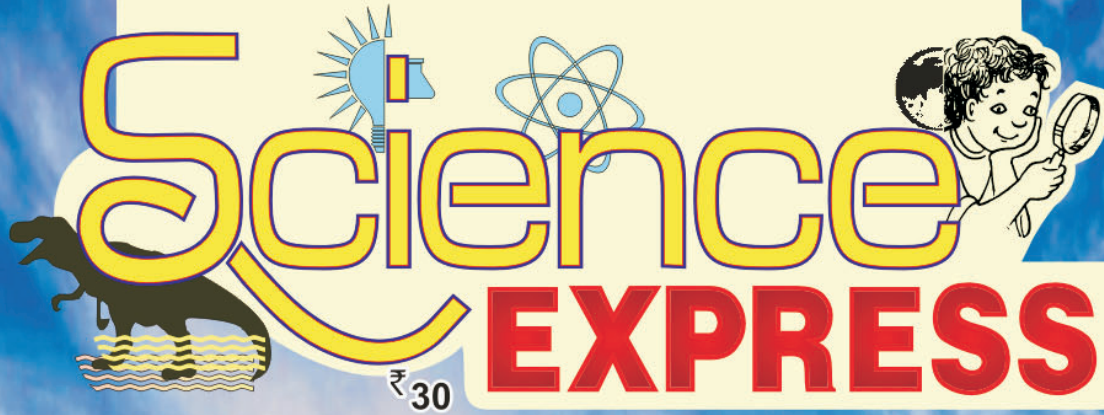


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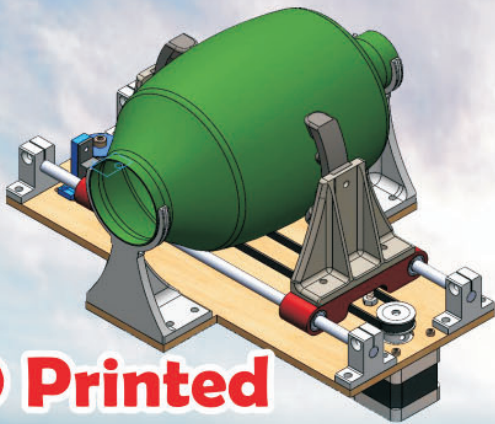
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Science EXPRESS

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Technological warriors vs. COVID-19



