Stanford International School
Science Department

Academic year 2024-2025
Quarter 1 Examination
Physics G12

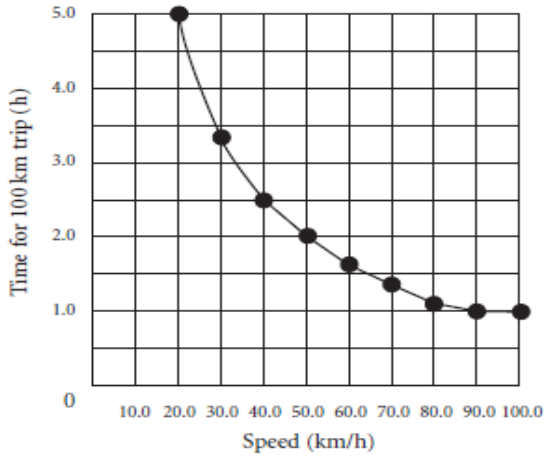
Multiple Choice

Choose the best answer from the options that follow each question.

____ 1. Which of the following is an area of physics that studies motion and its causes?
a. thermodynamics
b. mechanics
c. quantum mechanics
d. optics

____ 2. What two dimensions, in addition to mass, are commonly used by physicists to derive additional measurements?
a. length and width
b. area and mass
c. length and time
d. velocity and time

____ 3.

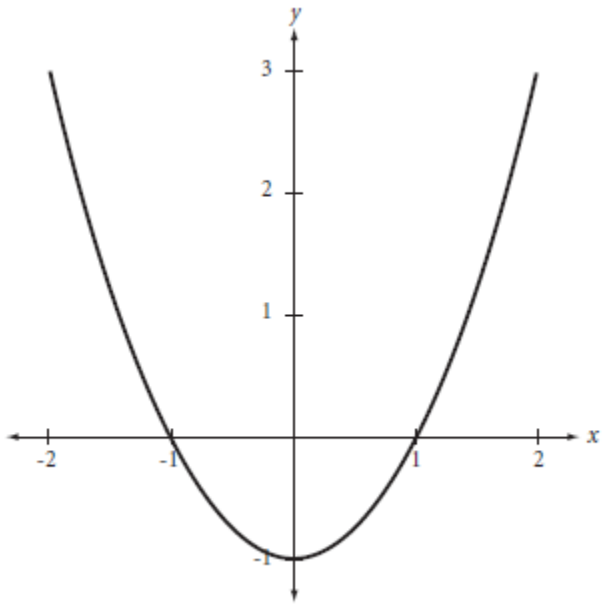


The time required to make a trip of 100.0 km is measured at various speeds. From the graph above, what speed will allow the trip to be made in 2 hours?
a. 20.0 km/h
b. 40.0 km/h
c. 50.0 km/h
d. 90.0 km/h

____ 4. A hiker uses a compass to navigate through the woods. Identify the area of physics that this involves.
a. thermodynamics
b. relativity
c. electromagnetism
d. quantum mechanics

____ 5. Diagrams are *not* designed to
a. show relationships between concepts.
b. show setups of experiments.
c. measure an event or a situation.
d. label parts of a model.

____ 6.



Which of the following equations best describes the graph above?
a. $y = x^2 + 1$
b. $y = x^2 - 1$
c. $y = -x^2 + 1$
d. $y = -x^2 - 1$

____ 7. Which expression has the same dimensions as an expression yielding a value for acceleration (m/s^2)? (Δv has units of m/s.)
   a. $\Delta v/(\Delta t)^2$
   b. $\Delta v/(\Delta x)^2$
   c. $(\Delta v)^2/\Delta t$
   d. $(\Delta v)^2/\Delta x$

____ 8. Which of the following situations represents a negative displacement? (Assume positive position is measured vertically upward along a *y*-axis.)
   a. A cat stands on a tree limb.
   b. A cat jumps from the ground onto a tree limb.
   c. A cat jumps from a lower tree limb to a higher one.
   d. A cat jumps from a tree limb to the ground.

