

第 4 届 SDUPT 赛题 (中英文对照版)

参见 2026 IYPT 竞赛题目

1. Invent Yourself

A self-starting siphon can be made using a piece of rigid tubing bent into a specific shape. When the siphon is partially immersed in water, it begins siphoning water without the need for initial suction. Investigate how the relevant parameters, such as the geometry, affect the siphoning process.

1. 自己发明

可以使用一根弯曲成特定形状的硬管制成一个自动启动的虹吸管。当虹吸管部分浸入水中时，会开始虹吸水，且无需初始吸力。研究相关参数（例如几何形状等）是如何影响虹吸过程的。

2. Electrical damping

A magnet suspended by a spring will display simple harmonic motion when displaced. If the magnet oscillates within a coil connected to a resistor, its motion will be damped. Investigate the factors that affect the damping.

2. 电磁阻尼

一个由弹簧悬挂的磁铁在位移时会表现出简谐运动。如果磁铁在连接有电阻的线圈内振动，其运动将会受到阻尼。研究影响阻尼的因素。

3. Ring fountain

When a flat metal ring falls from a certain height into a water tank, it generates a fountain that can shoot water high into the air. How does the maximum height of the fountain depend on the ring's parameters?

3. 环形喷泉

当一个扁平的金属环从一定高度落入水箱时，会产生能将水喷向高空的喷泉。喷泉能达到的最大高度与环的参数有何关系？

4. Oil flow

A thin layer of cooking oil on a flat metal surface flows outwards when heated. Investigate the phenomenon and its dependence on relevant parameters.

4. 油膜流动

当金属平面上覆盖的食用油薄层受热时，会形成向外扩展的流动。研究该现象及其对相关参数的依赖性。

5. Elastic wave dynamics

Suspend a metal ball from a fixed support using a rubber band and twist it many times around its vertical axis. When the ball is released, standing waves are formed on the rubber band. Investigate this phenomenon and study how the wave depends on relevant parameters.

5. 弹性波动力学

使用橡皮筋将金属球悬挂在固定支架上，并围绕其垂直轴扭转多次。当球被释放时，橡皮筋上会形成驻波。研究该现象并探讨波动特性与相关参数的依赖关系。

6. Flipo Flip

A Flipo Flip toy can roll for multiple turns even though its shape is not circular. Investigate how its motion depends on parameters such as geometry and the initial release conditions.

6. 非圆体翻转运动

Flipo Flip 玩具即使形状不是圆形，也可以滚动多圈。研究其运动特性与几何参数及初始释放条件等变量的依赖关系。

7. Tennis racket theorem

When an object with different principal moments of inertia about each axis is thrown while it rotates, it can suddenly start rotating around an axis different from the one it was initially rotating about. Investigate how the rotational motion of such an object is affected by relevant parameters during its free fall.

7. 网球拍定理

当一个惯量各不相同，且绕不同主轴转动的物体，在旋转状态下被抛出时，它可能会突然开始绕与初始旋转轴不同的轴旋转。研究此类物体在自由落体过程中其转动运动如何受到相关参数的影响。

8. Magnetic accelerator

Fix magnets in pairs onto a metal sheet as shown. If you attach two magnetic discs onto an axle this “vehicle” will accelerate over the rows of magnets under certain conditions. Investigate the phenomenon.

8. 磁力加速器

将磁铁成对固定在金属板上。如果将两个磁性圆盘安装在一根转轴上组成“小车”，在特定条件下，这个“车辆”会在磁铁排上加速。研究这一现象。

9. Levitation control

When arranged in a specific configuration, small graphite sheets can levitate on neodymium magnets. By shining light onto the surface of the graphite sheet, it is possible to control its movement. Explain and investigate the phenomenon.

9. 悬浮控制

当小石墨片以特定的排列方式放置在钕磁铁上时，它们能够悬浮起来。通过向石墨薄片表面照射光线，可以控制其运动状态。解释并研究这一现象。

10. Submerged crater

If you release sand or similar granular material in a container filled with water, the material will sink to the bottom and may form a crater-like structure. Explain and investigate the phenomenon.

10. 水下陨坑

将沙粒或类似颗粒状材料释放到盛水的容器中，材料会沉至底部并可能形成陨坑状结构。解释并研究该现象。

11. Sweet monochromator

Pass linearly polarised white light through a column of sugar solution. When transmitted light is observed through a polariser it may appear coloured. Rotate the polariser, and the transmitted light colour may change. Construct such a sweet monochromator and optimise for the narrowest light wavelength bandwidth.

11. 蔗糖单色仪

使线偏振白光通过蔗糖溶液柱。当透过偏振片观察透射光时，可能呈现彩色；旋转偏振片，透射光的颜色可能改变。构建此类“蔗糖单色仪”，并优化以获得最窄的光波长带宽。

12. Autumn coin

The motion of a coin falling to the bottom of a tank filled with liquid can be remarkably similar to the fluttering and tumbling of a falling autumn leaf. Investigate how the motion of the coin depends on relevant parameters.

12. 秋叶硬币

硬币在充满液体的容器中沉降至底部的运动，可能与秋叶飘落的飘荡和翻滚极为相似。研究硬币运动如何依赖于相关参数。

13. The singing ruler

When a ruler is clamped at one end and struck, it oscillates and emits a characteristic sound. Investigate how the sound depends on relevant parameters.

13. 歌唱的尺子

当一把尺子一端被夹住并敲击时，它会振荡并发出特有的声音。请探究该声音如何随相关参数变化。

14. Crystal Critters

Observe the evaporation of a drop of table salt solution on a warm hydrophobic surface. After the water evaporates, a variety of characteristic crystal shapes remain. Research and explain this phenomenon.

14. 晶体生物

观察一滴食盐溶液在温暖疏水表面的蒸发过程。待水分完全蒸发后，表面会留下形态各异特征晶体结构。请探究并解释这一现象。

15. Magnetic Newton's cradle

Repulsing, non-touching magnets are used instead of colliding balls to make a new type of Newton's cradle. The new cradle can act in a similar way to a regular cradle, but can also exhibit other interesting behaviour. Explain and study the movement of this magnetic cradle.

15. 磁性牛顿摆

采用相互排斥且不接触的磁铁代替碰撞的球体，制成一种新型牛顿摆。这种新型牛顿摆既能像普通牛顿摆一样运动，还能展现其他有趣的现象。解释并研究这种磁性牛顿摆的运动规律。

16. Twisted spaghetti

When a bundle of spaghetti is twisted, it might withstand higher transverse (side) forces than a straight, untwisted bundle. Investigate the response of a twisted bundle to transverse stress and identify the optimal twist that maximises tolerance to transverse stress.

16. 扭曲的意大利面

当一捆意大利面条被扭曲时，它可能比一捆直的、未扭曲的面条承受更高的横向（侧向）力。研究扭曲束对横向应力的响应，并确定能够最大限度地提高横向应力耐受性的最佳扭曲。

17. Travelling flame

A flame can propagate continuously around a ring-shaped trough containing a thin layer of flammable liquid. Investigate how the characteristics of this travelling flame depend on relevant parameters.

17. 行进的火焰

火焰可以在包含一层薄薄的易燃液体的环形槽周围连续传播。研究这种行进火焰的特性如何取决于相关参数。