±ÁRd£ª ª t ð

zªÃAiÄ: zªª ºg¼ÄU¼° ±ÁR¢Az Gv£ªªÁUÄª ª t ð¨Ãzz ¤gÆ¥u

¨ÃPÁUÄª ¸ÁªÄVU¼Ä: Thermochromic ºÁ¼, C®Äª«Ä¤AiÄA ºÁ¼ ªÄvÄ ±ÁRz ªÄÆ®.

«ªg: C®Äª«Ä¤AiÄA ºÁ¼AiÄ° avªÇAz£Äª (GzÁºguU H¸gª½) Pvj¹, ºÁ¼U CAn¹, Ez£Äª ±ÁRz ªÄÆ®z ªÄÃ¯ C®Äª«Ä¤AiÄA ºÁ¼ ©¹U MrPÆ¼ÄªAv Ej¹zÁU av §t §tªÁV PÁtÄvz. vtUÁz PÆq¯ av PÁtzÁUÄvz. P®ªª «±Ãµ zªª ºg¼ÄU¼Ä ±ÁRP C£ÄUÄtªÁV ¨Ãg ¨Ãg §tª£Äª ¥qAiÄÄvª. F «±Ãµ UÄtP Thermochromic CxªÁ ±ÁRd£ªª tð JAzÄ º¸jz. P®ªÃ rVU¼µÄ ªªvÁª¸ª£Äª §tªÃ ¸Æa¸ÄªAv ºg¼ÄU¼£Äª ga¸§ºÄzÄ. F vvª£Äª GµªiÁ¥PU¼° §¼¸¯ÁUÄw z.

THERMOCHROMIC CRYSTALS

Objective: To demonstrate that the colour the of liquid crystals changes with the temperature.

Materials required: A thermochromic sheet, aluminum foil and a hot plate.

Description: Cut out a pattern out of aluminum foil, say the chameleon. Stick it on one side of the thermochromic sheet. Now place the sheet on the hot plate with the foil side resting on the plate. Within a short while, one can see a colourful picture forming on the thermochromic sheet! On cooling, the picture is no longer visible.

Reason: Thermochromic sheets change colours according to temperature (it is beyond the scope of this book to explain how this comes about). Such strips are used to determine the temperature of the body

ªiÁAiiÁUÄZÀ

zÀÃAiÄ: ¤ªÄ z¥ðtªÀ v£À PÃAzz° ª¸Ä«£ £ÉÀd ªÄvÄ v¯P¼UÁz ¥w©A§ª£Ä ªÄÆr¸Ävz JA§Äzg ¤gÆ¥u.

¨ÃPÁUÄª ¸ÁªÄVU¼Ä: ¤ªÄ z¥ðt, ºÆUÄZÀ

«ªg: ¤ªÄ z¥ðtª£Ä Czg wdÀQÀAv 4 ¸.«ÄÃ. QjzÁVgÄª ¥nUAiÄ° Ej¸¯ÁVz. z¥ðtPÀ JzÄjgÄª ¥®Pz° z¥ðtz UÁvz ¸ÄªiÁgÄ Czðz¶gÄª gAzª£Ä ªiÁr. avz° vÆÃj¹gÄªAv ºÆUÄZÀª£Ä Ej¹. ¥nUAiÄ JzÄgÄ §AzÄ ¤Avªj U ºÆUÄZÀªÇAzÄ ¥nU¬ÄAzÁZU ºÆzÁ¤AiÄ ªÄÃ¯ PÁtÄvz. Dzg, PÉU ¹®ÄPÄªÀ¢® .

PÁgt: EzÆAzÄ PtÀn£Avº vAv. ªÁ¸ªz° ºÆUÄZÀª£Ä ¥nUAiÆ¼U ¤ªÄ z¥ðtz ªÄÄAz, Dzg, gAz¢Az P¼ªÄlz° Ej¸¯ÁVz. ºÁUÁV ºÆgV¤Az D ª¸Ä PÁtÄªÀ¢®. PÁtÄªÀzÄ ¥nU¬ÄAz DZU ªÄÆqÄª Czg £ÉÀd ¥w©A§.

¸®º: ¥nUAiÆ¼VgÄª ºÆUÄZÀz ªÄÃ¯ ¨¼PÄ ©Ã¼Äª ªÀª¸À ªiÁrz° ¥juÁªÄªÀ E£Æ CzÄvªÁV ªÄÆqÄvz.

PHANTOM BOUQUET

Objective: To illustrate that a concave mirror produces a real, inverted image when the object is placed at its centre of curvature

Materials required: A concave mirror, a vase with flowers

Description: A concave mirror of known radius of curvature is placed in a box whose length is about 4 cm shorter than the mirror's radius of curvature. A hole half the size of the mirror is made on the face of the box opposite the mirror and the vase is positioned as shown in the figure. A person standing in front of the box will 'see' a bouquet - in the vase but cannot feel or hold it!

Reason: This is a trick! The bouquet is actually placed in front of the mirror but out of the sight of the observer. It is just beneath the hole inside the box! What the observer 'sees' is the real image of the bouquet formed by the mirror!

Visual tip: The effect is enhanced by illuminating the bouquet from inside the box.

G¦£zÁª t z ¤gAvg Z®£

zÁÃAiÄ : ¸ÁAzv ºagÄª zªª£Ä PrªÄ ¸ÁAzvAiÄ zªz ªÄÃ¯ Ej¹zg, CzÄ C¹gªÁVgÄvz JA§Äzg ¤gÆ¥u.

¨ÃPÁUÄª ¸ÁªÄVU¼Ä: ªÉzÁÃAiÄ ¹jAeï, UÁf£ vÆn ªÄvÄ G¦£ zÁª t - ¨Á¦l j ZÁ°v ¨¼PÄ ªÄvÄ («ÄoÁ¬Ä ªÄvÄ ©¸vï q§U¼°gÄªAvº) v¼£AiÄ PÁUz, Ez¦g M¼AiÄzÄ.

«ªg: UÁf£ vÆnAiÄ° ±Ä¨ªÁz ¤Ãg£Ä vÄA©. Czg ªÄÃ¯ ªÄÃ¯ÁUz°AiÄ ¦¸£ï ª¦ª¸¦AiÄ£Ä vUz ¹jAeï£Ä ¤°¹. ¹jAeï£ ¸ÆfAiÄ ¨ÁU ¤Ãj£Æ¼Vg°. G¦£ zÁª tª£Ä vAiiÁj¹, ¹jAeï£Æ¼U vÄA©. FU CzÄ ¤Ãj£Æ¼U ¨gAiÄÄª «zÁ£ª£Ä UªÄ¤¹. ªÆz®Ä G¦£ zÁª t ¤ÃjU ¸ÃgÄvz. ¸® ¸ªÄAiÄz £Avg ¤ÃgÄ ¹jAeï£Æ¼U £ÄUÄvz. »ÃU ZP ªÄÄAzÄªgAiÄÄvz.

PÁgt : ¹jAeï£Æ¼V£ zÁª t ºÆgV£ ¤Ãj£Æq£ ¹gvAiÄ£Ä ¸Á¦¸Äª ¥AiÄv¹ªÃ F ZP. ¸ÁAzv ¸vvªÁV §z¯ÁªuAiiÁUÄwgÄª PÁgt, ¸ªÄvÆÃ®£ K¥ðr¸®Ä »ÃU ¥g¸g «gÄz¹ ¢QU Z®£ GAmÁUÄvz.

SALT OSCILLATOR

Objective: To illustrate that a denser liquid placed over a less dense one is unstable.

Materials Required: A hypodermic syringe, a glass tank and salt. A sheet of translucent paper and a battery operated torch are optional.

Description: This experiment illustrates the fact that a denser liquid over a less dense one is unstable. Take fresh water in the glass tank. Place the hypodermic syringe in a vertical position with the piston removed such that its pointed end is in water. Now, pour salt solution into the syringe. Observe that the salt solution, at first, runs into fresh water. After a while, fresh water rushes into the syringe and the cycle continues.

Reason: The fluid level inside the syringe oscillates back and forth between two equilibrium positions where the forces that cause the flow in either direction are balanced. The first equilibrium position is when the salt solution fills the needle and the second when fresh water fills it.

¦Ãq£z «±Ãµu

zÁÃAiÄ : ¥ÆÃmÆÃ J¯Á¹Pï ª¸ÄU¼° ¦Ãq£z (stress) «vguAiÄ ¤gÆ¥u.

¨ÃPÁUÄª ¸ÁªÄVU¼Ä: ¥ÆÃ®gÁdgïU¼Ä, ¨¼Q£ ªÄÆ® ªÄvÄ ª¸Ä«£ ªiÁzj.

«ªg: MAzPÆÁAzÄ ®A§ªÁVgÄª ¥ÆÃ®gÁdgïU¼ ªÄzÁz° CzÁAiÄ£ ªiÁq¨ÃPÁz DPÁwAiÄ£Ä Ej¹. ªÆz®£AiÄ ¥ÆÃ®gÁdgï£ ªÄÄAz ¨¼Q£ ªÄÆ®ª£Ä Ej¹, CzÁAiÄ£ ªiÁq¨ÃPÁz DPÁwAiÄ ªÄÃ¯ ¨Ágª Áz ª¸Äª£Ä Ej¹, Jgq£Ã ¥ÆÃ®gÁdgï£ ªÄÆ®P £ÆÃr. §t §tz UgU½Az PÆrz DPÁgª£Ä PÁt§ºÄzÄ.

