



Task 1: Coin in a Balloon

*Presentation is made by TEAM
KAZAKHSTAN.*



Description of a task:

An inflated air balloon contains a coin and is gently moved to set the coin rolling around the inside of the balloon. Explain and investigate the buzzing sound produced in this experiment.

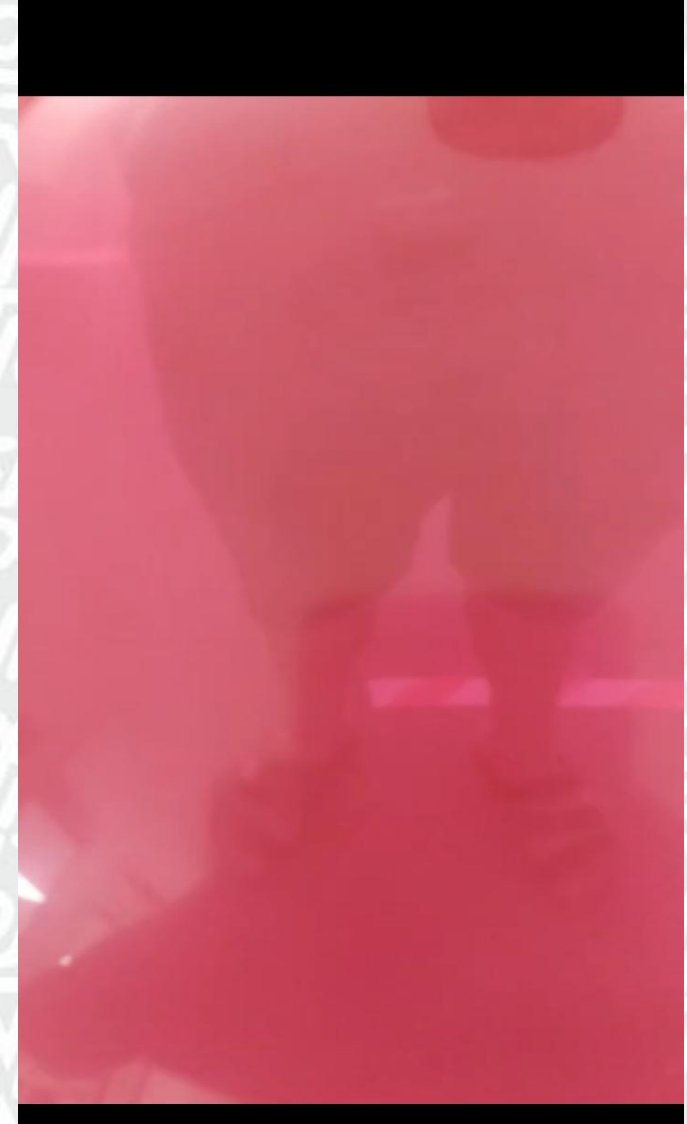


Our first experiment



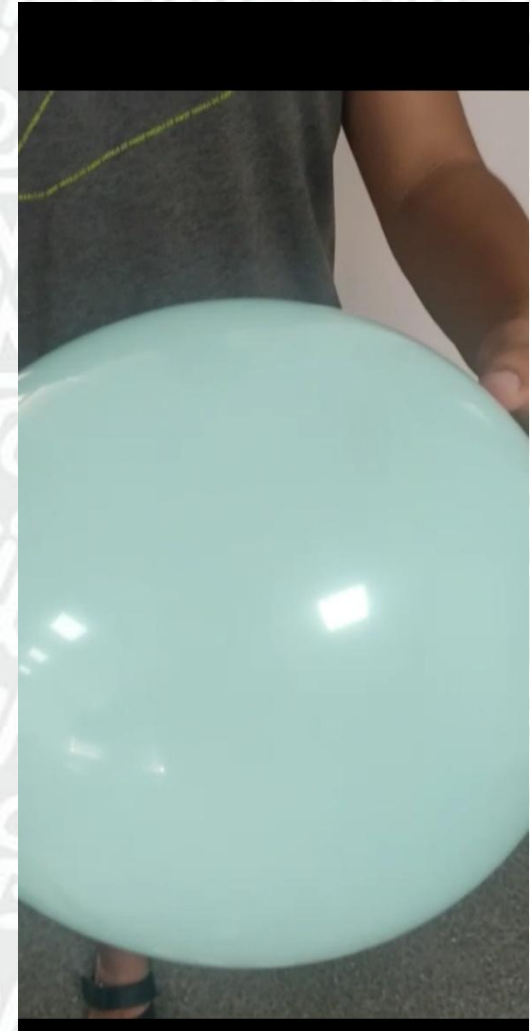


Our second experiment





Our third experiment





Conclusion

