E½eÁj£À ªÉÄÃº£À ¹Ã¯ï ZÉAqÀÄUÀ¼ÀÄ

zÉåÃAiÀÄ: PÁAwÃAiÀÄ ¥ÉÃgÀuÉAiÀÄ ¤gÀÆ¥ÀuÉ

¨ÉÃPÁUÀÄªÀ ¸ÁªÀÄVUÀ¼ÀÄ: JgÀqÀÄ ¹Ã¯ï ZÉAqÀÄUÀ¼ÀÄ, MAzÀÄ zÉÆqÀ ¹gÁ«ÄPï CAiÀÄ¸ÁAvÀ, PÉÃ¹AUï ¥Ànö

««gÀ: PÉÃ¹AUï ¥ÀnÖAiÀÄÄ£ÀÄß E½eÁj£ÀAvÉ Ej¹. PÉ¼ÀvÀÄ¢AiÀÄ §½ zÉÆqÀ CAiÀÄ¸ÁAvÀªÀ£ÀÄß Ej¹. ªÉÄÃ®Ä¢¬ÄAzÀ ¹Ã¯ï ZÉAqÀÄUÀ¼ÉgÀqÀ£ÀÄß MAzÀPÉÆÌAzÀÄ vÁUÀÄªÀAvÉ Ej¹ GgÀÄ¼À®Ä ©r. EªÀÅ ¸À® zÀÆgÀ GgÀÄ½ £ÀAvÀgÀzÀ°è ¸ÀVvÀUÉÆ¼ÀÄîvÀªÉ.

PÁgÀt: ¹Ã¯ï ZÉAqÀÄUÀ¼ÀÄ CAiÀÄ¸ÁAvÀzÀ ¸À«ÄÃ¥À §AzÀAvÉ CªÀÅUÀ¼À° PÁAwÃAiÀÄÄvÉ ¥ÉÃjvÀUÉÆ¼ÀÄîvÀzÉ. EzÀjAzÀ CªÀÅUÀ¼À GgÀÄ¼ÀÄ«PÉ ¤®ÄèvÀzÉ. F UÀ CªÀÅ eÁgÀ§ºÀÄzÉÃ ºÉÆgÀvÀÄ GgÀÄ¼À¯ÁUÀÄªÀÅ¢®. DzÀgÉ, eÁgÀÄªÀ WµÀðuÉAiÀÄÄ GgÀÄ¼ÀÄªÀ WµÀðuÉVAvÀ ºÉaÑgÀÄvÀÛzÀ. DzÀPÁgÀt ZÉAqÀÄUÀ¼ÀÄ ¸ÀVvÀUÉÆ¼ÀÄîvÀªÉ.

STEEL BALLS ROLLING DOWN A RAMP

Objective: To demonstrate magnetic induction

Description: Set up an inclined plane using a piece of plastic casing. Place a big ceramic magnet at the lower end of this. Allow the steel balls to roll on this inclined plane such that the two are in contact. The balls roll for a certain distance and then suddenly stops.

Reason: As the balls come close to the magnet a magnetic field is induced which in turn puts a halt to the rolling of the balls. The balls can now only slide but not roll. But sliding friction is greater than the rolling friction and hence the balls stop.

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«ªÀgÀ: ªÀÄÆgÀÄ w¨ÀÄdUÀ¼À°è Cw aPÀ w¨ÀÄdªÀ£ÀÄß Cw zÉÆqÀ w¨ÀÄdzÀ MAzÀÄ ªÀÄÆ¯ÉUÉ Ej¹.

ªÀÄzÀåªÀÄUÁvÀzÀ w¨ÀÄdªÀ£ÀÄß avÀæzÀ°è vÉÆÃj¹gÀÄªÀAvÉ ªÀÄÆgÀÄ ¨ÁUÀUÀ¼ÁV PÀvÀj¹. D ªÀÄÆgÀÆ vÀÄ t ÄPÀÄUÀ¼À£ÀÄß §¼À¹ zÉÆqÀ w¨ÀÄdzÀ G½zÀ ¨ÁUÀªÀ£ÀÄß vÀÄA©¹.

F ¥ÀPÁgÀªÁV ¸ÀªÀÄ¨ÁºÀÄ w¨ÀÄdUÀ¼À£ÀÄß §¼À¹ PÉÆAqÀÄ ¥ÉÊxÁUÉÆgÀ¸ï£À ¥ÀªÉÄÃAiÀÄªÀ£ÀÄß ¤gÀÆ¦¸À§ºÀÄzÀÄ.

PYTHAGORAS THEOREM FOR EQUILATERAL TRIANGLES

Objective: To demonstrate a dissection proof for Pythagoras theorem using equilateral triangles.

Materials Required: Three equilateral triangles with sides corresponding to the sides of right angled triangle.

Description:

- Place the smallest equilateral triangle to one corner of the biggest equilateral triangle.
- Dissect the medium size equilateral triangle as shown in the picture and re-arrange the pieces to fill the remaining portion of the biggest triangle.
- Thus proving Pythagoras theorem using equilateral triangles.

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¨ÉÃPÁUÀÄªÀ ¸ÁªÀÄVæUÀ¼ÀÄ: avÀzÀ° PÁt ÄªÀAvÀºÀ §I®Ä ªÀÄvÀÄ ªÀÄgÀzÀ zÀAqÀ

«zÁ£À: ªÀÄgÀzÀ zÀAqÀªÀ£ÀÄß §I°£À ºÉÆgÀªÉÄÊUÉ vÁV¸ÀÄvÁ ºÀ®ªÁgÀÄ ¸ÀÄvÀÄ ZÀ°¹. ¸ÀÄ¢ÃWÀðªÁzÀ ±À§ ºÉÆgÀºÉÆªÀÄÄävÀzÉ.

PÁgÀt: §I°£À DPÁgÀ ªÀÄvÀÄ §¼À¹gÀÄªÀ ªÀ¸ÀÄ, JgÀqÀÆ ¸ÀºÀ PÀA¥À£ÀUÀ¼À£ÀÄß GAIÄªÀiÁqÀÄªÀ° ªÀÄÄRå ¥ÁvÀ ªÀ»¸ÀÄvÀªÉ. ªÀÄgÀzÀ zÀAqÀªÀ£ÀÄß §I°£À ¸ÀÄvÀ GdÄvÁ ¸ÀÄwzÁUÀ PÉ®ªÀÅ ¸À¼ÀUÀ¼À° CªÀÅ ¥ÀgÀ¸ÀgÀ ¸À²ð¸ÀÄvÀªÉ ªÀÄvÀÄ PÉ®ªÀÅ ¸À¼ÀUÀ¼À° ¸À²ð¸ÀÄªÀÅ¢®. EzÀ£ÉßÃ ¹Pï-¹¥ï ZÀ®£É J£ÀÄßªÀÅzÀÄ. ¨ÉÆÃqïð£À ªÉÄÃ¯É ¹ÃªÉÄ¸ÀÄt¢AzÀ §gÉAiÀÄÄªÁUÀ®Æ PÉ®ªÉÇªÉÄä eÉÆÃgÁzÀ ±À§ §gÀÄªÀÅzÀÆ F ¹Pï-¹¥ï ZÀ®£É¬ÄAzÀ¯ÉÃ.

E° PÀA¥À£ÁAPÀªÀÅ §I°£À UÁvÀ(ªÀÄÄRåªÁV vÀÄ¢AiÀÄ°£À ªÁå¸À)ªÀ£ÀÄß CªÀ®A©¹gÀÄvÀzÉ.

SINGING BOWL

Objective: To show that sound can be produced by stick-slip motion

Experiment: Hold the metallic bowl on your palm as shown in the picture and gently stroke around the rim of the bowl with a wooden rod. A continuous sound is heard.

Reason: The material as well as the shape of the bowl helps in setting up the bell into vibrations. As we stroke the rim, the wooden rod makes and breaks contact with the surface. This is known as stick-slip motion. The squealing chalk while writing on the blackboard is also due to stick-slip motion. The frequency of the sound depends on the diameter of the bowl.

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«zÁ£À : ¨Á¸Émï ¨Á¯ï£À ªÉÄÃ¯É mÉ¤ß¸ï ZÉAqÀ£ÀÄß Ej¹. JgÀqÀ£ÀÄß Jw÷ æ rzÀÄ, MnUÉÃ PÉ¼ÀUÉ ©r. ¨Á¸Émï ¨Á¯ï £É®PÉ vÁVzÀ PÀÆqÀ¯ÉÃ mÉ¤ß¸ï ZÉAqÀÄ Cw ªÉÃUÀªÁV §ºÀÄ JvÀgÀPÉ ¥ÀÄnAiÀÄÄvÀzÉ.