PÁgt: ªÆz®£AiÄ ¥ÆÃ®gÁdgï£ ªÄÆ®P ºÁzÄ ºÆÃUÄª ¨¼PÄ zÄ«ÃPÁvUÆArgÄvz. £qÄª EgÄª ª¸Ä Czg zÄ«ÃPgt ¸ªÄv®ª£Ä DAiiÁ ¸¼z°gÄª ¦Ãq£P C£ÄUÄtªÁV wgÄV¸Ävz. ºa£ ¦Ãq£z ¸¼U¼° §tz UgU¼Æ ºZÁVgÄvª. GzÁºguU ¨Ág MvÄwgÄª ©AzÄ, £®P DzÁgªÁVgÄª ©AzÄU¼Ä ªÄvÄ DPÁwAiÄ°£ gAzU¼° §tU¼Ä ºZÄ.

ANALYSIS OF STRESS

Objective: To visualize the stress flow in objects using photoelastic effect

Materials Required: Polarizers and a model to be studied

Description: Place a model between two polarizers that are at right angles. Place a light source in front of the first polarizer. Apply load on the model and observe through the second polarizer. Coloured fringes are seen in the model.

Reason: Light passing through the first polarizer will be plane polarized in one plane. The model under stress rotates this plane of polarization in proportion to stress at each point. The areas of greater fringes indicate greater stress. The concentration of the fringes may be observed at loading point, holes and resting points.

££¦£ ±QAiÄ «Ä±¯ÆÃº

z¦ÃAiÄ : ¤n£Á¯ï JA§ «Ä±¯ÆÃºz «±Ãµ ¸¦nP UÄtz ¤gÆ¥u.

¨ÃPÁUÄª ¸ÁªÄVU¼Ä: ¤n£Á¯ï «Ä±¯ÆÃº¢Az ªiÁrz MAzÄ DPÁg, ±ÁRz ªÄÆ®.

«ªg: ¤n£Á¯ï JA§ÄzÄ ¤P¯ï ªÄvÄ mÉmÁ¤AiÄªiïU½Az ªiÁrz «Ä±¯ÆÃº. P®ª¦ Evg «Ä±¯ÆÃºU¼®Æ EgÄªAv ¤n£Á¯ï£°AiÄÆ ¸º MAzÄ «±Ãµ ¸¦nP UÄt«z. CzAzg MAzÄ ¤¢ðµ¦ vÁ¥ªiÁ£z°¦ MzV¹z DPÁgª£Ä¦ CzÄ ££¦£°¦ lÄPÆArgÄvz. ªÆz°U F «Ä±¯ÆÃºª£Ä¦ 70^0 ¸. vÁ¥P¦ Kj¹, MAzÄ DPÁg PÆlÄ MªÄ¯Ã vA¥ÁV¸¯ÁUÄvz. EzÁz £Avg D ª¸Ä«£ DPÁgª£Ä¦ JµÃ §z°¹ ¥Ä£B 70^0 ¸. vÁ¥P¦ Kj¹zg CzÄ vPt v£¦ »A¢£ DPÁgP¦ ªÄg¼Ävz. EAvº «±Ãµ UÄtz PÁgt ªÉz¦QÃAiÄ, PÉUÁjP ªÄvÄ ¨ÁºÁ¦PÁ± «¨ÁUz®Æ F jÃwAiÄ «Ä±¯ÆÃºU¼Ä §º¼ G¥AiÄÄPªÁVª.

SHAPE MEMORY ALLOY

Objective: To demonstrate the working of a shape memory alloy.

Materials Required: An object made of Nitinol, source of heat.

Experiment: The object is initially in some shape. Change the shape and heat it. It regains its initial shape.

Reason: Nitinol is an alloy of nickel and titanium. It, like some other alloys, has certain crystallographic property that enables it to 'remember' a particular shape imparted to it at a certain temperature. The alloy is initially heated to a temperature of about 70^0C. The alloy is then given the desired shaped and suddenly cooled. Thereafter, alloy takes the same conformation at that temperature. The dynamics of this is rather involved. Shape memory alloys, on account of this property, find extensive use in medical, industrial and space sciences.

ªÆÃ©AiÄ¸ï ¥n

zÁÃAiÄ : ªÆ©AiÄ¸ï ¥nAiÄÄ MAzÄ ªÄÄRz ªÄÃ¯ïÉ JA§Äzg ¤gÆ¥u.

¨ÃPÁUÄª ¸ÁªÄVU¼Ä: DAiÄvÁPÁgz Gz£AiÄ PÁUzz ¥n, UÆÃAzÄ.

«ªg: ªÄÃ¯ïÉ JAzÆq£ CzP JgqÄ ªÄÄRU½ª JAzÄ ¸ÁzÁgtªÁV £ÁªÄ w½AiÄÄvÃª. UÆÃ¼PÆ ¸º ºÆg¨ÁU ªÄvÄ M¼¨ÁU JAzÄ JgqÄ ªÄÃ¯ïÉU½gÄvª. EAvº MAzÄ ªÄÃ¯ïÉAiÄ° Z°¸ÄªÁU vÄ¢AiÄ£ÄÃ zÁlzÃ E£ÆÃAzÄ ªÄÃ¯ïÉ v®Ä¥ÄªÄzÄ ¸Áz«®. Dzg vÄ¢AiÄ£ÄÃ zÁlzÃ v¯P¼UÁV £qAiÄÄª G¥ÁAiÄ E°z. MAzÄ DAiÄvÁPÁgz Gz£AiÄ PÁUzz ¥nAiÄ£ÄÃ vUzÄPÆ½, JgqÆ aP vÄ¢U¼£ÄÃ CAn¹. CAn¸ÄªÁU ¥nAiÄ MAzÄ vÄ¢AiÄ£ÄÃ »AzP wgÄV¹ CAn¹. FU Ezg ªÄÃ¯ MAzÄ EgÄª Z°¹zg CzÄ ºÆgl ¸¼z P¼¨ÁUP §gÄvz. C£Avg E£ÆÃAzÄ ¸ÄvÄ ªÄÄV¹ ªÆz°£ eÁUP §gÄvz. »ÃU CzÄ vÄ¢AiÄ£ÄÃ zÁlzAiÄÃ JgqÆ ªÄÃ¯ïÉU¼° ¸AZj¸Ävz. Ez£ÄÃ ªÆz®Ä PAqÄ »rz ªÁQ «SÁÄv dªÄð£ï Utvd DU¸ï¸ï ¥rð£ÁAqï ªÆ©AiÄ¸ï. DzÁjAz EzP ªÆ©AiÄ¸ï ¥n JAzÄ º¸gÄ.

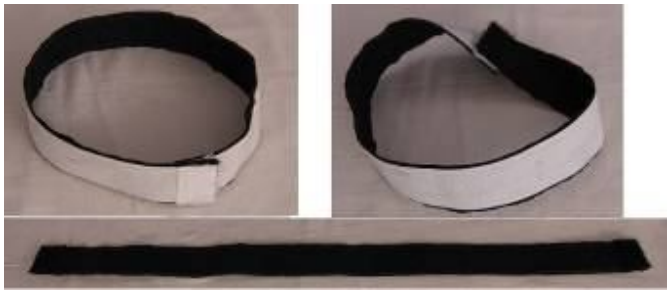
«¸gu: ªÆ©AiÄ¸ï ¥nAiÄ£ÄÃ GzP ¸ªiÁ£ÁAvgªÁV ªÄzÁz° Pvj¹zg K£ÁUÄªÄzÄ? CAn¹zÁU MAzÄ vÄ¢AiÄ£ÄÃ MªÄ ªiÁv »AzP wgÄV¸Äª §z®Ä, MAzÆªg, JgqÄ »ÃU wgÄV¹zg DU®Æ ªÆÃ©AiÄ¸ï ¥nAiÄÄ §gÄvzAiÄÄ ¥AiÆÃU ªiÁr £ÆÃr ¥°vÁA±ª£ÄÃ Zað¹.

MOBIUS STRIP

Objective: To demonstrate that the Mobius strip is a one sided surface

Description: Generally a surface has two sides. If one walks on such a surface, it is impossible to cross over to the other side without crossing over the edge. But, here is an interesting way in which one can walk to the other side without crossing over the edge! Take a rectangular strip of paper. Paste its two ends after giving one end a half twist as shown in the figure. A bug crawling along this surface, keeping always to the middle of the strip will return to the original position after traversing both the sides! This strip is called the Mobius Strip, named after the great German mathematician and astronomer, August Ferdinand Mobius and the one who described it first.

Further Exploration: Suppose you cut the Mobius Strip in the middle along the length. How many pieces would you have? Suppose you pasted the ends of the rectangular strip after giving one twist, one and a half twist, two twists. Would you get a Mobius Strip in each case? Try it out and reason your observations.



¸ªÄ¨ÁºÄ w¨Ädª¢Az CzÃ «¹Ãtðz ZËPz gZ£

zÁ¸ÃAiÄ : ¹Ã«Äv bÃz£U¼ ªÄÆ®P AiiÁªÁ¸zÃ eÁ¸«ÄwÃAiÄ DPÁgª£Ä¸ ¨ÃgÆAzÄ eÁ¸«ÄwÃAiÄ DPÁgP¸ ªiÁ¥ÁðqÄ ªiÁq§ºÄzÄ JA§Äzg ¤gÆ¥u.

¨ÃPÁUÄª ¸ÁªÄVU¼Ä: PÁqïð¨ÆÃqïð, ¹Ã¸z Pr¸, C¼v ¥n¸ ªÄvÄ Pvj.

