

PHYSICS – MIDTERM REVIEW

Choose the BEST answer to each question. Record all answers on the scantron sheet.

- 1) If a person claimed that a year has 398.25 days, that measurement would be:
a. accurate b. precise c. both accurate and precise d. neither
- 2) A student hypothesizes that the mass of a substance affects how the temperature of the substance changes when it is heated. The student uses the following procedure to test the hypothesis:
 - Each sample is initially at room temperature before heating.
 - Each sample is heated for the same amount of time.

Which of the following would be the BEST way to select the samples for testing the student's hypothesis?

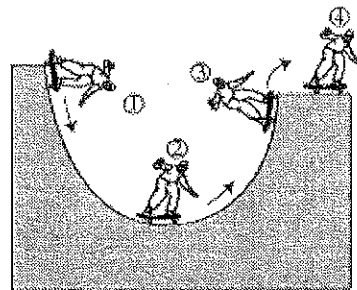
- Obtain samples of one substance, each with a different mass.
 - Obtain samples of one substance, each with the same mass.
 - Obtain samples of different substances, each with a different mass.
 - Obtain samples of different substances, each with the same mass.
- 3) A horizontal line on a velocity –time graph indicates
a. zero displacement b. zero speed c. zero acceleration
 - 4) In the absence of air resistance, which component of a projectile's velocity is constant?
a. horizontal b. vertical c. both d. neither
 - 5) A performer pulls a tablecloth out from under a complete set of dinnerware as shown in the illustration. Which of the following BEST explains the performer's success at leaving all the dinnerware on the table?
 - the inertia of the dinnerware
 - the large mass of the tablecloth
 - the smooth material of the tablecloth
 - the inertia of the tablecloth



- 6) A heavy box is at rest on a ramp. The box begins to slide down the ramp when a small force is applied. The force is removed as soon as the box begins to slide. The speed of the box increases as the box slides down the ramp.

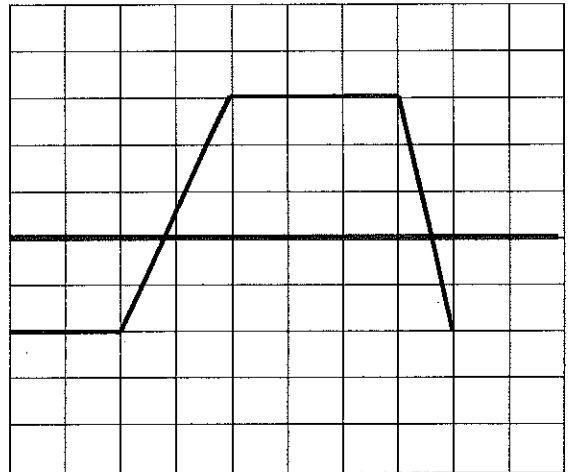
Which of the following is the MOST LIKELY cause of this increasing speed?

- The force of gravity on the box is less when the box is not moving.
 - The force of gravity on the box is greater towards the bottom of the ramp.
 - The force of friction on the box is less when the box is moving than when the box is at rest.
 - The initial applied force continues to accelerate the box down the ramp.
- 7) Which of the following quantities would change if you traveled to the moon?
a. your weight b. your mass
c. both your weight and mass would change d. none of the above.
 - 8) Joe pushes a large crate across the pavement. Which of the following would affect the amount of kinetic friction between the crate and the pavement? **Choose all that apply.**
 - The weight of the crate
 - The size of the crate (surface area)
 - The texture of the crate material
 - How hard Joe pushes on the crate



- 9) At which location does the skateboarder have the most kinetic energy?
a. 1 b. 2 c. 3 d. 4
- 10) Which of the following measurements has three significant digits?
a. 0.450 m b. 450.0 m c. 0.045 d. both a and c
- 11) Which of the following is a scalar quantity?
a. the mass of a brick b. the force required to lift a chair
c. the acceleration of a car d. the velocity of a falling rock

- 12) On the surface of the Moon, a ball is thrown straight up with an initial velocity. The ball has a constant acceleration due to the Moon's gravity. On the graph of the ball's velocity vs. time, which of the following would represent the ball at its highest point above Moon's surface?
- when the velocity is equal to 1.6 m/s.
 - when the velocity is 0 m/s.
 - when the velocity has its greatest value.
 - when the velocity has its most negative value.