PÁgÀt: ZÉAqÀÄUÀ¼À eÉÆÃr £É®PÉ C¥À½¹zÁUÀ ¨Á¸Émï ¨Á¯ïUÉ zÉÆgÉvÀ ¸ÀAªÉÃUÀªÀÅ CzÀgÀ ªÉÄÃ° £À mÉ¤ß¸ï ZÉArUÉ ªÀUÁðªÀuÉAiÀiÁUÀÄvÀzÉ. EzÀjAzÀ mÉ¤ß¸ï ZÉAr£À ªÉÃUÀ ºÉZÀÄÑvÀzÉ, ZÀ®£À±ÀQAiÀÄÆ ºÉZÀÄÑvÀzÉ. ªÀÄvÀzÀÄ §ºÀÄ JvÀgÀPÉ ¥ÀÄnAiÀÄÄvÀzÉ.

COEFFICIENT OF RESTITUTION

This is a dramatic display of collision and transfer of momentum. Consider a basketball and a tennis ball. If they are individually dropped from a height of about four feet, they reach a height of about two to three feet on bouncing back. Now, place the tennis ball on the basketball so that when the basketball is dropped, the tennis ball remains in contact with throughout the fall. As soon as the basketball hits the ground, the tennis ball flies off very fast and to a height several times the original one!

Reason: This is because the tennis ball acquires a greater velocity at the instant the basketball bounces back. Hence its kinetic energy also increases, taking it to a greater height.

Further Exploration: Will the basketball behave similarly, if it were placed above the tennis ball and the experiment repeated? Calculate the increase in the velocity of the tennis ball. Repeat the experiment with pairs of different balls. Suppose the basketball and the tennis ball were to initially have a gap of about 3cm. Would the tennis ball now bounce back to same height? Explain your observation.

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«ªÀgÀ: ¸ÀgÀ¼À£ÀÄß CzÀgÀ ªÀÄzÀå ©AzÀÄ«£À ° »rzÀÄ vÀÄ¢AiÀÄ£ÀÄß ¨ÁUÀPÉ ªÀÄgÀzÀ ¸ÀÄwUÉ¬ÄAzÀ £ÀAiÀÄªÁV ºÉÆqÉ¬Äj. ¤¢ðµÀÖ PÀA¥À£ÁAPÀzÀ ±À§ÝªÉÇAzÀÄ ªÀÄÆqÀÄvÀzÉ. ¸ÀgÀ¼À£ÀÄß ºÉÆqÉzÀÄ ¥ÀjuÁªÀÄ ªÀÄÆqÀÄªÀ ¤Ã¼À DzÉÆÃ®£ÀUÀ¼ÀÄ F ±À§ÝzÀ ªÀÄÆ®.

PÁgÀt: ¸ÀgÀ½£À ªÀÄzÀå©AzÀÄ '£ÉÆÃqï' DVgÀÄvÀzÉ. JAzÀgÉ CzÀÄ PÀA¦¸ÀzÀ ¸À¼ÀªÁVgÀÄvÀzÉ. ªÀÄgÀzÀ ¸ÀÄwUÉAiÀÄ £ÀAiÀÄªÁzÀ ºÉÆqÉvÀ ¸ÀgÀ½£À° ªÀÄÆ® PÀA¥À£ÁAPÀzÀ ¤Ã¼À DzÉÆÃ®£À GAlÄªÀiÁqÀÄvÀzÉ. F PÀA¥À£ÁAPÀªÀÅ ¸ÀgÀ½£À GzÀ ªÀÄÄvÀÛ D ªÀiÁzÀåªÀÄzÀ°£À ±À§ÝzÀ ªÉÃUÀªÀ£ÀÄß CªÀ®A©¹gÀÄvÀzÉ.

SINGING ALUMINIUM ROD

Materials Required: Aluminium rod of at least 1m in length, Wooden Mallet (hammer).

Description: Hold the rod at its mid-point and gently strike one of the ends with the mallet. The rod produces sound of a particular note. The sound is produced by the longitudinal oscillations of the rod excited by striking it.

Reason: The midpoint of the rod is a node, that is, a point that does not vibrate when the rod is struck by the mallet. The stroke produces longitudinal vibrations in the rod with a fundamental frequency that depends on the length of the rod and the speed of sound in aluminium (6320 m/s).

PÀA¦¸ÀÄªÀ vÀAw

zÉåÃAiÀÄ: «zÀÄåvï ¥ÀªÀ»¸ÀÄwgÀÄªÀ ªÁºÀPÀzÀ ªÉÄÃ¯É PÁAvÀPÉÃvÀæzÀ ¥ÀæÁªÀzÀ ¤gÀÆ¥ÀuÉ.

¨ÉÃPÁUÀÄªÀ ¸ÁªÀÄVæUÀ¼ÀÄ: vÀAw EgÀÄªÀ «zÀÄå¢Ã¥À, ±ÀQÛAiÀÄÄvÀªÁzÀ CAiÀÄ¸ÁAvÀ, ¦Ã£À ªÀÄ¸ÀÆgÀ ªÀÄvÀÄ J.¹. ¥ÀªÀgï ¸À¥ÉèÊ.

«ªÀgÀ: vÀAw EgÀÄªÀ «zÀÄå¢Ã¥ÀªÀ£ÀÄß J.¹. ªÉÄÊ£ïUÉ ¸ÀA¥ÀQð¹. F ¨É¼ÀUÀÄwgÀÄªÀ vÀAwAiÀÄÄ PÀA¦¸ÀÄwgÀÄªÀÅ¢®. ¦Ã£À ªÀÄ¸ÀÆgÀªÀ£ÀÄß §¼À¹ ¥ÀgÀzÉAiÀÄ ªÉÄÃ¯É EzÀgÀ ¥Àw©A§ªÀ£ÀÄß ªÀÄÆr¹. F UÀ «zÀÄå¢Ã¥ÀzÀ §½ ±ÀQ±Á° CAiÀÄ¸ÁAvÀªÀ£ÀÄß »r¬Äj. vÀAw PÀA¦¸ÀÄªÀÅzÀ£ÀÄß CzÀgÀ ¥Àw©A§zÀ°è PÁt§ºÀÄzÀÄ. (vÀAwAiÀÄÄ£ÀÄß £ÉÃgÀªÁV £ÉÆÃrzÀgÀÆ F PÀA¥À£À UÉÆÃZÀj¸ÀÄvÀzÉ).

PÁgÀt: vÀAwAiÀÄ°è J.¹. «zÀÄåvï ¥ÀªÀ»¸ÀÄwgÀÄªÀ PÁgÀt, §zÀ¯ÁUÀÄªÀ PÁAvÀPÉÃvÀæ ªÀÄÆqÀÄvÀzÉ. EzÀgÀ §½ ¨ÉÃgÉÆAzÀÄ CAiÀÄ¸ÁAvÀ §AzÁUÀ, F JgÀqÀÆ PÁAvÀPÉÃvÀæUÀ¼À £ÀqÀÄªÉ CAvÀgÀQæAiÉÄ GAmÁUÀÄvÀzÉ. J.¹. «zÀÄåvï£À zÀÄ«ÃAiÀÄÄvÉ §zÀ¯ÁzÀAvÉ vÀAwAiÀÄÄ CAiÀÄ¸ÁAvÀzÀvÀ DPÀµÀðuÉ ªÀÄvÀÄ «PÀµÀðuÉUÉ M¼ÀUÁUÀÄvÀzÉ. »ÃUÁV vÀAw PÀA¦¸ÀÄvÀzÉ.

VIBRATING FILAMENT

Objective: To demonstrate the effect of magnet on a current carrying conductor

Materials required: A filament bulb, a strong magnet and AC power supply, a convex lens (Optional)

Procedure: Connect the filament bulb, say 40W or 25W, to the AC mains supply. Observe that the glowing filament inside the bulb remains stationary. Cast the real image of the glowing filament on a screen using a convex lens. Now, bring the magnet close to the bulb. The filament vibrates and can be seen clearly – both directly and on the screen.

Reason: A current carrying filament produces a changing magnetic field due to AC. This interacts with the magnetic field of the permanent magnet brought near it. As the polarity of Ac changes, the filament alternately experiences attractive and repulsive forces, causing it to vibrate.