«ªg: ABC JA§ ¸ªÄ¨ÁºÄ w¨Ädª£Ä¸ Pvj¹PÆAqÄ, AB ªÄvÄ ACAiÄ ªÄz¸©AzÄU¼£Ä¸ E ªÄvÄ F JAzÄ UÄgÄw¹. w¨Ädz «¹Ãtð x Eg°. E C£Ä¸ PÃAzªÁVAiÄÆ √x C£Ä¸ wd¸ªÁVAiÄÆ Ej¹ J¼z PA¸ª¸ BC C£Ä¸ Q JA§° ¸A¢¸Ävz. PQ =½BC EgÄªAv BCAiÄ ªÄÃ¯ P C£Ä¸ UÄgÄw¹. P ªÄvÄ F U½Az EQ U ®A§U¼£Ä¸ J¼¬Äj. av (1) g°gÄªAv ¨ÁUU¼£Ä¸ UÄgÄw¹ ¨Ã¥ðr¹PÆAqÄ, av (2)g°gÄªAv eÆÃr¹zg ZËPÁPÁgª¸ zÆgAiÄÄvz.

DISSECTING AN EQUILATERAL TRIANGLE INTO A SQUARE

Objective: To demonstrate that it is possible to transform one geometrical figure to another with finite number of dissections.

Materials Required: Cardboard, pencil, scale, scissors

Description: Cut out an equilateral triangle ABC. Let E & F be the respective mid points of sides AB & AC. And also the area of the triangle be X sq. units. Q is obtained by drawing an arc on BC with E as the centre and √x as radius. Join EQ. Mark a point P on the segment BQ such that PQ=½BC . From P & F drop perpendiculars to EQ. Label the parts as shown in figure (1) and cut along the bold lines. Rearrange as in figure (2) to get a square.

$a^2 - b^2 = (a+b)(a-b)$ £ ¤gÆ¥u

zÁÃAiÄ : a^2-b^2 £ C¥ªvð£z ¤gÆ¥u

¨ÃPÁUÄª ¸ÁªÄVU¼Ä: PÁqïð¨ÆÃqïð, ¹Ã¸z Pr¸, C¼v ¥n¸ ªÄvÄ Pvj.

«ªg: a ¨ÁºÄª¼ ABCD JA§ ZËP¢Az b ¨ÁºÄª¼ BEFG JA§ aP¸ ZËPª£Ä Pvj¹. G½z ¨ÁUz «¹Ãtð $a^2 - b^2$. FD ªÄÆ®P Pvj¹. zÆgQz ¨ÁUU¼£Ä av (2)g°gÄªAv DAiÄvÁPÁgªÁV eÆÃr¹. Ezg GzÁU®U¼Ä (a+b) ªÄvÄ (a-b) DVgÄª¸z£Ä ¸ UªÄ¤¹.

$\therefore a^2 - b^2 = (a+b)(a-b)$

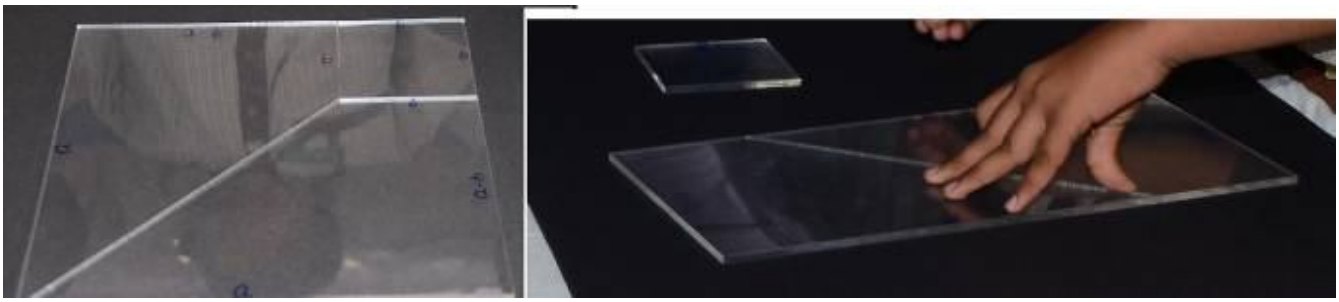
$a^2 - b^2 = (a+b)(a-b)$
DISSECTION PROOF

Objective: To prove the factorization of $a^2 - b^2$ by dissection method.

Materials Required: Cardboard, pencil, scale and scissors

Description: Take a square ABCD of side 'a'. Draw a small square BEFG of side 'b' and cut it out. The area of remaining part is $a^2 - b^2$. Cut along FD and arrange the two parts to get a rectangle as shown in figure (2). The sides of this rectangle will be (a+b) and (a-b)

$\therefore a^2 - b^2 = (a+b)(a-b)$



¨£Áqïð PtU¼Ä

zÁÃAiÄ : Gµªº£¢Az zªU¼° «£Á¸z gZ£AiÄ ¥ÁvÁQP.

¨ÃPÁUÄª ¸ÁªÄVU¼Ä: ¹°PÆÃ£ï Ju, C®Æ¸«Ä¤AiÄA ¥Ãr, ¦AUÁt §l®Ä, ºÁmï ¥Ãmï.

«ªg: ¦AUÁt §l°U ¸® ¥AiÆÃU JuAiÄ£Ä ºÁQ ºÁmï ¥Ãmï ªÄÃ°r. §l°£ v¼P ¸ªiÁ£ªÁV Gµz ºAaPAiiÁU¨ÃPÄ. DzÄzjAz ºÁmï ¥Ãmï §¼P Cª±. C®Æ¸«Ä¤AiÄA ¥ÄrAiÄ£Ä ºUÄgªÁV JuAiÄ ªÄÃ¯ GzÄj¹, ©¹AiiÁUÄwz ºÁU JuAiÄ ªÄÃ¯ ¨Ãg-¨Ãg DPÁgz (¥AZPÆÃ£, µmïPÆÃ£ »ÃU) gZ£U¼Ä ªÄÆqÄª¸z£Ä PÁt§ºÄzÄ. Eª¸U½U gÃ¯-¨£Áqðï PtU¼Ä JAzÄ º¸gÄ.

PÁgt : EzÆAzÄ ¸AQÃtð «z¸ªiÁ£. Cw ¸g¼ªÁz «ªguAiÄAzg Gµªº£z PÁgt JAzÄ ºÃ¼§ºÄzÄ. v¼¢Az ªÄÃ¯ zªz ªÄÆ®P Gµ §gÄª¸zÄ. JuAiÄ ªÄÃ¯ÄÉ ¸¼vªÇ ¥¨Áª ©ÃgÄvz. zªz ¹¸Uv, zªz D¼ F CA±U¼Æ ¥¨Áª ©ÃgÄvª. F §UAiÄ PtU¼ «£Á¸ª£Ä UÄgÄw¸®Ä C®Æ¸«Ä¤AiÄA ¥Ãr ¸ºPÁjAiÄUÄvz. ¸ÆAiÄð£ ªÄÃ¯ÄÉAiÄ° PÁtÄª Pt«£Á¸ Ez£¸Ã ºÆÃ®Ävz.

BENARD CELL

Objective: To demonstrate the formation of cells due to convection in liquids.

Materials Required: Silicone oil, Aluminium powder, porcelain container , electrically operated hot plate

Description: Pour a small quantity of silicone oil into the porcelain container. Place it on a flat hot plate. Sprinkle aluminum powder on the surface of the oil. Heat the container. In a few minutes you will notice that the surface of the oil exhibits polygonal cells. These are called Rayleigh-Benard Cells

Reason: This is a complicated phenomenon with several factors affecting it. A simplistic explanation is that cells are formed due to convection of the liquid and associated changes in the surface tension at the top layer. The size, shape and the life-time of the cells depend on such factors as the viscosity of the oil, temperature gradient in it, shape of the container and depth of oil in it. Aluminum powder is used to visualize the cells. Sun shows similar surface features known as granulations which too arise due to convection.

¸ÖÉqï gÆ¯ï WÁv ¸ASÉU¼ UÄuÁPÁg

zÉÃAiÄ: WÁv ¸ASÉU¼ UÄuÁPÁgª£ÀÄß ¤gÆ¦¸ÄªÉzÄ

¨ÃPÁUÄª ¸ÁªÄVU¼Ä: MAzÃ C¼vAiÄ DAiÄvÁPÁgz JgqÄ ¥nU¼Ä

«ªg: ¸ÄªiÁgÄ 30 ¸A.«ÄÃ. CAvg«gÄªAv UÄgÄvÄU¼£ÄÀß ªiÁr, 1,2,4,8, 16,32,64, 128,256,512 ..... »ÃU 2g WÁvU¼£ÄÀß §g¬Äj. EzjAz UÄuÁPÁg ªiÁqÄªÉz£ÄÀß w½AiÄ®Ä GzÁºguU 8 X 64 C£ÄÀß vUzÄPÄ½. ¥n 1g° 8g ¥P¥n 2g 1 ¸ASÉ §gÄªAv Er. ¥n 2g° 64 C£ÄÀß ºÄqÄQ. Ezg ¥Pz° ¥n 1g° 512 EgÄvz. EzÃ UÄt®§É.

«¸gu: ¨ÁUÁPÁg ªiÁq®Ä F ¥nU¼£ÄÀß ºÃU §¼¸§ºÄzÄ JAzÄ AiÆÃa¹. 1,2,4,8..... EªÉU¼ ¥Pz° $2^0,2^1,2^2,2^3$..... »ÃU UÄgÄw¹ WÁvU¼ ¤AiÄªÄU¼£ÆÀß EzÃ ¥nU¼ ¸ºÁAiÄ¢Az ¤gÆ¦¸§ºÄzÄ. Ezg »A¢£ vvª£ÄÀß CxÉð¸®Ä ¥AiÄwß¹.

