

Practice Honors Physics Test: Newtons Laws**Multiple Choice**

Identify the choice that best completes the statement or answers the question.

- _____ 1. Acceleration is defined as the CHANGE in
- time it takes to move from one place to another place.
 - distance divided by the time interval
 - velocity divided by the time interval
 - time it takes to move from one speed to another speed.
- _____ 2. A car travels 9 meters in the first second of travel, 9 meters again during the second second of travel, and 9 meters again during the third second. Its acceleration is
- 0 m/s².
 - 9 m/s².
 - 18 m/s².
 - 27 m/s².
 - none of the above
- _____ 3. A car starts from rest and after 9 seconds it is moving at 27 m/s. What is the car's average acceleration?
- 0.33 m/s²
 - 3.33 m/s²
 - 3 m/s²
 - 9 m/s²
- _____ 4. In the absence of air resistance, objects fall at constant
- speed.
 - velocity.
 - acceleration.
 - distances each successive second.
 - all of the above
- _____ 5. A ball is thrown straight up. At the top of its path its instantaneous speed is
- 0 m/s.
 - about 5 m/s.
 - about 10 m/s.
 - about 20 m/s.
 - about 50 m/s.
- _____ 6. A freely falling object starts from rest. After falling for 10 seconds, it will have a speed of about
- 500 m/s.
 - 100 m/s.
 - 50 m/s.
 - more than 500 m/s.
 - 10 m/s.
- _____ 7. At the instant a ball is thrown horizontally with a large force, an identical ball is dropped from the same height. Which ball hits the ground first?
- Neither. They both hit the ground at the same time.
 - The dropped ball
 - The horizontally thrown ball
- _____ 8. A ball is thrown into the air at some angle. At the very top of the ball's path, its velocity is
- entirely vertical.
 - There's not enough information given to determine.
 - both vertical and horizontal.
 - entirely horizontal.

- _____ 9. The law of inertia states that an object
- will continue moving at the same velocity unless an outside force acts on it.
 - will continue moving in a straight line unless an outside force acts on it.
 - that is not moving will never move unless a force acts on it.
 - at rest will remain at rest unless acted on by an outside force.
 - will do all of the above.
- _____ 10. The law of inertia applies to
- objects at rest.
 - moving objects.
 - both moving and nonmoving objects.
- _____ 11. The force required to maintain an object at a constant speed in free space is equal to
- the mass of the object.
 - the weight of the object.
 - zero.
 - the force required to stop it.
 - none of the above
- _____ 12. A 10-N force and a 55-N force act on an object in opposite directions. What is the net force on the object?
- 10 N
 - 45 N
 - 55 N
 - 65 N
 - none of the above
- _____ 13. A girl whose weight is 570 N hangs from the middle of a bar supported by two vertical strands of rope. What is the tension in each strand?
- 1140 N.
 - 855 N.
 - 285 N.
 - 0 N.
 - 570 N.
- _____ 14. Which has more mass, a kilogram of feathers or a kilogram of iron?
- the feathers
 - the iron
 - Neither, they both have the same mass
- _____ 15. A 12-N force and a 21-N force act in the same direction on an object. What is the net force on the object?
- 12 N
 - 9N
 - 21 N
 - 33 N
- _____ 16. Accelerations are produced by
- forces.
 - velocities.
 - accelerations.
 - masses.
- _____ 17. Suppose the force of friction on a sliding object is 10 N. The force needed to maintain a constant velocity is
- more than 10 N.
 - less than 10 N
 - 10N.