The first coin: Calm sound

The second coin: No sound at all

The third coin: The highest sound



The conditions of the buzzing sound

1. Human's ear can listen this sound
2. We have a lot of small sounds.



1. Human's ear can hear this sound

$$\left(\Delta p = \frac{2\sigma}{R}\right) - \text{Sound pressure}$$

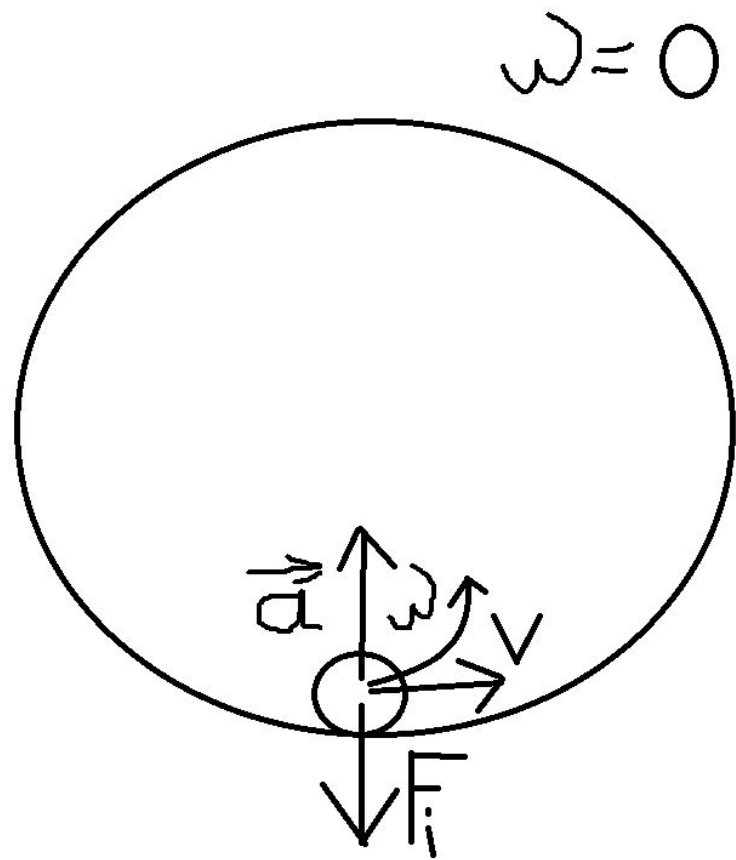
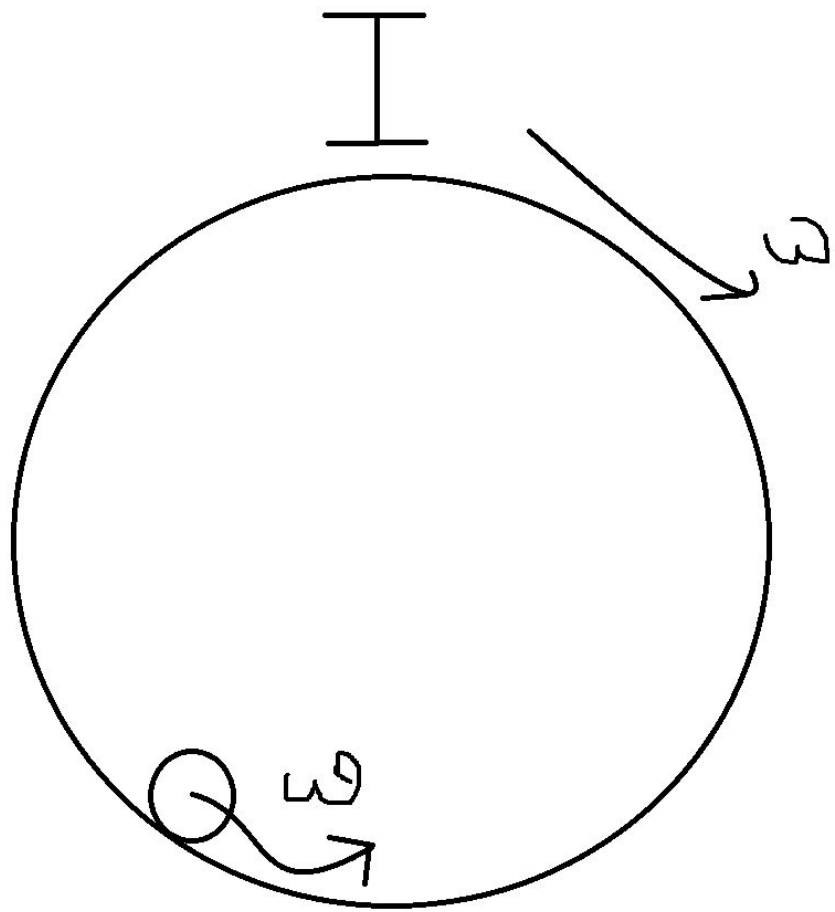
$$Lp = 20 \log_{10} \frac{\Delta p}{p_0} - p_0 = 0.2 * 10^{-11}$$