SLIDE RULE

Objective: To demonstrate the multiplication of exponential numbers.

Materials Required: Two identical rectangular strips of cardboard.

Description: Take two identical rectangular strips of cardboard of about 30cm. Make marks at equal intervals and write down the numbers1,2,4,8,16,32,64,128,256,512…… ……

Now, suppose you have to multiply 8 and 64, coincide 8 on strip1 with 1 on strip2. Locate 64 on strip2, the product 512 will be adjacent to it in the strip1.

Further Exploration: Figure out a method to divide two numbers displayed on the strips. Express the numbers graduated in exponential form. With this one can prove the laws of indices. Reason out the principle behind this.

¥ÉxÁUÆg¸ï£ ¥ªÄÃAiÄ

zÁÃAiÄ: ¥ÉxÁUÆg¸ï£ ¥ªÄÃAiÄz ¤gÆ¥u

¨ÃPÁUÄª ¸ÁªÄVU¼Ä: P.f. PÁqïð¨ÆÃqïð, Pvj

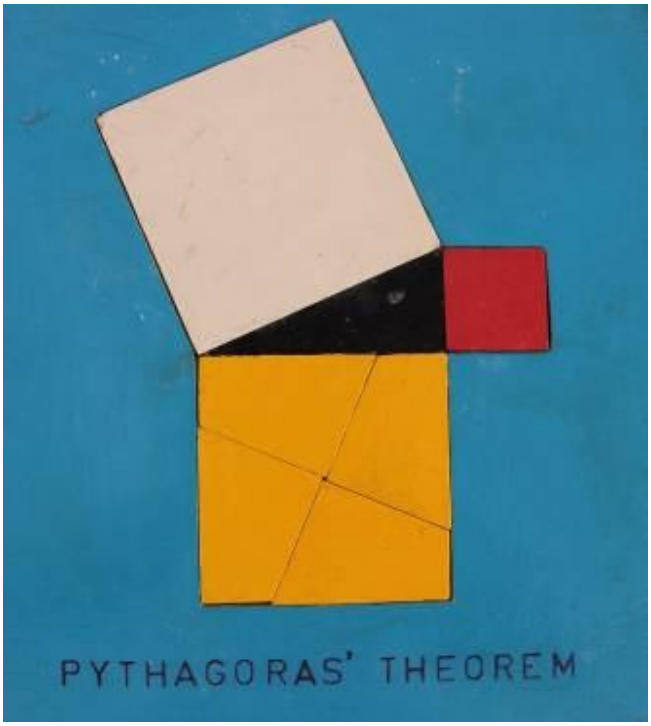
«ªg: PJA§ÄzÄ ®A§PÆÃ£ªÁUÄªAv PQR JA§ C¸ªÄ¨ÁºÄ ®A§PÆÃ£ w¨Äd ga¹. ¨ÁºÄU¼ ªÄÃ¯ ZËPU¼£Ä§ ga¹. ¨ÁºÄU¼ ªÄÃ¯ ZËPU¼£Ä§ ga¹. PQ ¨ÁºÄ«£ ªÄÃ°gÄª ZËPz ªÄz©AzÄ O C£Ä§ UÄgÄw¹. O £ ªÄÆ®P ºÁzÄ ºÆÃUÄªAv QR U ¸ªiÁ£ÁAvg gÃSAiÄ£Ä§ ga¹. F gÃSU O£ ªÄÆ®P ºÁzÄºÆÃUÄªAv ®A§ª£Ä§ ga¹. F gÃSÃU¼ ªÄÆ®P Pvj¹zg PQ ¨ÁºÄ«£ ZËPª£ÁÄ ¸ªÄ¨ÁUªÁUÄvz. F £Á®Ä ¨ÁUU¼Ä ªÄvÄ PR £ ªÄÃ°gÄª ZËPª£Ä§ §¼¹ QR £ ªÄÃ°gÄª ZËPª£Ä§ vÄA§§ºÄzÄ.

PYTHAGORAS THEOREM

Objective: To demonstrate Pythagoras theorem.

Materials Required: Cardboard, Scissors.

Description: Construct a scalene right angled triangle PQR, right angled at P. Construct squares on all the three sides of it. Mark the midpoint “O” of the square sitting on the side PQ. Draw a line parallel to QR passing through O. Draw a perpendicular to this line through O. These two mutually perpendicular lines divide the square on PQ into four parts. Cut them out. Cut out the square on PR. These five pieces can fill the area of the square on QR. This proves the theorem.



vÁ¦dÌz «¹Ãtð

zÌÃAiÄ: vÁ¦dÌz «¹Ãtðªà Czg Jvg ªÄvÄ ¸ªiÁ£ÁAvg ¨ÁºÄU¼ MlÄ GzÌz UÄt®§Ìz Czðz¶z JAzÄ ¤gÆ¦¸ÄªÀzÄ.

¨ÃPÁUÄª ¸ÁªÄVU¼Ä: P.f.PÁqïð¨ÆÃqïð, Pvj

«ªð: J,©.¹.r. vÁ¦dÌz° J.r ªÄvÄ ©.¹ U¼ ªÄzÌ©AzÄU¼£Ä§ PªÄªÁV E ªÄvÄ J¥ï JAzÄ UÄgÄw¹ ¸Ãj¹. J© ªÄvÄ EJ¥ï £qÄª fJZï JA§ ®A§ª£Ä§ J¼¬Äj. EzÄ EJ¥ï ££Ä§ ¸ªÄ£Áz Jgqä ¨ÁUU¼ÁV ªiÁq°. EJ¥ï ªÄvÄ fJZï U¼ ªÄÄSÃ£ Pvj¹. zÆgQz ªÄÆgÄ DPÁgU¼£Ä§ DAiÄvÁPÁgz° eÆÃr¹. F DAiÄÄvz GzÌªÀ »Az EzÌ vÁ¦dÌz ¸ªiÁAvg ¨ÁºÄU¼ ªÆvPÌ ¸ªÄ£ÁVz ªÄvÄ CU®ªà vÁ¦dÌz Jvgz Czðz¶z JA§Äz£Ä§ UªÄ¤¹.

DAiÄvz «¹Ãtð = GzÌ x CU®
= (vÁ¦dÌz ¸ªiÁAvg ¨ÁºÄU¼ GzÌz ªÆv) x 1/2 vÁ¦dÌz Jvg
= vÁ¦dÌz «¹Ãtð

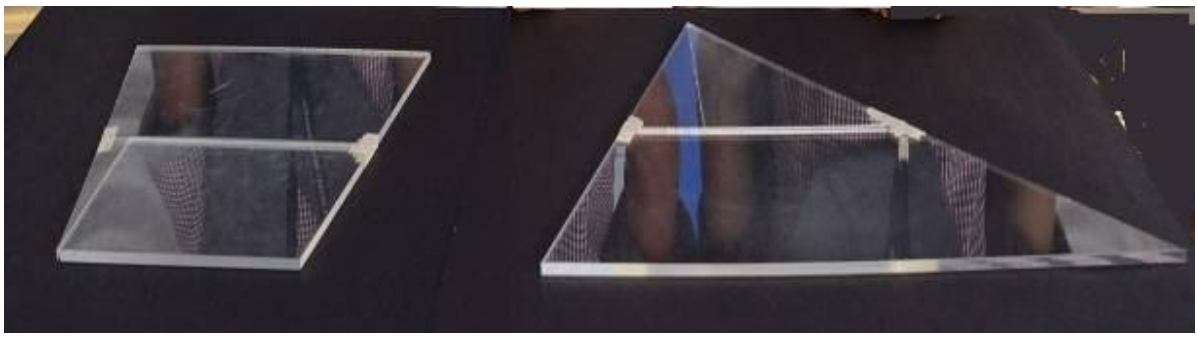
AREA OF A TRAPEZIUM

Objective: To prove that the area of a trapezium is half the product of its altitude and the sum of the parallel sides.

Materials required: Cardboard, scissors.

Description: Construct a trapezium ABCD. Mark the midpoints of the two non parallel sides AD and BC as E and F respectively. Join EF. Construct GH, the perpendicular bisector of EF and extend it to meet AB. Cut along GH and EF and rearrange the parts to from a rectangle. It can be noticed that the length of this rectangle is the sum of the lengths of the parallel sides of the original trapezium and its breadth is half of the altitude of the trapezium.

Area of rectangle= Length X Breadth
=(Sum of the parallel sides of the trapezium) X ½(Altitude of the trapezium)
= Area of trapezium.



PÁ§ð£ï qÉ DPöÉqï ªÄ¸Æg

zÁÃAiÄ: ±§¹z C¯U¼ ªQÃ¨ªÉ£ªÉ£Ä¹ ¤gÆ¦¸ÄªÁzÄ.

