

### Question 1

1. Which object is accelerating?

|  |  |                                                                                                          |
|--|--|----------------------------------------------------------------------------------------------------------|
|  |  | A helium balloon floating motionless in the middle of a room                                             |
|  |  | A spaceship is traveling directly toward Alpha Centauri with a constant speed of half the speed of light |
|  |  | A bus slowing down before crossing train tracks                                                          |
|  |  | A boat is crossing a lake moving due East at a constant speed of 5 miles per hour                        |

1.33 points

### Question 2

2. Which object has zero net force acting on it.

|  |  |                                                                 |
|--|--|-----------------------------------------------------------------|
|  |  | A car making a left turn around a corner                        |
|  |  | A car moving on a straight road at a constant 50 miles per hour |
|  |  | A Moon moving in orbit around Jupiter                           |
|  |  | A bike turning right at an intersection                         |

1.33 points

### Question 3

3. If you went to Mars, how would your mass and weight change?

|  |  |                                               |
|--|--|-----------------------------------------------|
|  |  | Mass remains the same, but the weight is less |
|  |  | Mass is more, but the weight is the same      |
|  |  | Mass is less, but the weight is the same      |
|  |  | Mass remains the same, but the weight is more |

1.33 points

### Question 4

4. Why do astronauts orbiting on the space station feel weightless?

|  |  |                                  |
|--|--|----------------------------------|
|  |  | There is no gravity in space     |
|  |  | They are not accelerating at all |

|  |  |                                              |
|--|--|----------------------------------------------|
|  |  | Trick question, their weight wouldn't change |
|  |  | They are in freefall as they orbit the Earth |

1.33 points

#### Question 5

5. Which of the following is MOST related to Newton's first law of motion?

|  |  |                                                                                    |
|--|--|------------------------------------------------------------------------------------|
|  |  | firing rockets to the left will accelerate your ship to the right                  |
|  |  | The rocket pushes out gas backwards, and the gas pushes the rocket forward         |
|  |  | the larger the thrust of the rocket, the more your ship will accelerate            |
|  |  | with the engines off, a spaceship moves off in a straight line at a constant speed |

1.33 points

#### Question 6

6. Which of the following is not a conserved quantity in nature?

|  |  |                  |
|--|--|------------------|
|  |  | Energy           |
|  |  | Surface gravity  |
|  |  | Momentum         |
|  |  | Angular Momentum |

1.33 points

#### Question 7

7. What happens to the gravitational potential energy of a collapsing gas cloud?

|  |  |                                                                                 |
|--|--|---------------------------------------------------------------------------------|
|  |  | It grows larger as the cloud collapses                                          |
|  |  | It remains constant during the entire collapse                                  |
|  |  | It is converted into kinetic energy causing the gas in the cloud to move faster |
|  |  | Trick question, it has no potential energy                                      |

1.33 points

#### Question 8

8. which of the following is NOT important to determine the gravity between two objects?

|  |  |                              |
|--|--|------------------------------|
|  |  | The mass of the first object |
|--|--|------------------------------|

|  |  |                                  |
|--|--|----------------------------------|
|  |  | The mass of the second object    |
|  |  | The distance between the objects |
|  |  | The objects' composition         |

1.33 points

#### Question 9

9. What would happen to the orbit of the Earth if the Sun disappeared?

|  |  |                                                          |
|--|--|----------------------------------------------------------|
|  |  | It wouldn't change                                       |
|  |  | It would move off in a straight line at a constant speed |
|  |  | It would slowly spiral outward                           |
|  |  | It would slowly spiral inward                            |

1.33 points

#### Question 10

10. What would happen to the orbit of the Earth if the Sun were replaced with a giant rock that had the exact same mass?

|  |  |                                                          |
|--|--|----------------------------------------------------------|
|  |  | It would slowly spiral toward the rock                   |
|  |  | It would move off in a straight line at a constant speed |
|  |  | It wouldn't change                                       |
|  |  | It would slowly spiral away from the rock                |

1.33 points

#### Question 11

11. In which case would a car have the most kinetic energy?

|  |  |                         |
|--|--|-------------------------|
|  |  | It is driving at 20 mph |
|  |  | It is parked            |
|  |  | it is driving at 45 mph |
|  |  | It is driving at 65 mph |

1.33 points

#### Question 12

12. Which of the following is false?

|  |  |                                                                                                                                |
|--|--|--------------------------------------------------------------------------------------------------------------------------------|
|  |  | If a rock in space passed Earth at the right distance and velocity, then it could get captured by Earth, making a second moon. |
|  |  | If the moon were closer to Earth, then we could have three high tides per day                                                  |

|  |  |                                                                                                                      |
|--|--|----------------------------------------------------------------------------------------------------------------------|
|  |  | In a vacuum chamber with all the air removed, a feather and a hammer would fall at the same rate toward the ground   |
|  |  | Using the size of Titan's orbit and its orbital period around Saturn, it is possible to calculate the mass of Saturn |

1.33 points

#### Question 13

13. Which of the following is MOST related to Newton's 3rd law of motion?

|  |  |                                                                       |
|--|--|-----------------------------------------------------------------------|
|  |  | The hockey puck slides in a straight line with a constant speed       |
|  |  | Firing rocket thrusters to the left makes your ship move to the right |
|  |  | The hockey puck remains stationary until acted on                     |
|  |  | Larger masses are harder to accelerate                                |

1.33 points

#### Question 14

14. What is the shape of an orbital path for an object moving faster than escape velocity?

|  |  |           |
|--|--|-----------|
|  |  | Ellipse   |
|  |  | Parabola  |
|  |  | Circle    |
|  |  | Hyperbola |

1.33 points

#### Question 15

15. Which of the following has, or would release, the most energy?

|  |  |                                        |
|--|--|----------------------------------------|
|  |  | Fusion of hydrogen in 1 liter of water |
|  |  | Burning 1 liter of oil                 |
|  |  | Thermal energy of a parked car         |
|  |  | Metabolizing a candy bar               |