

Pre-Mix – 5 MCQs for Prelims

Subject – Science & Tech.

Date – 28th January 2023

1. Consider the following statements regarding Sand battery seen in news recently.

1. It uses sand or sand-like materials as its storage medium
2. It store energy in a chemical form like other batteries and convert that into electrical energy when needed.
3. India became first country to install the world's first fully working "sand battery"

Which of the statements given above /are correct?

- A. 1 only
- B. 2 and 3 only
- C. 1 and 3 only
- D. All of the above.

2. Consider the following statements regarding Bone ossification test seen in news recently:

1. It is a test that determines age of a person based on the degree of bone fusion
2. It help to provide accurate results as the process of ossification remains same irrespective of external factors
3. Effectiveness of the test increases with the age

Select the correct answer code:

- A. 1 only
- B. 1 and 3 only
- C. 3 only
- D. 2 and 3 only

3 Recently terms Barnase, Barstar and Bar seen in news related to

- A. Stem cells
- B. Low fat milk
- C. GM crops
- D. Virus variants

4. Which among the following best describe the term Local Bubble seen in news recently:

- A. It is a cavity in the interstellar medium
- B. Lockdown restrictions to curb COVID 19 by china
- C. Tribal regions in forest area
- D. Region of the ocean with little oxygen

5. Gluten-free diets have become increasingly popular in recent years for various reasons. Which among the following is correct in this context :

1. Gluten is a family of storage fats which can lead to cardiovascular diseases
2. Gluten makes bread inelastic and decrease its moisture content
3. Most of the millets are gluten-free and are perfect substitutes for those suffering from Celiac Disease

Select the correct answer code:

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Answers with Explanations

Click [here](#) to watch the following topics on YouTube

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Answer : A

Explanation

Sand battery

Context: A new battery technology by a Finland-based company that uses sand to store thermal energy may aid clean energy solutions. The innovation comes at a time when Europe is facing an unprecedented energy crisis.

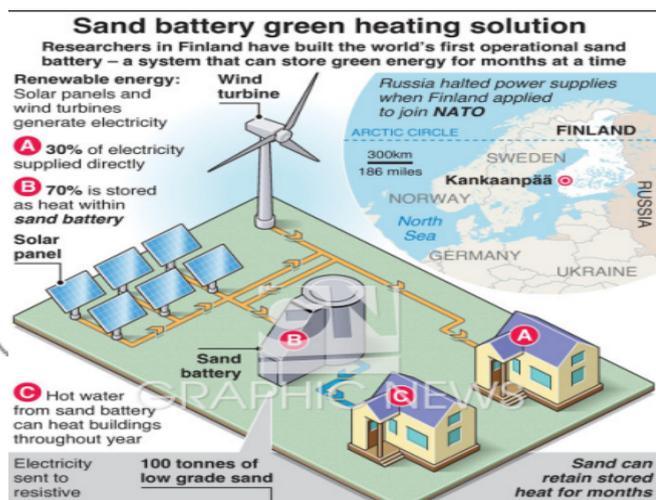
Background

- Russia – the supplier of **40 per cent of the European Union's natural gas supply** – has shut off its pipelines to a large extent. Countries in the Northern Hemisphere rely on a central heating system in winters, with natural gas as the most common heating fuel. This is unlike developing countries with a tropical climate.

Sand Battery

- A "sand battery" is a high temperature thermal energy storage that uses sand or sand-like materials as its storage medium. It stores energy in sand as heat.

How does the sand battery work?



- Just like conventional energy storage systems, when excess power is generated through renewable sources than is required, it is **directed towards the sand battery**.
- Instead of trying to move electrons from one electrode to the other or power pumps to send water to a higher reservoir, **a sand battery uses resistive heating to increase the temperature of the air**, which is then transferred to sand through a heat exchanger.
- With the melting temperature of the sand in **hundreds of degrees Celsius**, a tower of sand has a high potential to store energy. More importantly, sand store this energy for many months together, making it a viable long-term storage solution.

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Answer : A

Explanation

What is the bone ossification test?

- The bone ossification test (hereinafter "ossification test") is a test that determines age based on the "degree

of fusion of bone” by taking the x-ray of a few bones. In simple words, the ossification test or osteogenesis is the process of the bone formation based on the fusion of joints between birth and the age of twenty five years in an individual.

Problems associated with the test

- The major reason for ossification tests to not be a strong piece of evidence is because generally there is a variation of two years on both sides of the given possible age range. The process of ossification may also vary based on factors like the nutrition, genetic peculiarities, injuries, geographical and climatic conditions, economic conditions, etc.

AGE OF THE EXAMINEE

- Bone ossification test also becomes difficult after the person whose age is to be determined crosses a certain age. Therefore, it cannot be used to determine the age of people after a lapse of time from the time of occurrence of the crime or if the accused raises the plea of minority after the passage of a long period of time – there is no restriction in raising the plea at a later stage – as the

3. Recently terms Barnase, Barstar and Bar seen in news related to

- Stem cells
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Answer : C

Explanation

GM mustard

- Recently, **GM mustard Dhara Mustard Hybrid (DMH-11)** was tested in the field and shown to be more productive.

