Physics Fall final

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

____ 1. A tow truck exerts a force of 2000 N on a car, accelerating it at 1 m/s/s. What is the mass of the car?
a. 667 kg
b. 2000 kg
c. 1000 kg
d. 8000 kg
e. none of the above

____ 2. An airplane flying into a head wind loses ground speed, and an airplane flying with the wind gains ground speed. If an airplane flies at right angles to the wind, then ground speed is
a. unchanged.
b. more.
c. less.

____ 3. 80 joules of heat is added to a system that performs 55 Joules of work. The internal energy change of the system is
a. 25 J.
b. 55 J.
c. 135 J.
d. 0 J.
e. none of the above.

____ 4. A ball is thrown into the air at some angle. At the very top of the ball's path, its velocity is
a. There's not enough information given to determine.
b. entirely horizontal.
c. entirely vertical.
d. both vertical and horizontal.

____ 5. A collision is considered elastic if
a. there is no lasting deformation.
b. the objects don’t stick together.
c. the objects that collide don't get warmer.
d. after the collision, the objects have the same shape as before the collision.
e. all of the above

____ 6. The amount of potential energy possessed by an elevated object is equal to
a. the force needed to lift it.
b. the value of the acceleration due to gravity.
c. the work done in lifting it.
d. the distance it is lifted.
e. the power used to lift it.

____ 7. Which of the following would exert the most pressure on the ground?
a. A woman standing in running shoes
b. A woman standing in high-heel shoes
c. A woman standing on skis

____ 8. A vector is a quantity that has
a. magnitude and direction.
b. time and direction.
c. magnitude and time.

____ 9. A cannonball is launched from the ground at an angle of 30 degrees above the horizontal and a speed of 30 m/s. Ideally (no air resistance) the ball will land on the ground with a speed of
   a. There is not enough information to say.
   b. 0 m/s.
   c. 40 m/s.
   d. 30 m/s.
   e. 20 m/s.

____ 10. If you whirl a tin can on the end of a string and the string suddenly breaks, the can will
   a. spiral away from your hand.
   b. fly directly away from you.
   c. spiral in toward your hand.
   d. fly directly toward you.
   e. fly off, tangent to its circular path.

____ 11. A 4.0-kg ball has a momentum of 20.0 kg·m/s. What is the ball's speed?
   a. 5.0 m/s
   b. 20.0 m/s
   c. 0.2 m/s
   d. 80.0 m/s
   e. none of the above

____ 12. The reason padded dashboards are used in cars is that they
   a. decrease the impulse in a collision.
   b. increase the time of impact in a collision.
   c. look nice and feel good.
   d. increase the force of impact in a collision.
   e. decrease the momentum of a collision.

____ 13. A rock is thrown vertically into the air. At the very top of its trajectory the net force on it is
   a. less than its weight.
   b. its weight.
   c. more than its weight.

____ 14. What is the direction of the force that acts on clothes in the spin cycle of a washing machine?
   a. Down
   b. Up
   c. Inward
   d. Outward

____ 15. Power is defined as the
   a. force on an object times the distance the object moves.
   b. work done times the time taken to do that work.
   c. distance divided by the time taken to move that distance.
   d. force on an object divided by the time the force acts.
   e. work done on an object divided by the time taken to do the work.

____ 16. A person weighs less at the equator than at the poles. The reason for this has to do with the
   a. influence of the sun, moon, and all the planets.
   b. spin of the Earth.
   c. tidal bulges.
   d. higher temperature at the equator, and expansion of matter.
   e. none of the above

____ 17. People in the future may well live inside a rotating space structure that is more than 2 km in diameter. Inside the structure, people on the inside of the outer edge will experience 1 *g* while people halfway to the axis will experience

a. 0 *g*.
b. 1 *g*.
c. $\frac{1}{2}$ *g*.
d. $\frac{1}{4}$ *g*.
e. 2 *g*.

____ 18. Two people sit on a balanced seesaw. When one person leans toward the center of the seesaw, that person's end of the seesaw will _____.
a. stay at the same level
b. fall
c. rise

____ 19. A girl pulls on a 10-kg wagon with a constant force of 20 N. What is the wagon's acceleration?
a. 0.5 m/s^2
b. 10 m/s^2
c. 20 m/s^2
d. 200 m/s^2
e. 2 m/s^2

____ 20. 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?
a. Neither -- they both reach the ground together.
b. the heavy person
c. the light person

____ 21. You are on a frozen pond, and the ice starts to crack. If you lie down on the ice and begin to crawl, this will
a. decrease the total force on the ice.
b. decrease the pressure on the ice.
c. increase the pressure on the ice.
d. increase the total force on the ice.

____ 22. Suppose a girl is standing on a pond where there is no friction between her feet and the ice. In order to get off the ice, she can
a. walk very slowly on tiptoe.
b. throw something in the direction opposite to the way she wants to go.
c. get on her hands and knees and crawl off the ice.
d. bend over touching the ice in front of her and then bring her feet to her hands.
e. all of the above will work

____ 23. If the velocity of a moving object doubles, then what else doubles?
a. momentum.
b. kinetic energy.
c. acceleration.
d. all of the above
e. none of the above

____ 24. A ball is thrown into the air with 100 J of kinetic energy, which is transformed to gravitational potential energy at the top of its trajectory. When it returns to its original level after encountering air resistance, its kinetic energy is
a. more than 100 J.
b. less than 100 J.
c. 100 J.
d. Not enough information given.