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¨ÉÃPÁUÀÄªÀ ¸ÁªÀÄVUÀ¼ÀÄ: ¨ÁVzÀ ¦.«.¹. PÉÆ¼ÀªÉ ªÀÄvÀÄÛ PÀA¥É¸Àgï

«ªÀgÀ: ¨ÁVzÀ ¦.«.¹. PÉÆ¼ÀªÉAiÀÄ£ÀÄß CzÀÄ ¸ÀgÁUÀªÁV wgÀÄUÀ®Ä C£ÀÄPÀÆ®ªÁUÀÄªÀAvÉ avÀzÀ°è vÉÆÃj¹gÀÄªÀ vÀgÀºÀzÀ ªÀåªÀ¸É ªÀiÁr PÉÆ½î. PÀA¥É¸Àgï C£ÀÄß §¼À¹ PÉÆ¼ÀªÉAiÀÄ MAzÀÄ vÀÄ¢AiÉÆ¼ÀUÉ UÁ½AiÀÄ£ÀÄß £ÀÄV¹. F UÁ½ PÉÆ¼ÀªÉAiÀÄ E£ÉÆßAzÀÄ vÀÄ¢¬ÄAzÀ ºÉÆgÀUÉ §gÀÄvÀzÉ ªÀÄvÀÄÛ EzÀPÉÌ «gÀÄzÀÞ ¢QÌ£À°è PÉÆ¼ÀªÉAiÀÄÄ ZÀ°¸ÀÄvÀzÉ.
F UÀ PÉÆ¼ÀªÉAiÀÄ MAzÀÄ vÀÄ¢AiÀÄ£ÀÄß f¥ï ¯ÁPï PÀªÀj£ÉÆ¼ÀVj¹ UÁ½AiÀÄÄß PÀªÀj¤AzÀ DZÉ §gÀzÀAvÉ ¨ÀzÀÞ¥Àr¹. F UÀ E£ÉÆßAzÀÄ vÀÄ¢¬ÄAzÀ UÁ½AiÀÄ£ÀÄß £ÀÄV¹. PÉÆ¼ÀªÉ ZÀ°¸ÀÄªÀÅ¢®è.

PÁgÀt: ªÉÆzÀ® ¸À¤ßªÉÃ±ÀzÀ°è ºÉÆgÀ£ÀÄUÀÄªÀ UÁ½AiÀÄÄ PÉÆ¼ÀªÉ ¨ÁVgÀÄªÀ ¸À¼ÀzÀ°è §® ¥ÀAiÉÆÃV¸ÀÄvÀzÉ. ºÉÆgÀ£ÀÄUÀÄªÀ UÁ½AiÀÄÄ CzÀgÀ «gÀÄzÀÞ ¢QÌ£À°è PÉÆ¼ÀªÉUÉ ¸ÀAªÉÃUÀªÀ£ÀÄß MzÀV¸ÀÄvÀzÉ. DzÀgÉ JgÀqÀ£ÉAiÀÄ ¸À¤ßªÉÃ±ÀzÀ°è, PÉÆ¼ÀªÉ ªÀÄvÀÄÛ PÀªÀgÀÄ ¸ÉÃj MAzÉÃ ªÀåªÀ¸ÉÜAiÀiÁUÀÄvÀÛzÉ. ºÉÆgÀ£ÀÄUÀÄªÀ UÁ½AiÀÄÄ ¨ÁUÀÄ«PÉAiÀÄ §½ ¥ÀAiÉÆÃV¸ÀÄªÀ §®ªÀÅ PÀªÀj£À M¼À¥ÀzÀgÀUÀ½AzÀ ¸ÀjzÀÆUÀ®qÀÄvÀÛzÉ.

ACTION-REACTION

Objective: To demonstrate that Action and Reaction do not act on the same system

Materials Required: A bent PVC tube and air blower (compressor)

Procedure: Pivot the bent tube such that it can rotate freely. Blow air through this using the compressor. As the air exits from the free end, the tube recoils in the opposite direction. Next, tie a transparent plastic cover at the open end and repeat the experiment. Now, the tube does not recoil or shows extremely small recoil.

Reason: In the first case, air exerts a force at the bend as it moves towards the open end. The exiting air imparts a momentum in the opposite direction. In the second case, the pipe and the bag constitute a single system and the force exerted by the air at the bend is cancelled by the walls of the plastic cover.

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¨ÉÃPÁUÀÄªÀ ¸ÁªÀÄVæUÀ½ÄÄ: vÁªÀÄæzÀ PÉÆ½ÀªÉ (¸ÀÄªÀiÁgÀÄ 5 «Ä.«Ä. ªÁå¸ÀªÀļÀzÀÄ), ¨ÉAqÀÄ, ¤ÃgÀÄ vÀÄA©zÀ §PÉl Ä, ªÉÄÃtzÀ §wÛ ªÀÄvÀÄÛ ¹gÉAdÄ.

«ªÀgÀ: avÀæzÀ°è PÁtÄªÀ DPÁgÀPÉÌ vÁªÀÄæzÀ PÉÆ½ÀªÉAiÀÄ£ÀÄß ¨ÁV¹. PÉÆ½ÀªÉAiÀÄ vÀÄ¢UÀ¼ÀÄ ¥ÀgÀ¸ÀgÀ «ªÀÄÄÄRªÁVgÀÄªÀAvÉ ªÀiÁqÀÄªÀÅzÀÄ CwªÀÄÄÄRå. EzÀ£ÀÄß ¨ÉAr£ÉÆ½ÀUÉ Ej¹. PÉÆ½ÀªÉAiÉÆ½ÀUÉ ¤ÃgÀÄ vÀÄA©¹, §PÉn£À ¤Ãj£À ªÉÄÃ¯É F ªÀåªÀ¸ÉÜAiÀÄ£ÀÄß Ej¹. ¨É¼ÀUÀÄwgÀÄªÀ ªÉÄÃtzÀ §wÛAiÀÄ£ÀÄß ¸ÀÄgÀÄ½AiÀÄ PÉ¼ÀUÉ Ej¹. ¸À® ¸ÀªÀÄAiÀÄzÀ £ÀAvÀgÀ ¨ÉAr£À ªÀåªÀ¸É wgÀÄUÀ®Ä DgÀA©¸ÀÄvÀÛzÉ.

PÁgÀt: PÉÆ½ÀªÉAiÀÄ°ègÀÄªÀ ¤ÃgÀÄ PÁzÀÄ »UÀÄΣvÀÛzÉ. CzÀÄ ¨ÁVzÀ vÀÄ¢¬ÄAzÀ ºÉÆgÀºÉÆÃUÀÄªÁUÀ ¨ÁªÀÄPÀªÀ£ÀÄß GAl ÄªÀiÁqÀÄvÀÛzÉ. ªÀÄvÀÄÛ ¨ÉAr£À ErÃ ªÀåªÀ¸É wgÀÄUÀÄvÀÛzÉ.

ROTARY ENGINE

Objective: To demonstrate converting heat energy into mechanical energy

Materials Required: Copper pipe of about 5mm in diameter, a thermocole sheet, a small bucket of water, a candle and a syringe.

Procedure: The copper pipe is bent into a shape as shown in the photograph. It is important to bend the open ends of the pipe in opposite directions. Pierce the copper bent pipe into thermocole sheet, fill the pipe with water using a syringe and float it on water. Place a burning candle right below the loop in the pipe. After a short while the thermocole sheet begins to rotate.

Reason: Water present in the loop heats up and expands. As it exits through the bent pipe, it exerts a torque which sets the sheet into rotation.

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«ªÀgÀ: ¥ÉÆÃ®gÁAiÀiïØ ºÁ¼ÉUÀ¼À£ÀÄß ¥ÀgÀ¸ÀàgÀ ®A§ªÁVj¹. EªÉgÀqÀgÀ »AzÉ ¨É¼ÀQ£À ªÀÄÆ®ªÀ£ÀÄß Ej¹. ¥ÉÆÃ®gÁAiÀiïØ ªÀåªÀ¸ÉAiÀiÁ ªÀÄÆA¨ÁUÀPÉ F ¨É¼ÀPÀÄ vÀ®Ä¥ÀÄªÀÅ¢®è. FUÀ F ºÁ¼ÉUÀ¼À £ÀqÀÄªÉ PÁUÉ §AUÁgÀªÀ£ÀÄß Ej¹, ¥ÉÆÃ®gÁAiÀiïØ ªÀåªÀ¸ÉAiÀiÁ ªÀÄÆA¨ÁUÀ¢AzÀ £ÉÆÃr. PÁUÉ §AUÁgÀzÀ ««zÀ ¨ÁUÀUÀ¼À°è ºÀ®ªÁgÀÄ §tUÀ¼ÀÄ PÁtÄvÀªÉ.

