



# Answers

## Gravity

### Year 7 Science

### Chapter 9

<b>p203</b>	<ol style="list-style-type: none"><li>Gravity is the force of attraction between two masses. The larger the masses the stronger the force of attraction.</li><li>The mass of an object is the amount of matter in the object. An elephant has more mass than a duck.</li><li>The weight is the force caused by gravity. The larger the mass the greater the weight.</li><li><ol style="list-style-type: none"><li>True - Gravity is the reason things don't fall off the earth.</li><li>True - Gravity is larger on Earth than on the moon because Earth has a larger mass than the moon.</li><li>False - The unit for mass is kilograms and the unit for weight is Newtons.</li></ol></li><li><ol style="list-style-type: none"><li>The satellite is speeding around the Earth and would head off on a straight line into space if the force of gravity wasn't holding it in orbit around the Earth.</li><li>The rocket is using massive propulsive forces to overcome the force of attraction between the rocket and the Earth (gravity).</li></ol></li><li>The period be larger for the same pendulum on the moon (T would need to be larger in the formula to produce a smaller g - or the smaller gravity means a smaller force of attraction pulling the pendulum to the middle of the swing meaning a longer period).</li></ol>
<b>p205</b>	<ol style="list-style-type: none"><li><ol style="list-style-type: none"><li>Weight of a 10 kg mass on Earth = <math>10 \text{ kg} \times 9.8 \text{ m/s}^2 = 98 \text{ N}</math></li><li>Weight of a 100 kg mass on Earth = <math>100 \text{ kg} \times 9.8 \text{ m/s}^2 = 980 \text{ N}</math></li></ol></li><li><ol style="list-style-type: none"><li>True - Weight of an object and the force of attraction between the object and Earth is the same thing.</li><li>False - assuming nil air resistance, an elephant will not fall faster than a duck.</li></ol></li><li>A hammer and a feather are dropped from a balcony<ol style="list-style-type: none"><li>The hammer will hit the ground first?</li><li>The hammer and the feather will hit the ground at the same time if there were no air resistance?</li></ol></li></ol>
<b>p207</b>	<ol style="list-style-type: none"><li>The force of gravity keeps the planets, asteroids, comets, etc in orbit around the Sun?</li><li>The massive gravity on the Sun provides the heat and pressure to stimulate nuclear reactions in the Sun. These nuclear reactions provide our sunlight.</li><li>The asteroid belt separates the inner planets from the outer planets?</li><li>The 5 planets most likely seen by the ancient astronomers were: Mercury, Venus, Mars, Jupiter, Saturn.</li><li>The ancient Greeks would have described planets as wanderers because at some times they were visible and at other times they weren't visible. Thus appearing to wander around the sky.</li></ol>