____ 25. A game room in a rotating space habitat is located in a 0.25-*g* region. If a person can jump 0.5-m high in a 1-*g* region, how high can the same person jump in the game room?

a. 8 m
b. 0.5 m
c. More than 8 m
d. 4 m
e. 2 m

____ 26. How much farther will a car traveling at 100 km/s skid than the same car traveling at 50 km/s?
a. Twice as far.
b. Four times as far.
c. The same distance.
d. Half as far.
e. Five times as far.

____ 27. When a woman stands with two feet on a scale, the scale reads 280 N. When she lifts one foot, the scale reads
a. less than 280 N.
b. more than 280 N.
c. 280 N.

____ 28. When in orbit, a satellite such as the space shuttle is
a. in non-accelerated motion.
b. free from Earth's gravity.
c. simply a projectile.

____ 29. The centripetal force exerted on stunt motorcyclist Biker Bob while riding on the inner vertical surface of a circular track is
a. his weight.
b. friction.
c. the normal force.
d. none of the above

____ 30. The greater the difference in temperature between the input reservoir and output reservoir for a heat engine, the
a. less the efficiency.
b. greater the efficiency.
c. neither—efficiency doesn't depend on temperature difference.

____ 31. Suppose a cart is being moved by a force. If suddenly a load is dumped into the cart so that the cart's mass doubles, what happens to the cart's acceleration?
a. It quadruples.
b. It doubles.
c. It halves.
d. It stays the same.
e. It quarters.

____ 32. The terminal speed for a person parachuting (with the chute open) is about
a. 1500 km/h.
b. 150 km/h.
c. 0 km/h.
d. 15 km/h.

____ 33. The ratio of useful work output to total work input is called the
a. fulcrum.
b. efficiency.
c. lever arm.
d. pivot point.
e. mechanical advantage.

____ 34. A speeding truck locks it brakes and it skids to a stop. If the truck's total mass were doubled, its skidding distance would be
a. half as far.
b. nearly as far, but not quite.
c. twice as far.
d. four times as far.
e. the same.

____ 35. A job is done slowly, and an identical job is done quickly. Both jobs require the same amount of work but different amounts of
a. power.
b. energy.
c. both A and B
d. none of the above

____ 36. The unit of work is the
a. joule.
b. watt.
c. meter.
d. second.
e. newton.

____ 37. A pulley has two supporting strands. In order for it to lift a load 1 meter, the person pulling will have to pull a distance of
a. 4 m.
b. $\frac{1}{4}$ m.
c. 1 m.
d. $\frac{1}{2}$ m.
e. 2 m.

____ 38. A cannon fires a cannonball. The speed of the cannonball will be the same as the speed of the recoiling cannon
a. because momentum is conserved.
b. because velocity is conserved.
c. because both velocity and momentum are conserved.
d. if the mass of the cannonball equals the mass of the cannon.
e. none of the above

____ 39. Pressure is defined as
a. time per area.
b. force per area.
c. velocity per time.
d. distance per time.
e. force per time.

____ 40. Nellie Newton swings a rock into a circular path while holding an attached string overhead. The string makes a 45-degree angle to the vertical (comprising a "conical pendulum"). The centripetal force that holds the rock in its circular path is the
a. horizontal component of the string tension.
b. vertical component of the string tension.
c. tension in the string.
d. none of the above

____ 41. Which of the following would NOT be considered a projectile?
a. A cannonball thrown straight up

b. A cannonball thrown through the air
c. A cannonball rolling off the edge of a table
d. A cannonball rolling down a slope
e. All of the above are projectiles.

____ 42. Aunt Minnie throws a rock downward, and air resistance is negligible. Compared to a rock that is dropped, the acceleration of the rock after it is thrown is
a. the same.
b. more.
c. less.

____ 43. In the absence of air resistance, the angle at which a thrown ball will go the farthest is
a. 15 degrees.
b. 75 degrees.
c. 30 degrees.
d. 45 degrees.
e. 60 degrees.

____ 44. An arrow in a bow has 70 J of potential energy. Assuming no loss of energy to heat, how much kinetic energy will it have after it has been shot?
a. 35 J
b. 0 J
c. 140 J
d. 50 J
e. 70 J

____ 45. Running a refrigerator with its door open in a hot room makes the room
a. warmer.
b. cooler.
c. none of the above.

____ 46. As a pendulum swings back and forth
a. kinetic energy is transformed into potential energy.
b. at the lowest part of its swing, its energy is all kinetic.
c. potential energy is transformed into kinetic energy.
d. at the end points of its swing, its energy is all potential.
e. all of the above

____ 47. If the force acting on a cart doubles, what happens to the cart's acceleration?
a. It quadruples.
b. It stays the same.
c. It quarters.
d. It doubles.
e. It halves.

____ 48. If all people, animals, trains and trucks all over the world began to walk or run towards the east, then
a. Earth would spin a bit faster.
b. Earth would spin a bit slower.
c. Earth's spin would not be affected at all.

