「2017 第二屆 Summer IYPT 培訓營」預習參考資料

　　請同學根據規劃中範例之參考資料，針對該項題目預作部分探索與規劃，以便課室中可以積極參與討論。同學主要的工作將包括下面幾項：

- a. 該題目的意思，先釐清圖像，能做出題目所述的現象。
- b. 根據現象，找出可能的相關參數，就是現象所呈現的結果，將會因為哪些變數而變化。
- c. 提出假說，猜測造成此現象的原因，預期經由所提相關參數，於實驗中能達成的結果。
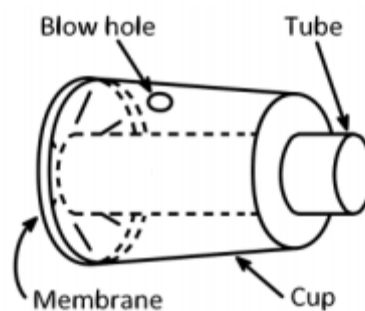- d. 經由實驗結果，透過合適分析，回饋支持所提假說，整理出相關法則，或是另闢解釋之道；甚至由推理而推翻（錯誤）實驗結果！再重起爐灶。
- e. 製作報告檔案，合理說服觀眾。

第九屆臺灣青年學生物理辯論競賽題目

以下為 2017 年 **IYPT** 題目，其中藍色字體標題 **TYPT** 為 2017 年選入的題目。不知道如何下手嗎？歡迎參考**實驗器材參考清單**或是點擊參考 2017 年 **IYPT 官方指引**

1. Invent Yourself

Construct a passive device that will provide safe landing for an uncooked hen's egg when dropped onto a hard surface from a fixed height of 2.5m. The device must fall together with the egg. What is the smallest size of the device you can achieve?

實驗用器材參考：force sensor(如電子秤或壓力感測器)、包覆材料、小盤子(from 3d printer)。

2. Balloon Airhorn

A simple airhorn can be constructed by stretching a balloon over the opening of a small container or cup with a tube through the other

end. Blowing through a small hole in the side of the container can produce a sound. Investigate how relevant parameters affect the sound.

實驗用器材參考：氣球、紙杯、塑膠杯、吸管、麥克風。

3. Single Lens Telescope

A telescope can be built using a single lens, provided that a small aperture is used instead of an eyepiece. How do the parameters of the lens and the hole influence the image (e.g. magnification, sharpness and brightness)?
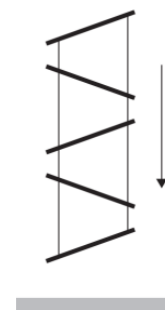
實驗用器材參考：凸透鏡、針孔或是可調式光圈、屏幕(or 厚紙板)、光學支撐棒與座、暗室(窗簾等)、鏡架。

4. Magnetic Hills

5. Leidenfrost Stars

6. Fast Chain

A chain consisting of wooden blocks inclined relative to the vertical and connected by two threads is suspended vertically and then released. Compared to free fall, the chain falls faster when it is dropped onto a horizontal surface. Explain this phenomenon and investigate how the relevant parameters affect the motion.

實驗用器材參考：木棍或是免洗筷、繩。

7. Spiral Waves

Spiral waves and other types of wave patterns may occur on a thin liquid film flowing over a rotating disk. Investigate these wave patterns.

實驗用器材參考：馬達、轉盤、水管、流速計。

8. Visualising Density

9. Ball in a Tube

A sealed transparent tube is filled with a liquid and contains a small ball. The tube is inclined and its lower end is attached to a motor such that the tube traces a conical surface. Investigate the motion of the ball as a function of relevant parameters.

實驗用器材參考：馬達、轉盤、斜底座+壓克力管(3D 印表機)、水(或其他液體)、塑膠球(壓克力球)、鋼珠。

10. Pulling Glasses Apart

11. Hair Hygrometer

A simple hygrometer can be built using human hair. Investigate its accuracy and response time as a function of relevant parameters.

實驗用器材參考：頭髮、螺旋測微器、force sensor、濕度控制環境、溼度計(電子式數位顯示)、量角器、鋼瓶、氮氣。

12. Torsion Gyroscope

Fasten the axis of a wheel to a vertical thread that has a certain torsional resistance. Twist the thread, spin the wheel, and release it. Investigate the dynamics of this system.

實驗用器材參考：滾珠軸承(ball bearing 或模型車輪或滑輪)、積木、繩、force sensor。

13. Resonating Glass

A wine glass partially filled with liquid will resonate when exposed to the sound from a loudspeaker. Investigate how the phenomenon depends on various parameters.

實驗用器材參考：酒杯、水、其他液體、喇叭、麥克風、燒杯、量筒(或量杯)、擴大機、音箱。

14. Gee-Haw Whammy Diddle

A gee-haw whammy diddle is a mechanical toy consisting of a simple wooden stick and a second stick that is made up of a series of notches with a propeller at its end. When the wooden stick is pulled over the notches, the propeller starts to rotate. Explain this phenomenon and investigate the relevant parameters.

實驗用器材參考：Gee-Haw Whammy Diddle、[馬達、轉盤、皮帶]=>電控活塞。

15. Boiled Egg

Suggest non-invasive methods to detect the degree to which a hen's egg is cooked by boiling. Investigate the sensitivity of your methods.

實驗用器材參考：電磁爐、水、鍋子、天平。

16. Metronome Synchronization

A number of mechanical metronomes standing next to each other and set at random initial phases under certain conditions reach synchronous behavior in a matter of minutes. Investigate the phenomenon.

實驗用器材參考：節拍器、鋁擠型、桌板(不同材質)、(高速)攝影機、計時器。

17. Vacuum Bazooka

※**藍色字體表示第九屆競賽用題目**，黑色字體則為 2017 國際賽題目，縮排內容為題目敘述。

※資料來源：**http://typt.phy.ntnu.edu.tw/problems.html**