3D Printed Devices



**'Kokum' -
A cooling fruit**



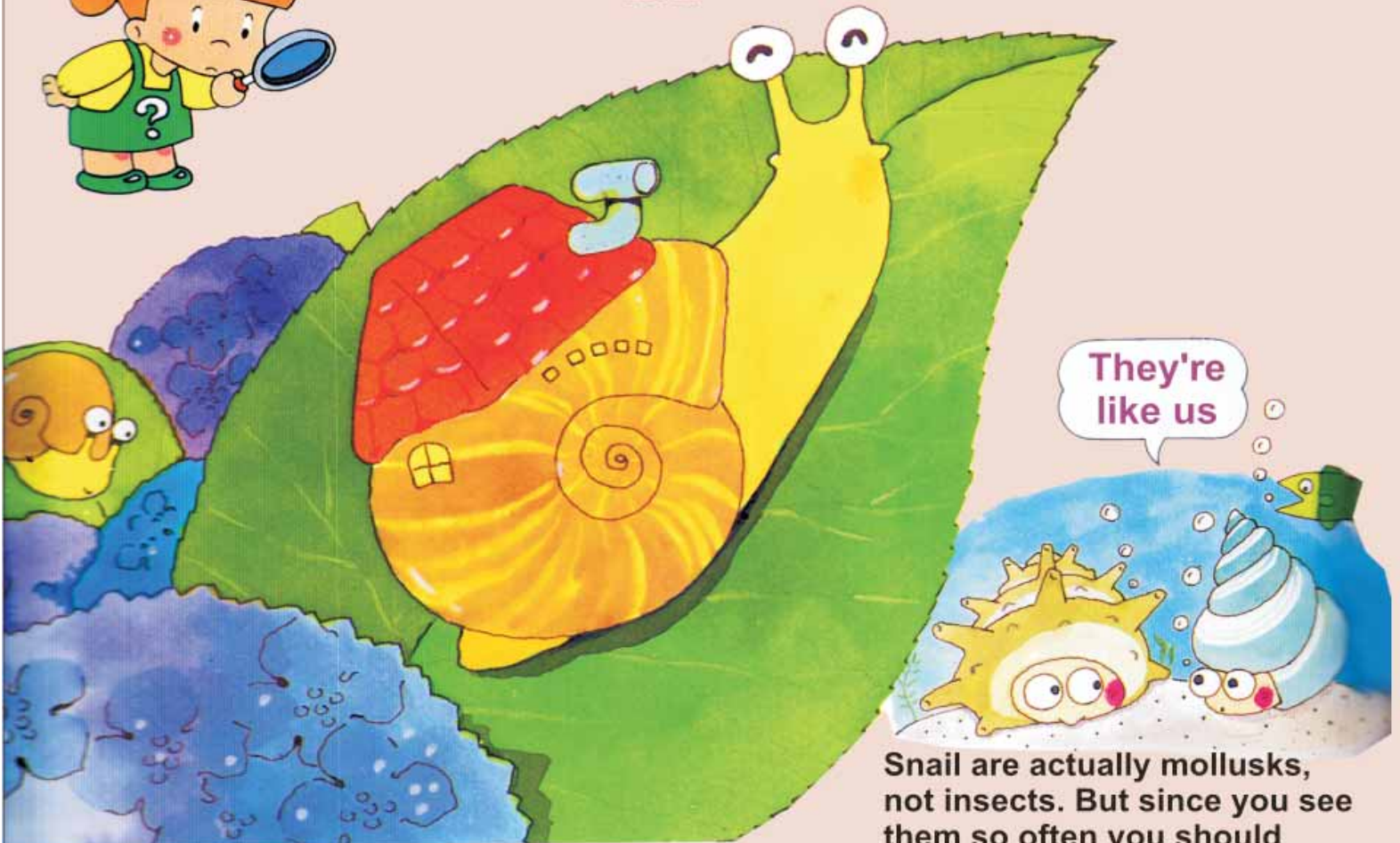
SAMSUNG

**CEO of
Samsung
Pranav Mistry**

Why do snails carry their houses on their backs ?

Snails live inside shells. The shells are made of the same kind of material as the shells of oysters and clams. The snail's heart, lungs and all other important parts are inside the shell. If the shell is broken the snail cannot fix it. But if it is broken badly the snail cannot fix it the animal usually dies.

Inside a snail shell



Snails are actually mollusks, not insects. But since you see them so often you should know about them.

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: Publication & Printer :
Monghiben Balvihar Trust
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Phone : (0278) 2209220
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Periodic Table

