

automated locking mechanisms.

★ **Healthcare:** Medical professionals, nowadays, make use of advanced technology (semiconductor-based) while carrying out complex surgical procedures, like heart surgeries or organ transplants for accuracy, precision, and safety. Even having discussions with patients, getting their history, and diagnosing them is possible via video conferencing.

In short, semiconductors have, undoubtedly, revolutionized modern electronics and, thus, the way we live.

**Answer:** (c) There are a number of theories and hypotheses that tried to explain the origin of the Universe. However, the most accepted among all is "The Expanding Universe Theory" or "The Big Bang Theory" formulated by Georges Lemaitre, a well-known mathematician, and astronomer of his time.

**Big Bang Expansion Theory:** According to the Big Bang Theory, the Universe is the result of an expansion and is continually expanding.



The theory states the following points:

**1. Singularity:** Before the creation of anything, there was present a singularity. Singularity means that our Universe was a very dense and hot single point and time and space were zero. Similarly, the matter and energy had same state and temperature was  $10^{10}$  bn $^{\circ}$ C. Further, gravity was the dominant energy at that time.

**2. Expansion:** About 13.5 billion years ago, some force suddenly expanded the singularity, resulting in the evolution of time and space. As the space started to expand, the temperature started to cool down gradually as a result of which the energy was converted into the Quarks - the first particle of matter to be formed.

**3. Formation:** Eventually, the Quarks started making groups and created different sub-atomic particles, which then formed atoms, elements, and molecules in the form of larger chunks. As gravity was present, it converted



these irregular chunks into round  
 and elliptical shaped galactic  
 content that, ultimately, lead to  
 the creation of the galaxies,  
 solar systems, planets, etc. This is  
 the Universe we see today.  
 The Universe is still expanding  
 at an accelerated rate.

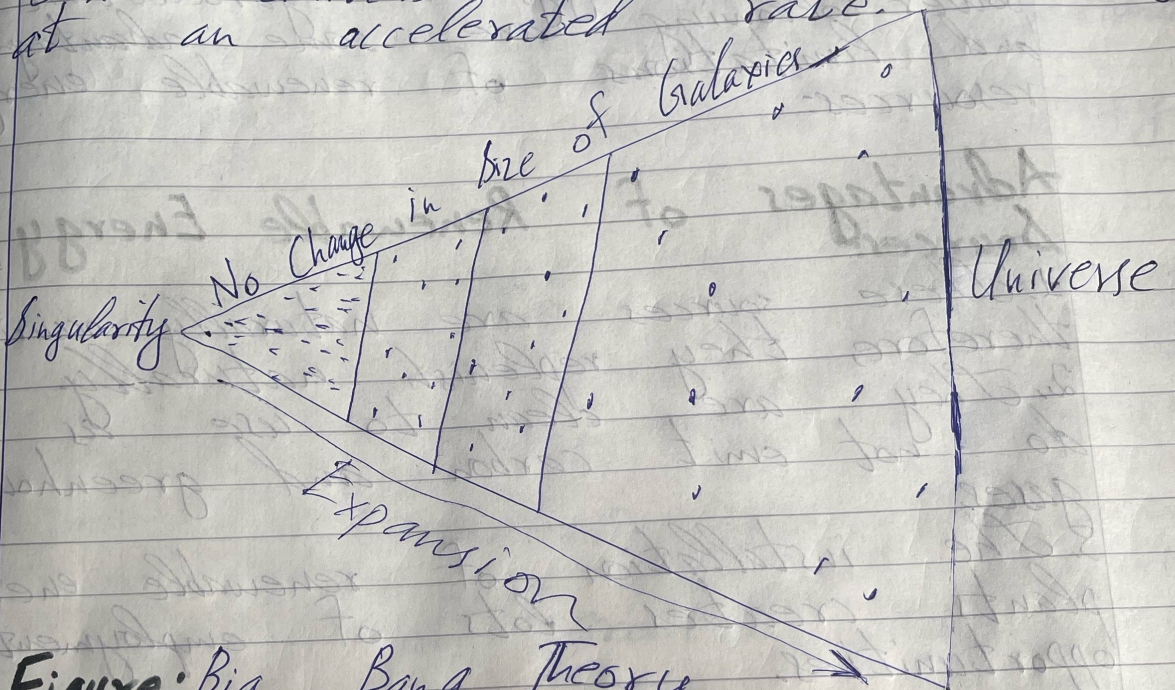


Figure: Big Bang Theory

**Evidence of Big Bang Theory:** Hubble's  
 provides scientific reasoning to the Big  
 Bang Theory and provides the basis for its authenticity.  
 The law explains that the galaxies are  
 continuously expanding without affecting the  
 of galaxies. Additionally, the presence of cos  
 background radiation also supports the theor



**Answer: Renewable Energy (D)** As the name indicates, renewable energy resources are the sources that are continuously replenished. These sources of energy include solar energy, wind energy, geothermal energy, and hydroelectric power. Following are some advantages and limitations of renewable energy resources:

### Advantages of Renewable Energy Sources:

1. These sources are naturally occurring; therefore, they replenish naturally.
2. They are clean to use as they do not emit carbon and greenhouse gases.
3. The installation of renewable energy plants creates lots of employment opportunities.

### Limitations of Renewable Energy Sources:

1. The installation of renewable energy plants is expensive and acquires lot of resources.
2. The power generation from these sources depends greatly on geographical location and weather conditions.



3. The storage cost of these energy sources is very high.

**Prospects of Non-Conventional Sources in Pakistan:** Pakistan is a country rich in alternative sources of energy and has great potential of non-conventional energy sources. Some of the prospects of non-conventional energy sources are given below:

**1. Wind Energy:** Wind is an abundant resource in Pakistan. Since the country has several well-known wind corridors and an average wind speed of 7.87 m/s in 10% of its windiest areas, the country still has a potential installable capacity of around 346,000 MW.

**2. Solar Energy:** Pakistan has tremendous potential to generate solar energy. According to the World Bank, the country can fulfill its current electricity demand by utilizing just 0.071% of the country area for solar voltaic power generation. Moreover, it can generate more than 2,400 gigawatts of solar power capacity.



3. **Biomass:** A large amount of solid waste is wasted every year due to improper solid waste management. However, if Pakistan properly manages its solid waste and animal dump, a large amount of biomass can be produced. According to estimation, the potential of biomass energy in Pakistan is 50,000 GW/year.