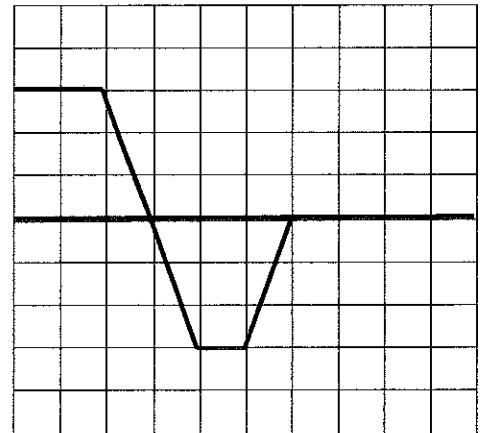


- 13) Two forces of 8 N and 12 N cannot have a resultant of ____.
- 4 N
 - 8 N
 - 15 N
 - 21 N
- 14) Refer to the **Position-time graph**. What is the total distance traveled?
- 0 meters
 - 60 meters
 - 100 meters
 - 60 meters

- 15) Refer to the **Position-time graph**. What is the average velocity between $t = 14$ and $t = 16$ sec?
- 25 m/s
 - 50 m/s
 - 25 m/s
 - 50 m/s

- 16) Refer the **Velocity-time graph BELOW**. What is happening between 10 and 12 seconds?
- slowing down, moving left
 - slowing down, moving right
 - speeding up, moving left
 - speeding up, moving right

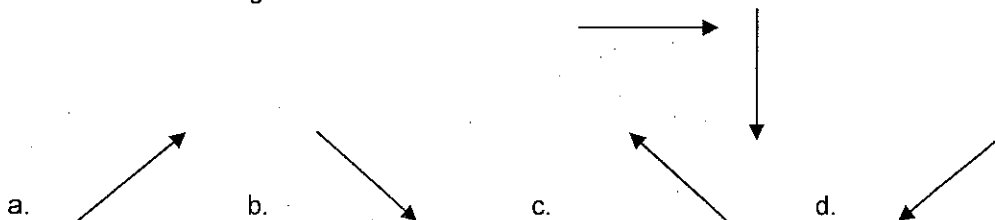
- 17) Refer to the **Velocity-time graph**. What occurs at $t = 6$ seconds?
- stops for a moment, zero acceleration
 - passes by the starting position
 - stops for a moment, negative acceleration
 - stops for a moment at the reference point.



- 18) Refer to the **Velocity-time graph**: Which of the following is TRUE between 4 and 8 seconds?
- It represents a decreasing velocity.
 - It represents a negative acceleration.
 - It represents a decreasing acceleration.
 - All of the above

- 19) Refer to the **Velocity-time graph**: Calculate the displacement of this object.
- 0 m
 - 6 m
 - 54 m
 - Cannot be determined

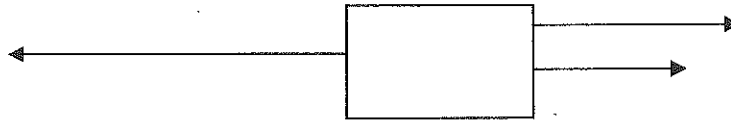
- 20) Which of the following is the direction of the resultant force when two forces with the following directions are added?



- 21) An engineering student is gathering data on the motion of a model car traveling down a ramp. If energy is conserved, the potential energy of the car at the top of the ramp should equal the kinetic energy of the car at the bottom of the ramp. After the first trial, the student calculates that the kinetic energy at the bottom of the ramp is less than the potential energy at the top of the ramp. Which of the following can BEST explain the difference?

