experiments in two spaceships moving at constant speed (in a straight line) with respect to one another; the ships are far away from all stellar systems. Their results will
- A) Be identical even if one ship accelerates
 - B) Cannot be compared because the ships are always far from each other
 - C) Be identical
 - D) Be almost the same, a small discrepancy occurs when they move at right-angles with respect to one another
 - E) Be different
13. Aristotle thought that
- A) All objects move according to their nature
 - B) The Earth moved around the sun
 - C) Only forces change the motion of objects
 - D) Only the gods can move an objects
 - E) Even the gods cannot move any object
14. Galileo
- A) Did not accurately define the concepts of velocity and acceleration.
 - B) Did not conceive the first pendulum clock.
 - C) Was not the first person to observe the moons of Jupiter.
 - D) Did not support the idea of a perfect and unchanging heavens beyond the moon.
 - E) Was not the first person to turn the telescope onto the heavens.

15. The Apollo spacecraft traveled from the Earth to the Moon using
- A) The heat from the engine that created a vacuum that pulled the rocket forward
 - B) A really big slingshot
 - C) The Sun's gravitational pull to get there
 - D) The repulsion by the Earth's magnetic force
 - E) The reaction the rocket experience from expelling gases
16. Newton assumed that space is
- A) Finite
 - B) Absolute
 - C) Contracting
 - D) Relative
 - E) Spherical
17. A frame of reference is
- A) A book where all physical formulae can be found.
 - B) A system of measuring apparatuses, at rest with respect to the Earth, which determine the position and time of occurrence of any event.
 - C) A system of measuring apparatuses, at rest with respect to the Sun, which determine the position and time of occurrence of any event.
 - D) A system of measuring apparatuses, at rest with respect to one another, which determine the position and time of occurrence of any event.
 - E) None of the above.
18. A scientific theory can be accepted only if
- A) It has limited applicability
 - B) It is sanctioned by the National Academy of Sciences.
 - C) It describes correctly all available observations and experimental results
 - D) It is first proven to be absolutely true in *all* circumstances and situations
 - E) It is supported by a majority of scientists
19. The scientific method is based on
- A) The verification of hypothesis using experimentation and observation
 - B) Majority rule
 - C) Consensus obtained through voting by the scientific community
 - D) The validation of hypotheses based on their underlying philosophy
 - E) The verification of hypotheses using argumentation

20. Erathostenes was able to
- A) Measure the radius, diameter and circumference of the earth to a high degree of accuracy.
 - B) Prove that the square of the hypotenuse of a right triangle was equal to the sum of the squares of the other two sides.
 - C) Show that the musical scales were related to the integer numbers, and convinced his contemporaries that the motion of the planets generated the “music in the spheres”.
 - D) Measure the ratio of the distance to the moon from earth to the radius of the earth.
 - E) Predict that the motion of the planets and eclipses fairly well with his earth-centered model of the universe.
21. Pythagoras is well remembered by his theorem which states that
- A) The sum of the cubes of the lengths of the of the small sides of a right triangle equals the cube of the length of the largest side
 - B) Every right triangle has a 90° angle
 - C) All angles in a right triangle are equal
 - D) The sum of the squares of the lengths of the small sides of a right triangle equals the square of the length of the largest side
 - E) The magnitude of the sides of a triangle is independent of its angles
22. Aristotle believed that
- A) The earth was the center of the universe
 - B) The sun circled the earth but all the other planets circled the sun
 - C) The universe had no center
 - D) The sun was the center of the universe
 - E) The moon circled the sun
23. The Michelson-Morley experiment was an attempt to
- A) Measure the speed of light.
 - B) Observe the motion of the earth relative to the ether.
 - C) Measure the speed of the earth relative to the sun.
 - D) Observe the motion of the apparatus in the laboratory relative to the sun.
 - E) Show that light is a wave
24. Ptolemy is famous because
- A) He perfected the epicyclical model of the solar system with the Earth at the center.
 - B) He translated the work of other Greek scientists into Latin.
 - C) He determined that the sun is at the center of the solar system (though this discovery was lost during the Middle ages).
 - D) He developed a calendar which is used today throughout the world.
 - E) He perfected the epicyclical model of the solar system with the Sun at the center.