¨ÃPÁVgÄª ¸ÁªÄVU¼Ä: zÆq §®Æ£Ä, ±§¹z ªÄÆ®, ªÄgz ¥nU, PÁ§ð£ï qÉ DPöÉqï

«ªg: ¥nUAiÄ MAzÄ ªÄÄRªÉ£Ä¹ Pvj¹ vU¬Äj. EzP «gÄz¹ ¢Q¹£°gÄª ªÄÄRz° gAz ªiÁrPÆ½. §®Æ¤£Æ¼U PÁ§ð£ï qÉ DPöÉqï vÄA©¹ ¥nUAiÆ¼U Ej¹. gAzz §½ ±§¹z ªÄÆ®ªÉ£Ä¹ Er. §®Æ¤£ MAzÄ ¤¢ðµ ¸¼z° ¤ªÄ Q«AiÄ£Ä¹ Ej¹zÁU ±§¹z ªÄÆ®¢Az ºÆgqÄª QÃt ±§¹ªÇ ¸µªÁV PÃ¼Ävz. F PÁ§ð£ï qÉ DPöÉqï ªiÁz¹ªÄz ¸ÁAzv UÁ½VAv®Æ ºZÄ. F ¸ÁAz ªiÁz¹ªÄªÁ G©z §®Æ¤£ DPÁgz°gÄª¹zjAz ±§¹z C¯U¼Ä ªQÃ¨ªÉ£UÆAqÄ MAzÄ ©AzÄ«£° ¸A¢¸Ävª. »ÃU PÁ§ð£ï qÉ DPöÉqï §®Æ£Ä ªÄ¸ÆgzAv ªwð¹ ±§¹ª£Ä¹ PÃA¢ÃPj¸Ävz. C° Q« Ej¹zÁU ±§¹ª¸µªÁV ºÁUÆ eÆÃgÁV PÃ½¸Ävz.

CO_2 LENSING

Objective: To demonstrate refraction of sound.

Material Required: A balloon filled with CO_2, a source of sound, a box.

Description: One of the faces of the box is removed and a circular opening is made in the opposite face. CO_2 is filled in the balloon and placed inside the box. Place the source of sound near the opening and bring your ear to a position in front of the balloon. Even a feeble sound from the source can be heard clearly.

Reason: CO_2 being denser than air and in the shape as inside an inflated balloon, acts like a lens. The sound waves get refracted and converge to a point which is the focal point. When the ear is placed at this point, the sound is loud and clear.

±§ªÄÆ®¢Az «£Á¸¸U¼Ä

z¸ÃAiÄ: ±§¸z C¯U¼£Ä§ z¸±¸ gÆ¥P¸ ¥jªwð¸ÄªÁzÄ.

¨ÃPÁUÄª ¸ÁªÄVU¼Ä: ªÄÉPÆÃ¥ÆÃ£ï, DA¦¥AiÄgï, CRO

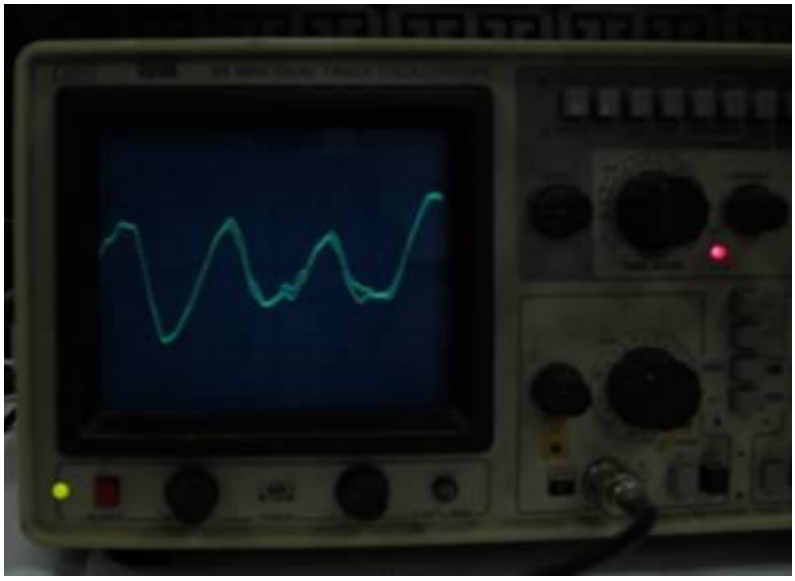
«ªg: ªÄÉPÆÃ¥ÆÃ£ï C£Ä§ DA¦¥AiÄgï£ÆA¢U ¸A¥Qð¹, Czg Omï¥Ämï C£Ä§ CRO U v®Ä¦¸¯ÁVz. ªÄÉPÆÃ¥ÆÃ£ï£ §½ AiiÁgÁzgÆ ªiÁv£Ár zg E®ªÃ AiiÁª¸zÃ ±§¸ª£Ä§ GAlÄ ªiÁrzg, ªÄÉPÆÃ¥ÆÃ£ï D ±§¸ vgAUU¼£Ä§ «zÄ¸vï ¸APÃvU¼ÁV ¥jªwð¸Ävz. DA¦¥AiÄgï F ¸APÃvU¼£Ä§ ª¢ð¹ CRO U v®Ä¦¸Ävz. CRO £ ¥gzAiÄ ªÄÃ¯ F ¸APÃvU¼ z¸±¸gÆ¥ PÁtÄwz. vgAUzÆg ªÄvÄ ¥ÁgU¼£Ä§ C¼AiÄ§ºÄzÄ.

ACOUSTIC PATTERNS

Objective: To visualize sound waves.

Materials Required: Microphone, Amplifier, CRO

Description: Microphone is connected to the amplifier and the output of the amplifier is given to the CRO. When a person talks or makes any sort of sound in front of the microphone, it picks up those waves and converts it into electric signals. These are amplified and sent to CRO which gives the wave patterns for those signals; the amplitude and wavelength can be measured.



¤Ãj£ «zÄ¢¨d£

zÁÃAiÄ: ¤Ãj£ «zÄ¢¨d£AiÄ£Ä¤gÆ¦¸ÄªÁzÄ

¨ÃPÁUÄª ¸ÁªÄVU¼Ä: UÁf£ zÆq ¥Áv, gAzU½gÄª C®Æ«Ä¤AiÄA ¥nU¼Ä, ¨Á¢lj, ºÉqÆÃPÆÃjPï DªÄ.

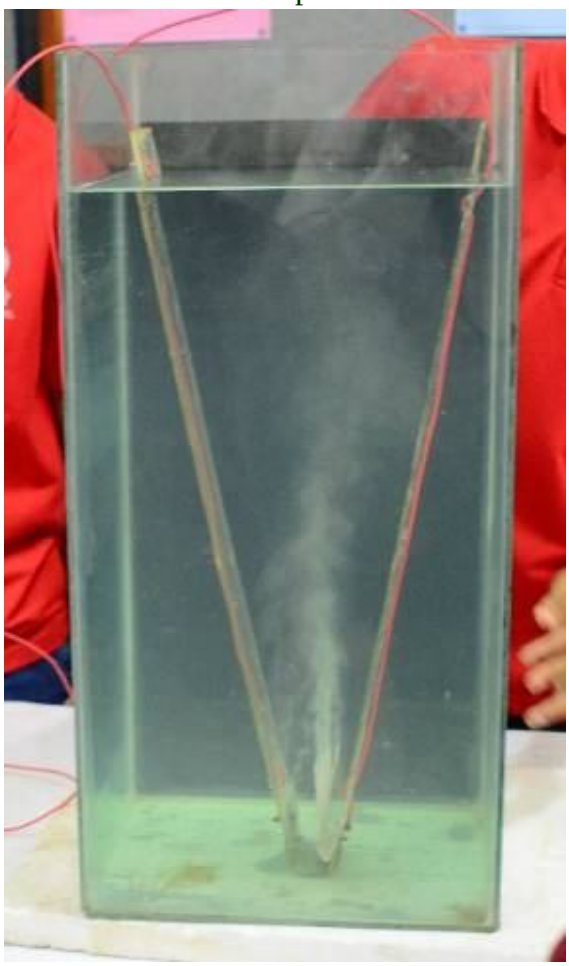
«ªg: gAzU½gÄª C®Æ«Ä¤AiÄA ¥nU¼° MAz£Ä¢ ¨Á¢ljAiÄ z£ÁvÏP vÄ¢U ªÄvÆAz£Ä¢ lÄuÁvÏP vÄ¢U ¸A¥Qð¹. ¤ÃgÄ vÄA©z UÁf£ ¥ÁvAiÄ° ¸® CAvg«gÄªAv Ej¹. ºÉqÆÃPÆÃjPï DªÄz P®ª¼ º¤U¼£Ä¢ ¸Ãj¹. ¤Ãj£ ªÄÆ®P «zÄ¢vï ¥ª»¹zÁU ¤Ãj£ «zÄ¢¨d£AiiÁV lÄuÁvÏP J¯PÆÃqï£° ¸ÃgÄª ºÉqÆÃd£ï ¨ÁUª¼ UÄ¼U¼ÁV ªÄÃ¯ÃgÄvz. eÆvU zªª£Æ¢ ªÄÃ¯ÆAiÄÄ¢vz. »ÃU ºÉqÆÃd£ï UÄ¼U¼ §ÄUÁAiÄÄ GAmÁUÄvz. E° ºÉqÆÃPÆÃjPï DªÄª¼ ªÃUªzðPªÁVz

BUBBLE PLUMES

Objective: To demonstrate the electrolysis of water.

Materials Required: A big glass container, Aluminum strips with perforations, power supply, conc. HCl

Description: Connect an Aluminum strip to the positive of the power supply and seven of them to its negative. Place these electrodes in a glass tank containing water and a few drops of conc. HCl. On passing the current, water undergoes electrolysis. The Hydrogen part of the water that gets collected near the negative electrode rises up as bubbles carrying the liquid together. This forms the plumes.



Here, conc. HCl acts as a catalyst.