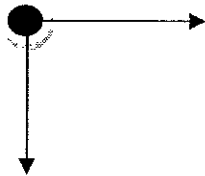
- The force of gravity of the car increased slightly as it moved down the ramp.
- The student accidentally accelerated the car at the top of the ramp.
- The measured height of the ramp was less than the actual height.
- The frictional force between the cart and the ramp caused some energy to be transformed into thermal energy.

- 22) On earth, the acceleration of an object is -9.81 m/s^2 ONLY when:
- It is falling straight down
 - It is rising straight up in the air
 - There is no air resistance
 - The object is falling at terminal velocity
- 23) Two identical coins (A) and (B) are knocked off a table at the same time. If (A) falls straight down and (B) is shot straight out with some initial horizontal velocity, which one hits the ground first?
- (A)
 - (B)
 - They hit at the same time
 - Depends on (B)'s initial velocity.
- 24) The box below is in equilibrium and moving at -3.0 m/s . What is the magnitude of the missing force?

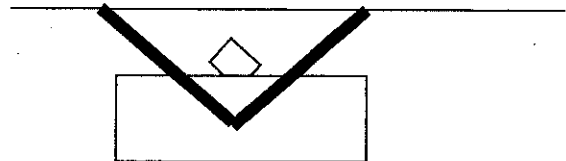


- 3 N
 - 6 N
 - 9 N
 - Need to know the mass
- 25) A 500 kg truck traveling at 10 m/s skids to a stop in 25 meters. If the truck were heavily loaded so that it had twice the original mass how far would it skid under the same condition?
- 12.5 meters
 - 25 meters
 - 50 meters
 - 100 meters
- 26) Using significant figures, ADD the following measurements: 106.2 meters + 18.3 meters:
- 125 m
 - 123.0 m
 - 124.5 m
 - 120 m
- 27) Using significant figures, MULTIPLY the following measurements: 12.61 kg X 3.8 m/s²:
- 47.9 N
 - 47.92 N
 - 48.0 N
 - 48 N
- 28) Which of the following measurements is the largest?
- 6.1×10^2 grams
 - 20 grams
 - 141 cg
 - 5.62×10^5 mg
- 29) A boy walks 250 meters due east, then 100 meters due south. The boy's DISPLACEMENT is:
- 350 meters
 - 270 meters
 - 270 m, SW
 - 270 meters, SE
- 30) A 9.0 kg cart is accelerated uniformly from 4.0 m/s to 34 m/s in 6.0 seconds. The average acceleration of the cart is ___
- 2.5 m/s^2
 - 5.0 m/s^2
 - 24 m/s^2
 - 40 m/s^2
- 31) A cart, initially at rest, accelerates at a constant rate of 4.5 m/s^2 for 9.0 seconds. Calculate the cart's final speed.
- 41 m/s
 - 16 m/s
 - 66 m/s
 - 87 m/s
- 32) A rock falls from a height of 122 meters. How long is the rock in the air?
- 5.0 sec.
 - 25 sec.
 - 2.5 sec.
 - 6.35 sec.
- 33) A plane has to reach a speed of 75 m/s before take-off. If the runway is 6.0×10^2 meters long, at what rate should the plane accelerate?
- 0.063 m/s^2
 - 4.7 m/s^2
 - 19 m/s^2
 - 24 m/s^2
- 34) Two forces act on an object. 60 N at 75° and 135 N at 40° NW. Calculate the resultant force on the object.
- 169 N at 59° NW
 - 169 N at 51° NW
 - 186 N at 51°
 - 186 N at 51° SE
- 35) A coin is snapped off a table with a horizontal velocity of 6.8 m/s. It lands on the floor 4.0 meters from the base of the table. How high is the table?
- 14 m
 - 2.8 m
 - 1.7 m
 - 0.50 m
- 36) A rock is thrown horizontally from a 250 meter high cliff. How long is the rock in the air?
- need to know initial speed
 - 51 sec.
 - 7.1 sec.
 - 3.6 sec.
- 37) An object is launched from the ground at an angle of 55.0° with an initial velocity of 141 m/s. Calculate the maximum height reached by the object.
- 2100 m
 - 334 m
 - 38.4 m
 - 686 m
- 38) A golf ball is hit from the ground at an angle of 30.0° with an initial velocity of 49 m/s. Calculate the range of the ball.
- 210 m
 - 130 m
 - 110 m
 - 32 m