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A cooling fruit

7.  **Alchemist :**
Nitrogen &
its compounds

28.  **Health Bytes :**
Parkinson's
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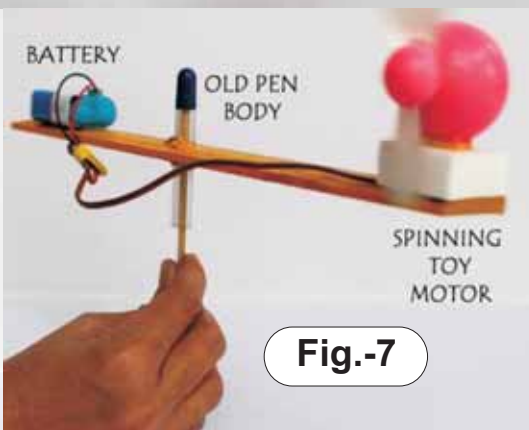
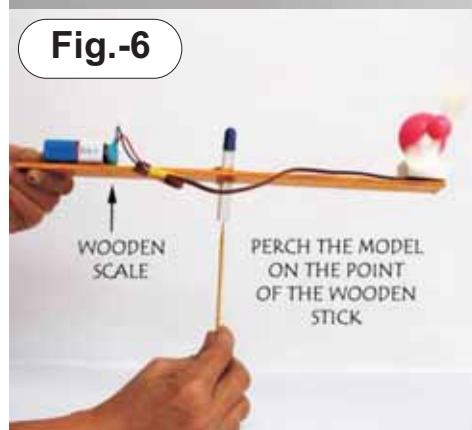
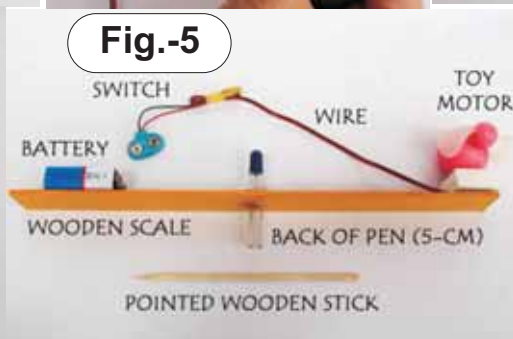
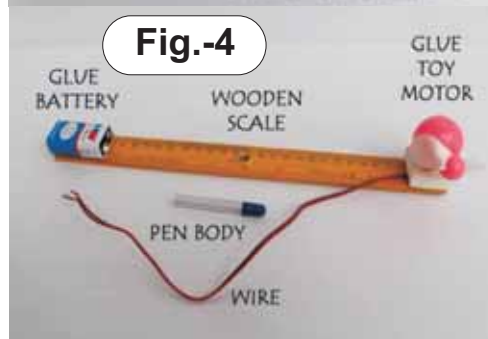
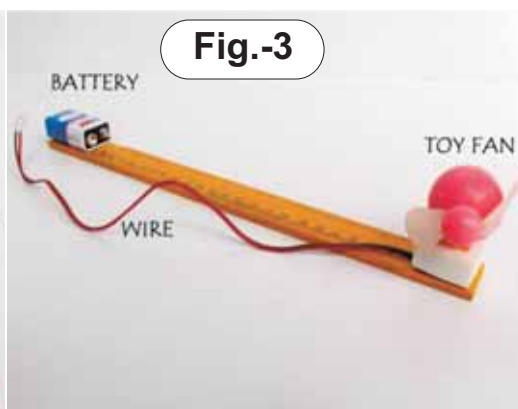
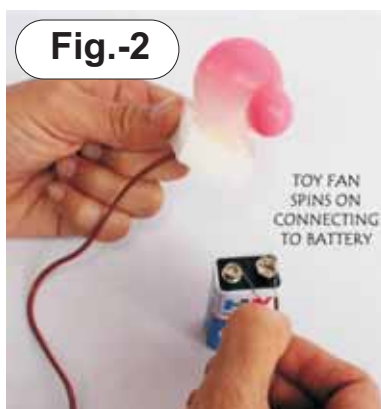
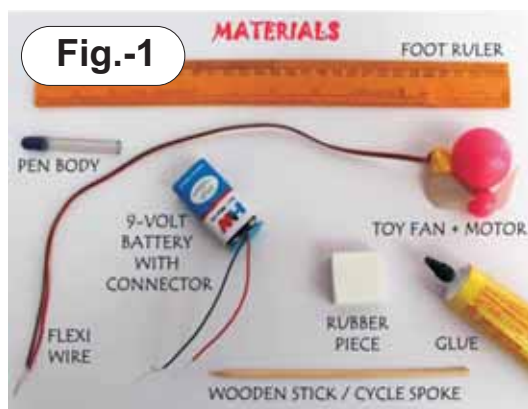
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Let's make Helicopter Fan

Fig. 1: Material required - Wooden scale, empty ball pen, 9V battery with connector, Flexible wire, a piece of rubber, A piece of wooden stick or cycle spoke, glue. You can make it by sticking fan with toy fan or D.C. motor of a toy. According to fig. 2, connect battery with motor & check, the fan is okay or not. According to fig. 3, stick toy fan & battery on the wooden scale with glue. Take care, when fan is moving it doesn't clash with the wooden scale. Make hole in between wooden scale as shown in fig. 4. According to fig.5, pass empty ball pen into the hole of wooden scale and attach battery cap wire to the toy fan wire. According to fig. 6, attach fan to the battery cap that's why the fan will move. Now take wooden scale in hand,



keep pen refill/wooden stick/cycle spoke in empty ball pen kept in the hole. According to fig.7, hold with the single hand, your helicopter fan will move round and round.