- _____ 18. A rock is thrown vertically into the air. At the very top of its trajectory the net force on it is
- its weight.
 - less than its weight.
 - more than its weight.
- _____ 19. Suppose a particle is accelerated through space by a constant 10-N force. Suddenly the particle encounters a second force of 10-N in a direction opposite to that of the first force. The particle
- is brought to a rapid halt.
 - theoretically accelerates to speeds approaching the speed of light.
 - continues at the speed it had when it encountered the second force.
 - gradually decelerates to a halt.
 - none of the above
- _____ 20. A 20-N falling object encounters 4 N of air resistance. The magnitude of the net force on the object is
- 0 N.
 - 4 N.
 - 16 N.
 - 20 N.
 - none of the above
- _____ 21. A jet has a mass of 40,000 kg. The thrust for each of four engines is 20,000 N. What is the jet's acceleration when taking off?
- 0.3 m/s²
 - 0.5 m/s²
 - 1 m/s²
 - 2 m/s²
 - none of the above
- _____ 22. You pull horizontally on a 50-kg crate with a force of 450 N and the friction force on the crate is 250 N. The acceleration of the crate is
- 2 m/s².
 - 4 m/s².
 - 9 m/s².
 - 14 m/s².
- _____ 23. How much force is needed to accelerate a 4.0-kg physics book to an acceleration of 2.0 m/s²?
- 0 N
 - 2.0 N
 - 0.5 N
 - 8.0 N
 - 24.0 N
- _____ 24. A 6-N falling object encounters 6 N of air resistance. The magnitude of the net force on the object is
- 0 N.
 - 6 N.
 - 12 N.
 - none of the above
- _____ 25. Forces always occur
- as single quantities.
 - by themselves.
 - in pairs.
 - in triplets.
- _____ 26. A person is attracted towards the center of Earth by a 440-N gravitational force. The force with which Earth is attracted toward the person is
- 440 N.
 - very very small.
 - very very large.

- _____ 27. Speed is
- a measure of how fast something is moving.
 - always measured in terms of a unit of distance divided by a unit of time.
 - the distance covered per unit time.
 - all of the above.
 - none of the above.
- _____ 28. Suppose an object is in free fall. Each second the object falls
- the same distance as in the second before.
 - a larger distance than in the second before.
 - with the same instantaneous speed.
 - with the same average speed.
 - none of the above
- _____ 29. A ball is thrown straight up. At the top of its path its acceleration is
- 0 m/s².
 - about 5 m/s².
 - about 10 m/s².
 - about 20 m/s².
 - about 50 m/s².
- _____ 30. After a cannonball is fired into frictionless space, the amount of force needed to keep it going equals
- zero, since no force is necessary to keep it moving.
 - twice the force with which it was fired.
 - one half the force with which it was fired.
 - the same amount of force with which it was fired.
 - one quarter the force with which it was fired.
- _____ 31. Compared to its weight on Earth, a 10-kg object on the moon will weigh
- the same amount.
 - less.
 - more.
- _____ 32. Compared to its mass on Earth, the mass of a 10-kg object on the moon is
- the same.
 - more.
 - less.
- _____ 33. An object following a straight-line path at constant speed
- has no forces acting on it.
 - has a net force acting on it in the direction of motion.
 - has zero acceleration.
 - must be moving in a vacuum.
 - none of the above
- _____ 34. Equilibrium occurs when
- all the forces acting on an object are balanced.
 - the sum of the +x forces on an object equals the sum of the -x forces.
 - the net force on the object is zero.
 - the sum of the upward forces equals the sum of the downward forces.
 - all of the above
- _____ 35. What is the maximum resultant possible when adding a 2-N force to an 8-N force?
- 2 N
 - 6 N
 - 8 N
 - 10 N
 - 16 N

- _____ 36. The weight of a person can be represented by a vector that acts
- in a direction that depends on where the person is standing.
 - perpendicular to the ground underneath the person.
 - parallel to the ground.
 - straight down, even if the person is standing on a hill.
 - all of the above
- _____ 37. Which has more mass, a kilogram of feathers or a kilogram of iron?
- The feathers
 - The iron
 - Neither—they both have the same mass.
- _____ 38. When an object reaches terminal velocity its acceleration is
- 0 m/s².
 - 4.9 m/s².
 - 9.8 m/s².
- _____ 39. A heavy person and a light person parachute together and wear the same size parachutes. Assuming they open their parachutes at the same time, which person reaches the ground first?
- the light person
 - the heavy person
 - Neither -- they both reach the ground together.
- _____ 40. A 10-kg brick and a 1-kg book are dropped in a vacuum. The force of gravity on the 10-kg brick is
- 10 times as much as the force on the 1-kg book.
 - zero.
 - the same as the force on the 1-kg book.
- _____ 41. When a woman stands with two feet on a scale, the scale reads 280 N. When she lifts one foot, the scale reads
- less than 280 N.
 - more than 280 N.
 - 280 N.
- _____ 42. A book weighs 4 N. When held at rest in your hands, the net force on the book is
- 0 N.
 - 0.4 N.
 - 4 N.
 - 39 N.
 - none of the above
- _____ 43. An apple weighs 1 N. The net force on the apple when it is in free fall is
- 0 N.
 - 0.1 N.
 - 1 N.
 - 9.8 N.
 - none of the above
- _____ 44. A girl pulls on a 10-kg wagon with a constant force of 20 N. What is the wagon's acceleration?
- 0.5 m/s²
 - 2 m/s²
 - 10 m/s²
 - 20 m/s²
 - 200 m/s²
- _____ 45. An object has a constant mass. A constant force on the object produces constant
- velocity.
 - acceleration.
 - both A and B
 - none of the above