____ 9. If you know a car's acceleration, the information you must have to determine if the car's velocity is increasing is the
   a. direction of the car's initial velocity.
   b. direction of the car's acceleration.
   c. initial speed of the car.
   d. final velocity of the car.

____10. Which would hit the ground first if dropped from the same height in a vacuum—a feather or a metal bolt?
   a. the feather
   b. the metal bolt
   c. They would hit the ground at the same time.
   d. They would be suspended in a vacuum.

Choose the best answer from the options that follow each question.

____11. Which of the following is the equation for average velocity?
   a. $v_{avg} = \frac{\Delta x}{\Delta t}$
   b. $v_{avg} = \frac{\Delta t}{\Delta x}$
   c. $v_{avg} = \Delta x \Delta t$
   d. $v_{avg} = \frac{v_i - v_f}{2}$

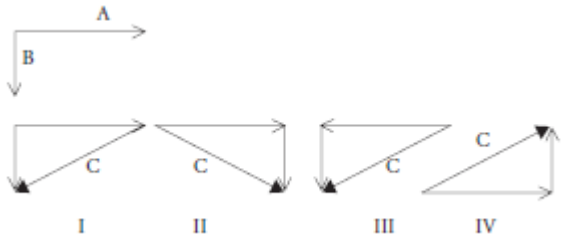
____12. When a car's velocity is negative and its acceleration is negative, what is happening to the car's motion?
a. The car slows down.
b. The car speeds up.
c. The car travels at constant speed.
d. The car remains at rest.

____13. Which of the following line segments on a velocity versus time graph is physically impossible?
a. horizontal line
b. straight line with positive slope
c. straight line with negative slope
d. vertical line

____14. A baseball catcher throws a ball vertically upward and catches it in the same spot as it returns to the mitt. At what point in the ball's path does it experience zero velocity and nonzero acceleration at the same time?
a. midway on the way up
b. at the top of its path
c. the instant it leaves the catcher's hand
d. the instant before it arrives in the catcher's mitt

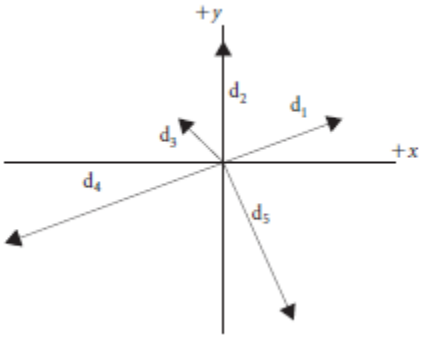
Choose the best answer from the options that follow each question.

____15.



In the figure above, which diagram represents the vector addition, **C** = **A** + **B**?
a. I
b. II
c. III
d. IV

____16.



How many displacement vectors shown in the figure above have horizontal components?

a. 2
b. 3
c. 4
d. 5

____17. A passenger on a bus moving east sees a man standing on a curb.From the passenger's perspective, the man appears to

a. stand still.
b. move west at a speed that is less than the bus's speed.
c. move west at a speed that is equal to the bus's speed.
d. move east at a speed that is equal to the bus's speed.

Choose the best answer from the options that follow each question.

____18. Which of the following is the tendency of an object to maintain its state of motion?

a. acceleration
b. inertia
c. force
d. velocity

____19. If a nonzero net force is acting on an object, then the object is definitely

a. at rest.
b. moving with a constant velocity.
c. being accelerated.
d. losing mass.

____20. Which statement about the acceleration of an object is correct?
a. The acceleration of an object is directly proportional to the net external force acting on the object and inversely proportional to the mass of the object.
b. The acceleration of an object is directly proportional to the net external force acting on the object and directly proportional to the mass of the object.
c. The acceleration of an object is inversely proportional to the net external force acting on the object and inversely proportional to the mass of the object.
d. The acceleration of an object is inversely proportional to the net external force acting on the object and directly proportional to the mass of the object.

____21. Newton's third law of motion involves the interactions of
a. one object and one force.
b. one object and two forces.
c. two objects and one force.
d. two objects and two forces.