Enjoying!!
Do you know??

1. Why this helicopter fan moves round & round?
2. If battery is connected to the opposite site, what will happen??



GoodFood

'Kokum' - A cooling fruit



With the onset of summer, various recipes are adopted to keep the heat cool. If one prefers to drink Amla water, one prefers the delicious mango made from raw mangoes. When you hear the name

'Kokum Sharbat', a popular drink of various cities of Maharashtra and Mumbaigara, the first thought that comes to mind is that it is used to make dal-vegetables delicious. Kokum contains many qualities to keep us healthy. Kokum syrup is a natural drink. Kokum sharbat is easily available at most of the railway stations in Mumbai during summer season. You



can see many people consuming it to protect himself from the scorching heat. Companies making different types of jams, jellies, syrups and quashes also prefer kokum syrup. You can easily find bottles or cans of kokum syrup with different varieties.

Let's also know the benefits of Kokum for cooling, in the summer for good health:

Kokum fruit is small in size like betel nut, in appearance. Its color is purple. It became blackish after drying. Using Kokum on hot days cools the body. If the body has become awkward, regular use of

Kokum gradually reduces the fat accumulated in the body. Kokum also helps in lowering cholesterol.

Antifungal - Antioxidant properties

Kokum seem to be sour in taste but if it

is made into a syrup and drunk, it cools the mind. Kokum can also be kept longer. If it is to be kept for a long time, it needs to be dried properly in sunlight. Sweating in the body increases in hot days. Lack of proper hygiene can sometimes lead to skin related infections in the body. By consuming kokum, body's immunity can be increased. Infectious diseases can also

be prevented.

Power Booster nutrients

Kokum contains a lot of power booster nutrients and vitamins that the body needs. Kokum is rich in malic acid, citric acid and carbon. Besides Vitamin-B it is rich in ascorbic acid, manganese, potassium and dietary fiber. Consumption of kokum during pregnancy is considered beneficial.

Beneficial in metabolism

Patients suffering from constipation or diarrhea can be benefited in their stomach problems if they consume

Continue on page No.13



Nano news

Smart Zebra Crossing

Zebra crossings are used everywhere in the world. They are very helpful for



pedestrians to cross roads. Usually, during night, due to low traffic, people tend to drive a bit carelessly; sometimes, they miss pedestrians crossing road which can lead to accidents. A group of British designers have come up with an innovative idea for resolving this. The new & improved zebra crossings are made up of red LEDs which will light up and inform vehicles if there are pedestrians crossing the road. It uses various camera and sensors to detect movement and alert drivers about the same. This technology can help prevent many accidents.

USB + Wi-Fi dual band

With increasing rise in smartphones, TVs and laptops, it is necessary to have a good Wi-Fi connection. To support this,



'Smart' is the Key

innovative USB and Wi-Fi bands have been released; this device can be plugged into your laptop or computer in the USB slot and can give you good speed. This device is compatible with old model of computers and laptop and thus it doesn't need an external LAN cable. The band is also a data storage device which can help in increasing the RAM of your computer and laptop. It can be used for making your TV smart and using it for watching HD videos on TV directly.

Techy Bottle

Water is essential for human body to function properly. Many times people forget to drink water; to address such issues and generate awareness, innovators have come up with a new tech-savvy bottle named 'HydraCoach'. This innovative water bottle calculates how much water a person needs for staying hydrated, tracks every sip of water taken, monitors progress and also prompts individuals to maintain and achieve proper hydration.



SUV or Truck?