- _____ 46. The reason a tennis ball and a solid steel ball will accelerate at the same rate, in the absence of air resistance, is that
- they have the same mass.
 - the ball with the larger force has the smaller mass.
 - the ball with the larger force also has the larger mass.
 - the force acting on them is the same.
 - none of the above
- _____ 47. When the angle of an incline with a block resting on it increases, the normal support force
- increases.
 - stays the same.
 - decreases.
- _____ 48. A high school student hits a nail with a hammer. During the collision, there is a force
- on the nail but not on the hammer.
 - on the nail and also on the hammer.
 - on the hammer but not on the nail.
- _____ 49. A player catches a ball. Consider the action force to be the impact of the ball against the player's glove. What is the reaction to this force?
- The muscular effort in the player's arms
 - The force the glove exerts on the ball
 - Friction of the ground against the player's shoes
 - The player's grip on the glove
 - none of the above
- _____ 50. A player hits a ball with a bat. The action force is the impact of the bat against the ball. What is the reaction to this force?
- The force of the ball against the bat
 - The weight of the ball
 - Air resistance on the ball
 - The grip of the player's hand against the bat
 - none of the above
- _____ 51. An unfortunate bug splatters against the windshield of a moving car. Compared to the force of the car on the bug, the force of the bug on the car is
- larger.
 - the same.
 - smaller.
 - Need more information to say
- _____ 52. An unfortunate bug splatters against the windshield of a moving car. Compared to the deceleration of the car, the deceleration of the bug is
- larger.
 - the same.
 - smaller.
- _____ 53. According to Newton's third law, if you push gently on something, it will push
- gently on something else.
 - on you only if you aren't moving.
 - gently on you.
 - on something only under the right conditions.
- _____ 54. Nellie Newton holds an apple in her hand. If action is Earth pulling on the apple, then reaction is
- her hand providing a normal force on the apple.
 - her hand pushing up on the apple.
 - both A and B
 - neither A nor B

- _____ 55. A force is exerted on the tires of a car to accelerate the car along the road. The force is exerted by the
- road.
 - engine.
 - tires.
 - air.
- _____ 56. A karate chop delivers a blow of 2300 N to a board that breaks. The force that acts on the hand during this feat
- is less than 2300 N.
 - is 2300 N.
 - is more than 2300 N.
 - cannot be determined.
- _____ 57. Your friend says that the heavyweight champion of the world cannot exert a force of 95 N on a piece of tissue paper with his best punch. The tissue paper is held in midair, no wall and no tricks.
- You agree that it can't be done.
 - You disagree, for a good punch easily delivers this much force.
 - You have reservations about this claim.

True/False

Indicate whether the statement is true or false.

- _____ 58. Friction refers to the force between two surfaces that are sliding past each other.
- _____ 59. A force can be simply defined as a push or a pull.
- _____ 60. The force due to gravity acting on an object is its mass.
- _____ 61. An astronaut has the same mass on Earth as in space.
- _____ 62. If you were to slide a hockey puck across a frictionless ice rink, there must be a horizontal force on it to keep it in motion.
- _____ 63. The reason a penny thrown straight up inside an airplane will come back to your hand is that you, the air inside the plane, and the penny are all moving at the same horizontal velocity.
- _____ 64. The combination of all the forces that act on an object is called the net force.
- _____ 65. Excluding the force due to air pressure, there is only one force acting on a book lying at rest on a tabletop.
- _____ 66. The net force on an object falling at terminal velocity is zero.