GM technology

- GM technology is a **disruptive technology capable of bringing any targeted change with in the crop variety** to overcome a problem that is difficult or impossible to achieve that are also safe to humans, animals and environment.
- Thus, the GM technology has **imminent potential for the much-needed revolution in Indian agriculture.**
- It is important to look at the current scenario particularly in relation to domestic production, requirement and import of edible oils in the country.

GM Mustard

Barstar-Barnase system

- Problem with mustard is that its **flowers contain both female and male reproductive organs**, making the plants largely self-pollinating.
- When the **egg cells of one plant cannot be easily fertilised by the pollen grains from another**, the scope for developing hybrids through crossing of parents from divergent genetic pools is restricted.

WHAT IS A BONE OSSIFICATION TEST

OSSIFICATION
At birth, ends of bones are cartilaginous and middle part (bone shaft) is bony tissue. Cartilaginous portions become bone tissue as a person ages. This process—formation of new bone material (by cells called osteoblasts)—is called ossification.

HOW THE TEST IS CONDUCTED
By X-ray analysis of mainly pelvic, shoulder, elbow, knee, ankle, thigh and wrist bones. This is supplemented by dental X-rays and a thorough physical examination, including analysis of secondary sexual characteristics. Age is declared after all tests are taken into consideration.

FORENSIC UTILITY
Ossification of different bones occurs at different ages (see table); the process is complete only at the age of 25. Thus, a person's age (till 25) can be determined by an analysis of bones. The test is useful in determining if a person is minor or not. In criminal cases, it can help determine if a person has to be tried as a juvenile or an adult.

LIMITATIONS
Age can be determined with a margin of error of two years. It means age cannot be exactly determined. Effectiveness of the test decreases with increase in age. It is easier to determine the age of a person who is 5-15 than 20-25.

OSSIFICATION IN HUMANS

AGE	EXTENT OF OSSIFICATION
5-14	Ossification is progress in various bones
17-20	Complete in hand and shoulder blade bones
18-23	Complete in leg and hip bones
23-25	Complete in breastbone, collarbone and vertebrae
25	Complete in almost all bones in body

Justice Sachana Jadhav

already inaccurate ossification test becomes even more inaccurate.



- This is where GM technology comes in. The **Barnase gene alluded to earlier, codes for a protein that impairs pollen production.** The plant into which it is incorporated, then becomes male-sterile, and capable of receiving pollen from another parent.
- That plant, in turn, contains the Barstar gene, which blocks the action of the Barnase gene.
- The resultant F1 progeny is both high yielding and can also produce seed/grain, thanks to the Barstar gene in the second male-fertile line.
- Using this technology, the **Delhi University scientists bred DMH-11, a GM hybrid obtained from crossing an Indian mustard variety, Varuna ('Barnase' line), with Early Heera-2 ('Barstar').**
- DMH-11 has reported a roughly 30% yield advantage over the Varuna 'check' variety in the bio-safety research level field trials carried out between 2010-11 and 2014-15.

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Answer : A

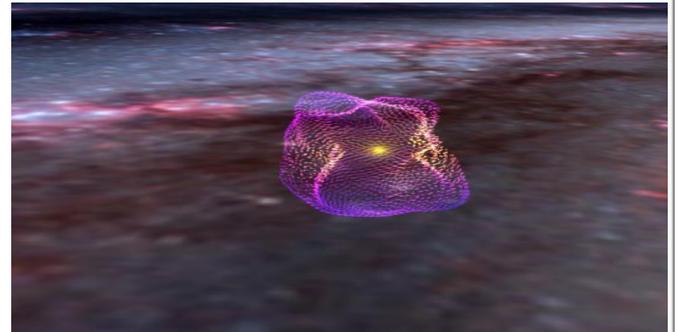
Explanation

Local Bubble

Recently Researchers from the Center for Astrophysics (CfA) | Harvard & Smithsonian have generated a 3D magnetic map of the cavity called Local Bubble

Local Bubble

- The Local Bubble is a 1,000-light-year-wide cavity or a superbubble. Other superbubbles also exist in the Milky Way, according to scientists.
- Space is full of these superbubbles that trigger the formation of new stars and planets and influence the overall shapes of galaxies



5. Gluten-free diets have become increasingly popular in recent years for various reasons. Which among the following is correct in this context :

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- Gluten makes bread inelastic and decrease its moisture content
- Most of the millets are gluten-free and are perfect substitutes for those suffering from Celiac Disease

Select the correct answer code:

- 1 and 2 only
- 2 and 3 only
- 3 only**
- All of the above.

Answer : C

Explanation

Gluten

- Gluten is a family of proteins found in grains, including wheat, rye, spelt, and barley.
- Of the gluten-containing grains, wheat is by far the most common.

- Glutenin and gliadin are the two main proteins Trusted Source in gluten. Gliadin is responsible for most of Trusted Source the adverse health effects of gluten.
- When flour mixes with water, the gluten proteins form a sticky network that has a glue-like consistency.
- This glue-like property makes the dough elastic and gives bread the ability to rise during baking. It also provides a chewy, satisfying texture.
- Interestingly, the name gluten derives from this glue-like property of wet dough
- millets are gluten-free and are perfect substitutes for wheat if you want to give up gluten or are suffering from Celiac Disease.