<p><b>p210</b></p>	<ol style="list-style-type: none"> <li>1 Gravity is the force of attraction between two masses. The larger the masses the stronger the force of attraction.</li> <li>2 The mass of an object is the amount of matter in the object. An elephant has more mass than a duck.</li> <li>3 The weight is the force caused by gravity. The larger the mass the greater the weight.</li> <li>4 A ball falls when it is dropped because the force of attraction between the ball and the Earth (gravity) is pulling the ball towards the Earth.</li> <li>5 The direction of the dropped ball is towards the centre of the Earth.</li> <li>6               <ol style="list-style-type: none"> <li>a) True - Gravity is the reason things don't fall off the earth.</li> <li>b) True - Gravity is larger on Earth than on the moon because Earth has a larger mass than the moon.</li> <li>c) False - The unit for mass is Newtons and the unit for weight is kilograms.</li> </ol> </li> </ol>
<p><b>p210</b></p>	<ol style="list-style-type: none"> <li>1           <ol style="list-style-type: none"> <li>a) Weight of a 10 kg mass on Earth = <math>10 \text{ kg} \times 9.8 \text{ m/s}^2 = 98 \text{ N}</math></li> <li>b) Weight of a 100 kg mass on Earth = <math>100 \text{ kg} \times 9.8 \text{ m/s}^2 = 980 \text{ N}</math></li> </ol> </li> <li>3 A hammer and a feather are dropped from a balcony           <ol style="list-style-type: none"> <li>a) The hammer will hit the ground first?</li> <li>b) The hammer and the feather will hit the ground at the same time if there were no air resistance?</li> </ol> </li> <li>3 Harry would weigh less on the moon because the force of attraction between Harry and the Moon is less than the force of attraction between Harry and the Earth.</li> <li>4 Gravity can be measured in a number of ways including the use of a pendulum and dropping a ball.</li> </ol>
<p><b>p211</b></p>	<ol style="list-style-type: none"> <li>1           <ol style="list-style-type: none"> <li>a) Mars = arms</li> <li>b) Moon = mono</li> <li>c) Planet = platen</li> </ol> </li> <li>2           <ol style="list-style-type: none"> <li>a) Start the 4min and 7min glass together and let 4min run out = 4 minutes</li> <li>b) Flip the 4 min glass and let 7 min glass run out run out = 3 mins</li> <li>c) Flip the 7 min glass and let 4 min glass run out = 1 min</li> <li>d) Flip the 7 min glass with 1 min of sand in it = 1 min</li> </ol> <p style="text-align: right;">Total = 9 min</p> </li> <li>3 Cut a cake into eight equal pieces with only three cuts.            Solution 1: Use two cuts to divide the cake into four equal pieces (quarters). For the third cut, cut the cake in half, horizontally. Some pieces may not have any icing, but their size will be equal.            Solution 2: As in the first solution, use two cuts to divide the cake into four equal pieces (quarters). Then, stack the four pieces on top of each other and use a third cut to cut all four pieces in two.</li> </ol>
<p><b>p212</b></p>	<ol style="list-style-type: none"> <li>1 The force of gravity keeps the planets, asteroids, comets, etc in orbit around the Sun?</li> <li>2 The massive gravity on the Sun provides the heat and pressure to stimulate nuclear reactions in the Sun. These nuclear reactions provide our sunlight.</li> <li>3 The asteroid belt separates the inner planets from the outer planets?</li> <li>4 The 5 planets most likely seen by the ancient astronomers were: Mercury, Venus, Mars, Jupiter, Saturn.</li> <li>5 The ancient Greeks would have described planets as wanderers because at some times they were visible and at other times they weren't visible. Thus appearing to wander around the sky.</li> <li>6 Weightlessness is a feeling of no weight. A feeling of no weight happens in free fall when there is nothing to support our body. Weightlessness doesn't mean that there is no gravity. The astronaut in the photo may feel weightless but there is a force of attraction between the astronaut and the Earth (and other bodies in the universe).  It is definitely possible to be weightless in our Solar System but impossible to not be under the influence of gravity.</li> </ol>

- 1
  - a) True - A low gravity planet would be good for humans with weak hearts.
  - b) True - A high gravity planet would have a smoother surface than a low gravity planet.
  - c) True - A high gravity planet would have a dense atmosphere.
  - d) False - A low gravity planet would be colder.
- 2 It would be expected that satellites orbit the Earth in the shape of an ellipse because the satellite would not only be under the force of attraction with the Earth but also the Moon and the Sun.
- 3
  - a) The period of a pendulum at the top of Mt Everest would be longer than at sea level because the force of attraction between the pendulum and the Earth would be less.
  - b) The period of a pendulum on the moon would be longer than on Earth because the force of attraction between the pendulum and the Moon would be less than that of Earth.
- 4 Weight of a 100 kg person experiencing 1 g =  $100 \text{ kg} \times 9.8 \text{ m/s}^2 = 980 \text{ N}$   
Weight of a 100 kg person experiencing 8 g =  $100 \text{ kg} \times 8 \times 9.8 \text{ m/s}^2 = 7840 \text{ N}$
- 5 A satellite speeding around the Earth and would head off on a straight line into space if the force of gravity wasn't holding it in orbit around the Earth.
- 6 The Moon may have no atmosphere because the force of gravity isn't strong enough to hold an atmosphere around the Moon.
- 7 Mercury takes Earth 88 days to circle the Sun.  
Mercury takes Earth 59 days to spin once on its axis.  
The number of Mercury days would be the number of times Mercury spins in a complete orbit of the Sun =  $88/59 = 1.5$  days assuming Mercury spins in a different direction to its orbit around the Sun.  
Mercury actually spins in the same direction as its orbit around the Sun thus meaning that the planet faces the Sun for longer. More information is needed to find the number of days in a year.
- 8 Eris is a dwarf planet rather than our ninth planet because:
  - Eris doesn't have a significant gravity. The gravity on Eris is  $0.8 \text{ m/s}^2$  which quite low compared to each of our eight planets.
  - Eris is small, 2326 km diameter, compared other smaller planets such as Mercury (4900 km diameter).It may be assumed that Eris orbits the Sun on the same plane but the relatively small size and small gravity of Eris suggests that Eris is not our ninth planet.