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MICA UNDER POLARIZED LIGHT

Objective: To demonstrate effect of polarized light on Mica

Materials Required: Mica sheet, two Polaroid sheets, a source of diffuse light

Procedure: Place the two Polaroid sheets at right angles to one another. Place a source of diffuse light beyond the polaroids. Look at the source of light through the polaroids. Light is completely cut off by the polaroids placed at right angles to one another. Now, keep the sheet of mica between the polaroids and observe as before. Different colours are seen at different parts of mica sheet.

Reason: The colours are due to interference of polarized light. The colour at any point depends on the wavelength of lights and thickness of mica.

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STEPPING FEET ILLUSION

Objective: To demonstrate perception of motion of objects against contrasting background

Materials Required: A patterned sheet as shown in the figure, a DC Motor

Procedure: Paste the patterned paper on a circular disc that is mounted on a low rpm DC motor. Another transparent circular disc is mounted on the shaft of the motor such that the transparent disc rotates while the patterned disc is stationary. Stick small pieces of dark blue and light yellow on the transparent sheet, as shown in the figure. As the disc rotates against the black and white pattern, the coloured pieces appear to move intermittently and alternately. But in the white quadrant background, both pieces move at the same speed and together – as they should.

Reason: When the blue piece lies on the white sectors, it appears to move faster than it is really moving. Similarly, when against the black sectors it appears to move slower. And, the opposite effect happens with yellow piece. This is due to the contrast between the colour and the background.

C¸ÀµÀ DPÁgÀ

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¨ÉÃPÁUÀÄªÀ ¸ÁªÀÄVæUÀ¼ÀÄ: PÀ£Àßr, PÉÆÃQa ¸ÀÄVºÀgÁ gÀªÀgÀ vÀAiÀiÁj¹zÀ ¨ÀæÉÄ ªÀÄÆr¸ÀÄ DPÁgÀzÀ 3r ªÀÄÄ¢vÀ ¥Àw

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PÁgÀt: ¥ÉÆ. PÉÆQa ¸ÀÄVºÀgÁ gÀªÀgÀÄ vÀÄA¨Á ¤UÁ ªÀ»¹ £ÀªÀÄä ªÉÄzÀÄ¼À£ÀÄß ºÁ¢ vÀ¦¸ÀÄªÀAvÉ F 3r DPÁgÀUÀ¼À CAZÀÄUÀ¼À£ÀÄß vÀAiÀiÁj¸ÀÄvÁgÉ. E° ZËPÀzÀAvÉ PÁtªÀÄzÀÄ ªÁ¸ÀªÀzÀ° ZËPÀªÉÃ C®. EªÀÅ ¨ÀæÉÄ ªÀÄÆr¸ÀÄªÀ ¸À®ÄªÁV «±ÉÃµÀªÁV PÀA¥ÀÆålgï ¥ÉÆUÁæªÀiï ¤AzÀ vÀAiÀiÁgÁVgÀÄªÀ CAZÀÄUÀ¼ÀÄ.

AMBIGUOUS ILLUSION

Objective: To demonstrate ambiguous optical illusion

Materials Required: A plane mirror and a 3D template of Kokichi Sugihara's illusion

Procedure: Place the Sugihara's 3D model of ambiguous illusion generated by a computer program, in front of a plane mirror. Observe the shape of the model as well as the shape as it appears in the mirror. We would expect the mirror image to be truthful to the shape of the object. Not here! Square appears as a circle in the mirror and vice versa! This is the ambiguous illusion.

Reason: Prof Kokichi Sugihara carefully prepares such 3D shapes with contours that mislead the brain. What we perceive as square is actually NOT a square at all. The contours carefully created to produce this illusion.

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A PUZZLE CONCERNING WATER FLOW

Objective: To demonstrate the role of pressure head in flow of water (Fluids)

Materials Required: A funnel, hose pipe that fits into the stem of the funnel, a cylindrical pipe or a bobbin

Procedure: Connect about two metres of hose pipe to the funnel. Seal the joint air-tight. Coil the hose pipe on a PVC pipe or a large bobbin. Fix the funnel to a stand at a height of about 20 cm and place the coil on the table. On pouring water into the funnel, very little water flows into the coil and the funnel overflows.

Reason: A quantity of water flows over the first winding of the hose to fall to the bottom and form an air trap. The trapped air prevents any more water from entering the first loop of the hose.

If the funnel end of the empty hose is high enough, water poured into it will be forced over more than one winding. The diameter, times the number of coils, gives the approximate height the water column at the funnel end must be to force water out at the other end.

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«ªÀgÀ: ªÉÄmÉÆ£ÉÆÃªÀiï JA§ÄzÀÄ ¤¢ðµÀ PÁ®zÀ CAvÀgÀUÀ¼À° ±À§Ý UÀ¼À£ÀÄß GAl ÄªÀiÁqÀÄªÀ MAzÀÄ ¸ÁzsÀ£À. ªÀÄÆ®vÀB DAzÉÆÃ®£ÁªÀ¢AiÀÄ£ÀÄß §zÀ° ¸ÀÄªÀ CªÀPÁ±À«gÀÄªÀAvÀºÀ MAzÀÄ ¯ÉÆÃ®PÀ. JgÀqÀÄ ªÉÄmÉÆ£ÉÆÃªÀiï UÀ¼À£ÀÄß »AzÉ ªÀÄÄAzÉ DqÀÄªÀAvÀºÀ vÀ®zÀ ªÉÄÃ¯É Ej¹. ¸À® ¸ÀªÀÄAiÀÄzÀ CAvÀgÀ«gÀÄªÀAvÉ F DAzÉÆÃ®PÀUÀ¼À£ÀÄß DAzÉÆÃ®£ÀPÉ M¼À¥À r¹. DzÀgÉ ¸À® ¸ÀªÀÄAiÀÄzÀ §½PÀ EªÀÅ KPÀvÁ£ÀvÉAiÀÄ° DAzÉÆÃ ¸ÀÄªÀÀzÀ£ÀÄß PÁ t §ºÀÄzÀÄ.

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SYNCHRONIZATION OF METRONOMES

Objective: To demonstrate synchronization of oscillators

Materials Required: Two metronomes, a platform

Experiment: A metronome is a mechanical device that produces sound at set regular intervals of time. It is basically a pendulum with adjustable periodicity. Place two metronomes on the platform that is free to rock back and forth. Start the motions of the pendulums in the two metronomes at slightly different times such that they DO NOT reach extreme positions at the same time. After a short while, the two metronomes synchronize their motions such that they reach extreme positions at exactly the same instant.

Reason: The sensitively placed platform rocks back and forth in response to the oscillations of the metronome pendulums, thus exchanging energy between the two systems. This results in a gradual synchronization of the metronomes. A large number of closed systems in nature that exchange energies show this behaviour.

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COUPLED MAGNETIC OSCILLATORS

Objective: To demonstrate the transfer of energy in magnetic systems

Materials Required: strong magnets, three or more fidget spinners

Procedure: Fasten the magnets to the fidget spinners. Mount the fidget spinners on a wooden board, as shown in the photograph. Spin one of them. We notice that other fidget spinners respond by spinning.

Reason: The magnets have been mounted such that magnets from neighbouring spinners repel one another. Setting one of the spinners into rotation causes neighbouring ones to rotate due to the force exerted by the magnets on one another. Systems in which energy can be exchanged are said to be coupled systems.

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Jawaharlal Nehru Planetarium

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«ªÀgÀ: J£ÁªÀÄ¯ï gÀ»vÀ vÁªÀÄzÀ vÀAwAiÀÄ£ÀÄß avÀæzÀ°è vÉÆÃj¹gÀÄªÀ DPÁgÀzÀ°è ¨ÁV¹, ¥ÀªÀgï ¸À¥ÉèöÊUÉ ¸ÀA¥ÀQð¹. avÀæzÀ°è vÉÆÃj¹gÀÄªÀAvÉ DAiÀÄ ¸ÀܼÀUÀ¼À°è PÁAwÃAiÀÄ ¢PÀÆaUÀ¼À£ÀÄß Ej¹. «zÀÄåvï ¥ÀªÀÄ»¸ÀzÉÃ EzÀÝgÉ, F ¢PÀÆaUÀ½É®ªÀÇ ¨sÀÆ«ÄAiÀÄ PÁAvÀPÉÃvÀæPÉ C£ÀÄUÀÄtªÁV ¤®ÄvÀªÉ. «zÀÄåvï ¥ÀªÁºÀ¢AzÁV vÁªÀÄzÀ vÀAwAiÀÄ ¸ÀÄvÀÛ® PÁAvÀPÉÃvÀæ GAmÁUÀÄvÀÛzÉ. FUÀ ¢PÀÆaUÀ¼À°è EzÀÝPÉ C£ÀÄUÀÄtªÁzÀ «ZÀ®£À PÁtÄvÉÃªÉ. «zÀÄåvï£À ¢PÀÄÌ ªÀÄvÀÄÛ JgÀqÀÄ vÀAwUÀ½gÀÄªÀ ¸À¼ÀUÀ¼À°è ¤ªÀ¼À «zÀÄåvï£À ¥ÀªÀiÁt ªÀÄvÀÄÛ ¢PÀÄÌUÀ¼ÀÄ ¢PÀÆaUÀ¼À «ZÀ®£ÀzÀ ¥ÀªÀiÁt ªÀÄvÀÄÛ ¢PÀ£ÀÄß ¤zsÀð¸ÀÄvÀÛzÉ.

