gp 1-2 practice

Multiple Choice

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. Listening to your favorite radio station involves which area of physics?
   a. optics
   b. thermodynamics
   c. vibrations and wave phenomena
   d. relativity

3. In the steps of the scientific method, what is the next step after formulating and objectively testing hypotheses?
   a. interpreting results
   b. stating conclusions
   c. conducting experiments
   d. making observations and collecting data

4. Which statement about models is not correct?
   a. Models describe only part of reality.
   b. Models help build hypotheses.
   c. Models help guide experimental design.
   d. Models manipulate a single variable or factor in an experiment.

5. The SI base unit used to measure mass is the
   a. meter.
   b. second.
   c. kilogram.
   d. liter.

6. A lack of precision in scientific measurements typically arises from
   a. limitations of the measuring instrument.
   b. human error.
   c. lack of calibration.
   d. too many significant figures.

7. Which of the following units is the SI unit of velocity?
   a. meter
   b. meter\cdot second
   c. meter per second
   d. second per meter

8. In the graph above, what is the correct description of any location to the left of the zero?
   a. negative displacement
   b. negative distance
   c. negative position
   d. negative change of displacement
9. According to the graph above, the cat has the fastest speed during which interval?
   a. 0.0–5.0 s  
   b. 5.0–10.0 s  
   c. 10.0–15.0 s  
   d. 15.0–20.0 s

10. According to the graph above, during which interval does the cat have the greatest positive velocity?
   a. 0.0–5.0 s  
   b. 5.0–10.0 s  
   c. 10.0–15.0 s  
   d. 15.0–20.0 s

11. Which of the following is the equation for acceleration?
   a. \( a = \frac{\Delta t}{\Delta \nu} \)  
   b. \( a = \frac{\Delta \nu}{\Delta t} \)  
   c. \( a = \Delta \nu \Delta t \)  
   d. \( \frac{\nu_f - \nu_i}{t_f - t_i} \)

12. When a car’s velocity is positive 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. The graph above describes the motion of a cyclist. During the interval shown, the cyclist is
a. slowing down.
b. speeding up.
c. traveling at the same speed.
d. at rest.

14. What does the graph above illustrate about acceleration?
   a. The acceleration varies.
   b. The acceleration is zero.
   c. The acceleration is constant.
   d. The acceleration increases then becomes constant.

15. Objects that are falling toward Earth in free fall move
   a. faster and faster.
b. slower and slower.
c. at a constant velocity.
d. slower then faster.
Short Answer

16. Two areas within physics are mechanics and quantum mechanics. Distinguish between these two areas.

17. List the steps in the scientific method.

18. Convert $92 \times 10^3$ km to decimeters using scientific notation.

19. Explain how a dog that has moved can have a displacement of zero.

Problem

20. A horse trots past a fencepost located 14 m to the left of a gatepost. It then passes another fencepost located 15 m to the right of the gatepost 14 s later. What is the average velocity of the horse?

21. A sports car traveling at 24.7 m/s slows at a constant rate to a stop in 16.00 s. What is the displacement of the sports car in this time interval?

22. A toy car is given an initial velocity of 7.0 m/s and experiences a constant acceleration of 1.0 m/s$^2$. What is the final velocity after 6.0 s?

23. A soccer ball is moving horizontally at a speed of 4.0 m/s. It then undergoes a constant acceleration. After 8.00 s, the ball is moving at 4.8 m/s. What is the ball’s displacement?

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

25. Someone throws a rubber ball vertically upward from the roof of a building 7.58 m in height. The ball rises, then falls. It just misses the edge of the roof, and strikes the ground. If the ball is in the air for 5.32 s, what was its initial velocity? (Disregard air resistance. $a = -g = -9.81$ m/s$^2$.)
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Answer Section

MULTIPLE CHOICE

1. ANS: B  PTS: 1  DIF: I  OBJ: 1-1.1
2. ANS: C  PTS: 1  DIF: I  OBJ: 1-1.1
3. ANS: A  PTS: 1  DIF: I  OBJ: 1-1.2
4. ANS: D  PTS: 1  DIF: I  OBJ: 1-1.3
5. ANS: C  PTS: 1  DIF: I  OBJ: 1-2.1
7. ANS: C  PTS: 1  DIF: I  OBJ: 2-1.1
8. ANS: C  PTS: 1  DIF: I  OBJ: 2-1.1
9. ANS: C  PTS: 1  DIF: II  OBJ: 2-1.3
10. ANS: A  PTS: 1  DIF: II  OBJ: 2-1.3
11. ANS: B  PTS: 1  DIF: I  OBJ: 2-2.1
12. ANS: A  PTS: 1  DIF: II  OBJ: 2-2.1
13. ANS: B  PTS: 1  DIF: I  OBJ: 2-2.2
14. ANS: A  PTS: 1  DIF: I  OBJ: 2-2.2
15. ANS: A  PTS: 1  DIF: I  OBJ: 2-3.3

SHORT ANSWER

16. ANS:
Answers may vary. Sample answer: Mechanics studies the interactions of large objects, while quantum mechanics studies the behavior of subatomic (or very small) particles.