'Reconfigurable Body Panelling' is one of the top upcoming automobile technologies. Under this, a car will have

Continue on page No.10



Alchemist

Nitrogen & its compounds



'Dhoom' movie is quite famous for its bikes & stunts; John Abraham's Suzuki Hayabusa, which was equipped with a nitrous oxide booster, gained a lot of attention. Nitrous oxide booster for automobile is one of the many uses of an important element, Nitrogen.

Atmospherically, nitrogen makes up for about 78% of the air. However, it is not much of use in its gaseous form in atmosphere. Discovery of nitrogen gas was made in 1760s when Henry Cavendish and Joseph Priestly conducted experiments on air; they removed oxygen from air and found the resultant product could extinguish a candle and also kill a mouse when it is forced to breathe it. However, they did not realise the importance of this resultant gas. Later in 1772, David Rutherford discovered nitrogen in his doctorate thesis. Nitrogen is derived from the Greek word 'nitron' and 'genes' which means nitre forming.

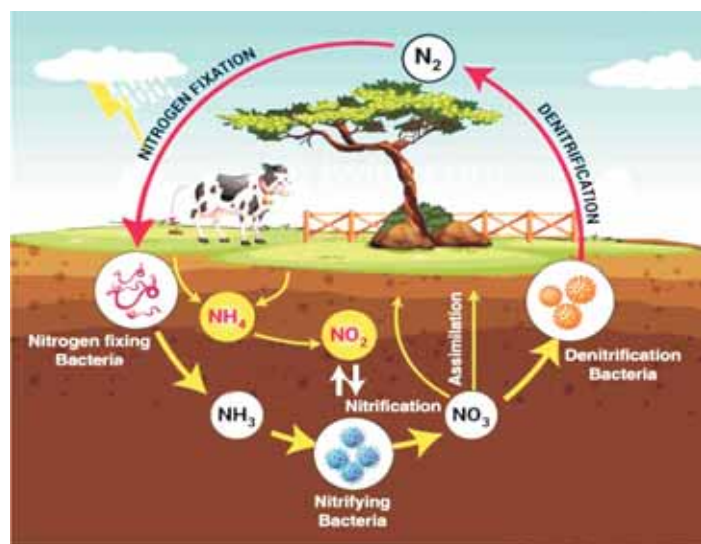
Nitrogen has its own 'nitrogen cycle' in the atmosphere. Elemental nitrogen is not of much use to plants or humans; it is absorbed by green plants and algae in the form of nitrates. This is used for building bases of DNA, RNA and amino acids. Amino acids are building blocks of proteins. By consumption of plants, animals obtain their quota of nitrogen.

How are these nitrates formed? There are nitrogen-fixing bacteria and microbes present in the soil which directly convert nitrogen into nitrates for plants. Due to electrical energy present in atmosphere, nitrogen and oxygen molecules are dissociated which leads to formation of nitrous oxide NO , and nitrogen dioxide NO_2 . Nitrogen dioxide reacts with water to form nitric acid, HNO_3 , which dissolves to form a dilute solution and comes to Earth in the form of rain. Once in the soil, it is used for making Nitrates and Nitrites. When concentration of nitrogen oxide and sulphur dioxide increases atmosphere, the above process produces a more concentrated nitric acid, which is known as 'Acid Rain'.

Nitrogen is a colourless and odourless gas. When condensed at -195.8°C , it forms a colourless, mobile liquid known as liquid nitrogen, which has uses in many industries. Chemically, it is an inert substance. Nitrogen forms many compounds; many of its common compounds are produced with hydrogen, oxygen and sulphur. The process of incorporating elemental nitrogen into compounds is known as nitrogen fixing. Ammonia and nitric acid are most important compounds of nitrogen.

Ammonia is one of the principal

compounds of nitrogen which is used commercially. It is produced by Haber - Bosch process in which nitrogen from air is fixed with hydrogen from natural gas under extremely high pressure in the presence of an iron or ruthenium catalyst to form ammonia, NH_3 . Ammonia is a colourless gas with a pungent, irritating smell. It is used in the production of soda ash, preparation of hydrazine (which is a colourless liquid used commonly as rocket fuel), as a fertilizer in agriculture sector, as a refrigerant & in purification of water and is commonly found in many household and



industrial cleaning solutions. It is also present in most hair dyes, paints, plastics, textiles and pesticides.