25. The epicycle model was created to
- A) Satisfy Galileo's ideas about motion
 - B) Provide a simpler alternative to the heliocentric model
 - C) Complicate matters so that only a few astronomers would understand the way in which the solar system works
 - D) Account for Kepler's third law
 - E) Reconcile the observations with the idea that the planets move in circles
26. One of Kepler's laws of motion of the planets is
- A) All planets move in ellipses around the sun
 - B) The moon does not spin on its axis
 - C) All planets fall towards the sun
 - D) All planets move away from the sun
 - E) All planets move around the earth
27. A consequence of Galileo's principle of relativity is that
- A) Velocity is absolute.
 - B) Space has three dimensions.
 - C) Acceleration is completely relative.
 - D) The speed of sound is constant.
 - E) Velocity is relative.
28. The retrograde motion of planets in the heliocentric model is a result of
- A) The absence of gravity in space
 - B) The fact that light travels at infinite speed
 - C) The vacuum of space
 - D) The different speed of the planets as they move around the sun
 - E) The rotation of the sun
29. Coulomb described the force between charges he found that
- A) Charges of equal signs repel and charges with opposite signs attract
 - B) Charges of equal and opposite signs repel
 - C) The force is independent of the charges
 - D) Charges of equal and opposite signs attract
 - E) Charges of equal signs attract and charges with opposite signs repel

30. Heraclitus the Young drops a rock and sees it fall down. Being a pupil of Aristotle he believes that this is caused by
- A) The wind that is created as the rock moves
 - B) The fact that the Earth rises up to meet the rock
 - C) The natural motion of the rock which makes it move towards the center of the universe
 - D) The magnetic attraction of the Earth
 - E) The gravitational attraction of the Earth
31. During the Middle Ages
- A) The teachings of the Catholic Church were completely ignored.
 - B) All the works from the Greek civilization were lost forever.
 - C) The Earth was almost universally believed to be at the center of the universe.
 - D) The telescope was invented.
 - E) The Sun was almost universally believed to be at the center of the universe.
32. William of Ockham stated that “entities should not be needlessly multiplied”; by this he meant
- A) The best theory is as complicated as possible.
 - B) Spirits rule the natural world
 - C) The simplest explanation (the one with the least number of assumptions) is the preferred one.
 - D) Birth control should be institutionalized.
 - E) All entities are subjective.
33. Maxwell's equations describe all electric and magnetic phenomena and also a certain type of waves that
- A) Have been unobserved heretofore.
 - B) Always correspond to visible light
 - C) Travel at a speed of almost 300, 000 km/sec.
 - D) Describe *all* wave phenomena, *including* sound.
 - E) Require air to propagate.
34. A philosopher living in New York claims that every time he meditates the number of violent crimes in California drops; if we follow Ockham's reasoning one should
- A) Be very skeptical as there is no clear connection between this man's mind and that of the Californian criminals
 - B) Take this as a proof of the weak mindedness of all criminals
 - C) Hire more philosophers and fewer policemen.
 - D) Take his claim as true and give him a raise
 - E) Take this as a proof of the dominance of mind over matter

35. A compass works because
- A) The needle is repelled by the constellation called the South Cross
 - B) The needle is charged
 - C) The needle is attracted by the North Star
 - D) There is an unknown interaction between the ice caps and the needle
 - E) The needle and the Earth are magnets
36. In inertial frame of reference it is observed that
- A) Bodies not affected by forces move at constant acceleration in a straight line.
 - B) Bodies not affected by forces move at constant speed in a straight line
 - C) Heavier bodies fall faster than light ones.
 - D) Bodies are affected by gravity independently of their mass
 - E) Bodies do not move at all.

Answer Key

1. B
2. B
3. E
4. C
5. C
6. D
7. B
8. A
9. A
10. A
11. E
12. C
13. A
14. D
15. E
16. B
17. D
18. C
19. A
20. A
21. D
22. A
23. B
24. A
25. E
26. A
27. E
28. D
29. A
30. C
31. C
32. C
33. C
34. A
35. E
36. B