____22. A measure of the quantity of matter is
a. density.
b. weight.
c. force.
d. mass.

____23. A change in the gravitational force acting on an object will affect the object's
a. mass.
b. coefficient of static friction.
c. weight.
d. inertia.

Choose the best answer from the options that follow each question.

____24. What is the common formula for work?
a. $W = F\Delta_v$
b. $W = Fd$
c. $W = Fd^2$
d. $W = F^2d$

____25. If both the mass and the velocity of a ball were tripled, the kinetic energy of the ball would increase by a factor of
a. 3.
b. 6.
c. 9.
d. 27.

____26. If friction is the only force acting on an object during a given physical process, which of the following assumptions can be made in regard to the object's kinetic energy?
a. The kinetic energy decreases.
b. The kinetic energy increases.
c. The kinetic energy remains constant.
d. The kinetic energy decreases and then increases.

____27. Why doesn't the principle of mechanical energy conservation hold in situations when frictional forces are present?
a. Kinetic energy is not completely converted to a form of potential energy.
b. Potential energy is completely converted to a form of gravitational energy.
c. Chemical energy is not completely converted to electrical energy.
d. Kinetic energy is completely converted to a form of gravitational energy.

Choose the best answer from the options that follow each question.

____28. Two skaters stand facing each other. One skater's mass is 60 kg, and the other's mass is 72 kg. If the skaters push away from each other without spinning,
a. the lighter skater has less momentum.
b. their momenta are equal but opposite.
c. their total momentum doubles.
d. their total momentum decreases.

Choose the best answer from the options that follow each question.

____29. A person sitting in a chair with wheels stands up, causing the chair to roll backward across the floor. The momentum of the chair
a. was zero while stationary and increased when the person stood.
b. was greatest while the person sat in the chair.
c. remained the same.
d. was zero when the person got out of the chair and increased while the person sat.

____30. Two objects with different masses collide and bounce back after an elastic collision. Before the collision, the two objects were moving at velocities equal in magnitude but opposite in direction. After the collision,
a. the less massive object had gained momentum.
b. the more massive object had gained momentum.
c. both objects had the same momentum.
d. both objects lost momentum.

Problems

31.

	Trial 1	Trial 2	Trial 3	Trial 4
0.0 s	20.5° C	21.3° C	20.8° C	21.0° C
5.0 s	21.0° C	22.9° C	21.4° C	21.7° C
10.0 s	21.6° C	24.1° C	22.0° C	22.3° C
15.0 s	22.2° C	26.8° C	22.7° C	22.8° C
20.0 s	23.0° C	28.2° C	23.2° C	23.3° C

Four trials of a chemical reaction were completed, and the change in temperature ΔT was measured every five seconds. Based on the data in the table above, answer the following questions.
Are there any unexpected or unusual results? Explain your answer. What is the general relationship between temperature and time? Disregarding any trial(s) with unexpected results, express this relationship in the form of a general equation.

Answers:
A- Yes; trial 2 has a much greater ΔT over the same period of time; temperature increases as time decreases;
the equation is $y = mx$. $\Delta T = 0.52\Delta t$
B- Yes; trial 2 has a much greater ΔT over the same period of time; temperature increases as time decreases;
the equation is $y = mx$. $\Delta T = 0.12\Delta t$
C- Yes; trial 2 has a much greater ΔT over the same period of time; temperature increases as time increases;
the equation is $y = mx$. $\Delta T = 0.12\Delta t$
D- Yes; trial 3 has a much greater ΔT over the same period of time; temperature decreases as time increases;
the equation is $y = mx$. $\Delta T = 0.12\Delta t$

32. A skater glides off a frozen pond onto a patch of ground at a speed of 1.8 m/s. Here she is slowed at a constant rate of 3.00 m/s$_2$. How fast is the skater moving when she has slid 0.37 m across the ground?

A. 1.0 m/s
B. 2.0 m/s
C. 3.0 m/s
D. 4.0 m/s

33. Human reaction time is usually about 0.20 s. If your lab partner holds a ruler between your finger and thumb and releases it without warning, how far can you expect the ruler to fall before you catch it?
(Disregard air resistance. $a = -g = -9.81$ m/s^2.)