____ 49. 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?
a. Neither—they both hit the ground at the same time.
b. The dropped ball
c. The horizontally thrown ball

____ 50. The unit of pressure is
a. the newton.

b. newtons per meter.
c. the meter.
d. newtons per square meter (or pascals).
e. meters per second squared.

____ 51. A cannonball shot from a long-barrel cannon travels faster than one shot from a short-barrel cannon because the cannonball receives a greater
a. impulse.
b. force.
c. both A and B
d. neither A nor B

____ 52. In the absence of air resistance, at what other angle will a thrown ball go the same distance as one thrown at an angle of 75 degrees?
a. 15 degrees.
b. 90 degrees.
c. 70 degrees.
d. 65 degrees.
e. 80 degrees.

____ 53. Suzie Spacewalker hovers in space beside a rotating space station in outer space. Both she and the center of mass of the space station are at relative rest. If the space station is in Earth orbit, then Suzie
a. is also in Earth orbit.
b. is not in Earth orbit.
c. may or may not be in Earth orbit.

____ 54. Recoil is noticeable if you throw a heavy ball while standing on roller skates. If instead you go through the motions of throwing the ball but hold onto it, your net recoil velocity will be
a. the same as before.
b. zero.
c. small but noticeable.

____ 55. A popular toy consists of an aligned row of identical elastic balls suspended by strings so they touch each other. When two balls on one end are elevated and released, they slam into the array of balls and two balls pop out the other side. If instead, one ball popped out with twice the speed, this would be a violation of the conservation of
a. both energy and momentum.
b. energy.
c. momentum.

____ 56. The first law of thermodynamics is a restatement of the
a. Carnot cycle.
b. principle of entropy.
c. law of heat addition.
d. conservation of energy.
e. none of the above

____ 57. Which has more rotational inertia, a bicycle wheel or a solid disk of the same mass and diameter?
a. They both have the same rotational inertia.
b. The wheel.
c. The disk.

____ 58. A tennis ball and a solid steel ball with the same diameter are dropped at the same time. Which ball has the greater force acting on it?
a. The steel ball
b. They both have the same force acting on them.
c. The tennis ball

____ 59. As a system becomes more disordered, entropy
a. increases.
b. decreases.
c. remains the same.

____ 60. The force of an apple hitting the ground depends upon
a. air resistance on the apple as it falls.
b. the speed of the apple just before it hits.
c. the time of impact with the ground.
d. whether or not the apple bounces.
e. all of the above

____ 61. How much power is expended if you lift a 60 N crate 10 meters in 1 second?
a. 0 W
b. 60 W
c. 10 W
d. 6 W
e. 600 W

____ 62. An object is dropped and falls freely to the ground with an acceleration of *g*. If it is thrown upward at an angle instead, its acceleration would be
a. 0.
b. larger than *g*.
c. *g* downward.
d. *g* upward.
e. none of the above

____ 63. A ball thrown in the air will never go as far as physics ideally would predict because
a. ideally the ball would never land.
b. one can never throw the ball fast enough.
c. gravity is acting.
d. air friction slows the ball.
e. all of the above

____ 64. Stunt motorcyclist Biker Bob rides his bike inside a futuristic rotating space station-a giant rotating donut-shaped structure in space. The normal support force feels like weight to him. As he rides his bike in the same direction that the station rotates, the normal force
a. remains unaffected.
b. decreases.
c. increases.

____ 65. Angular momentum is defined as _____.
a. momentum times rotational velocity
b. mass times velocity
c. rotational inertia times linear velocity
d. none of the above

____ 66. How does acceleration of an object change in relation to its mass? It is
a. inversely proportional.
b. Acceleration doesn't depend on mass at all.
c. directly proportional.

____ 67. A frictionless inclined plane is 8.0 m long and rests on a wall that is 2.0 m high. How much force is needed to push a block of ice weighing 300.0 N up the plane?
a. 300.0 N
b. 600.0 N
c. 75.0 N

d. 100.0 N
e. 37.5 N

____ 68. If an object has kinetic energy, then it also must have
a. impulse.
b. acceleration.
c. force.
d. momentum.
e. none of the above

____ 69. At what part of a path does a projectile have minimum speed?
a. When it returns to the ground
b. At the top of its path
c. Halfway to the top
d. When it is thrown
e. There's not enough information to say.

____ 70. A projectile launched horizontally hits the ground in 0.8 seconds. If it had been launched with a much higher speed in the same direction, it would have hit the ground (neglecting Earth's curvature and air resistance) in
a. more than 0.8 s.
b. less than 0.8 s.
c. 0.8 s.

____ 71. The horizontal component of a projectile's velocity is independent of
a. the range of the projectile.
b. time.
c. the vertical component of its velocity.

____ 72. What is the resultant of a 3-unit vector and 4-unit vector at right angles to each other?
a. 7 units.
b. 5 units.
c. 1 unit.
d. none of the above

____ 73. Two objects, A and B, have the same size and shape, but A is twice as heavy as B. When they are dropped simultaneously from a tower, they reach the ground at the same time, but A has a higher
a. momentum.
b. acceleration.
c. speed.
d. all of the above
e. none of the above

____ 74. A box is dragged without acceleration in a straight-line path across a level surface by a force of 13 N. What is the frictional force between the box and the surface?
a. More than 13 N
b. Less than 13 N
c. 13 N
d. Need more information to say.

