

# Physics Final Exam Review

Here are some specific questions to help in your preparation for the final exam.

## Linear Motion

1. What is the difference between instantaneous and average speed?
2. What is the equation for speed? What are some possible units for speed?
3. Differentiate between speed and velocity.
4. When does an object have constant velocity?
5. What is the motion equation for acceleration?
6. Give an example of an object traveling at a constant velocity and accelerating.
7. What are the three ways an object can accelerate?
8. What is free fall and how does it relate to gravity?
9. What is the value for the acceleration due to gravity?
10. If a ball is thrown up at 10 m/s, what will be the speed of the ball when it's caught back at the original point of the throw?
11. If you throw a ball straight up, what is the ball's instantaneous speed at the top of its path?
12. If you throw a ball straight up, what is the ball's acceleration at the top of its path?

## Projectiles

13. What is a scalar? Give three examples of scalar quantities.
14. What is a vector? Give three examples of vector quantities.
15. Explain how to determine the resultant of two vectors (a) in opposite directions (b) in the same direction, and (c) perpendicular to each other.
16. Define projectile. Give some examples of projectiles.
17. Draw the path of a projectile. Label the horizontal and vertical velocities at a point going up, at a point going down, and at the top of the path.
18. How are a projectile's horizontal velocity and vertical velocity related?
19. Identify the relationship of different launch angles with a projectile's range (the horizontal distance traveled.)

## Newton's Laws

20. What is inertia?
21. How is mass related to inertia?
22. How do you calculate weight?
23. What is the difference between mass and weight?
24. Your mass is 59 kg, calculate your weight on earth and moon ( $g = 1.6 \text{ m/s}^2$ )?
25. What is Newton's first law of motion? Does it apply to objects at rest, moving objects, or both?
26. What is friction?
27. How do you calculate the net force of two objects acting in the same direction?

28. How do you calculate the net force of two objects acting in opposite directions? What is equilibrium and how does one achieve equilibrium?
29. What is Newton's second law of motion?
30. If you push with 25 N on a 5 kg box and there is a 10 N force of friction, how fast will the box accelerate?
31. If an object moves with a constant velocity, what is the acceleration of the object? What is the net force acting on the object?
32. What is Newton's third law of motion?
33. A bug splatters against the windshield of a moving car. Compare the force of the bug on the car to the force of the car on the bug.
34. A bug splatters against the windshield of a moving car. Compare the acceleration of the bug to the acceleration of the car.

## Momentum and Energy

35. Distinguish between mass and momentum. Which is inertia and which is inertia in motion?
36. When the force of impact on an object is extended in time, does the impulse increase or decrease?
37. In a car crash, why is it a good idea for an occupant to extend the time during which the collision takes place?
38. You are standing on a skateboard.
  - a) When you throw a ball, do you experience an impulse?
  - b) Do you experience an impulse when you catch a ball of the same speed?
  - c) Do you experience an impulse when you catch it and then throw it out again?
  - d) Which impulse is greatest?
39. What does it mean to say that momentum is conserved?
40. Distinguish between an elastic and an inelastic collision.
41. What is the momentum of a 6 kg bowling ball rolling at 2 m/s?
42. How many joules of work are done on an object when a force of 10 N pushes it a distance of 10 m?
43. What is power?
44. In which situation is more power required: Slowly lifting a book bag full of books up the stairs or quickly lifting the same book bag full of books up the same stairs?
45. How much power is required to do 100 J of work on an object in a time of 0.5 sec?
46. What are the two main forms of mechanical energy?
47. A boulder is raised above the ground so that its potential energy relative to the ground is 200 J. Then it is dropped. What is its kinetic energy just before it hits the ground?
48. What will be the kinetic energy of an arrow having a potential energy of 50 J after it is shot from a bow?
49. What is the potential energy of a 10 kg box 10 m above the floor?
50. What is the kinetic energy of a 4 kg football traveling at 10 m/s?