SUPERPOSITION OF CURRENTS

Apparatus Required: A magnetic compass, a metal rod, a wooden board and a power supply – 6v / 9v DC.

Objective: To demonstrate superposition of currents.

Procedure: Several magnetic compasses are positioned at vantage points on the bare copper wire that is connected to the power supply. The shape in which the wire is bent is important to illustrate the behaviour of electric current. The compass aligns itself in response to the Earth's magnetic field when there is no current flowing through the wire. Current passing through the wire creates a magnetic field. The compass now aligns itself in response to the current. The direction of deflection and the magnitude of deflection depend on the direction of the current and the resultant of currents, if the compass is placed over two segments of the wire.

PÁ t zÀ «Ä£ÀÄUÀÄ«PÉ

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¨ÉÃPÁUÀÄªÀ ¸ÁªÀÄVæUÀ¼ÀÄ: ¤AiÀiÁ£ï §®Ä 1KΩ gÉÆÃzÀPÀ, J.¹. ¸À¥ÉèÉ, ªÀAiÀÄgÀÄ.

«ªÀgÀ: ¤AiÀiÁ£ï §®§£ÀÄß 1KΩ gÉÆÃzÀPÀzÉÆA¢UÉ ¸ÀgÀtAiÀÄ°è ¸ÀA¥ÀQð¹. EzÀ£ÀÄß J.¹. ªÉÄÊ£ï£ÉÆA¢UÉ ¸ÀA¥ÀQð¹. §®§£ÀÄß ºÉÆA¢gÀÄªÀ ªÀAiÀÄgÀ£ÀÄß ªÀÄÈvÁPÁgÀzÀ°è wgÀÄV¹. ¨É¼ÀQ£À ¸ÀA¥ÀÆtð ªÀÈvÀ ªÀÄÆqÀÄªÀÅ¢®. ¤¢ðµÀ CAvÀgÀUÀ¼À°è ¨É¼ÀPÀÄ ªÀÄvÀÄÛ PÀvÀ°£À ¨ÁUÀUÀ¼À£ÀÄß ºÉÆA¢gÀÄªÀ ªÀÈvÀ ªÀÄÆqÀÄvÀzÉ.

PÁgÀt: ¤AiÀiÁ£ï §°£À 65 ªÉÇÃ¯ïUÀ½UÉ CAiÀiÁ¤ÃPÀgÀt GAmÁUÀÄvÀzÉ. 50Hz PÀA¥À£ÁAPÀ«gÀÄªÀ J.¹. «zÀÄåvï£À°è 0-220 ªÉÇÃ¯ïUÀ¼ÀªÀgÉUÀÆ ªÉÇÃ¯ÉÃeï §zÀ¯ÁUÀÄvÀzÉ. CAzÀgÉ ªÉÇÃ¯ÉÃeï 65 ªÉÇÃ¯ïVAvÀ PÀrªÉÄ EgÀÄªÀ CªÀ¢UÀ¼À¯Æ EgÀÄvÀªÉ. D CªÀ¢UÀ¼À°è ¤AiÀiÁ£ï ¢Ã¥À ¨É¼ÀUÀÄªÀÅ¢®.

INVISIBLE FLICKER

Objective: To illustrate that gas discharge lamps produce light beyond a certain voltage

Method: Take a small neon bulb with a one kilo ohm resistor connected in series with it. Such bulbs are readily available in electrical shops. Connect the bulb across the wires of a flexible power cord. Plug the other end of the cord into the AC mains supply. The neon bulb glows. Now, hold the cord about one metre from the bulb and whirl it. You will observe arcs of light broken at regular intervals.

Reason: A neon bulb of this kind requires about 65 volt to ionize the gas and produce light. Since the power supply is an alternating voltage, the voltage goes from zero to 220 volt. And, the AC frequency is 50 hertz. So, there will be periods in the ac supply when the voltage is below 65 voltage. That is when the bulb does not glow!

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¨ÉÃPÁUÀÄªÀ ¸ÁªÀÄVÀæUÀ¼ÀÄ: vÀAw, zÁgÀ, ¸ÉÆÃ¦£À zÁªÀt

«ªÀgÀ: vÀAwAiÀÄÄ£ÀÄß avÀzÀ°è vÉÆÃj¹gÀÄªÀ DPÁgÀPÉ ¨ÁV¹. ¸ÀªÀiÁAvÀgÀ ¨ÁºÀÄUÀ¼À £ÀqÀÄªÉ zÁgÀªÀ£ÀÄß eÉÆÃvÀÄ ©r. EzÀ£ÀÄß ¸ÉÆÃ¦£À zÁªÀtzÀ°è C¢ vÉUÉ¬Äj. eÉÆÃvÀÄ ©zÀ zÁgÀ JgÀqÀ£ÉÃ avÀzÀ°è PÁtÄªÀAvÉ ªÉÄÃ¯ÉäAiÀÄ®ngÀÄvÀzÉ. ¸ÉÆÃ¦£À zÁªÀtzÀ°è C¢zÀ PÉÊUÀ½AzÀ F zÁgÀªÀ£ÀÄß PÉ¼ÀUÉ¼É¬Äj. CzÀÄ ¥ÀÄ£ÀB »A¢£À DPÁgÀPÉÃ ªÉÄÃ¯ÉäAiÀÄ®ÆqÀÄvÀzÉ.

PÁgÀt: ¸ÉÆÃ¦£À ¥ÀzÀgÀzÀ ªÉÄÃ¯ÉäÊ ¸É¼ÉvÀªÀÅ ¥ÀzÀgÀzÀ «¹Ãtð¥ÀÆtðvÉAiÀÄ£ÀÄß PÀ¤µÀUÉÆ½¸ÀÄvÀzÉ. DzÀjAzÀ¯ÉÃ zÁgÀªÀ£ÀÄß PÉ¼ÀUÉ¼ÉzÀgÀÆ CzÀÄ ¥ÀÄ£ÀB ªÉÄÃ¯ÉäAiÀÄ®ÆqÀÄvÀzÉ.

SURFACE TENSION DRAWS A CIRCLE

Materials Required: Circular frame, thread, soap solution.

Description: A circular metal frame is dipped into a soap solution. On taking it out, one will notice a soap film encompassing the entire frame. Greater the area of the film, larger is the energy required to maintain it. This depends on the surface tension of the solution. Next, a loop of thread is placed on the film and the film inside the thread is broken by touching with a dry finger. The film inside the loop breaks and the thread is drawn into a perfect circle!

Reason: When the film inside the thread is broken, the film outside it takes a shape of minimum area. So, the area of the thread has to be a maximum. Since the perimeter of the thread is fixed, the largest area possible for the thread is a circle.