____ 75. Which has greater linear speed, a horse near the outside rail of a merry-go-round or a horse near the inside rail?
a. The outside horse
b. The inside horse
c. Neither—they both have the same linear speed.

____ 76. A piece of putty moving with 2 units of momentum strikes and sticks to a heavy bowling ball that is initially at rest. After the putty sticks to the ball, both are set in motion with a combined momentum that is
a. more than 2 units.

b. 2 units.
c. There is not enough information to say.
d. less than 2 units.

____ 77. A 1-N apple falls to the ground. The apple hits the ground with an impact force of
a. Not enough information to say
b. 1 N.
c. 2 N.
d. 9.8 N.
e. 4 N.

____ 78. When representing velocity as a vector,
a. the length of the arrow is drawn to a suitable scale.
b. the direction of the arrow shows the direction of motion.
c. the length of the arrow represents the speed.
d. all of the above
e. none of the above

____ 79. A moving freight car runs into an identical car at rest on the track. The cars couple together. Compared to the velocity of the first car before the collision, the velocity of the combined cars after the collision is
a. one half as large.
b. zero.
c. the same.
d. More information is needed to say.
e. twice as large.

____ 80. The reason a tennis ball and a solid steel ball will accelerate at the same rate, in the absence of air resistance, is that
a. the ball with the larger force has the smaller mass.
b. the force acting on them is the same.
c. the ball with the larger force also has the larger mass.
d. they have the same mass.
e. none of the above

____ 81. A karate expert executes a swift blow and splits a cement block with her bare hand.
a. The forces on both the block and the expert's hand have the same magnitude.
b. The impulses on both the block and the expert's hand have the same magnitude.
c. The times of impact on both the block and the expert's hand are the same.
d. all of the above
e. none of the above

____ 82. When mechanical work is done on a system, there can be an increase in its
a. temperature.
b. internal energy.
c. both of the above
d. none of the above

____ 83. A heavy object and a light object are released from rest at the same height and time in a vacuum. As they fall, they have equal
a. momenta.
b. energies.
c. weights.
d. all of the above
e. none of the above

____ 84. Suppose the force of friction on a sliding object is 25 N. The force needed to maintain a constant velocity is
a. less than 25 N.

b. 25 N
c. more than 25 N.

____ 85. About how efficient is a typical gasoline-burning car engine?
a. 70%
b. 5%
c. 100%
d. 30%

____ 86. A meter stick is balanced at the 50.0-cm mark. You tie a 10.0-N weight at the 15.0-cm mark. Where should a 30.0-N weight be placed so the meter stick will again be balanced?
a. 25.0-cm mark
b. 61.7-cm mark
c. 15.0-cm mark
d. 10.0-cm mark
e. 30.0-cm mark

____ 87. All simple machines ideally work on the principle that
a. work input equals work output.
b. force equals mass times acceleration.
c. total momentum before a collision equals total momentum after the collision.
d. kinetic energy transforms into potential energy.
e. impulse equals momentum change.

____ 88. A force of 3 N accelerates a mass of 3 kg at the rate of 1 m/s^2. The acceleration of a mass of 6 kg acted upon by a force of 6 N is
a. half as much.
b. the same.
c. twice as much.
d. none of the above

____ 89. Which has more momentum, a large truck moving at 30 miles per hour or a small truck moving at 30 miles per hour?
a. Both have the same momentum.
b. The large truck
c. The small truck

____ 90. When a volume of air is compressed and no heat enters or leaves, the air temperature will
a. increase.
b. decrease.
c. remain unchanged.

____ 91. When an object reaches terminal velocity its acceleration is
a. 9.8 m/s^2.
b. 0 m/s^2.
c. 4.9 m/s^2.

____ 92. An object that has kinetic energy must be
a. falling.
b. moving.
c. elevated.
d. at rest.

____ 93. A 10-kg brick and a 1-kg book are dropped in a vacuum. The force of gravity on the 10-kg brick is
a. the same as the force on the 1-kg book.
b. zero.
c. 10 times as much as the force on the 1-kg book.

____ 94. A cannonball is fired at some angle into the air. In the first second it moves 5 meters horizontally. Assuming it doesn't hit the ground and air resistance is negligible, how far does it move horizontally in the next second?
a. 5 m
b. Less than 5 m
c. More than 5 m
d. Not enough information.

____ 95. Which has greater angular speed, a horse near the outside rail of a merry-go-round or a horse near the inside rail?
a. The outside horse
b. The inside horse
c. Neither—they both have the same angular speed.

____ 96. To weigh less in the Northern Hemisphere, you should go
a. east.
b. west.
c. north.
d. south.

____ 97. A certain jack has a theoretical mechanical advantage of 300. However, due to frictional forces, the actual mechanical advantage is only 100. What is the efficiency of the jack?
a. 3
b. 30,000
c. $\frac{1}{3}$
d. 300
e. 30

____ 98. If the momentum of an object changes and its mass remains constant,
a. there is a force acting on it.
b. it is accelerating (or decelerating).
c. its velocity is changing.
d. all of the above
e. none of the above

____ 99. A ball is moving at 6.0 m/s and has a momentum of 24.0 kg·m/s. What is the ball's mass?
a. 24.0 kg
b. 4.0 kg
c. 144.0 kg
d. 0.3 kg
e. none of the above

____ 100. If you lift two loads up one story, how much work do you do compared to lifting just one load up one story?
a. One half as much
b. Twice as much
c. Four times as much
d. One quarter as much
e. The same amount

____ 101. Potential energy is the energy an object has because of its
a. speed.
b. location.
c. density.
d. temperature.
e. size.