Nitric acid is another common commercial product of nitrogen. Industrial preparation of nitric acid uses Ostwald's process which involves oxidation of ammonia, NH_3 . It is a colourless and highly corrosive liquid which finds applications in fertilizers, dyes, drugs and explosives such as TNT (trinitrotoluene). Ammonium nitrate, which is a salt of ammonia and nitric acid, is commonly used in artificial

fertilizers in agriculture industry. It is also used in manufacture of chemicals, in metallurgy, in etching processes and reprocessing of spent nuclear fuel.

Nitrogen reacts with oxygen to form several oxides like nitric oxide NO & nitrogen dioxide NO_2 . Nitrous oxide, N_2O , has a peculiar characteristic; it is a colourless gas with pleasant and sweetish odour which when inhaled causes mild hysteria, sometimes laughter. It is commonly known as 'laughing gas' and reduces a person's sensitivity to pain; due to this property, it is also used as an anaesthetic in minor operations. Some other common applications of nitrogen & its compounds are listed below:

- ★ In food packaging industries, nitrogen is used along with carbon dioxide for creating a modified atmosphere which is used in preservation of fresh packaged foods.
- ★ Used extensively in pharmaceutical industry and also used in cryopreservation process to preserve biological specimens.
- ★ In manufacturing and construction industry, it is used in 'shrink fitting' process when inner part of metal is cooled using liquid nitrogen and shrinks it. Once inserted, temperature is returned to normal and metal turns into its original size and gives it a tight fit.
- ★ Nitrogen gas is used in steel industry as a purging gas; it protects the weld seam by cooling it to a point where oxidation can no longer occur. It is also used as a shield gas for safeguarding technological processes against oxidation.



Curiosity

It all started with a Big Bang...

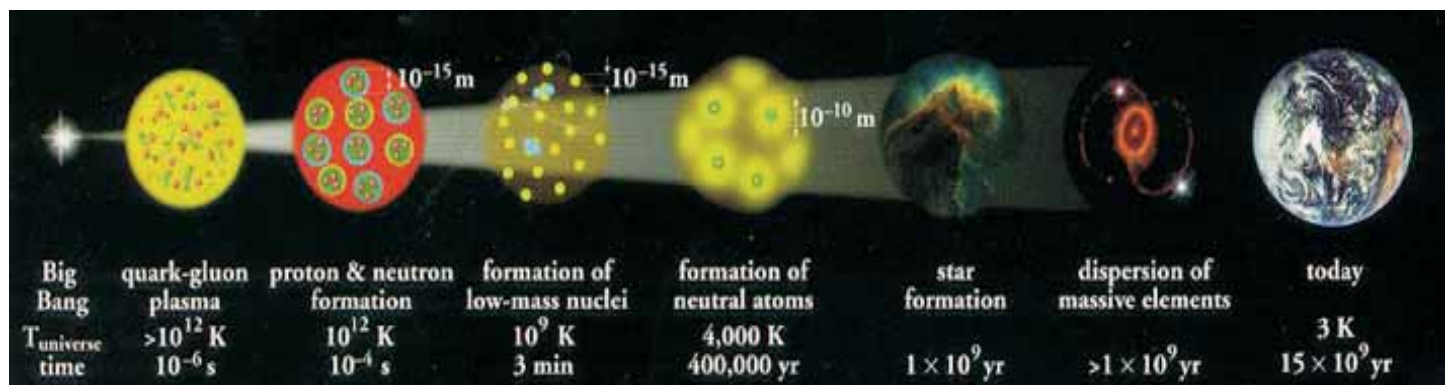
How were the 94 elements of Earth/Universe formed?

