Questions – Linear Motion

- 1.) A car increases its speed from 9.6 meters per second to 11.2 meters per second in 4.0 seconds. The average acceleration of the car during this 4.0-second interval is
 - (1) 0.40 m/s^2 (2) 2.4 m/s^2 (3) 2.8 m/s^2 (4) 5.2 m/s^2
- 2.) What is the speed of a 2.5-kilogram mass after it has fallen freely from rest through a distance of 12 meters?
 - (1) 4.8 m/s (2) 15 m/s (3) 30. m/s (4) 43 m/s
- 3.) A cart travels with a constant nonzero acceleration along a straight line. Which graph best represents the relationship between the distance the cart travels and time of travel?



4.) Which graph best represents the relationship between the acceleration of an object falling freely near the surface of Earth and the time that it falls?



- 5.) An astronaut standing on a platform on the Moon drops a hammer. If the hammer falls 6.0 meters vertically in 2.7 seconds, what is its acceleration?
 - (1) 1.6 m/s^2 (2) 2.2 m/s^2 (3) 4.4 m/s^2 (4) 9.8 m/s^2
- 6.) A child walks 5.0 meters north, then 4.0 meters east, and finally 2.0 meters south. What is the magnitude of the resultant displacement of the child after the entire walk?
 - (1) 1.0 m (2) 5.0 m (3) 3.0 m (4) 11.0 m

- 7.) A race car starting from rest accelerates uniformly at a rate of 4.90 meters per second². What is the car's speed after it has traveled 200. meters?
 - (1) 1960 m/s (2) 62.6 m/s (3) 44.3 m/s (4) 31.3 m/s
- 8.) An observer recorded the following data for the motion of a car undergoing constant acceleration.

What was the magnitud	e of the acceleration of the car?	Time (s)	Speed (m/s)
$(\mathbf{A}) \mathbf{A} \mathbf{O} \mathbf{A}^2$	(0) (0) (1) (1)	3.0	4.0
(1) 1.3 m/s ⁻ (2) 2.0 m/s ²	(3) 1.5 m/s [−] (4) 4 5 m/s ²	5.0	7.0
(2) 2.0 11/0		6.0	8.5

- 9.) A ball is thrown straight downward with a speed of 0.50 meter per second from a height of 4.0 meters. What is the speed of the ball 0.70 second after it is released? [Neglect friction.]
 - (1) 0.50 m/s (2) 7.4 m/s (3) 9.8 m/s (4) 15 m/s
- 10.) A race car starting from rest accelerates uniformly at a rate of 4.90 meters per second². What is the car's speed after it has traveled 200. meters?

(1) 1960 m/s	(2) 44.3 m/s	(3) 62.6 m/s	(4) 31.3 m/s
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11.) The mass of a paper clip is approximately

(1) 1 × 10 ⁶ ka	(2) 1 × 10 ⁻³ ka	(3) 1 × 10 ³ ka	(4) 1 × 10 ⁻⁶ ka
(1) 1×10 kg	(z) i \sim 10 kg	(0) i \wedge 10 kg	(+) I ^ IU KY

- 12.) An egg is dropped from a third-story window. The distance the egg falls from the window to the ground is closest to
 - (3) 10^1 m (4) 10^3 m (1) 10^0 m (2) 10^2 m

- 13.) A 1.00-kilogram mass was dropped from rest from a height of 25.0 meters above Earth's surface. The speed of the mass was determined at 5 meter intervals and recorded in the data table.
 - a) Plot the data points for speed versus height above Earth's surface on the grid below.



Height Above Earth's Surface (m)	Speed (m/s)
25.0	0.0
20.0	9.9
15.0	14.0
10.0	17.1
5.0	19.8
0	22.1

Height Above Earth's Surface (m)

- b) Draw the line or curve of best fit.
- c) Using your graph, determine the speed of the mass after it has fallen a vertical distance of 12.5 m.