____ 102. A book weighs 4 N. When held at rest in your hands, the net force on the book is
a. 0.4 N.

b. 4 N.
c. 0 N.
d. 39 N.
e. none of the above

____ 103. A volume of air has a temperature of 0 degrees Celsius. An equal volume of air that is twice as hot has a temperature of about
a. 0 degrees C.
b. 2 degrees C.
c. 273 degrees C.
d. 100 degrees C.
e. none of the above

____ 104. Two identical blocks of iron, one at 10 degrees C and the other at 20 degrees C, are put in contact. Suppose the cooler block cools to 5 degrees C and the warmer block warms to 25 degrees C. This would violate the
a. first law of thermodynamics.
b. second law of thermodynamics.
c. both of the above
d. none of the above

____ 105. A table tennis ball launcher is fired. Compared to the force on the ball, the force on the launcher is
a. larger.
b. the same.
c. smaller.

____ 106. An object at rest may have
a. speed.
b. momentum.
c. energy.
d. velocity.
e. none of the above

____ 107. If Nellie Newton pushes an object with twice the force for twice the distance, she does
a. twice the work.
b. the same work.
c. eight times the work.
d. four times the work.

____ 108. When a railroad train rounds a banked track, the centripetal force needed comes not from friction, but from the
a. vertical component of the normal force.
b. normal force.
c. horizontal component of the normal force.
d. none of the above

____ 109. Any solid cylinder will roll down an incline with greater acceleration than any hollow cylinder if the _____.
a. mass of the solid cylinder is large
b. mass of the solid cylinder is small
c. diameter of the solid cylinder is large
d. none of the above are necessary

____ 110. A 2-kg ball is thrown at 3 m/s. What is the ball's momentum?
a. 9 kg·m/s
b. 2 kg·m/s
c. 3 kg·m/s
d. 6 kg·m/s
e. none of the above

____ 111. How much work is done on a 60-N box of books that you carry horizontally across a 6-m room?
a. 10 J
b. 60 J
c. 6 J
d. 0 J
e. 360 J

____ 112. A small economy car (low mass) and a limousine (high mass) are pushed from rest across a parking lot, equal distances with equal forces. The car that receives more kinetic energy is the
a. neither one—they receive the same amount of kinetic energy.
b. the small economy car.
c. the limousine.

____ 113. Rockets are launched from an airplane in the forward direction of motion. The kinetic energy of the airplane will be
a. decreased.
b. increased.
c. unchanged.

____ 114. The ideal efficiency for a heat engine operating between temperatures of 2050 K and 310 K is
a. 50%.
b. 15%.
c. 25%.
d. 85%.
e. none of the above.

____ 115. How many joules of work are done on a box when a force of 25 N pushes it 3 m?
a. 3 J
b. 1 J
c. 75 J
d. 25 J
e. 8 J

____ 116. How much work is done on a 20-N crate that you lift 2 m?
a. 40 J
b. 0 J
c. 20 J
d. 1 J
e. 2 J

____ 117. A cannon recoils from launching a cannonball. The speed of the cannon's recoil is small because the
a. cannon has far more mass than the cannonball.
b. impulse on the cannon is less than the impulse on the cannonball.
c. force against the cannon is relatively small.
d. momentum of the cannon is unchanged.
e. none of the above

____ 118. A baseball is hurled into the air at an angle of 30 degrees above the horizontal and lands on a target that is at the same level as that where the baseball started. The baseball will also land on the target if it is thrown at an angle of
a. 20 degrees.
b. 40 degrees.
c. 50 degrees.
d. 60 degrees.
e. none of the above

____ 119. The momentum change of an object is equal to the

a. impulse acting on it.
b. force acting on it times its velocity.
c. object's mass times the force acting on it.
d. force acting on it.
e. velocity change of the object.

____ 120. Which of the following has the largest momentum?
a. A large truck parked in a parking lot
b. The science building at your school
c. A pickup truck traveling down the highway
d. A tightrope walker crossing Niagara Falls
e. A dog running down the street

____ 121. Systems that are left alone tend to move toward a state of
a. more entropy.
b. no entropy.
c. less entropy.

____ 122. When work is done by a system and no heat is added to it, the temperature of the system
a. increases.
b. remains unchanged.
c. decreases.

____ 123. A space habitat is designed so that the variation in *g* between a person's head and feet is less than 0.01 *g*. If the person is 2 m tall, then the radius of the habitat is
a. more than 2000 m.
b. 2000 m.
c. 200 m.
d. 20 m.

____ 124. A block is at rest on an incline. The force of friction necessary to prevent the block from sliding increases when the incline angle is
a. decreased.
b. neither A nor B (Force of friction stays the same.)
c. increased.