$$\frac{\sigma}{R} = \frac{1}{10^{11}} - R = 2 * 10^{17}(\text{imp})$$

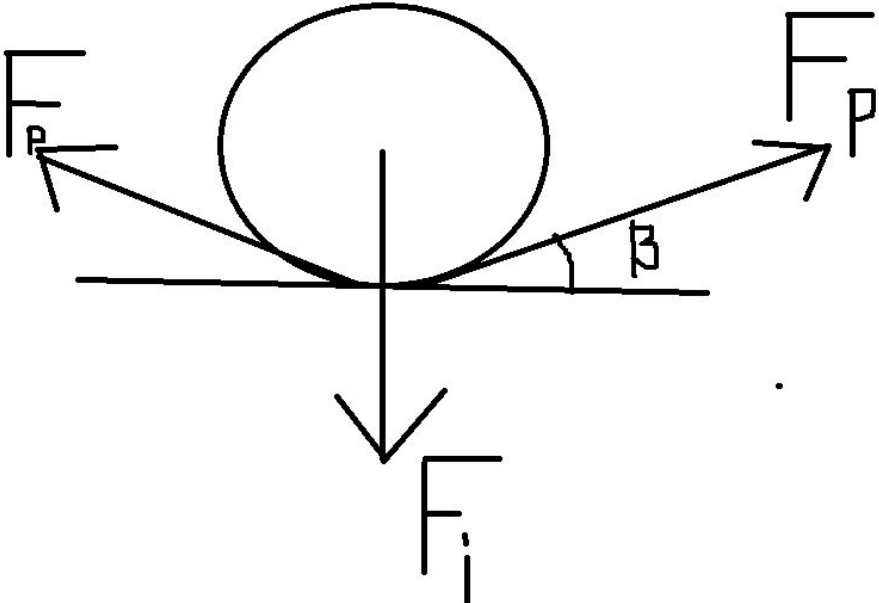
$$F(\textit{inertia}) = \frac{m\vartheta^2}{r}$$