Scientists believe that creation of universe happened due to Big Bang; it was a massive explosion which occurred when space was extremely hot & dense and under great pressure. The expansion of matter and energy after the explosion led to creation of universe. Immediately after the explosion, it was as hot as 10^{32} degrees! At one second after the Big Bang, scientists believe that a "particle soup" was created by particles which could exist in a tiny short frame; gluons, pairs of quarks created and destroyed one another. Different forces such as nuclear force, electromagnetic and gravitational force were beginning to take form. When the universe stretched to a billion kilometres in diameter, temperature started to decrease slightly; protons and neutrons were formed. All of this took place in seconds and exactly three minutes after Big Bang, the first element, deuterium, an isotope of

hydrogen, was formed. It is quite logical that hydrogen be formed first as it has only one proton in nucleus surround by one electron in its outer orbit.

Two deuterons joined to form the second element, Helium, which is the lightest element. It had 2 protons and 2 electrons in its outer orbit. We can say that 75% of hydrogen and 25% of helium are responsible for creating the mass of universe. Quite rarely, collisions of deuterium also produced Lithium and beryllium in trace quantities. With further expansion and decrease in temperature, it was time for 'Dark Ages'; there were no stars, no visible light as atoms of gases collected around hydrogen which did not allow light to pass through. As the cosmic dust and gases started cooling, stars were formed.

When a star's core runs out of hydrogen gas, it starts to die and expands into a Red Giant. This process gave birth to carbon atoms by fusion of helium atoms. As more



and more massive stars began a series of nuclear reactions, nitrogen and oxygen were also created. So how were the remaining heavy elements formed? As larger stars (5 times bigger than Sun) began to collapse, an explosive shock wave was created; this is called 'Supernova'. Supernova is responsible for creation of heavier elements like iron, aluminium, uranium, gold and titanium. Collisions of cosmic rays with Hydrogen and Helium led to formation of rare elements like lithium, beryllium and boron. A few examples of element making in helium burning reactions are: 3 helium atoms to give a carbon atom, a carbon & helium atom gives oxygen by fusion, oxygen atom fusing with helium to give a neon atom and a neon atom with a helium to give magnesium. The natural elements were thus formed by such processes. According to Britain's astronomer, Sir Martin Rees, we are nothing but ashes of dead stars. Our entire bodies are just bits and parts formed by expansion of universe!



Continue from page No. 6

reconfigurable body parts which can allow a SUV to be converted into a truck. This feature would be useful for people who need to have a car for transport as well as load carrying requirement. The car would be enabled with a push button using which the roof and side glass retracts into lower body panels and a SUV is converted into a mini-truck. It would make moving and long trips quite easy. Two-in-one benefits!



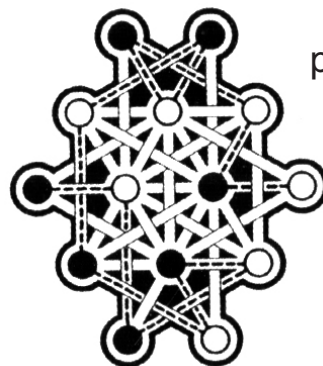
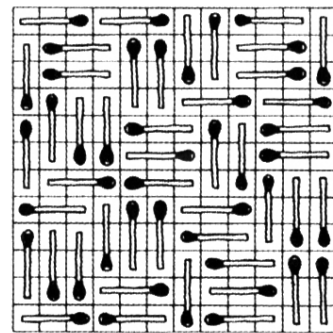
Answers

Focus

1. Turn the page so that the arrow points up words and you will see a scene from the circus
2. Try turning the page up side down.
3. Both are of the same size.
4. Turn the page upside down and you'll see he has change himself into donkey.

IQ Booster

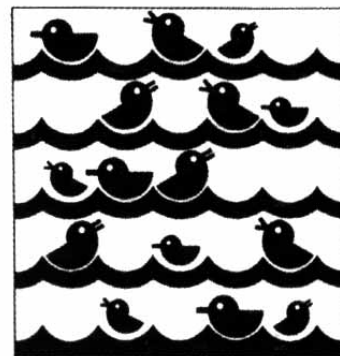
1



One of three possible solutions.