- 39) A boy standing on a 212 m high bridge throws a rock with an initial velocity of 8.5 m/s at 55° to the horizontal. How long is the rock in the air?
 a. 0.87 sec b. 5.9 sec c. 7.3 sec d. 7.5 sec
- 40) A rocket weighs 8.0×10^3 N on earth. Calculate the mass of the rocket.
 a. 820 kg b. 8000 kg
 c. 8.0×10^4 kg d. depends on its location.
- 41) It takes an applied force of 165 N to keep a 75 kg skater moving at a constant speed of 4.0 m/s. Calculate the coefficient of friction between the skater and the floor.
 a. 0 b. 0.22 c. 0.45 d. 0.09
- 42) An applied force of 122 N gives a 9.0 kg box an acceleration of 4.0 m/s^2 across a wood table. Calculate the force of friction between the box and the table.
 a. 0 N b. 8.7 N c. 86 N d. 36 N
- 43) How much applied force is required to accelerate a 6.0 kg object at 3.5 m/s^2 if the coefficient of kinetic friction is 0.17?
 a. 31 N b. 22 N c. 21 N d. 11 N
- 44) Determine the magnitude of the acceleration of the 2.0 kg object shown below.
 a. 50 m/s^2 b. 25 m/s^2 c. 1250 m/s^2 d. 2500 m/s^2



- 45) A 5.6 kg box is sliding down a ramp that makes a 20° angle with the horizontal. The coefficient of kinetic friction between the box and the ramp is 0.19. Calculate the acceleration of the box.
 a. 0.67 m/s^2 b. 1.6 m/s^2 c. 3.9 m/s^2 d. 6.6 m/s^2
- 46) A 560 N sign is hung by two cables as shown. Calculate the tension in each cable.
 a. 560 N each b. 280 N each
 c. 396 N each d. 198 N each



- 47) Three different boxes are lifted to different heights.
- Box X weighs 115 N, and is lifted to 15 m
 - Box Y weighs 210 N and is lifted to 10 m
 - Box Z weighs 305 N and is lifted to 5 m

Which of the following statements best describes the boxes' change in mechanical energy?

- a. Box X had the greatest change in mechanical energy
 b. Box Z had the smallest change in mechanical energy
 c. Boxes X and Y had the same change in mechanical energy
 d. No box had a change in mechanical energy
- 48) A boy starts from rest at the top of a *frictionless* slide that is 2.5 m high. How fast will he be moving at the bottom of the slide?
 a. 7 m/s b. 4.9 m/s
 c. 49 m/s d. Need to know the mass of the boy to calculate.

Physics 2nd Semester Review
"Momentum, Rotational Motion, Gravity, Waves, Light"

Name: _____ Date: _____ Hour: _____

Choose the letter of the BEST answer to each question and write it in the space provided.

_____ 1) A car moving at 5 m/s and an identical car moving at -5 m/s have a head-on collision. Which of the following statements is TRUE?

- a. The total momentum after the collision was zero.
- b. Each car had zero momentum before the collision.
- c. The total momentum of the system before the collision was greater than the total momentum after the collision.
- d. Each car had the same momentum before the collision.

_____ 2) A semi-truck and a compact car; both moving at 50 mph; have a head-on collision. Which vehicle will experience the greater change in momentum?

- a. The semi-truck
- b. The car
- c. Same change in momentum

_____ 3) From question #2, which vehicle will have the greater change in velocity?

- a. The semi-truck
- b. The car
- c. Same change in velocity

_____ 4) When a cannon fires a cannon ball, why does the ball have a greater change in velocity than the cannon itself?

- a. There was a greater force exerted on the ball.
- b. The ball has less mass than the cannon.
- c. The ball had a greater change in momentum
- d. There was a greater impulse on the ball.