A. at least 0.40 m
B. at least 0.30 m
C. at least 0.20 m
D. at least 0.10 m

34. A pair of glasses are dropped from the top of a 32.0 m high stadium. A pen is dropped 2.00 s later. How high above the ground is the pen when the glasses hit the ground?
(Disregard air resistance. $a = -g = -9.81$ m/s^2.)

A. 15.5m
B. 20.5m
C. 25.5m
D. 30.5m

35. Vector **A** is 3.2 m in length and points along the positive *y*-axis. Vector **B** is 4.6 m in length and points along a direction 195° counterclockwise from the positive *x*-axis. What is the magnitude of the resultant when vectors **A** and **B** are added?

A. 4.1 m
B. 4.3 m
C. 4.6 m
D. 4.9 m

36. A model rocket flies horizontally off the edge of a cliff at a velocity of 50.0m/s. If the canyon below is 100.0 m deep, how far from the edge of the cliff does the model rocket land? ($a_y = -g = -9.81$ m/s^2)

A. 226 m
B. 206 m
C. 186 m
D. 166 m

37. Basking in the sun, a 1.10-kg lizard lies on a flat rock tilted at an angle of 15.0° with respect to the horizontal. What is the magnitude of the normal force exerted by the rock on the lizard?

A. 8.4 N
B. 10.4 N
C. 12.4 N
D. 14.4 N

38. A professional skier starts from rest and reaches a speed of 56 m/s on a ski slope angled 30.0° above the horizontal. Using the work-kinetic energy theorem and disregarding friction, find the minimum distance along the slope the skier would have to travel in order to reach this speed.

A. 320 m
B. 340 m
C. 360 m
D. 380 m

39. A 6.0×10^{-2} kg tennis ball moves at a velocity of 12 m/s. The ball is struck by a racket, causing it to rebound in the opposite direction at a speed of 18 m/s. What is the change in the ball's momentum?

A. −1.2 kg•m/s
B. −1.4 kg•m/s
C. −1.8 kg•m/s
D. −2.0 kg•m/s

40. An astronaut with a mass of 85 kg is outside a space capsule when the tether line breaks. To return to the capsule, the astronaut throws a 2.0 kg wrench away from the capsule at a speed of 14 m/s. At what speed does the astronaut move toward the capsule?

A. 0.30 m/s
B. 0.33 m/s
C. 0.36 m/s
D. 0.39 m/s

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End

Physics High School

Quarter 1 Exam. Answer Sheet

	A	B	C	D	E
Q1	○	○	○	○	○
Q2	○	○	○	○	○
Q3	○	○	○	○	○
Q4	○	○	○	○	○
Q5	○	○	○	○	○
Q6	○	○	○	○	○
Q7	○	○	○	○	○
Q8	○	○	○	○	○
Q9	○	○	○	○	○
Q10	○	○	○	○	○
Q11	○	○	○	○	○
Q12	○	○	○	○	○
Q13	○	○	○	○	○
Q14	○	○	○	○	○
Q15	○	○	○	○	○
Q16	○	○	○	○	○
Q17	○	○	○	○	○
Q18	○	○	○	○	○
Q19	○	○	○	○	○
Q20	○	○	○	○	○

	A	B	C	D	E
Q21	○	○	○	○	○
Q22	○	○	○	○	○
Q23	○	○	○	○	○
Q24	○	○	○	○	○
Q25	○	○	○	○	○
Q26	○	○	○	○	○
Q27	○	○	○	○	○
Q28	○	○	○	○	○
Q29	○	○	○	○	○
Q30	○	○	○	○	○
Q31	○	○	○	○	○
Q32	○	○	○	○	○
Q33	○	○	○	○	○
Q34	○	○	○	○	○
Q35	○	○	○	○	○
Q36	○	○	○	○	○
Q37	○	○	○	○	○
Q38	○	○	○	○	○
Q39	○	○	○	○	○
Q40	○	○	○	○	○

Student Name: ----------

Student Class: ----------