____ 125. If you lift one load up two stories, how much work do you do compared to lifting one load up only one story?
a. One quarter as much
b. The same amount
c. Four times as much
d. Twice as much
e. One half as much

____ 126. A 20-N falling object encounters 4 N of air resistance. The magnitude of the net force on the object is
a. 4 N.
b. 0 N.
c. 16 N.
d. 20 N.
e. none of the above

____ 127. A 5.0-kg chunk of putty moving at 10.0 m/s collides with and sticks to a 7.0-kg bowling ball that is initially at rest. The bowling ball with its putty passenger will then be set in motion with a momentum of
a. 2.0 kg·m/s.
b. more than 50.0 kg·m/s.
c. 50.0 kg·m/s.
d. 0 kg·m/s.
e. 15.0 kg·m/s.

____ 128. The momentum of an object is defined as the object's
a. mass times its velocity.
b. force times the time interval.
c. mass times it acceleration.
d. force times its acceleration.
e. velocity times the time interval.

____ 129. A cannon with a barrel velocity of 140 m/s launches a cannonball horizontally from a tower. Neglecting air resistance, how far vertically will the cannonball have fallen after 4 seconds?
a. 2240 m
b. 560 m
c. 140 m
d. 80 m
e. none of the above

____ 130. 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?
a. The dropped ball
b. Neither. They both hit the ground at the same time.
c. The horizontally thrown ball

____ 131. How much force is needed to accelerate a 4.0-kg physics book to an acceleration of 2.0 m/s^2?
a. 8.0 N
b. 2.0 N
c. 0 N
d. 24.0 N
e. 0.5 N

____ 132. If Kelly the skater's speed increases so he has three times the momentum, then his kinetic energy increases by
a. nine times.
b. three times.
c. one third times.
d. none of the above (KE remains the same).

____ 133. When an ice skater pulls in his hands to turn faster _____.
a. his rotational speed changes
b. his moment of inertia changes
c. angular momentum must be conserved
d. all of the above

____ 134. 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
a. 9 m/s^2.
b. 14 m/s^2.
c. 4 m/s^2.
d. 2 m/s^2.

____ 135. Which has greater kinetic energy, a car traveling at 30 km/h or a half-as-massive car traveling at 60 km/h?
a. The 60 km/h car
b. Both have the same kinetic energy.
c. The 30 km/h car

____ 136. Two gliders having the same mass and speed move toward each other on an air track and stick together. After the collision, the velocity of the gliders is
a. one half the original velocity.
b. twice the original velocity.
c. There is not enough information to say.

d. zero.
e. the same as the original velocity.

____ 137. A possible space habitat of the future is a cylinder in space rotating about its long axis. What is the relative gravitational field along the axis of the habitat?
a. *g*
b. One-quarter *g*
c. One-half *g*
d. Zero
e. Three-quarters *g*

____ 138. After a rock that is thrown straight up reaches the top of its path and is starting to fall back down, its acceleration is (neglecting air resistance)
a. greater than when it was at the top of its path.
b. the same as when it was at the top of its path.
c. less than when it was at the top of its path.

____ 139. Ceramic automobile engines that operate at higher temperatures will be
a. more efficient.
b. less efficient.
c. neither of the above.

____ 140. While roller-skating, Granny collides with her tiny grandson Ambrose who is at rest. Ignoring any friction effects, Ambrose's speed after the collision will be greatest when
a. he and Granny make a bouncing collision, each going in opposite directions.
b. Granny catches him and they both move together.

____ 141. "Centrifugal forces" are an apparent reality to observers in a reference frame that is
a. at rest.
b. an inertial reference frame.
c. moving at constant velocity.
d. rotating.
e. none of the above

____ 142. A sportscar has a mass of 1500 kg and accelerates at 5 meters per second squared. What is the magnitude of the force acting on the sportscar?
a. 7500 N.
b. 1500 N.
c. 300 N.
d. 2250 N.
e. none of the above

____ 143. Which of the following is NOT a unit of rotational speed?
a. Meters per second
b. Revolutions per second
c. Revolutions per minute
d. Rotations per minute
e. Rotations per second

____ 144. Cool a sample of air from zero on the Celsius scale to near zero on the absolute scale and the air loses
a. pressure.
b. volume.
c. both A and B
d. neither A nor B

____ 145. A 3-kg ball is whirled on the end of a string that is 2 m long. The ball's linear speed is 4 m/s. What is its angular momentum?
a. 2 kg·m·m/s

b. 24 kg·m·m/s
c. 8 kg·m·m/s
d. 48 kg·m·m/s
e. 6 kg·m·m/s

____ 146. Suppose you try loosening a nut with a wrench, and the nut doesn't give at all. You increase your chance of success if you _____.
a. extend the lever arm
b. have a friend help you pull on the wrench
c. be sure to exert force perpendicular to the lever arm
d. exert a larger force
e. all of the above

____ 147. If a volume of air is swept upward with no heat input or output, its temperature
a. increases.
b. decreases.
c. remains the same.

____ 148. A 60-N object moves at 1 m/s. Its kinetic energy is
a. 1 J.
b. 60 J.
c. more than 60 J.
d. 3 J.

____ 149. A 6-N falling object encounters 6 N of air resistance. The magnitude of the net force on the object is
a. 12 N.
b. 0 N.
c. 6 N.
d. none of the above

____ 150. Which requires more work: lifting a 70-kg sack vertically 2 meters or lifting a 35-kg sack vertically 4 meters?
a. Lifting the 35 kg sack
b. Lifting the 70 kg sack
c. Both require the same amount of work.