_____ 5) Why aren't seatbelts required on school buses, but are required in a car?

- a. School buses are not usually involved in traffic accidents.
- b. There is no room on the bus for seatbelts.
- c. Cars are usually moving faster than a bus when a collision occurs.
- d. The bus has a greater mass and therefore a smaller deceleration during collisions.

_____ 6) When you jump off a table, it is best to land with your legs relaxed. The reason for this is _____.

- a. You will decrease the impulse on your body.
- b. You will decrease the time of impact and decrease the force.
- c. You will be able to absorb more force into your body.
- d. You will increase the time of impact and decrease the force.

_____ 7) Any object that is moving in a circular path must have a _____ force acting on it.

- a. centripetal
- b. centrifugal
- c. electrical
- d. nuclear

_____8) When a spinning ice skater pulls her arms in towards her body, she decreases her _____.

- a. mass
- b. angular momentum
- c. angular speed
- d. rotational inertia

_____9) Einstein's Theory of Gravity states that _____.

- a. light bends space
- b. mass bends space
- c. black holes are collapsed stars
- d. $e = mc^2$

_____10) One support of Einstein's theory of gravity is _____.

- a. Starlight is bent by the sun's gravitational field
- b. Electrons are bent off course in a magnetic field
- c. Time slows down when you travel very fast
- d. "G" is a universal constant

_____11) Which of the following is true about black holes?

- a. They are a vacuum in space.
- b. They have infinite mass in the center.
- c. They are formed from collapsed stars.
- d. They emit black light.

_____12) If the force of gravity between two objects is 200 N; what will the force of gravity between them be if they are moved twice as far apart?

- a. 50 N
- b. 100 N
- c. 20 N
- d. 2 N

_____13) In what way are the gravitational and electric forces similar?

- a. Both forces can be attractive or repulsive.
- b. Both forces have a large constant in the numerator.
- c. Both forces were discovered by Sir Isaac Newton.
- d. Both forces decrease with distance according to the inverse-square law.

_____14) Which of the following statements is true for satellites in orbit around earth?

- a. Geosynchronous satellites have a greater tangential velocity than low-orbit satellites.
- b. The mass of the satellite does not affect the speed of the satellite.
- c. Low orbit satellites have a greater period than geosynchronous satellites.
- d. All of the above are true.

_____15) If the frequency of a wave triples, what happens to the wavelength of the wave? Assume no change in medium.

- a. The wavelength is reduced to $1/3$.
- b. The wavelength triples
- c. The wavelength increases by a factor of 9.
- d. The wavelength is reduced to $1/9$.

_____16) A seismic transverse wave has an amplitude of 1.5 meters. If the amplitude of the wave is doubled to 3.0 meters, how much more energy does it carry?

- a. Four times as much energy.
- b. Twice as much energy
- c. The same amount of energy in either case.

_____ 17) Which of the following shows what happens when a crest and a trough from opposite ends of a spring meet?

- a. _____
- b. _____
- c. _____
- d. _____

_____ 18) What type of wave behavior is responsible for dead spots in an auditorium?

- a. diffraction
- b. refraction
- c. interference
- d. reflection

_____ 19) What type of wave behavior is useful in designing lenses for eye glasses?

- a. diffraction
- b. refraction
- c. interference
- d. reflection

_____ 20) What color does a yellow lemon appear when blue light shines on it?

- a. green
- b. blue
- c. yellow
- d. black

_____ 21) Polarized light is _____.

- a. light that vibrates in many different directions.
- b. Used to produce 3-D movie effects.
- c. produced in most fluorescent bulbs
- d. Both A and B.

_____ 22) When you stare at a blue object and then look at a white sheet of paper, you will see the object in its complimentary color which is _____.