Problem

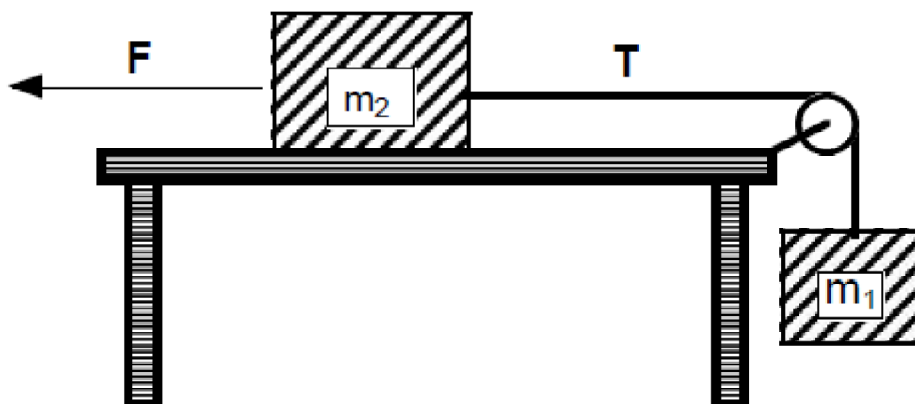
Choose 5 to answer

67. A jet on an aircraft carrier can be launched from 0 to 40 m/s in 2 seconds. What is the acceleration of the jet?
68. A skateboarder starting from rest accelerates down a ramp at 2 m/s^2 for 2 s. What is the final speed of the skateboarder?
69. What speed must you toss a ball straight up so that it takes 4 s to return to you?
70. How much time does a car with an acceleration of 5 m/s^2 take to go from 5 m/s to 40 m/s?
71. A crate falls from an airplane flying horizontally at an altitude of 1250 m. Neglecting air drag, how long will the crate take to strike the ground?

72. How much (in newtons) does a 10.0-kg bag of grass seed weigh?
73. A person weighs 650 N. What is the mass of the person?
74. What is the magnitude of the resultant of a 6.0-N force acting vertically upward and a 4.0-N force acting horizontally?
75. The following forces act on an object: 9 N north, 52 N south, and 55 N west. What is the magnitude of the net force?
76. A certain unbalanced force gives a 20-kg object an acceleration of 2.0 m/s^2 . What acceleration would the same force give a 30-kg object?
77. A net force of 1.0 N acts on a 4.0-kg object, initially at rest, for 4.0 seconds. What is the distance the object moves during that time?
78. You push with 10.0 N on a 5.0-kg block and there are no opposing forces. How fast will the block accelerate?
79. You push with 27 N on a 10-kg chest, and there is a 7-N force of friction. How fast will the chest accelerate?

Other

80. A mass of $m_2 = 8.0 \text{ kg}$ is sitting on a horizontal surface which has a coefficient of sliding friction of $\mu_k = 0.505$. A force F is applied to this mass so as to pull the mass to the left at a constant speed. This mass is in turn attached to a second mass $m_1 = 5.0 \text{ kg}$ by a string which has a tension T .
 - a. On the diagram below indicate all the forces acting on mass m_2 as the system moves at a constant speed. [5 pts]
 - b. What will be the magnitude of the normal force acting on m_2 ? [5 pts]
 - c. What will be the magnitude of the frictional force acting on m_2 as it moves to the left at a constant speed? [5 pts]
 - d. What will be the magnitude of the tension T in the string between m_1 and m_2 as this system is pulled to the left at a constant speed? [5 pts]
 - e. How much force F should be applied if the mass m_2 is to move toward the left at a constant speed? [5 pts]