$$F(\textit{inertia}) = 2F(\textit{pulling}) * (\sin \beta)(\textit{equal})$$

$$F(\textit{inertia}) > 2F(\textit{pulling}) * (\sin \beta)$$



The last situation



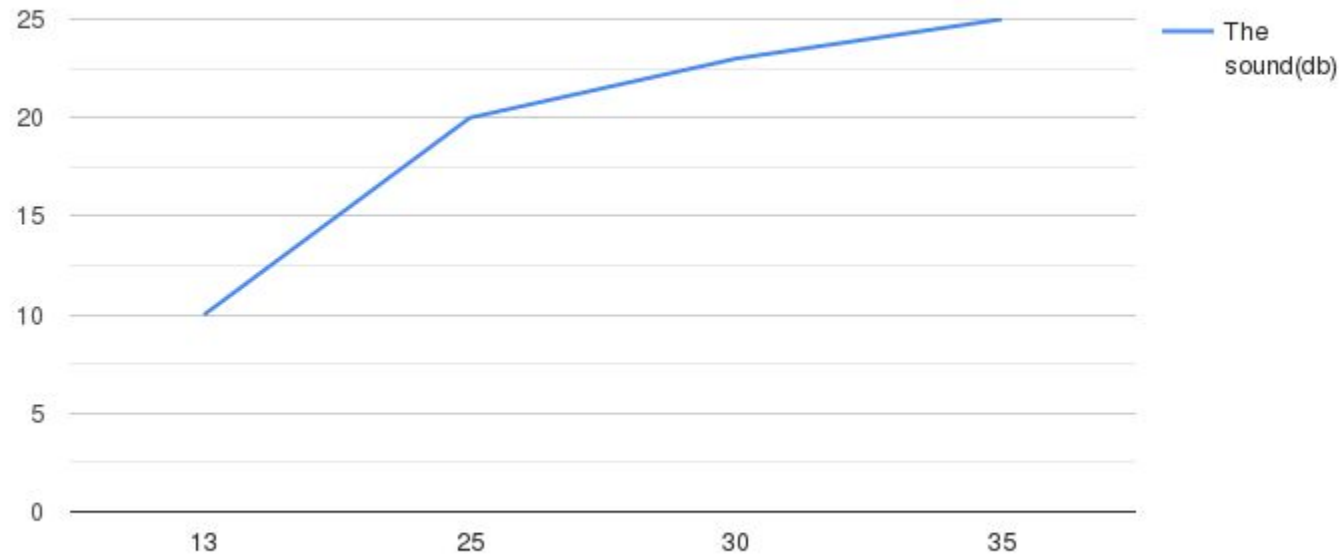


2. We can hear the buzzing sound

$$2\pi r\sigma > \frac{m\vartheta^2}{R} \rightarrow$$

$$\rightarrow r > \frac{m\vartheta^2}{4\pi R\sigma}$$

Relation between size of a balloon and the sound



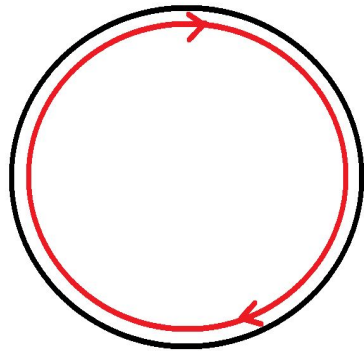
One coin was used for all four experiments. The size of a balloon(cm) in x-axis, the sound(db) at y-axis.



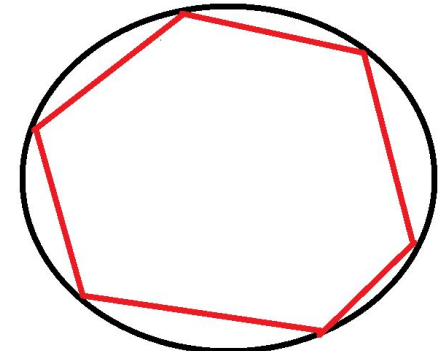
The definition picture:

Big diameter coin should roll over to it's hip to start rolling as a small diameter coin.

The rolling of small diameter coin



The rolling of big diameter coin

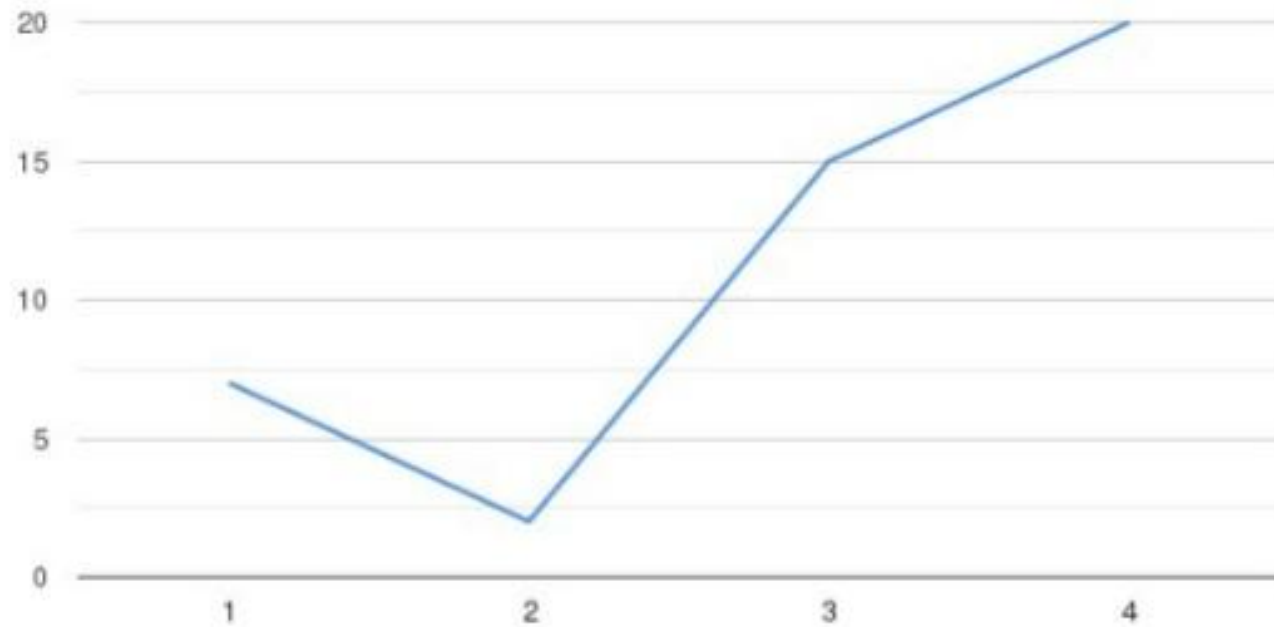




What's the matter?