- a. yellow
- b. magenta
- c. red
- d. cyan

_____ 23) Our sky is blue because _____.

- a. The particles in our atmosphere are scattered by the blue light.
- b. The particles in our atmosphere scatter the high frequencies of light.
- c. The particles in our atmosphere actually have a bluish tint.
- d. The particles in our atmosphere reflect blue light to our eyes.

_____ 24) What happens when a ray of light enters glass from air?

- a. It slows down and is bent away from the normal.
- b. It speeds up and is bent towards the normal.
- c. It slows down and is bent towards the normal.
- d. It speeds up and is bent away from the normal.

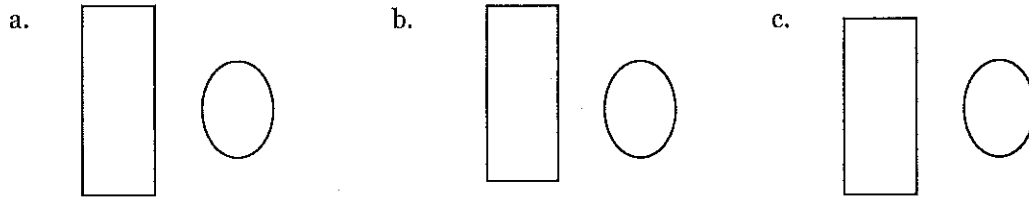
_____ 25) In which case will light be refracted?

- a. Traveling from air into glass along the normal line.
- b. At a diamond to air boundary with an incident angle of 45°
- c. At an air to diamond boundary with an incident angle of 35° .
- d. When it hits the hood of a shiny car.

_____ 26) Why can scientists ignore the gravitational force when measuring the electrostatic force between two electrons?

- a. There is no gravitational force between two electrons.
- b. The gravitational force between two electrons is extremely small.
- c. Gravitational forces are almost always ignored by scientists.
- d. We do not know the mass of an electron and cannot calculate gravitational force between electrons.

_____ 27) Which one of the following shows what happens on the surface of a wall when a positively charged object is brought close to the wall?



_____ 28) During a storm, clouds become very highly negatively charged. What charge do the clouds induce on the ground below?

- a. negative b. positive
c. no charge until a lightening bolt strikes the ground

_____ 29) When a charged object is brought near a neutral object, they will _____.

- a. attract b. repel c. neither

_____ 36) A 500 kg car initially moving at 2.0 m/s collides with a stationary truck that is twice as massive. The two vehicles get tangled together. How fast are they moving after the collision?

- a. 2.0 m/s b. 0.67 m/s
c. 0.75 m/s d. 1.0 m/s



_____ 37) A 65 kg man running at 3.0 m/s hits a telephone pole and stops in 0.78 s. Calculate the impact force on the man.

- a. 22 N b. 83 N c. 152 N d. 250 N

_____ 38) Two objects, one twice as massive as the other, are 6.0 cm apart and experience 4.6×10^{-7} N of gravitational force. Calculate the mass of the objects.

- a. 8.3 kg and 17 kg b. 14 kg and 28 kg
c. 3.5 kg and 7.0 kg d. 352 kg and 704 kg

_____ 39) Two objects have masses of 6.8 kg and 4.9 kg. How far apart are the masses if they exert 2.8×10^{-7} N of gravitational force on each other?

- a. 126 m b. 11.2 m c. 0.089 m d. 0.0079 m

_____ 40) A remote control uses infrared waves of wavelength 812 nm. What is the frequency of these waves?

- a. 0.42 Hz b. 3.7×10^5 Hz c. 3.7×10^{14} Hz d. 1.25×10^6 Hz

_____ 41) A ray of light passes from air into quartz ($n = 1.54$) with an incident angle of 25° . Calculate the angle of refraction.

- a. 16° b. 36° c. 41° d. 0.27°

_____ 42) A ray of light leaves diamond ($n = 2.49$) and enters an unknown substance as shown below. Calculate the index of refraction for the unknown substance.

- a. 1.82 b. 3.41 c. 1.35