____ 151. Suppose a cannon is made of a strong but very light material. Suppose also that the cannonball is more massive than the cannon itself. For such a system
a. conservation of momentum would not hold.
b. the force on the cannonball would be greater than the force on the cannon.
c. recoil problems would be lessened.
d. the target would be a safer place than where the operator is located.
e. conservation of energy would not hold.

____ 152. In order to catch a ball, a baseball player moves his or her hand backward in the direction of the ball's motion. Doing this reduces the force of impact on the player's hand principally because
a. the momentum of impact is reduced.
b. the velocity of the hand is reduced.
c. the time of impact is decreased.
d. the time of impact is increased.
e. none of the above

____ 153. The lowest possible temperature in nature is
a. –273 degrees C.
b. 0 degrees C.
c. 4 K.

____ 154. In order to increase the final momentum of a golf ball, we could
a. swing as hard as possible.

b. follow through when hitting the ball.
c. increase the force acting on it.
d. increase the time of contact with the ball.
e. all of the above

____ 155. It takes 80 J to push a large box 8 m across a floor. Assuming the push is in the same direction as the move, what is the magnitude of the force on the box?
a. 10 N
b. 80 N
c. 8 N
d. 640 N
e. none of the above

____ 156. Kinetic energy of an object is equal to
a. one half the product of its mass times its speed.
b. its mass multiplied by its acceleration.
c. one half the product of its mass times its speed squared.
d. its mass multiplied by its acceleration squared.
e. its mass multiplied by its speed.

____ 157. Accelerations are produced by
a. accelerations.
b. masses.
c. forces.
d. velocities.
e. none of the above

____ 158. 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?
a. 2 m/s^2
b. 0.3 m/s^2
c. 1 m/s^2
d. 0.5 m/s^2
e. none of the above

____ 159. The ratio of output force to input force of a simple machine is called the
a. pivot point.
b. mechanical advantage.
c. lever arm.
d. efficiency.
e. fulcrum.

____ 160. If you could throw a baseball horizontally at a speed of 8 km/s and if there were no air drag and nothing to stop it,
a. it would orbit Earth.
b. it would escape Earth’s atmosphere.
c. after 90 minutes it would return to you.

____ 161. The force that accelerates a rocket into outer space is exerted on the rocket by
a. rocket's wings.
b. the exhaust gases.
c. atmospheric pressure.
d. Earth's gravity.
e. none of the above

____ 162. Suppose a moving car has 3000 J of kinetic energy. If the car's speed doubles, how much kinetic energy will it then have?

a. 1500 J
b. 12,000 J
c. 6000 J
d. 1000 J
e. 3000 J

____ 163. The acceleration produced by a net force on an object is
a. in the same direction as the net force.
b. directly proportional to the magnitude of the net force.
c. inversely proportional to the mass of the object.
d. all of the above
e. none of the above

____ 164. If a football is kicked so the force on the ball is through its center of gravity, the ball will _____.
a. not even get into the air
b. deflate
c. move without any tumbling or spinning
d. tumble end over end in the air
e. spin about its axis in the air

____ 165. If Earth rotated more slowly about its axis, your weight would
a. stay the same.
b. decrease.
c. increase.

____ 166. To turn a stubborn screw, it is best to use a screwdriver that has a _____.
a. long handle
b. yellow color
c. wide handle
d. none of the above

____ 167. The unit of power is the
a. watt.
b. second.
c. newton.
d. joule.
e. meter.

____ 168. A woman can lift barrels a vertical distance of 1 meter or can roll them up a 2-meter long ramp to the same elevation. If she uses the ramp, the applied force required is
a. $\frac{1}{4}$ as much.
b. $\frac{1}{2}$ as much.
c. the same amount.
d. 2 times as much.
e. 4 times as much.

____ 169. A freight train rolls along a track with considerable momentum. If it were to roll at the same speed but had twice as much mass, its momentum would be
a. quadrupled.
b. doubled.
c. unchanged.
d. zero.

____ 170. When you jump off a step, you usually bend your knees as you reach the ground. By doing this, the time of the impact is about 10 times more what it would be in a stiff-legged landing, and the average force on your body is reduced by
a. more than 10 times.

b. less than 10 times.
c. about 10 times.

____ 171. Torque is defined as _____.
a. momentum times radius
b. mass times velocity
c. force times time
d. force times lever arm
e. mass times acceleration

____ 172. A jumbo jet cruises at a constant velocity when the total thrust of the engines on the jet is 50,000 N. How much air resistance acts on the jet?
a. 75,000 N
b. 50,000 N
c. 25,000 N
d. 0 N
e. 100,000 N

____ 173. Suppose the temperature of the input reservoir in a heat engine doesn't change. As the sink temperature is lowered, the efficiency of the engine
a. decreases.
b. stays the same.
c. increases.

____ 174. A ball is thrown straight upward at 10 m/s. Ideally (no air resistance), the ball will return to the thrower's hand with a speed of
a. 0 m/s.
b. 20 m/s.
c. 10 m/s.
d. 5 m/s.
e. There is not enough information to say.