**Practice Honors Physics Test: Newtons Laws
Answer Section**

MULTIPLE CHOICE

- | | | | |
|------------------------|--------|--------|----------------------------|
| 1. ANS: C
OBJ: 2.4 | PTS: 1 | DIF: 1 | REF: p. 15 |
| 2. ANS: A
OBJ: 2.4 | PTS: 1 | DIF: 2 | REF: p. 15 p. 16 |
| 3. ANS: C
OBJ: 2.4 | PTS: 1 | DIF: 2 | REF: p. 16 |
| 4. ANS: C
OBJ: 2.5 | PTS: 1 | DIF: 2 | REF: p. 17 p. 18 p. 19 |
| 5. ANS: A
OBJ: 2.5 | PTS: 1 | DIF: 2 | REF: p. 18 p. 19 |
| 6. ANS: B
OBJ: 2.6 | PTS: 1 | DIF: 3 | REF: p. 17 p. 18 |
| 7. ANS: A
OBJ: 3.4 | PTS: 1 | DIF: 3 | REF: p. 33 p. 34 |
| 8. ANS: D
OBJ: 3.4 | PTS: 1 | DIF: 2 | REF: p. 36 |
| 9. ANS: E
OBJ: 4.4 | PTS: 1 | DIF: 1 | REF: p. 46 |
| 10. ANS: C
OBJ: 4.4 | PTS: 1 | DIF: 2 | REF: p. 46 |
| 11. ANS: C
OBJ: 4.4 | PTS: 1 | DIF: 2 | REF: p. 47 p. 48 |
| 12. ANS: B
OBJ: 4.6 | PTS: 1 | DIF: 2 | REF: p. 51 |
| 13. ANS: C
OBJ: 4.7 | PTS: 1 | DIF: 2 | REF: p. 52 |
| 14. ANS: C
OBJ: 4.8 | PTS: 1 | DIF: 3 | REF: p. 53 |
| 15. ANS: D
OBJ: 4.6 | PTS: 1 | DIF: 2 | REF: p. 51 |
| 16. ANS: A
OBJ: 5.1 | PTS: 1 | DIF: 1 | REF: p. 59 |
| 17. ANS: C
OBJ: 5.4 | PTS: 1 | DIF: 2 | REF: p. 63 p. 64 |
| 18. ANS: A
OBJ: 5.6 | PTS: 1 | DIF: 2 | REF: p. 67 |
| 19. ANS: C
OBJ: 5.3 | PTS: 1 | DIF: 3 | REF: p. 60 p. 61 |
| 20. ANS: C
OBJ: 5.7 | PTS: 1 | DIF: 2 | REF: p. 68 p. 69 |
| 21. ANS: D
OBJ: 5.3 | PTS: 1 | DIF: 3 | REF: p. 62 |
| 22. ANS: B
OBJ: 5.3 | PTS: 1 | DIF: 3 | REF: p. 62 |

23.	ANS: D OBJ: 5.3	PTS: 1	DIF: 2	REF: p. 62
24.	ANS: A OBJ: 5.3	PTS: 1	DIF: 2	REF: p. 63 p. 64
25.	ANS: C OBJ: 6.2	PTS: 1	DIF: 1	REF: p. 75
26.	ANS: A OBJ: 6.4	PTS: 1	DIF: 2	REF: p. 77
27.	ANS: D OBJ: 2.2	PTS: 1	DIF: 2	REF: p. 11 p. 12
28.	ANS: B OBJ: 2.5	PTS: 1	DIF: 2	REF: p. 17 p. 18 p. 19
29.	ANS: C OBJ: 2.5	PTS: 1	DIF: 3	REF: p. 18
30.	ANS: A OBJ: 4.4	PTS: 1	DIF: 2	REF: p. 47 p. 48
31.	ANS: B OBJ: 4.5	PTS: 1	DIF: 2	REF: p. 49
32.	ANS: A OBJ: 4.5	PTS: 1	DIF: 2	REF: p. 49
33.	ANS: C OBJ: 4.4	PTS: 1	DIF: 3	REF: p. 47 p. 48
34.	ANS: E OBJ: 4.7	PTS: 1	DIF: 2	REF: p. 51 p. 52
35.	ANS: D OBJ: 4.6	PTS: 1	DIF: 2	REF: p. 51
36.	ANS: D OBJ: 4.7	PTS: 1	DIF: 2	REF: p. 51 p. 52
37.	ANS: C OBJ: 4.5	PTS: 1	DIF: 2	REF: p. 48 p. 49
38.	ANS: A OBJ: 5.7	PTS: 1	DIF: 1	REF: p. 69
39.	ANS: B OBJ: 5.7	PTS: 1	DIF: 2	REF: p. 69 p. 70
40.	ANS: A OBJ: 5.6	PTS: 1	DIF: 2	REF: p. 68
41.	ANS: C OBJ: 5.5	PTS: 1	DIF: 2	REF: p. 65
42.	ANS: A OBJ: 5.1	PTS: 1	DIF: 2	REF: p. 59 p. 60
43.	ANS: C OBJ: 5.6	PTS: 1	DIF: 2	REF: p. 67 p. 68
44.	ANS: B OBJ: 5.3	PTS: 1	DIF: 2	REF: p. 62
45.	ANS: B OBJ: 5.3	PTS: 1	DIF: 2	REF: p. 60 p. 61
46.	ANS: C OBJ: 5.6	PTS: 1	DIF: 3	REF: p. 68
47.	ANS: C OBJ: 5.3	PTS: 1	DIF: 3	REF: p. 60 p. 61