The hip's surface area is very low, so the amount of touching will be bigger.

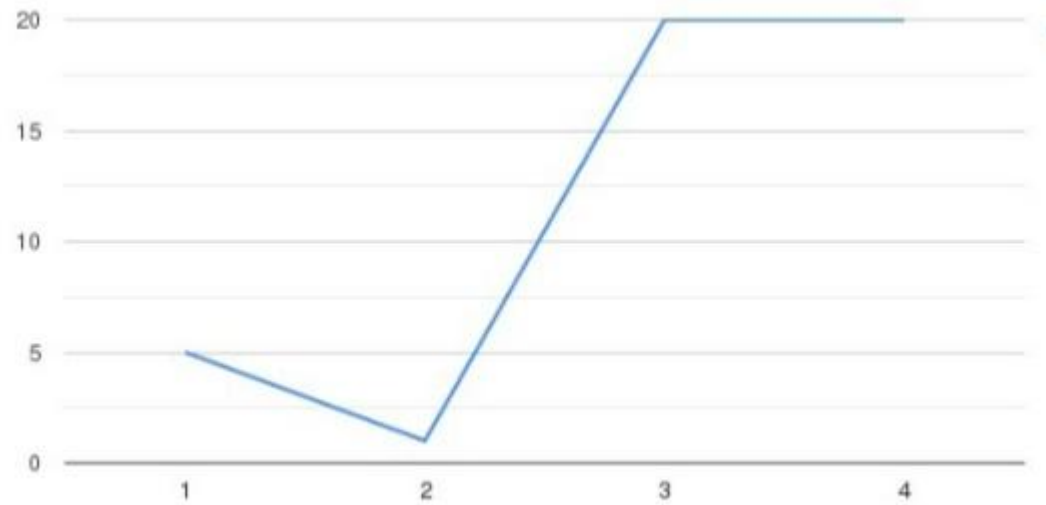
When we roll the big coin, we can see, that balloon expands for a millisecond and then gets back to it's size.



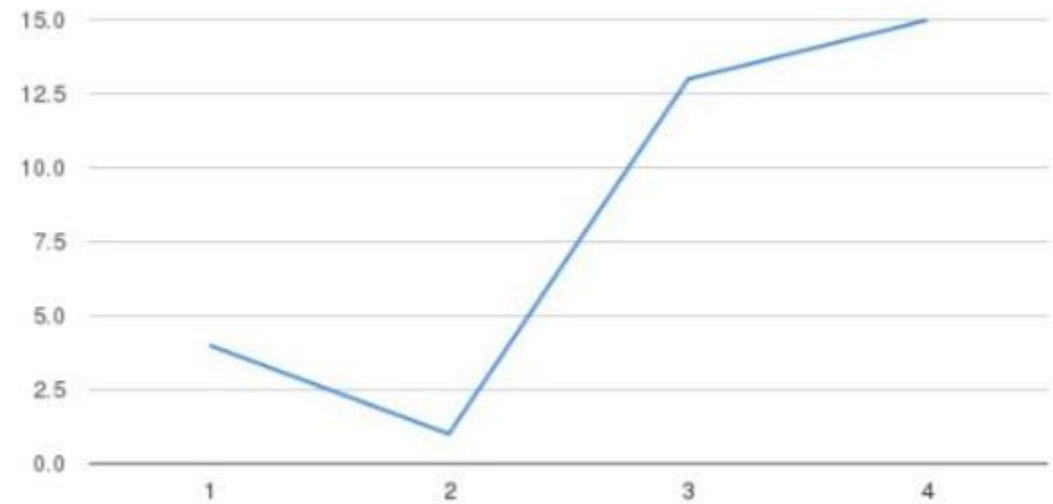
The relation of radius(cm) and sound volume(db).
Radius - X. Db - Y.

1. Air balloon

2. Helium balloon.



3. Hydrogen balloon





Thank you for your attention!