PÁAvPÃv¢Az ªÄÃ¯ÃgÄª vm

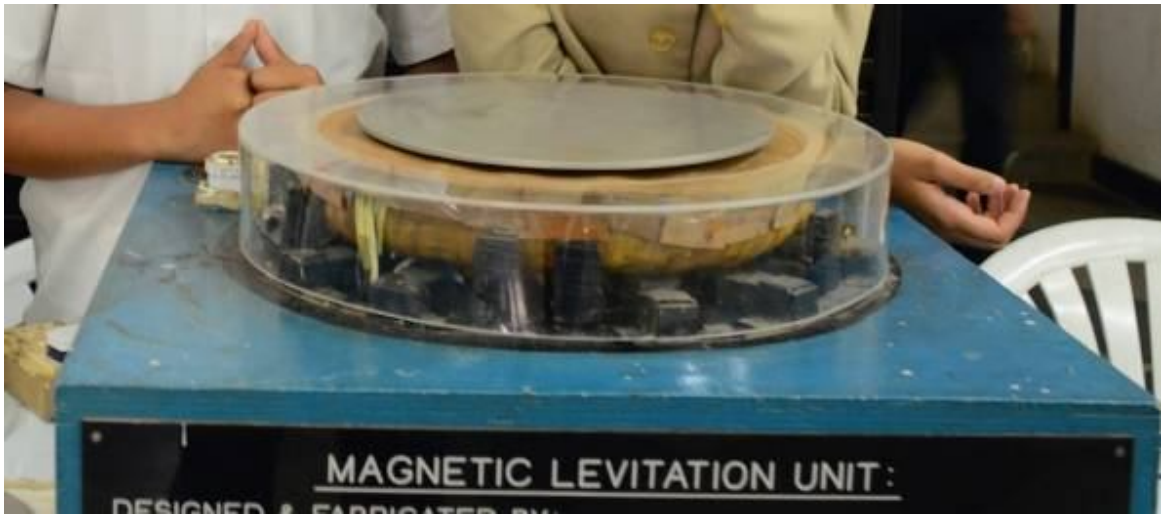
zÃAiÄ: «zÄvï PÁAwÃAiÄ ¥ÃguAiÄ ¤gÆ¥u

«ªg: vÁªÄz vAwAiÄ£Ä ºª®ªÁgÄ ¨Áj ¸Äw ¸ÄgÄ½AiÄ£Ä ªiÁq¯ÁVz. ¸ÄgÄ½AiÄ ªÄÃ¯ ¯ÆÃºz vmAiÄ£Ä Ej¸¯ÁVz. F ¸ÄgÄ½AiÄ° «zÄvï ¥ª»¹zÁU PÁAvPÃv GAmÁUÄvz. EzjAzÁV ¯ÆÃºz vmAiÄ° «zÄvï ¥ÃjvªÁUÄvz. CzÄªÃ "Jr PgAmï". F ¥Ãjv «zÄvï¤AzÁVAiÄÆ PÁAvPÃv GAmÁUÄvz. F JgqÆ PÁAvPÃvU¼ ¥g¸g «Pµðt¢AzÁV vmAiÄÄ ªÄÃ¯Ãj vÃ®ÄwgÄªAv PÁtÄvz.

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.



W£ EAUÁ®z qÉ DPöÉqï£ ºÁQ DI

zÁÃAiÄ: ºÆÃªgï PÁ¥ïU¼ PÁAiÄð ¤ªðºuAiÄ vvªÁ£Äß ¤gÆ¦¸ÄªÁzÄ.

¨ÃPÁUÄª ¸ÁªÄVU¼Ä: ¥Á¹Pï q©, W£ PÁ§ð£ï qÉ DPöÉqï, UÁf£ vmï

«ªg: ¥Á¹Pï q©AiÄ v¼zº ¸tzÆAzÄ gAz ªiÁr. q©AiÆ¼U qöÉ L¸ï CxªÁ W£ EAUÁ®z qÉ DPöÉqï ºÁQ ªÄÄZ¼ª£Äß ¨z¥r¹. Ez£Äß UÁf£ vmAiÄ ªÄÃºj¹. (gAz«gÄª v¼ªÁ UÁf£ ªÄÃºgÄªAv Ej¹).

PÁgt: PÆorAiÄ ¸ÁzÁgt vÁ¥ªiÁ£zº W£ PÁ§ð£ï qÉ DPöÉqï C¤®ªÁV §z¯ÁUÄwz. gAz¢Az ºÆg £ÄUÄª F C¤®ªÁ q© ªÄvÄ UÁf£ £qÄª ºgrPÆAqÄ CªÁU¼ ªÄÃ¯öÉU¼Ä MAzPÆÁAzÄ vÁUzAv ªiÁqÄvz. EzjAz Wµðu PrªÄAiiÁUÄwz. »ÃUÁV PrªÄ §® ¥AiÆÃU¢Az¯Ã q© ºZÄ zÆg ¸ÁU®Ä ¸ÁzÁªÁUÄvz.

DRY ICE HOCKEY

Objective: To demonstrate the principle behind the working of hovercrafts

Materials required: A plastic bottle, dry ice, glass plate.

Description: Make an opening at the bottom of the bottle, put some dry ice into it and tighten the lid. Place this on the glass plate and provide a small force. The bottle moves for a surprisingly long distance.

Reason: At room temperature, dry ice sublimates into CO2 gas. This escapes out of the bottle through the opening and spreads as a layer between the two surfaces. This reduces the friction. As a result, the bottle moves large distances for a small applied force.

ªïÁAiiÁ zª

zÁÃAiÄ: ¥Ágz±ðP ª¸ÄU¼ UÆÃZj¸Ä«PAiÄ° ªQÃ¨ª£ÁAPz ¥Ávª£Ä¤gÆ¦¸Äª¦zÄ.

¨ÃPÁUÄª ¸ÁªÄVU¼Ä: ¨AfÃ£ï, PÁ§ð£ï qÉ¸¯ÖÉqï, UÁf£ ¥n/vÄAqÄ, ªÄÄZÁ¼«gÄª UÁf£ ¥Áv.

«ªg: ¨AfÃ£ï ªÄvÄ PÁ§ð£ï qÉ¸¯ÖÉqïU¼£Ä 51:49 C£Ä¥Ávz° ¨g¹ UÁf£ ¥ÁvU ºÁQ. ªÄÄZÁ¼z M¼ ¨ÁUPÁ GzÁ£AiÄ UÁf£ vÄAq£Ä CAn¹. UÁf£ ¥ÁvU ªÄÄZ¼ª£Ä ºÁV ¨z¥r¹zÁU zªz° ªÄÄ¼ÄVgÄª UÁf£ vÄAqÄ PÁtÄªÁ¢®. Dzg UÁ½AiÄ°gÄª Czg ªÄÃ¯ÁÜU PÁtÄvz.

PÁgt: zª ªÄvÄ UÁdÄU¼ ªQÃ¨ª£ÁAPªÁ MAzÃ DVgÄªÁzjAz zªz° ªÄÄ¼ÄVgÄª UÁf£ ¨ÁUªÁ PÁtzAvÁUÄvz.

MAGIC LIQUID

Objective: To demonstrate the role of refractive index in the visibility of transparent materials.

Materials Required: Benzene, carbon disulphide, glass slab, a glass container with lid.

Description: Mix Benzene and Carbon disulphide in the ratio 51:49 and take this in a glass container. Fix the glass slab to the inner surface of the lid and close the container with the same. The slab is partly in air and partly inside the liquid. The portion inside the liquid becomes invisible.

Reason: The mixture has the same refractive index as that of the glass and hence the two media are the same for the light. That means no reflection from the glass surface that is inside the liquid and hence it is invisible

CAiiÁ£ÄU¼ ¥ªÁº

zÀÃAiÄ: Cw ºa£«¨£ÁAvg K¥ðmÁU CªÁºP ªiÁzÀªÄz®Æ «zÄvï ¥ª»¸Ävz JA§Äzg ¤gÆ¥u

¨ÃPÁUÄª ¸ÁªÄVU¼Ä: «zÄ¢ÃÃ¥, C®Æ«Ä¤AiÄA ºÁ¼, Cw ºa£ «¨ªÁAvg MzV¸Äª ªÄÆ® (ºÉ ªÇÃ¯Ãeï ¥ªgï ¸¥ÖÉ)

«ªg: «zÄ¢ÃÃ¥z JgqÆ ¸A¥Pð vAwU¼£Ä MAzÄUÆr¸¯ÁVz. Ezg P¼U CyðAUï ªiÁq¯ÁVgÄª C®Æ«Ä¤AiÄA ¥®P Ej¸¯ÁVz. «zÄ¢ÃÃ¥P Cw ºa£ «¨ªÁAvg MzV¹zÁU ¨¼PÄ ¥ª»¸Ävz.

PÁgt: ºa£ «zÄvï «¨ª¢AzÁV «zÄ¢ÃÃ¥zÆ¼VgÄª CªÁºP ªiÁzÀªÄzº ªÄÄP J¯PÁ£ïU¼ ¸ASÀ UtÃAiÄªÁV KgÄvz. DzÀjAz QjzÁz ªÁºP PÁ®ÄªU¼ gZ£AiiÁUÄvz. CzÄªÃ ¨¼Q£ QrU¼ÁV PÁtÄvª. «zÄvï ºjAiÄªÄz£Ä ¨¼Q£ gÆ¥zº PÁt§ºÄzÄ.