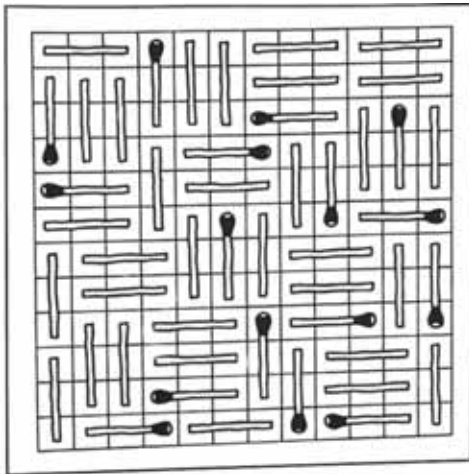
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3




IQ Boosters

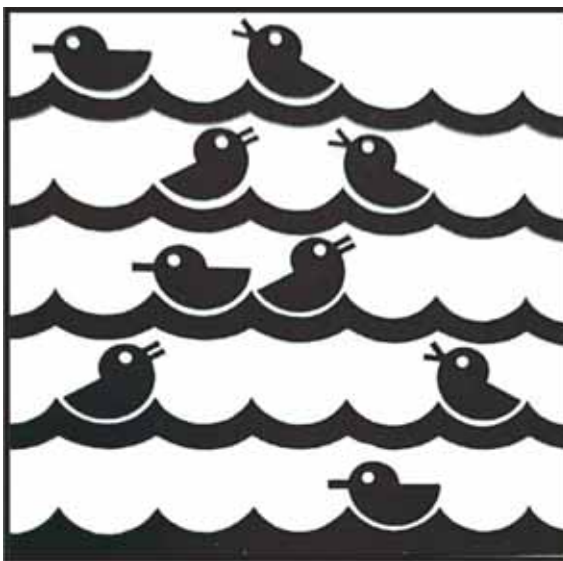
Try these...


1
BLACK MATCHSTICKS

Draw the match heads on the remaining thirty-two matchsticks in such a way that each horizontal and each vertical row of squares has the same number of match heads.


2
ALTERNATING OCCURRENCE

Beginning at the black spot on the far left, trace a path connecting each of the fourteen spots in the puzzle, alternating black and white, and ending with the white spot on the far right. None of the crisscrossing paths or intersections may be used more than once.

3

SITTING DUCKS

There are three different kinds of ducks in this puzzle. Position six more ducks on this two-dimensional pond so that each of the five horizontal and vertical rows will sport all three different kind of sitting ducks.

SE

Answers are somewhere in this issue



Long Lasting Legos

During childhood, we have played many a times with Legos; these plastic blocks, which could be attached and removed, provide us with great fun and satisfaction. Recent studies have proved that these blocks are not much fun to the environment; a single Lego block could take hundreds of years to break down in the ocean.

It is common knowledge that our oceans have been littered with garbage and plastics. There are researches which study time taken for different types of plastics to break down in sea. But it is a rather difficult process to date debris as its source is not easy to find. But in case of Legos, this is not applicable. Andrew Turner, an environmental scientist who works at University of Plymouth, says that identifying Legos is fairly easy as they have distinct shapes. The method of making Legos has changed over time and so it can be easy to check the chemical composition of Legos and identify when it was manufactured.

A beach clean-up crew collected some washed up Legos in 2010; Turner and his crew were responsible for analysis of these

blocks. Scientists used X-rays to identify the chemical composition of blocks; by noting the energies given by X-rays, researchers could find the atoms which make the block. This analysis method showed that the 2010 bleached blocks were made of cadmium and other compounds. In early 1970s and 1980s, manufacturers used cadmium for yellow and red pigmentation of the blocks. Later,



due to its toxicity, its usage in blocks was stopped. Based on the assumption that the Legos were lost in sea soon after they were bought, Turner and his team tried

gauging how much these blocks had worn down in 30-40 years in the exposure to sunlight and sediments. For this purpose, they compared the blocks they had with collector had held since 1970s using chemical fingerprints. The scientists ended up with 14 pairs of matching Legos; the beached versions of block had about 3-40% less mass compared to the mint versions. This analysis proved that it would take about 1000 to 1300 years to completely breakdown a single piece of Lego! Such a long period for a short piece of plastic block! Just imagine, there are so