E½eÁj£À ªÉÄÃ°gÀÄªÀ UÀAmÉUÀ¼ÀÄ

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¨ÉÃPÁUÀÄªÀ ¸ÁªÀÄVUÀ¼ÀÄ: E½eÁj£À ¥ÀxÀ UÀAmÉUÀ¼ÀÄ, ZÉAqÀÄ, PÀrUÀ¼ÀÄ, PÀlÖ ªÀiÁqÀÄªÀ

«zÁ£À: avÀzÀ°è vÉÆÃj¹gÀÄªÀAvÉ, E½eÁj£À ¥ÀxÀzÀ ªÉÄÃ¯É PÀlÖ£ÀÄß Ej¹. D PÀn£À°è C¸ÀªÀiÁ£À zÀÆgÀUÀ¼À°è UÀAmÉUÀ¼À£ÀÄß PÀnÖ. UÀAmÉUÀ¼À ªÀÄzÀåzÀ°èÁUÀzÀ vÀÄ¢UÉ PÀrUÀ¼À£ÀÄß PÀnÖ E½eÁj£À ªÉÄÃ¯É GgÀÄ¼ÀÄªÀ ZÉAqÀÄ F PÀrUÉ½UÉ vÁUÀÄªÀAvÉ EgÀ¨ÉÃPÀÄ. F ¥ÀPÁgÀªÁV GAmÁzÀ ±À§Ý C¸ÀªÀiÁ£À ¸ÀªÀÄAiÀiÁAvÀgÀ ºÉÆA¢gÀÄvÀzÉ JAzÀÄ ¨Á«¸ÀÄªÀÅzÀÄ ¸ÀºÀd. DzÀgÉ E° ºÁUÁUÀÄªÀÅ¢®è. F UÀAmÉUÀ¼À £ÀqÀÄ«£À CAvÀgÀªÀÅ £ÉÊ¸ÀVðPÀ ¸ÀASÉåUÀ¼À ªÀUÀðUÀ¼À C£ÀÄ¥ÁvÀzÀ°èªÉ. E½eÁj£À ªÉÄÃ¯É ZÀ°¸ÀÄªÀ ªÀ¸ÀÄÛUÀ¼ÀÄ ZÀ°¸ÀÄªÀ zÀÆgÀªÀÅ ZÀ®£ÉAiÀÄ ¸ÀªÀÄAiÀÄzÀ ªÀUÀðzÀ C£ÀÄ¥ÁvÀzÀ°gÀÄvÀzÉ. DzÀPÁgÀt ±À§ÝUÀ¼À £ÀqÀÄ«£À CAvÀgÀªÀÅ ¸ÀªÀiÁ£ÀªÁVgÀÄvÀzÉ.

THE BELLS AND THE INCLINED PATH

Objective: To demonstrate that the distance covered by the objects on an inclined plane is proportional to the square of the time taken.

Materials Required: Inclined track, bells, a frame, ball and sticks.

Description: Fix the frame to the inclined track as shown in the figure. The bells are fixed to the frame at unequal intervals. Sticks are attached to the clappers of each bell. The ball that rolls on the track touches these sticks and in turn the clappers hit the bell. We expect the sound to be produced at unequal intervals of time. But the sounds are produced with equal spacing in time. The spacing between the bells are proportional to the squares of the natural numbers. The distance covered by the objects on an inclined plane is proportional to the square of the time taken. Hence the sounds are produced at equal intervals of time.

PÁAvÀPÉÃvÀ¢AzÀ ªÉÄÃ¯ÉÃgÀÄªÀ vÀmÉ

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«ªÀgÀ: vÁªÀÄzÀ vÀAwAiÀÄ£ÀÄß ºÀ®ªÁgÀÄ ¨ÁjUÀ¼À ¸ÀÄgÀÄ½AiÀÄ£ÀÄß ªÀiÁqÀ¯ÁVzÉ. ¸ÀÄgÀÄ½AiÀÄ ªÉÄÃ¯É ¯ÉÆÃºÀzÀ vÀmÉAiÀÄ£ÀÄß EjÀ¯ÁVzÉ. F ¸ÀÄgÀÄ½AiÀÄ°è «zÀÄåvï ¥ÀªÁºÀ ºÀjzÁUÀ PÁAvÀPÉÃvÀ GAmÁUÀÄvÀzÉ. EzÀjAzÁV ¯ÉÆÃºÀzÀ vÀmÉAiÀÄ°è «zÀÄåvï ¥ÉÃjvÀªÁUÀÄvÀzÉ. CzÀÄªÉÃ "Jr PÀgÉAmï". F ¥ÉÃjvÀ «zÀÄåvï¤AzÁVAiÀÄÆ PÁAvÀPÉÃvÀ GAmÁUÀÄvÀzÉ. F JgÀqÀÆ PÁAvÀPÉÃvÀUÀ¼À ¥ÀgÀ¸ÀgÀ «PÀµÀðt¢AzÁV vÀmÉAiÀÄÄ ªÉÄÃ¯ÉÃj vÉÃ®ÄwgÀÄªÀAvÉ PÁtÄvÀzÉ

MAGNETIC LEVITATION

Objective: To demonstrate electromagnetic induction.

Description: A coil of several turns is connected to a power supply. A metal plate is placed on the coil. Current flowing in the coil gives rise to a magnetic field around it. This magnetic field induces a current in the metal plate. These are called Eddy currents. These currents also give rise to a magnetic field around the metal plate which repels the magnetic field around the coil. As a result, the plate rises up.

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«ªÀgÀ: ªÀÄvÁPÁgÀzÀ PÀn£À ºï zÁgÀzÀ PÀÄ t PÉAiÉÆAzÀ£ÀÄß vÀÆUÀÄ ©r. EzÀ£ÀÄß ¸ÉÆÃ¦£À zÁªÀ t zÀ ºï C¢ vÉUÉzÁUÀ, ¸ÉÆÃ¦£À ¥ÀzÀgÀzÀ ºgÀÄªÀ PÀÄ t PÉÉ AiÀiÁªÀÄzÉÃ ¤¢ðµÀ DPÁgÀ«gÀÄªÀÅ¢®. PÀÄ t PÉAiÀÄ M¼ÀVgÀÄªÀ ¸ÉÆÃ¦£À ¥ÀzÀgÀªÀ£ÀÄß eÉÆÃ¥Á£ÀªÁV MqÉ¬Ä j. vÀPÀ t ªÉÃ PÀÄ t PÉAiÀÄÄÄ ªÀÄvÁPÁgÀªÀ£ÀÄß ¥ÀqÉAiÀÄÄvÀzÉ.

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SURFACE TENSION OF SOAP FILMS

Objective: To demonstrate the surface tension of soap films

Materials Required : Metal rod, thread, soap solution

Description: Bend the rod and tie a thread between its parallel sides as shown in the figure. Dip this in soap solution. The thread that was hung before is now pulled up and held as shown in figure 2. Try pulling down this with wet hands. Even then it gets pulled back to the same position.

Reason: The surface tension in the soap film minimises the area of the film. It is this force which is pulling the thread back.

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Jawaharlal Nehru Planetarium

PÁå¯ÉìÊmï ºÀgÀ½£À° ¢ªÀQÃ¨ÀªÀ£À

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¥ÀAiÉÆÃUÀ: ¥ÁgÀzÀ±ÀðPÀ PÁå¯ÉìÊmï ºÀgÀ¼À£ÀÄß ¤«ÄµÀPÉ 5 ¨Áj DªÀwð¸ÀÄªÀ ªÉÆÃmÁgïUÉ ªÉÄÃ¯É PÀÆj¸À¯ÁVzÉ. EzÀ£ÀÄß UÁf£À ªÀÄÄA¨ÁUÀªÀżÀ ¥ÉnÖUÉAiÀÄ° Ej¹zÉ. ¥ÉnÖUÉAiÉÆ¼ÀPÉ ¸À® ºÉÆUÉ vÀÄA©¹, CzÀ£ÀÄß ªÀÄÄa ©r, §¢AiÉÆAzÀgÀ° PÉÆgÉ¢gÀÄªÀ ¸Àt gÀAzÀæ ªÀÄÆ®PÀ ºÀgÀ½£À ªÉÄÃ¯É ¯ÉÃ¸Àgï ¨É¼ÀPÀ£ÀÄß ºÁ¬Ä¹.

«ÃQ¹: ºÀgÀ½£À ªÉÄÃ¯É ©Ã¼ÀÄwÛgÀÄªÀªÀÅzÀÄ MAzÉÃ ¯ÉÃ¸Àgï QgÀt ªÁzÀgÀÆ ºÀgÀ½¤AzÀ ºÉÆgÀ§gÀÄªÀªÀÅzÀÄ JgÀqÀÄ QgÀtUÀ¼ÀÄ. ºÀgÀ¼À£ÀÄß DªÀwð¹zÀgÉ MAzÀÄ QgÀt zÀ ¢PÀÄÌ §zÀ¯ÁUÀÄªÀÅ¢®, DzÀgÉ ªÀÄvÉÆÛAzÀgÀ §zÀ¯ÁUÀÄvÀzÉ.