48.	ANS: B OBJ: 6.3	PTS: 1	DIF: 2	REF: p. 76
49.	ANS: B OBJ: 6.3	PTS: 1	DIF: 2	REF: p. 76
50.	ANS: A OBJ: 6.3	PTS: 1	DIF: 2	REF: p. 76
51.	ANS: B OBJ: 6.4	PTS: 1	DIF: 2	REF: p. 77
52.	ANS: A OBJ: 6.4	PTS: 1	DIF: 3	REF: p. 77
53.	ANS: C OBJ: 6.2	PTS: 1	DIF: 2	REF: p. 75
54.	ANS: D OBJ: 6.3	PTS: 1	DIF: 3	REF: p. 76
55.	ANS: A OBJ: 6.4	PTS: 1	DIF: 2	REF: p. 77
56.	ANS: B OBJ: 6.3	PTS: 1	DIF: 2	REF: p. 76
57.	ANS: A OBJ: 6.7	PTS: 1	DIF: 3	REF: p. 82

TRUE/FALSE

58.	ANS: T OBJ: 4.3	PTS: 1	DIF: 1	REF: p. 44
59.	ANS: T OBJ: 4.3	PTS: 1	DIF: 1	REF: p. 44
60.	ANS: F OBJ: 4.5	PTS: 1	DIF: 1	REF: p. 49
61.	ANS: T OBJ: 4.5	PTS: 1	DIF: 2	REF: p. 49
62.	ANS: F OBJ: 4.4	PTS: 1	DIF: 2	REF: p. 47
63.	ANS: T OBJ: 4.9	PTS: 1	DIF: 3	REF: p. 45
64.	ANS: T OBJ: 5.1	PTS: 1	DIF: 1	REF: p. 60
65.	ANS: F OBJ: 5.5	PTS: 1	DIF: 2	REF: p. 65
66.	ANS: T OBJ: 5.7	PTS: 1	DIF: 2	REF: p. 68 p. 69

PROBLEM

67.	ANS: 20 m/s			
	PTS: 1	DIF: 2	REF: p. 15 p. 16	OBJ: 2.4

68. ANS:
4 m/s
- PTS: 1 DIF: 3 REF: p. 15 | p. 16 OBJ: 2.4
69. ANS:
20 m/s
- PTS: 1 DIF: 3 REF: p. 18 OBJ: 2.6
70. ANS:
7 s
- PTS: 1 DIF: 3 REF: p. 15 | p. 16 OBJ: 2.4
71. ANS:
15.8 s
- PTS: 1 DIF: 3 REF: p. 22 OBJ: 2.7
72. ANS:
98 N
- PTS: 1 DIF: 2 REF: p. 50 OBJ: 4.5
73. ANS:
66 kg
- PTS: 1 DIF: 2 REF: p. 50 OBJ: 4.5
74. ANS:
7.2 N
- PTS: 1 DIF: 3 REF: p. 51 OBJ: 4.6
75. ANS:
70 N
- PTS: 1 DIF: 3 REF: p. 53 OBJ: 4.8
76. ANS:
1.3 m/s²
- PTS: 1 DIF: 3 REF: p. 62 OBJ: 5.3
77. ANS:
2.0 m
- PTS: 1 DIF: 3 REF: p. 62 OBJ: 5.3
78. ANS:
2.0 m/s²
- PTS: 1 DIF: 3 REF: p. 62 OBJ: 5.3
79. ANS:
2 m/s²
- PTS: 1 DIF: 3 REF: p. 62 OBJ: 5.3

OTHER

80. ANS:

$$1. \quad m_2 := 8.0 \cdot \text{kg} \quad \mu := 0.505 \quad F := 1 \cdot \text{N} \quad m_1 := 5.0 \cdot \text{kg} \quad T := 1 \cdot \text{N}$$

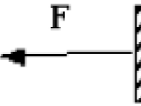
a. The freebody diagram at the right. [5 pts]

$$b. \quad F_N := m_2 \cdot g \quad F_N = 78.45 \text{ N} \quad 1b. \text{ The normal force acting on } m_2. \text{ [5 pts]}$$

$$c. \quad F_f := F_N \cdot \mu \quad F_f = 39.62 \text{ N} \quad 1c. \text{ The frictional force acting on } m_2. \text{ [5 pts]}$$

$$d. \quad T := m_1 \cdot g \quad T = 49.03 \text{ N} \quad 1d. \text{ The tension in the string. [5 pts]}$$

$$e. \quad F := T + F_f \quad F = 88.65 \text{ N} \quad 1e. \text{ The magnitude of the applied force } F. \text{ [5 pts]}$$



PTS: 1