PTS: 1  DIF: I  OBJ: 1-1.1

17. ANS:
The steps in the scientific method include making observations and collecting data that lead to a question, formulating and objectively testing hypotheses by experiments, interpreting results and revising hypotheses if necessary, and stating conclusions in a form that can be evaluated by others.

PTS: 1  DIF: I  OBJ: 1-1.2

18. ANS:
9.2 \times 10^8 \text{ dm}

Solution

\[
\left(92 \times 10^3 \text{ km}\right) \left(\frac{10^4 \text{ dm}}{1 \text{ km}}\right) = 92 \times 10^7 \text{ dm} = 9.2 \times 10^8 \text{ dm}
\]

PTS: 1  DIF: IIIA  OBJ: 1-2.2

19. ANS:
The dog’s initial position and its final position are the same position.
PROBLEM

20. ANS:
2.1 m/s, to the right

Given
\( x_i = -14 \text{ m} \)
\( x_f = 15 \text{ m} \)
\( \Delta t = 14 \text{ s} \)

Solution

\[
\nu_{avg} = \frac{\Delta x}{\Delta t} = \frac{x_f - x_i}{\Delta t} = \frac{(15 \text{ m}) - (-14 \text{ m})}{14 \text{ s}} = 2.1 \text{ m/s, to the right}
\]

PTS: 1 DIF: IIIA OBJ: 2-1.1

21. ANS:
198 m

Given
\( v_i = 24.7 \text{ m/s} \)
\( v_f = 0.0 \text{ m/s} \)
\( \Delta t = 16.00 \text{ s} \)

Solution

\[
\Delta x = \frac{1}{2} (v_i + v_f)\Delta t = \frac{1}{2} (24.7 \text{ m/s} + 0.0 \text{ m/s})(16.00 \text{ s}) = 198 \text{ m}
\]

PTS: 1 DIF: IIIA OBJ: 2-2.3

22. ANS:
13.0 m/s

Given
\( v_i = 7.0 \text{ m/s} \)
\( a = 1.0 \text{ m/s}^2 \)
\( \Delta t = 6.0 \text{ s} \)

Solution

\[
\nu_f = \nu_i + a\Delta t = 7.0 \text{ m/s} + (1.0 \text{ m/s}^2)(6.0 \text{ s}) = 13.0 \text{ m/s}
\]

PTS: 1 DIF: IIIB OBJ: 2-2.3

23. ANS:
35.2 m

Given
\( v_i = 4.0 \text{ m/s} \)
\[ \nu_f = 4.8 \text{ m/s} \]
\[ \Delta t = 8.00 \text{ s} \]

**Solution**
\[
\Delta x = \frac{1}{2} (\nu_i + \nu_f) \Delta t = \frac{1}{2} (4.0 \text{ m/s} + 4.8 \text{ m/s})(8.00 \text{ s}) = \frac{1}{2} (8.8 \text{ m/s})(8.00 \text{ s}) = 35.2 \text{ m}
\]

**PTS:** 1  \hspace{1cm} **DIF:** IIIB  \hspace{1cm} **OBJ:** 2-2.3

24. **ANS:**
at least 0.20 m

**Given**
\[ a = -g = -9.81 \text{ m/s}^2 \]
\[ \Delta t = 0.20 \text{ s} \]
\[ \nu_i = 0.0 \text{ m/s} \]

**Solution**
\[
\Delta x = \nu_i \Delta t + \frac{1}{2} a (\Delta t)^2
\]
\[
\Delta x = (0 \text{ m/s})(0.20 \text{ s}) + \frac{1}{2} (-9.81 \text{ m/s}^2)(0.20 \text{ s})^2 = -0.20 \text{ m}
\]

**PTS:** 1  \hspace{1cm} **DIF:** IIIA  \hspace{1cm} **OBJ:** 2-3.2

25. **ANS:**
24.7 m/s

**Given**
\[ a = -g = -9.81 \text{ m/s}^2 \]
\[ \Delta x = -7.58 \text{ m} \]
\[ \Delta t = 5.32 \text{ s} \]

**Solution**
\[
\Delta x = \nu_i \Delta t + \frac{1}{2} a (\Delta t)^2
\]
\[
\nu_i = \frac{\Delta x}{\Delta t} - \frac{1}{2} a \Delta t = \frac{-7.58 \text{ m}}{5.32 \text{ s}} - \frac{(-9.81 \text{ m/s}^2)(5.32 \text{ s})}{2}
\]
\[
\nu_i = -1.42 \text{ m/s} + 26.1 \text{ m/s} = 24.7 \text{ m/s}
\]

**PTS:** 1  \hspace{1cm} **DIF:** IIIB  \hspace{1cm} **OBJ:** 2-3.2