____ 175. A car traveling along the highway needs a certain amount of force exerted on it to stop. More stopping force may be required when the car has
a. less stopping distance.
b. more mass.
c. more momentum.
d. all of the above
e. none of the above

____ 176. A person on a roof throws one ball downward and an identical ball upward at the same speed. The ball thrown downward hits the ground with 140 J of kinetic energy. Ignoring air friction, with how much kinetic energy does the second ball hit the ground?
a. 140 J
b. more than 280 J
c. less than 140 J
d. 280 J
e. none of the above

____ 177. Suppose a small plane can fly at 170 km/h relative to the surrounding air. Suppose also that there is a 60 km/h tailwind. How fast does the plane's shadow move across the ground?
a. 5 km/h
b. 230 km/h
c. 110 km/h
d. 60 km/h
e. 170 km/h

____ 178. A machine puts out 100 watts of power for every 1000 watts put into it. The efficiency of the machine is
a. 110%.
b. 10%.
c. 50%.
d. 90%.
e. none of the above

____ 179. A car travels in a circle with constant speed. The net force on the car
a. is directed forward, in the direction of travel.
b. is directed toward the center of the curve.
c. is zero because the car is not accelerating.
d. none of the above

____ 180. When a car's speed triples, its kinetic energy
a. remains the same.
b. increases by nine times.
c. triples.
d. increases by four times.
e. none of the above

____ 181. Superman is at rest in space when he throws an asteroid that has more mass than he does. Which moves faster, Superman or the asteroid?
a. The asteroid
b. They both move at the same speed.
c. Superman

____ 182. When the angle of an incline with a block resting on it increases, the normal support force
a. stays the same.
b. increases.
c. decreases.

____ 183. The resistance an object has to changes in its rotational state of motion is called rotational _____.
a. torque
b. velocity
c. inertia
d. momentum
e. acceleration

____ 184. Entropy measures
a. temperature at constant volume.
b. temperature as pressure increases.
c. temperature as volume increases.
d. messiness.
e. temperature at constant pressure.

____ 185. A small economy car (low mass) and a limousine (high mass) are pushed from rest across a parking lot, equal distances with equal forces. The car that receives the greater impulse is the
a. small economy car.
b. limousine.
c. neither A nor B (same for each).

____ 186. A table tennis ball moving forward with 5 units of momentum strikes and bounces backward off a heavy bowling ball that is initially at rest and free to move. The bowling ball is set in motion with a momentum of
a. 5 units.
b. more than 5 units.
c. not enough information.
d. less than 5 units.

____ 187. As the rotational speed of a space habitat increases, the weight of people inside
a. increases.
b. stays the same.
c. decreases.

____ 188. If you pull horizontally on a desk with a force of 150 N and the desk doesn't move, the friction force must be 150 N. Now if you pull with 250 N so the desk slides at constant velocity, the friction force is
a. more than 150 N but less than 250 N.
b. 250 N.
c. more than 250.

____ 189. A tin can whirled on the end of a string moves in a circle because
a. there is an inward force acting on the can.
b. once the can starts moving, that is its natural tendency.
c. the can continually pulls on the string.
d. there is a force on the can pulling it outward.
e. all of the above

____ 190. Suppose an astronaut in outer space wishes to toss a ball against a very massive and perfectly elastic concrete wall and catch it as it bounces back. If the ball is as massive as the astronaut, then
a. the astronaut will catch one bounce only.
b. the astronaut's time between catches will decrease as the game progresses.
c. the astronaut will never catch the first bounce.
d. none of the above

____ 191. Energy is changed from one form to another with no net loss or gain.
a. Always true
b. Sometimes true
c. Always false

____ 192. In physics, work is defined as
a. force times distance.
b. force divided by time.
c. distance divided by time.
d. force times time.
e. force divided by distance.

____ 193. Suppose a huge rotating cloud of particles in space gravitates together to form a dense ball. As the cloud shrinks in size it rotates _____.
a. slower
b. faster
c. at the same speed

____ 194. A push on a 1-kilogram brick accelerates the brick. Neglecting friction, to equally accelerate a 10-kilogram brick, one would have to push
a. with just as much force.
b. with 100 times as much force.
c. with $\frac{1}{10}$ the amount of force.
d. with 10 times as much force.
e. none of the above

____ 195. Consider molecules of hydrogen gas and molecules of heavier oxygen gas that have the same kinetic energy. The molecules with the greater speed are
a. oxygen.
b. hydrogen.
c. Both have the same speed.

____ 196. How much power is required to do 40 J of work on an object in 5 seconds?

a. 40 W
b. 8 W
c. 200 W
d. 0 W
e. 5 W

____ 197. Compared to a sports car moving at 30 miles per hour, the same sports car moving at 60 miles per hour has
a. the same momentum.
b. four times as much momentum.
c. twice as much momentum.

____ 198. Momentum of a system is conserved only when
a. the system is not moving.
b. the system has zero momentum.
c. there is no net external force acting on the system.
d. there are no forces acting on the system.
e. there are no internal forces acting on the system.

____ 199. An object has a constant mass. A constant force on the object produces constant
a. acceleration.
b. velocity.
c. both A and B
d. none of the above

____ 200. A ring and a disk roll down a hill together. Which reaches the bottom first?
a. Depends on the masses
b. Depends on the moments of inertia
c. Both reach the bottom at the same time
d. The ring
e. The disk