PÁgÀt: PÁå¯ÉìÊmï ºÀgÀ½£À° ¨ÉÃgÉ ¢PÀÌÄUÀ¼À° ¨É¼ÀQ£À ªÉÃUÀªÀÅ ¨ÉÃgÉ ¨ÉÃgÉAiÁVgÀÄªÀÅzÀjAzÀ ºÀgÀ½£É EzÉ. JAzÀgÉ ¨ÉÃgÉ ¨ÉÃgÉ ¢QÌ£À° CzÀgÀ ªÀQÃ¨ÀªÀ£ÁAPÀ ¨ÉÃgÉ ¨ÉÃgÉ EgÀÄvÀzÉ. ¢PÀÄÌ §zÀ°¸ÀzÀ QgÀt ªÀ£ÀÄß ¸ÁªÀiÁ£Àå QgÀt ªÉAzÀÆ ¢PÀÄÌ §zÀ°¸ÀÄªÀ QgÀt ªÀ£ÀÄß C¸ÁªÀiÁ£Àå QgÀt ªÉAzÀÆ PÀgÉAiÀÄÄvÁÛgÉ.

DOUBLE REFRACTION IN CALCITE

Objective: To demonstrate birefringence or Double Refraction in Calcite Crystal

Experiment: A transparent crystal of calcite is mounted on a 5 rpm motor. This is placed in a wooden box with a glass front. The box is closed and filled with a small quantity of smoke that enables us to see the path of light. A narrow beam of light from a laser pointer is shone on the crystal through an small opening in the box.

Observation: A single beam of light enters the crystal but two beams emerge out of it. One of the beams has a fixed direction as the crystal rotates about a vertical axis. The other beam, however, rotates along with the crystal.

Reason: Calcite has a structure that affects the speed of light differently along different directions – that is, different refractive indices. The beam that remains fixed in direction is called the Ordinary Ray and the other 'Extraordinary Ray'.

CUÀ¸ïÌ PÀÄAqïÌ £À PÉÆ¼ÀªÉ

¨ÉÃPÁUÀÄªÀ ¸ÁªÀÄVæUÀ¼ÀÄ: MAzÀÄ GzÀÝ£ÉAiÀÄ ¥ÁgÀzÀ±ÀðPÀ PÉÆ¼ÀªÉ, ªÀÄgÀzÀ ºÉÆlÄÖ ªÀÄvÀÄÛ ¹Ãn.

«zÁ£À: MAzÀÄ GzÀÝ£ÉAiÀÄ ¥ÁgÀzÀ±ÀðPÀ PÉÆ¼ÀªÉAiÀÄ°è ¸Àé® ¥ÀªÀiÁtzÀ ªÀÄgÀzÀ ºÉÆlÖ£ÀÄß C¸ÀªÀiÁ£ÀªÁV ºÀgÀqÀ¯ÁVzÉ. PÉÆ¼ÀªÉAiÀÄ MAzÀÄ vÀÄ¢AiÀÄ£ÀÄß ªÀÄÄaÑ E£ÉÆßAzÀÄ vÀÄ¢AiÀÄ §½ eÉÆÃgÁV ¹Ãn H¢zÁUÀ ºÉÆn£À PÀtUÀ¼ÉÆ®ªÀÇ ¸ÀªÀÄªÁ¢ vÀªÀiÁV ¸ÀªÀiÁ£À CAvÀgÀ ºÉÆA¢gÀÄªÀ UÉgÉUÀ¼ÀAvÉ eÉÆÃqÀuÉUÉÆ¼ÀÄîvÀzÉ. PÉÆ¼ÀªÉAiÀÄ vÉgÉzÀ vÀÄ¢¬ÄAzÀ ºÉÆgÀlÄ ±À§zÀ vÀgÀAUÀUÀ¼ÀÄ ªÀÄÄaÑzÀ vÀÄ¢¬ÄAzÀ ¥ÀwzÀ°vÀUÉÆ¼ÀÄîvÀªÉ. F JgÀqÀÄ vÀgÀAUÀUÀ¼ÀÄ MAzÀgÀ ªÉÄÃ¯ÉÆAzÀÄ §AzÀÄ ¸À§ vÀgÀAUÀUÀ¼ÀÄ GAmÁUÀÄvÀªÉ. ºÉÆn£À PÀtUÀ¼ÉÆ®ªÀÇ ¸À§ ©AzÀÄUÀ¼À°è ¸ÀAUÀºÀuÉUÉÆ¼ÀÄîªÀÅzÀjAzÀ UÉgÉUÀ¼ÀAvÀºÀ gÀZÀ£É PÀAqÀÄ§gÀÄvÀzÉ. CUÀ¸ïÌ PÀÄAqïÌ JA§ «eÁ¤ F ¥ÀAiÉÆÃUÀªÀ£ÀÄß ªÉÆzÀ® ¨ÁjUÉ ¤gÀÆ¦¹zÀÄÝ. DzÀ PÁgÀt, F PÉÆ¼ÀªÉUÉ PÀÄAqï£À PÉÆ¼ÀªÉ JAzÀÄ ºÉ¸ÀgÀÄ.

KUNDT'S TUBE

Apparatus Required: A long glass tube, saw dust and a whistle.

Procedure:

- A little saw dust is spread randomly in a long transparent tube whose one end is sealed.
- A whistle is kept at the open end and blown.
- All the saw dust gets aligned in the form of lines with regular spacing.
- This is because the sound waves generated at the open end gets reflected at the closed end. The two waves superpose to form stationary waves. The saw dust gets accumulated at the nodes.

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¨ÉÃPÁUÀÄªÀ ¸ÁªÀÄVæUÀ¼ÀÄ: JgÀqÀÄ UÁf£À vÀmÉUÀ¼ÀÄ, ¯ÉÊPÉÆÃ¥ÉÆÃrAiÀÄªÀiï ¥ÀÄr, CAl Ä ¥Àn, «zÀÄå¢Ã¥À (¨É¼ÀQ£À ªÀÄÆ®).

«zÁ£À: JgÀqÀÄ UÁf£À vÀmÉUÀ¼À ªÀÄzÉå ¸À® ¯ÉÊPÉÆ¥ÉÆÃrAiÀÄªÀiï ¥ÀÄrAiÀÄ£ÀÄß ºÁQ CAl Ä¥ÀnAiÀÄ ¸ÀºÁAiÀÄ¢AzÀ vÀmÉUÀ¼À£ÀÄß »r¢qÀ¯ÁVzÉ. EzÀgÀ ªÀÄÆ®PÀ ¨É¼ÀQ£À ªÀÄÆ®ªÀ£ÀÄß £ÉÆÃrzÀgÉ CzÀgÀ ¸ÀÄvÀÛ®Æ §tzÀ GAUÀÄgÀUÀ¼À£ÀÄß PÁtÄvÉÛÃªÉ. GAUÀÄgÀzÀ M¼À¨ÁUÀªÀÅ ¤Ã°AiÀiÁVzÀÄÝ ºÉÆgÀ¨ÁUÀªÀÅ PÉA¥ÁV PÁtÄvÀzÉ. ¯ÉÊPÉÆÃ¥ÉÆÃrAiÀÄªÀiï ¥ÀÄrAiÀÄ «±ÉÃµÀvÉ JAzÀgÉ CzÀgÀ J¯Á PÀtUÀ¼ÀÆ MAzÉÃ UÁvÀzÀ ¥ÀjªÀÄtzÀ UÉÆÃ¼ÁUÀÀÄ. EªÀÅUÀ½AzÁV ¨É¼ÀPÀÄ «ªÀvÀð£ÉUÉÆ¼ÀÄîªÀÄzÀjAzÀ F vÀgÀºÀzÀ §tzÀ GAUÀÄgÀUÀ¼ÀÄ PÁtÄvÀÛªÉ. D¥ÁvÀ ¨É¼ÀQ£À ¢Q¤AzÀ PÀrªÉÄ «ZÀ®£ÉUÉÆAqÀ ¤Ã° GAUÀÄgÀzÀ M¼À¨ÁUÀPÉ PÀAqÀÄ§gÀÄvÀzÉ. ºÉZÀÄÄ «ZÀ®£ÉUÉÆAqÀ PÉA¥ÀÄ ºÉÆgÀ¨ÁUÀPÉ PÁtÄvÀzÉ.

LYCOPODIUM DIFFRACTION

Apparatus Required: 2glass plates, lycopodium powder, gum tape.

Procedure: A small amount of lycopodium powder is sandwiched between 2 properly sealed glass plates. Observe the light source through this. Coloured rings with blue on the inner side and red on the outer side are formed around the light source. These rings are due to the diffraction of light by the lycopodium particles which are perfectly spherical and nearly equal to one another in size. The deviation of the blue with respect to the direction of the incident light is small compared to that of red and hence seen in the inner region of the ring.

