TOPIC IN A BOX

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Box Creator: Cardinal Newman Catholic School, Coventry

GCSE Physics (Gravity) Lesson Plan

Box Contents (based on assumed class size of 30 students):

Resources	Quantity
Top Pan Balance	10
Newton Meter	10
Empty drinks cans (various weights), sand, lead shot, iron filings, cardboard and glue gun	Make a separately weighted can for different celestial bodies by adding mass using sand, lead shot and/or iron filings. Cut a piece of cardboard and use a glue gun to seal the can, then label with the celestial body that it represents.

Lesson Plan:

Lesson objective: To explain the relationship between mass, weight and gravity.
Learning outcomes: Recall a definition of mass, weight and gravity. Explain how gravity changes with mass. Calculate the weight of objects in different gravitational fields.

Activity	Time Taken	Method	Related GSCE Topic
Introduction (slides 1-4)	5 mins	• Q; How can you lose weight if you go to the moon, but have the same mass? Take suggestions from students. • True or False questions.	Forces and their Interactions

<table>
<tr>
<td>Activity 1: Measuring mass and weight. (slides 5-7)</td>
<td>10 mins</td>
<td>Measure the mass and weight of different items – what conclusion can you draw? That the weight is about x10 of the mass; relationship between mass and weight is directly proportional.

Q: What is the difference between mass and weight? (slides 6-7)</td>
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<td>Activity 2: Gravity cans (slide 8)</td>
<td>15 mins</td>
<td>Gravity cans – make pre-weighted drinks cans to illustrate the weight on different planets in the solar system. Load empty drinks cans with sand, lead shot or iron fillings to get to the mass in the table. When lifted this simulates the weight of the full drinks can on different celestial bodies in our solar system.

<table>
<tr><th>Planet</th><th>Gravity (m/s^2)</th><th>Weight (N)</th><th>Mass (g)</th></tr>
<tr><td>The Moon</td><td>1.6</td><td>598.8</td><td>56</td></tr>
<tr><td>Mercury</td><td>3.7</td><td>1269</td><td>129.5</td></tr>
<tr><td>Venus</td><td>8.9</td><td>3052.7</td><td>311.5</td></tr>
<tr><td>Earth</td><td>9.8</td><td>3361.4</td><td>343 (full can)</td></tr>
<tr><td>Mars</td><td>3.7</td><td>1269.1</td><td>129.5</td></tr>
<tr><td>Jupiter</td><td>24.5</td><td>8403.5</td><td>857.5</td></tr>
<tr><td>Saturn</td><td>10.4</td><td>3567.2</td><td>364</td></tr>
<tr><td>Uranus</td><td>8.9</td><td>3052.7</td><td>311.5</td></tr>
<tr><td>Neptune</td><td>11.2</td><td>3841.6</td><td>392</td></tr>
<tr><td>Pluto</td><td>0.6</td><td>205.8</td><td>21</td></tr>
</table>

Ask the students if the celestial body is bigger or smaller than Earth then to predict if the weight of the drinks can would be bigger or smaller on that planet. Then pass the can around.
Extension: Measure the mass of a full can of fizzy drink. Then use Newton balanced to measure the modelled weight of the cans on different celestial bodies. Use these data to calculate the gravitational field strength on different celestial bodies.</td>
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Activity 4: Calculating Weight (slides 9-13)	10 mins	Equation for working out weight/mass/gravitational strength. Calculate the weight of a person on Mars.	
Activity 3: Astronauts (slide 14)	5 mins	You Tube: https://www.youtube.com/watch?v=Sbxguzogm1Q&t=99s • Why is it important for astronauts to feel changes in gravity in training? • How do we train the astronauts for changes in gravity?	
Conclusion		• Why are we 'lighter' on the moon? • Q&A.	