

A 组**A1. Inventing Yourself : Paper Boomerang 自己发明:
自制纸飞镖**

Make a returning boomerang from a sheet of paper by folding and/or cutting. Investigate how its motion depends on relevant parameters.

用一张纸通过折叠和/或裁剪制作一个可以返回的回旋镖。研究其运动如何取决于相关参数。

A2. Lato Lato 拉托拉托

Attach a ball to each end of a string and connect the center of the string to a pivot. When the pivot oscillates along the vertical direction, the balls start to collide and oscillate with increasing amplitude. Investigate the phenomenon.

将两个球分别系在一根绳子的两端，绳子的中点连接到一根轴上。当轴在垂直方向上振荡时，球开始碰撞并以增加的振幅振荡。研究这一现象。

A3. Ruler Cannon 尺子加农炮

Two rulers are tightly held against each other. A round projectile (e.g. a plastic bottle cap or a ball) is inserted between them close to one of their ends. When extra force is exerted on the surface of the rulers, the projectile is ejected at a high speed. Investigate this effect and the parameters that affect ejection speed.

两把尺子紧紧握在一起。将一个圆形射弹（如塑料瓶盖或小球）插入两把尺子之间靠近它们的一端。当在尺子表面施加额外的力时，射弹会以高速射出。研究这一效果以及影响射出速度的参数。

A4. Water Bottle Rocket 水瓶火箭

Pump air into a plastic water bottle partially filled with water. Under certain conditions, the bottle is launched and flies into the air. Investigate how the acceleration during lift-off depends on relevant parameters.

向部分装有水的塑料水瓶中打气。在特定条件下，水瓶会被发射并飞向空中。研究起飞过程中的加速度如何取决于相关参数。

B 组**B1. Climbing Magnets 攀爬磁铁**

Attach a rod assembled from cylindrical neodymium magnets horizontally to a vertical ferromagnetic rod. Limit the motion of the magnets to the vertical direction. When the ferromagnetic rod is spun around its axis of symmetry, the magnetic rod begins to climb up. Explain this phenomenon and investigate how the rate of climbing depends on relevant parameters.

将一个由圆柱形钕铁硼磁铁组成的杆水平地附着在垂直的铁磁杆上。限制磁铁的运动方向为垂直方向。当铁磁杆绕其对称轴旋转时，磁杆开始向上攀爬。解释这一现象并研究攀爬速率如何取决于相关参数。

B2. Rayleigh-Benard Convection 瑞利-贝纳德对流

Uniformly and gently heat the bottom of a container containing a suspension of powder in oil (e.g. mica powder in silicon oil), cell-like structures may form. Explain and investigate this phenomenon.

均匀且温和地加热装有油中有悬浮粉末（如硅油中的云母粉）的容器底部，可能会形成类似细胞的结构。解释并研究这一现象。

B3. Wailing Bowl 哭泣的碗

When you strike the side of a metal bowl containing some water, you can hear a characteristic sound. The sound changes when the water in the bowl is moving. Explain and investigate the phenomenon.

当你敲击装有水的金属碗的侧面时，会听到一种特有的声音。当碗中的水在移动时，声音会发生变化。解释并研究这一现象。

B4. Quantum Fingerprint 量子指纹

Shine laser light onto an organic polymer (eg. styrofoam). The scattered light may have a higher or lower wavelength than the incident light. Explain the phenomenon and determine what can be concluded about the molecular structure of the material from the wavelength shift.

将激光照射到有机聚合物（如聚苯乙烯泡沫）上。散射光的波长可能比入射光长或短。解释这一现象，并确定从波长偏移中可以得出关于材料分子结构的哪些结论。