C£ÀÄgÀt£À

zÉåÃAiÀÄ: AiÀiÁªÀÅzÉÃ GAUÀÄgÀzÀ ªÁå¸ÀªÀÅ CzÀgÀ ¸ÀºÀd PÀA¥À£ÁAPÀªÀ£ÀÄß ¤zÀðj¸ÀÄvÀzÉ JA§ÄzÀgÀ ¤gÀÆ¥ÀuÉ.

Cª±ÀåPÀ ªÀ¸ÀÄÛUÀ¼ÀÄ : ªÀÄÆgÀÄ ¨ÉÃgÉ-¨ÉÃgÉ ªÁå¸ÀzÀ ¯ÉÆÃºÀzÀ GAUÀÄgÀUÀ¼ÀÄ, ¹UÀß¯ï d£ÀgÉÃlgï, DA¦èÊAiÀÄgï ªÀÄvÀÄÛ ¹ÃPÀgï (zÀ¤ªÀzÀðPÀ ªÀåªÀ¸ÉÜ).

¥ÀAiÉÆÃUÀ : ¨ÉÃgÉ-¨ÉÃgÉ ªÁå¸ÀzÀ ¯ÉÆÃºÀzÀ GAUÀÄgÀUÀ¼À£ÀÄß PÀA¦¸À®Ä ¸ÁzÀåªÁUÀÄªÀAvÉ ºÀUÀÄgÀªÁV ºÀ®UÉUÉ CAn¸À¯ÁVzÉ. ºÀ®UÉUÉ ¹ÃPÀgï£À ¸ÀºÁAiÀÄ¢AzÀ PÀA¥À£ÀªÀ£ÀÄß ªÀUÁð¬Ä¹zÁUÀ, PÀA¥À£ÁAPÀPÉ C£ÀÄUÀÄtªÁV MAzÀÄ GAUÀÄgÀ ªÀiÁvÀæ C¯ÁqÀÄvÀzÉ. PÀA¥À£ÁAPÀzÀ ºÉZÁÑzÀAvÉ ªÀÄvÉÆÛAzÀÄ ¨ÉÃgÉ ¨ÉÃgÉ GAUÀÄgÀUÀ¼ÀÄ PÀA¦¸ÀÄvÀªÉ.

PÁgÀt : ¥ÀæwAiÉÆAzÀÄ ªÀ¸ÀÄÛ«UÀÆ ¸ÀºÀdªÁzÀ MAzÀÄ DªÀÈw (Natural Frequency) EgÀÄvÀzÉ. MAzÀÄ ªÀ¸ÀÄÛ«£ÀzÀ ªÀ¸ÀÄÛ«£À ¸ÀºÀd DªÀÈwAiÀÄ PÀA¥À£ÀªÀ£ÀÄß ºÉÆgÀUÀr¹zÁUÀ D E£ÉÆßAzÀÄ ªÀ¸ÀÄÛ PÀA¦¸ÀÄvÀzÉ. EzÀ£ÀÄß C£ÀÄgÀt£À J£ÀÄßvÁgÉ. EzÀgÀAvÉ, ¯ÉÆÃºÀzÀ GAUÀÄgÀUÀ¼ÀÄ vÀªÀÄä-vÀªÀÄä ¸ÀºÀd DªÀÈwAiÀÄ PÀA¥À£ÀUÀ½UÉ ¸À«ÄÃ¥ÀzÀ PÀA¥À£ÀUÀ¼ÀÄ ¹ÃPÀgï¤AzÀ ºÉÆgÀ§AzÀAvÉ PÀA¦¸À¯ÁgÀA©¸ÀÄvÀªÉ.

RESONANT RINGS

Objective: To show that rings of different radii respond at different frequencies

Experiment: Rings of different diameters are made out of thick paper. Care should be taken to make rings of equal width. The rings are then glued to cardboard and placed on a speaker that is connected to an oscillator. An oscillator produces a range of frequencies, we notice that rings of different radii respond with maximum vibration at different frequencies.

Reason: Every object is characterised by its natural frequency of oscillation- the resonant frequency. The resonant frequency of a ring depends on the radius of the ring. Larger the radius, lower is its natural frequency of oscillation. As the speaker vibrates at different frequencies, the rings vibrate the most when the oscillator frequency matches with the ring's natural frequency or its integral multiples.

ºÁqÀÄªÀ PÉÆ¼ÀªÉ

zÉåÃAiÀÄ: GµÀ¢AzÀ GAmÁUÀÄªÀ MvÀqÀzÀ ªÀåvÁå¸À¢AzÀ zÀ¤AiÀÄ GvÁzÀ£ÉAiÀÄ ¥ÁvÀåQPÉ

Cª À±Àå ªÀ¸ÀÄUÀ¼ÀÄ : 2 ¸É0.«ÄÃ. ªÁå¸ÀzÀ Cª À±Àå ªÀ¸ÀÄUÀ¼ÀÄ ¯ÉÆÃºÀzÀ PÉÆ¼ÀªÉ. ¸À t vÀ0wAiÀÄ §¯É, §Ä£À£ï §£Àðgï.

¥ÀAiÉÆÃUÀ : vÀ0wAiÀÄ §¯ÉAiÀÄ£ÀÄß ¥ÀAiÉÆÃUÀ PÉÆ¼ÀªÉAiÀÄ ªÁå¸ÀQ0vÀ ¸À® ºÉZÁVgÀÄªÀ0vÉ PÀvÀj ¹. CzÀ£ÀÄß PÉÆ¼ÀªÉAiÉÆ¼ÀUÉ vÀÆj ¹, PÉÆ¼ÀªÉAiÀÄ £Á®£É MOzÀÄ ¨ÁUÀzÀµÀÄ M¼ÀPÉ vÀ½. F UÀ PÉÆ¼ÀªÉAiÀÄ£ÀÄß §£Àðgï ªÉÄÃ¯É »rzÀÄ ¸À® ºÉÆvÀÄ vÀ0w PÉ0¥ÁUÀÄªÀªÀgÉUÉ PÁ¬Ä¹. F UÀ PÉÆ¼ÀªÉAiÀÄ£ÀÄß eÁ¯É¬ÄOzÀ ºÉÆgÀvÉUÉ¬Äj. DUÀð£ï ªÁzÀåzÀOvÀºÀ ±À§ªÀ£ÀÄß PÉÃ¼ÀÄ«j.

PÁgÀ t : vÉgÉzÀ PÉÆ¼ÀªÉ PÁgÀ t C£ÀÄgÀ t £ÀPÁjAiÀÄOvÉ ªÀwð¸ÀÄvÀzÉ. PÁzÀ vÀ0wAiÀÄ §¯É CzÀgÀ C£ÀÄgÀ t £À ±À§ªÀ£ÀÄß ºÉÆgÀ r ¸ÀÄvÀzÉ. EzÀgÀ ªÀÄÆ®PÀ ºÁzÀÄ §OzÀ UÁ½ «PÁ¸ÀªÁUÀÄvÀzÉ. EzÀÄ PÉÆ¼ÀªÉAiÀÄ ªÀÄzÀå ¨ÁUÀzÀªÀgÉUÀÆ «¸Àj¸ÀÄvÀzÉ. vÀ l ¸ÀªÁVzÀ ¹OU ï C£ÀÄß Mw-©mÁUÀ CzÀÄ ªÉÄÃ¯É PÉ¼ÀUÉ DqÀÄªÀOvÉ, UÁ½AiÀÄÆ ªÉÄÃ¯É PÉ¼ÀUÉ KgÀvÉÆqÀUÀÄvÀzÉ. CzÀgÀ ¸ÀºÀd C£ÀÄgÀ t £À PÀO¥À£ÁOPÀ¢OzÀ ¸ÀO¢¹zÁUÀ ±À§ PÉÃ¼ÀÄvÀzÉ.

SINGING TUBE

This experiment demonstrates production of sound due to air currents generated by heat

Materials Required: A metal pipe of about 2 cm diameter, fine wire mesh, bunsen burner.

Experiment: Cut the wire mesh slightly bigger than the diameter of the pipe. Insert it into one of the ends and push to place it at about one-fourth the length of the pipe. Hold the tube vertically above the flame of the burner so that the wire mesh heats to redness. Remove the tube from the flame. We hear a loud, continuous sound that persists for a while.

Reason: The tube behaves as an open end resonator. The heated mesh produces a strong tone at its resonant frequency for several seconds. The standard explanation has to with the ease of excitation of a system at its resonant frequency. The air which passes up through the red hot mesh is heated and expands, producing a pulse of air toward the center of the pipe. Like a push which raises a mass on a spring above its equilibrium position, that pulse of air will start the system into oscillation at its natural frequency.