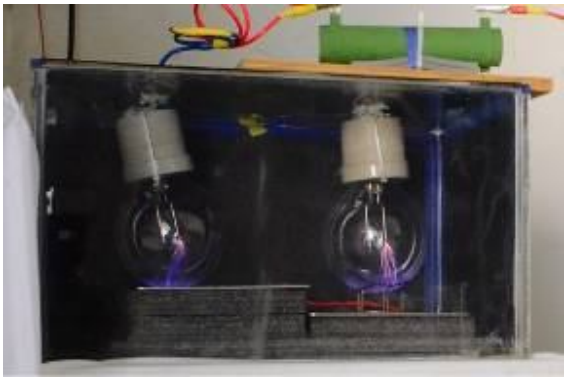
CORONA DISCHARGE

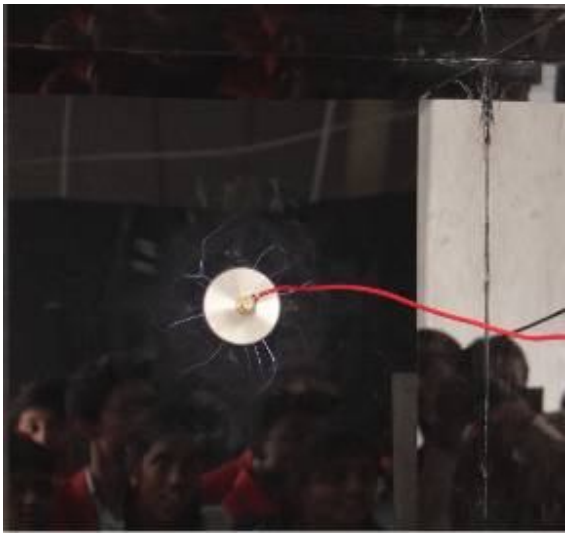
Objective: To demonstrate that a dielectric medium also conducts when very high voltages are applied.

Materials required: Electric bulb, Aluminium plate, high voltage power supply.

Description: The two leads of the bulb are shorted. Aluminium plate is place below the bulb and is connected to the ground. When very high voltages are established between the bulb and the Aluminium plate, sparks are seen.

Reason: There is a substantial increase in the number of free electrons in the dielectric medium because of the very high voltages. This gives rise to small conducting channels that appears as sparks.



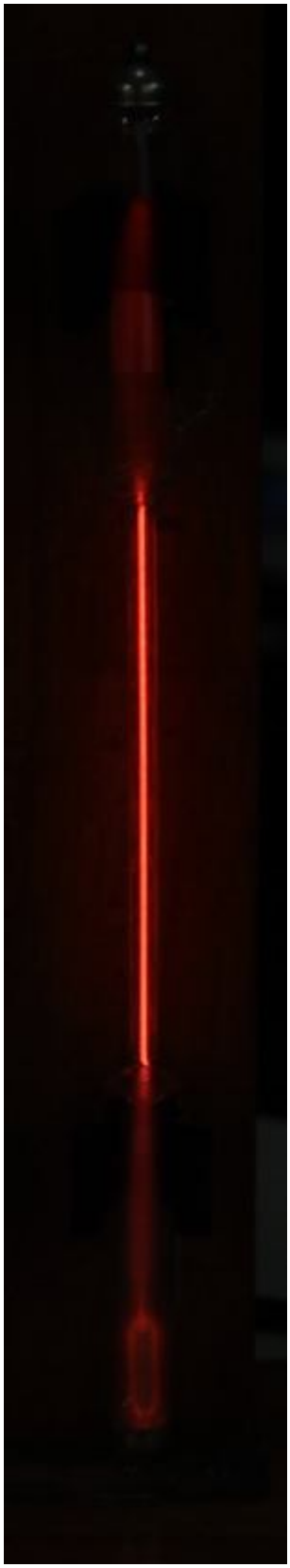


§tz ¨¼Q£ PÆ¼ªU¼Ä

zÁÃAiÄ: CAiiÁ¤ÃPgtUÆAq C¤®U¼Ä ¤¢ðµ §tz ¨¼P£Ä¤ÃqÄvª JA§Äz£Ä¤gÆ¦¸ÄªÁzÄ.

¨ÃPÁUÄª ¸ÁªÄVU¼Ä: ««z C¤®U¼Ä vÄA©gÄª ªÄÆgÄ PÆ¼ªU¼Ä, EAqP£ï PÁ¬Ä¯ï

«ªg: ««z C¤®U¼Ä vÄA©gÄª ªÄÆgÄ PÆ¼ªU¼£Ä¸ªiÁAvgªÁV EAqP£ï PÁ¬Ä¯ï£ÆA¢U¸A¥Qð¸¯ÁVz. F C¤®U¼£Ä¤ºa£ «zÄvï «¨ªP M¼¥r¹zÁU CªÁ CAiiÁ¤ÃPgtUÆAqÄ CªÁU¼ ¤¢ðµ §tz ¨¼P£Ä¤ºÆg¸Æ¸Ävª.

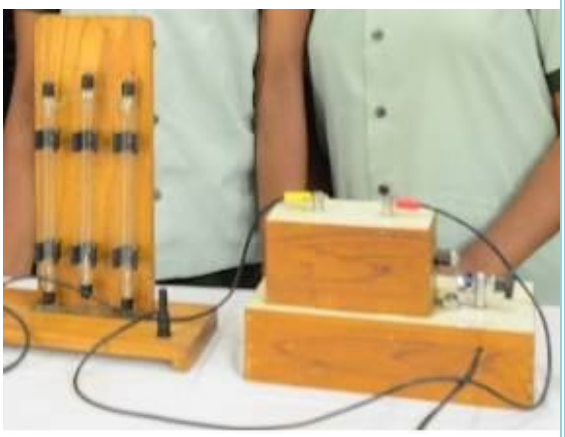


GEISSLER'S TUBE

Objective: To demonstrate that the ionized gases glow with a characteristic colour.

Materials required: Three tubes filled with different gases, induction coil.

Description: Three tubes filled with different gases are connected in parallel across the induction. When these gases are subjected to high voltages, they ionize and glow with their characteristic colours



zª £ÉmÆÃd£ï §¼¸Äª ¥AiÆÃUU¼Ä

zÁÃAiÄ: 1) ¨ÁAiiï÷£ ¤AiÄªÄª£Ä¤gÆ¦¸ÄªÁzÄ; 2) Cw Prªä vÁ¥ªiÁ£U¼º qPöÉ¯ï ª¸ÄU¼Ä Cvï® §® ¥AiÆÃU¢Az ¥ÄrAiiÁUÄvª.

¨ÃPÁUÄª ¸ÁªÄVU¼Ä: zª £ÉmÆÃd£ï, UÁ½ vÄA©z §®Æ££Ä, g§gï ZAqÄ, ºÆªÁ, J¯ EvÁ¢U¼Ä

«ªg: 1) UÁ½ vÄA©z §®Æ££Ä¤ zª £ÉmÆÃd£ï£ M¼U Ej¹ vUzÁU CzÄ PÄVgÄªÁz£Ä¤ PÁt§ºÄzÄ. vÁ¥ªiÁ£ºZÁzAv ª¸ÄU¼Ä »UÄvª, PrªÄAiiÁzAv PÄUÄvª. W£ Cxª Á zª ª¸ÄU½VAv®Æ C¤® E®ªÃ UÁ½AiÄ° F PÄUÄ«P Ut¤ÃAiÄªÁV PAqÄ§gÄvz.
2) g§gï ZAqÄ, ºÆªÁ, J¯ EvÁ¢U¼£Ä¤ zª £ÉmÆÃd£ïz° Ej¹ vU¬Äj. FU CªÁU¼ ªÄÃ¯ C® ¥ªiÁtz §® ¥AiÆÃU ªiÁrzgÆ CªÁ UÁf£Av ¥Ä r ¥ÄrAiiÁUÄvª. qPöÉ¯ï ª¸ÄU¼Ä Cw PrªÄ vÁ¥ªiÁ£z° vªÄ ¸ÁªiÁ£ªÁz J¯Á¹Pï UÄtª£Ä¤ P¼zÄPÆ¼Ävª. Dz PÁgt UÁf£Av ¥ÄrAiiÁUÄvª.

LIQUID NITROGEN EXPERIMENTS

Objective: i) To demonstrate Boyle's law

ii) To demonstrate the brittleness of the ductile materials upon cooling.

Materials Required: Liquid Nitrogen, air filled balloon, rubber ball, flowers, leaves etc.

Description: i) Place the air filled balloon inside the liquid nitrogen. On taking it out, we can notice that it has been shrunken in size. Volume decreases with decrease in temperature and this decrement is much more noticeable in gases than in solids and liquids.

ii) Place the rubber ball, flowers and leaves inside the liquid nitrogen and take them out. They become brittle and shatter even when a small force is applied on them. Ductile materials lose their elastic nature when cooled beyond a particular temperature and hence become brittle.

ªÄÆgÄ DAiiÁªÄz £g¼Ä

zÁÃAiÄ: ¸ªÄvmÁz ªÄÃ¯ïÉAiÄ° £ªÄ PtÄ ºÃU D¼ª£Ä U»¸Ävz JA§Äzg ¤gÆ¥u.

¨ÃPÁUÄª ¸ÁªÄVU¼Ä: PA¥Ä ªÄvÄ ¹AiiÁ£ï ¸ÆÃ¸ÄPU¼£Ä C¼ªr¹gÄª JgqÄ J¯A¥Æ ¥ÆePgïU¼Ä, CzÃ ¸ÆÃ¸ÄPU¼ P£qP, ¯ÆÃ®ÄP, ¥gz.