## Electrostatics and Electric Fields

51. In terms of attraction and repulsion, how do negative particles affect negative particles? How do negatives affect positives?
52. What happens to electrons in any charging process?
53. Give an example of something charged by friction.
54. Give an example of something charged by simple contact.
55. Give an example of temporarily charging an object by induction.
56. What occurs when we "ground" an object?
57. How does an electrically polarized object differ from an electrically charged object?
58. How does the magnitude of electrical force between a pair of charged objects change when the objects are moved twice as far apart? Three times as far apart?
59. If you put in 10 joules of work to push 1 coulomb of charge against an electric field, what will be its voltage with respect to its starting position?
60. Sketch the electric field around an electron.
61. Why is there no electric field in the middle of a charged spherical conductor?

## Electricity and Magnetism

62. What are the units for electrical potential or potential difference? What are the units for electric current? What are the units for electrical resistance?
63. Define electric current.
64. Give at least two examples of a voltage source.
65. A wire's electrical resistance depends on what three things?
66. True or false and explain: "the source of electrons in a circuit is the voltage source"
67. What surrounds a stationary electric charge? a moving electric charge?
68. What is the cause of magnetism?
69. Sketch and describe the structure and properties of a magnet. Include, label, and define: magnetic domains, magnetic poles, and magnetic field lines.
70. How is a piece of iron temporarily magnetized when near a magnet?
71. Explain how an electromagnet is created. Sketch a simple electromagnet (include all parts).

## Electric Circuits and Motors

72. What is a series circuit? What is a parallel circuit?
73. State Ohm's law.
74. If the voltage impressed across a circuit is held constant while the resistance doubles, what change occurs in the current?
75. If the resistance of a circuit remains constant while the voltage across the circuit decreases to half its former value, what change occurs in the current?
76. What is the effect on current in a wire if both the voltage across it and its resistance are doubled? If both are halved?
77. A certain device in a 120 V circuit has a current rating of 20 A. What is the resistance of the device?

78. If 6 V are impressed across the above circuit and the voltage across the first lamp is 2 V. what is the voltage across the second lamp? Defend your answer.
79. What is a main shortcoming of a series circuit?
80. In a circuit of two lamps in parallel, if there are 6 V across one lamp. What is the voltage across the other lamp?
81. How does the sum of the currents through the branches of a simple parallel circuit compare to the current that flows through the voltage source?
82. To connect a pair of resistors so their equivalent resistance will be more than the resistance of either one, should you connect them in series or in parallel?
83. To connect a pair of resistors so their equivalent resistance will be less than the resistance of either one, should you connect them in series or in parallel?
84. How many amperes flow through a 60 W bulb connected in a 120 V circuit?
85. What must change in order for electromagnetic induction to occur?
86. Why is a generator shaft harder to rotate when it is connected to a circuit and supplying electric current?
87. What is the primary difference between an electric motor, and an electric generator?

## Waves and Sound

88. Draw and label a transverse wave.
89. Draw and label a longitudinal wave.
90. Distinguish between the period and the frequency of a vibration or a wave. How do they relate to one another?
91. As the frequency of sound is increased, does the wavelength increase or decrease?
92. What happens to the speed of sound in air as the air temperature increases?
93. When a wave source moves toward a receiver, does the receiver encounter an increase in frequency, speed, or both? What is this effect called?
94. Distinguish between constructive interference and destructive interference.

## Light and Optics

95. Sketch the electromagnetic spectrum: include all 7 regions in order from low frequency to high frequency. Give an application of each region of the electromagnetic spectrum.
96. What is the speed of light in a vacuum?
97. How is a light wave produced?
98. What are the primary colors of light? What are the primary colors of pigment?
100. State the law of reflection.
101. Draw a light ray that reflects off a flat surface with an angle of reflection of  $30^\circ$ . Label both angles, normal line, and both light rays.
102. Does light speed up or slow down when it leaves water into the air?
103. How is white light separated into the various colors of the rainbow by a prism?