Questions – Forces

1.) A 2.00-kilogram object weighs 19.6 newtons on Earth. If the acceleration due to gravity on Mars is 3.71 meters per second², what is the object's mass on Mars?

(1) 2.64 kg (2) 19.6 N (3) 2.00 kg (4) 7.42 N

2.) A force of 1 newton is equivalent to 1



- 3.) A 6.0-newton force and an 8.0-newton force act concurrently on a point. As the angle between these forces increases from 0° to 90°, the magnitude of their resultant
 - (1) decreases (2) increases (3) remains the same
- 4.) Which object has the greatest inertia?
 - (1) a 5.0-kg object moving at a speed of 5.0 m/s
 - (2) a 10.-kg object moving at a speed of 3.0 m/s
 - (3) a 15-kg object moving at a speed of 1.0 m/s
 - (4) a 20.-kg object at rest
- 5.) What is the magnitude of the force needed to keep a 60.-newton rubber block moving across level, dry asphalt in a straight line at a constant speed of 2.0 meters per second?
 - (1) 40. N (3) 60. N (2) 51 N (4) 120 N
- 6.) A cart travels with a constant nonzero acceleration along a straight line. Which graph best represents the relationship between the distance the cart travels and time of travel?



7.) The diagram below shows a 4.0-kilogram object accelerating at 10. meters per second² on a rough horizontal surface.



 8.) A car moves with a constant speed in a clockwise direction around a circular path of radius *r*, as represented in the diagram. When the car is in the position shown, its acceleration is directed toward the

(1) north	(3) west
(2) south	(4) east



- 9.) A 0.50-kilogram object moves in a horizontal circular path with a radius of 0.25 meter at a constant speed of 4.0 meters per second. What is the magnitude of the object's acceleration?
 - (1) 8.0 m/s² (2) 32 m/s² (3) 16 m/s²
- (4) 64 m/s²
- 10.) The diagram shows two bowling balls, *A* and *B*, each having a mass of 7.00 kilograms, placed 2.00 meters apart. What is the magnitude of the gravitational force exerted by ball *A* on ball *B*?

(1) 8.17 × 10 ^{−9} N	(3) 8.17 × 10 ⁻¹⁰ N
(2) 1.63 × 10 ⁻⁹ N	(4) 1.17 × 10 ⁻¹⁰ N



- 11.) As an astronaut travels from the surface of Earth to a position that is four times as far away from the center of Earth, the astronaut's
 - (1) mass decreases (3) mass remains the same
 - (2) weight increases (4) weight remains the same



Base your answers to questions 13 through 15 on the passage and data table below.

The net force on a planet is due primarily to the other planets and the Sun. By taking into account all the forces acting on a planet, investigators calculated the orbit of each planet. A small discrepancy between the calculated orbit and the observed orbit of the planet Uranus was noted. It appeared that the sum of the forces on Uranus did not equal its mass times its acceleration, unless there was another force on the planet that was not included in the calculation. Assuming that this force was exerted by an unobserved planet, two scientists working independently calculated where this unknown planet must be in order to account for the discrepancy. Astronomers pointed their telescopes in the predicted direction and found the planet we now call Neptune.

13.) What fundamental force is the author referring to in this passage as a force between planets?

Deta Table	
1.99 × 10 ⁹⁰ kg	
8.73 x 10 ⁹⁵ kg	
1.03 x 10 ⁹⁶ kg	
2.87 x 10 ¹² m	
4.50 x 10 ¹² m	

14.) The diagram below represents Neptune, Uranus, and the Sun in a straight line. Neptune is 1.63 × 10¹² meters from Uranus. Calculate the magnitude of the interplanetary force of attraction between Uranus and Neptune at this point.



15.) The magnitude of the force the Sun exerts on Uranus is 1.41 × 10²¹ N. Explain how it is possible for the Sun to exert a greater force on Uranus than Neptune exerts on Uranus.