«ªg: ¯ÆÃ®ÄPª¼ ¥gzAiÄ »Az DAzÆÃ®£ ªiÁqÄªAv ª¼ª¸ ªiÁr. JgqÆ ¥ÆePgïU½Az §gÄª ¨¼PÄ ¯ÆÃ®ÄPz ªÄÃ¯ ©Ã¼°. ¥gzAiÄ ªÄÃ¯ ªÄÆqÄª JgqÄ £g¼ÄU¼Ä ¸ÄªiÁgÄ 90 ¨ÁUzµÄ MAzg ªÄÃ¯ÆAzÄ ©Ã¼ÄªAv ªiÁr. ¥gzAiÄ ªÄÄAz ¤AvÄ ¸ÆÃ¸ÄP ºÆA¢gÄª P£qPz ªÄÆ®P DAzÆÃ®£ ªiÁqÄwgÄª ¯ÆÃ®ÄPª£Ä £ÆÃrzg D £g¼Ä MAzÃ v®z° Z°¸z ªÈvÁPÁgz° Z°¸ÄwgÄªAv ¨Á¸ªÁUÄvz.

PÁgt: PA¥Ä ªÄvÄ ¹AiiÁ£ï ¸ÆÃ¸ÄPU¼ ªÄÆ®P £ªÄ Pt£Ä v®Ä¥Äª ¨¼Q£ ¸APÃvU¼£Ä ªÄzÄ½U gªÁ¤¸Äª° ¸® ªÄn£ ¸ªÄAiÄz CAvg GAmÁUÄvz. F CAvg¢AzÁV £g½U ªÄÆgÄ DAiiÁªÄ«gÄªAv ªÄvÄ CzÄ ªÈvÁPÁgz° ¸ÄvÄwgÄªAv ¨ªÄ GAmÁUÄvz.

3D SHADOW

Objective: To illustrate how eye perceives depth from flat surface.

Materials Required: Two projectors fitted with red and cyan filters, a spectacle fitted wit the same filters, a pendulum and a screen.

Description: Position the pendulum to oscillate behind the screen. Make the light coming from the two projectors fitted with red and cyan filters to fall on the pendulum such that we see slightly overlapping shadows of the pendulum on the screen. Observe this from the other side through the spectacle fitted with red and cyan filters. The pendulum that is actually oscillating in a plane appears to be going in circular manner.

Reason: When the light coming through the two filters enter our eyes there is a time delay in the signal sent to the brain. This results in the perception of the non existent depth of the shadow.

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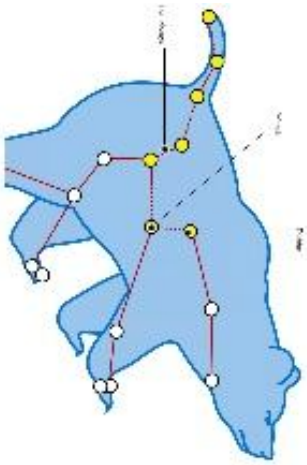
¸¥¶ð ªÄAq® §º¼ ¥javªÁz £Pv ¥ÁAd. PvÄ, ¥®º, ¥®¸ö CAVÃg¸, Cw, ª¹µ, ªÄjÃa »ÃU K¼Ä IÄ¶U¼ º¸gÄU¼£Ä F £PvU½U Eq¯ÁVz. ¥Á±Ávg° C¸Áð ªÄÃdgï JA§ º¸jz. zÆq Pgr JAzÄ Cxð. K¼Ä £PvU¼ eÆvU E£µÄ £PvU¼£Ä ¸Ãj¹ PgrAiÄ gÆ¥ª£Ä P°¹PÆ¼¯ÁVz. F ªiÁzjAiÄÄ PgrAiÄ P®£ ºÃU JAzÄ vÆÃj¹PÆqÄvz.

BIG DIPPER

Demonstration of the imaginary patterns using stars

The best known constellation contains the Saptharishi Manadala also known as the Big Dipper. This is the constellation of Ursa Major (latin word for Great Bear). The various names are a consequence of the different imagery applied to same seven stars in different ways. The model shows how the bear is imagined from the group of stars. Saptharshi Mandala refers to the seven sages called Krithu, Pulaha, Pulastya, Angeerasa, Atri, Vasishta and Marichi.



±ÁR »ÃgÄª PÆ¼ª

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¨ÃPÁUÄª ¸ÁªÄVU¼Ä: M¼¨ÁUzº PÆz¯¼AiÄAvº ¸t PÁ®ÄªU½gÄªAvº C®Æ«Ä¤AiÄA PÆ¼ª zª CªÆÃ¤AiiÁ, ©¹ ¤ÃgÄ.

«ªg: ±ÁR »ÃgÄª PÆ¼ªU¼Ä, ±ÁRª£Ä¸¼¢Az ªÄvÆAzÄ ¸¼P ¸Ä®¨ªÁV ¸ÁV¸§® ¸Áz£U¼Ä, PÆz¯¼AiÄAvº ¸t PÁ®ÄªU½gÄª C®Æ«Ä¤AiÄA PÆ¼ªAiÄ M¼U zª CªÆÃ¤AiÄA vUzÄPÆAqÄ PÆ¼ªAiÄ JgqÆ vÄ¢U¼£Ä¸ ¨zªÁV ªÄÄZÄª ª¸ª¸ ªiÁq¯ÁVz. F PÆ¼ªAiÄ vÄ¢AiÄ£Ä¸ ±ÁRz ªÄÆ®zº C¢zÁU zª CªÆÃ¤AiiÁ D«AiiÁV ªÄÃ¯ÃgÄvz. Cº D«AiiÁUÄ«PAiÄ UÄ¥ÆÃµª£Ä¸ PÆ¼ªU ©lÄPÆqÄª ªÄÆ®P zª gÆ¥P ªÄg½ P¼U §gÄvz. F ¥QAiÄ ZPzAv ªÄÄAzÄªgAiÄÄvz. D«AiiÁUÄª ªÄvÄ D«¬ÄAz zª gÆ¥P ªÄg¼Äª vÁ¥ªiÁ£U¼º ºZÃ£Æ CAvg«®. Dz PÁgt, F ±ÁR »ÃgÄª PÆ¼ªU¼Ä vÁ¥ªiÁ£zº£ PrªÄ ª¸vÁ¸zÆA¢U Cw ºZÄ ±ÁRª£Ä¸ ¸ÁV¸Äªº ¸ªÄxðªÁVª.

HEAT PIPE

Objective: To demonstrate the working of a heat pipe.

Materials Required: Aluminum pipes with capillary channels on the inner walls, liquid ammonia, hot water.

Description: Heat pipes are the devices that can quickly transfer heat from one point to another. Liquid ammonia is taken inside an aluminum pipe with capillary channels and both the ends are sealed properly. When one end of this pipe is dipped in the heat source, the liquid inside gets vapourised and the vapour rises to the top where is condenses realizing the latent heat of vapourisation. The liquid returns to the bottom and the cycle continues. Evaporation and condensation temperatures being nearly same, the heat pipe transports a large amount of heat with a small temperature difference.

¥nUAiÆ¼V£ C¹¦¥Adg

¨ÃPÁUÄª ¸ÁªÄVU¼Ä: ¥nU – MAzÄ §¢AiÄ° ¸® vg¢gÄªAvºÄzÄ, ªiÁ£ª£ C¹¦¥Adgz ªiÁzj, §®ÄU¼Ä, ªÃjAiiÁPï, UÁf£ ºÁ¼,

«ªg: ¥nUAiÄ ªÄÄAz ¤AvÄ £ÆÃr, C¹¦¥AdgªÇAzÄ ¥v¦PªÁV PtgAiiÁUÄvz. UÁf£ ºÁ¼AiÄ ¥nUAiÄ£Ä Czg «Ptð¦ C£ÄUÄtªÁV JgqÄ ¸ªÄ¨ÁUU¼ÁV «¨f¸Ävz. JgqÄ ¨ÁUU¼° ªÃjAiiÁPï C¼ªr¹gÄª JgqÄ ¥v¦ÃP §®ÄU½ª. ªÆz°U ¥nUAiÄ MAzÄ ¨ÁUz° ¨¼QzÄ PªÄÃt CzÄ ªÄ¨ÁUÄvz. DU E£Æ¦AzÄ §®Ä ªÄAzªÁV GjAiÄ®Ä DgA©¹, PªÄÃt ºZÄ ¥PÁ±UÆ¼Ävz. £ªÄ z¦¶U PÁtzAv Ej¸¯ÁVgÄª C¹¦¥Adgz ¥w¥°v ©A§ PÁtÄvz.

PÁgt: NgAiiÁV Ej¹z UÁf£ ºÁ¼ GvªÄªÁV ¥w¥°¸Ävz. ºÁUÁV, C¹¦¥Adgz ªÄÃ¯ ©z¦ ¨¼PÄ ¥w¥°¹zÁU, £ÁªÄ Cz£Ä PÁtÄvÃª.

PEPPER'S GHOST

Materials Required: A box with one face partly open, a human skeleton model, bulbs, variac(optional) and a sheet of glass.

"Stand in front of the cube and watch a skeleton materialise out of nowhere!"

Description: The cube is divided into two by a sheet of glass placed along its diagonal. The two portions are lit separately. And, a variac is used to fade in light in one compartment as it fades out in the other. To start with, the farther compartment is lit. As the light fades in that compartment, the light other half brightens up. Then, a reflection of the skeleton placed away from our view is seen.

Reason: Glass placed obliquely reflects light fairly well. Hence we 'see' the skeleton.