

# General Science 2022 Ability

## PART-II (Section A)

Question no. 2:

Answer: Renewable versus Non-Renewable Energy Sources:

### Renewable

Renewable energy sources are the energy sources that are naturally replenished on a human timescale.

For example, Solar energy, Wind energy, Hydropower, Biomass, etc.

These relatively contain low carbon, and thus are environmentally friendly.

Renewable resources are inexhaustible and reusable.

Although the initial cost of utilization of renewable energy sources is high,

### Non-Renewable

Non-renewable energy sources are the energy sources that are not replenished naturally on a human timescale.

For example, Nuclear energy, Coal energy, Natural Gas energy, Oil energy.

These relatively contain high carbon, and thus are hazardous to the environment.

Non-renewable resources are exhaustible and can not be reused.

Both initial and maintenance costs of utilization of non-renewable energy sources

maintenance are high.  
cost is quite  
low with high  
durability.

**Wind Energy:** Wind energy is one of the fastest spreading renewable energy, particularly in areas with strong wind speed. As the name explains, in wind energy projects, the wind is used to harness the power through kinetic energy created by wind. The power is transformed into electrical energy through large-scale wind turbines or wind energy conversion systems.

### **Pros of Wind Energy:**

Since wind energy is renewable energy, it is an inexhaustible and sustainable source of power generation with negligible effects on the environment.

Wind energy is cost-effective, especially in regions with strong wind speed because theoretically, when wind speed

doubles, wind power potential increases eight times.

### Cons of Wind Energy:

Wind energy units are a threat to wildlife.

Wind energy can be harnessed at certain locations only.

### Solar Energy:

As the name indicates, in solar energy, solar radiations are utilized to produce thermal or electrical energy. It is also the cleanest and the most abundant renewable source of energy like wind. When the radiations from the Sun collide with the photovoltaic cells of specially designed solar panels, electric energy/power is generated which is used to meet the electricity needs. As the direct energy from the Sun can only be utilized during the daytime, the storage batteries are attached to the system to be used at night.

### Pros of Solar Energy:

Like wind energy, solar energy is also pollution-free, reusable and does not require  $H_2O$  for cooling. It does not require huge machinery to function, the smallest functional panels

come in sizes that range from 0.6 x 2.5 inches.

### Cons of Solar Energy:

The initial cost of solar energy is relatively high. Solar energy is highly weather dependant.

**Biofuels:** Any fuel that is obtained from biomass, plants, algae, animal waste, etc comes under the category of biofuels. Since they are directly or indirectly extracted from living organisms, they are also non-renewable energy source. They can be efficiently used as a cheap and environment friendly alternative to fossil fuels as the fossil fuels are hazardous as well as non-renewable. In biofuel energy production, biomass is combusted at high pressure and temperature to produce steam. The steam then drives the power generators through the rotation of the turbines. Particularly, liquid biofuels, like ethanol, are preferred as they are easier to use and transport.

### Pros of Biofuels:

Biofuels like all other renewable sources of energy are sustainable.

and cheap.  
Biofuels reduce the reliance on expensive, depleting and hazardous fossil fuels.

### Cons of Biofuels:

They have serious environmental drawbacks, for the major electricity from biofuels is produced by direct combustion.

A large amount of raw material has to be used to harness a small amount of energy.

### Answer: Tornado (C)

A tornado is a small but intense vortex of rising air associated with the strong updraft of an intense thunderstorm. It generally occurs in mid-latitude. The airspeed of tornadoes ranges from 40-300+ mph and width varies from a few yards to more than a mile. Apparently, it is a dark funnel cloud hanging from the base of a dense cumulonimbus cloud. While moving around the countryside, it writhes and twists, and where it touches the down, it can destroy almost everything.

### Formation of Tornado:

Although the appearance of tornado varies widely, the

Following are the steps through which tornadoes form:

### 1. Storm (Parent) Development Stage:

When sun's radiations reach the Earth's surface, they warm up the air near ground level. As a result, localized warm air pockets are formed, resulting in an unstable atmosphere. The air pockets then rise, and form shallow cumulus clouds. The cumulus cloud then rises while the surrounding temperature starts decreasing with height. The clouds are then transformed into cumulonimbus clouds with the help of the current of ascending air-updrafts.

### 2. Storm Organization Stage:

In regions with significant wind shear-change in wind speed and direction with height, the updrafts start rotating, and a horizontal spin is created in the atmosphere. Gradually, as the strength of updrafts increases, the rolling motion is tilted vertically so that the spin occurs about a vertical axis.

### 3. Tornado Maturation Stage:

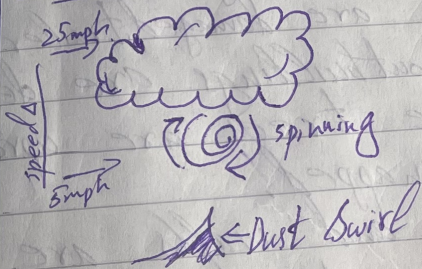
Ultimately the rotation becomes so concentrated that a narrow column of violently rotating air.

If the fierce column of air reaches the ground, a tornado is created officially. A tornado is typically a funnel-shaped cloud that forms due to the relatively low pressure within the tornado than outside. Additionally, the black colour of the funnel is due to the collected dust and debris.

### 4. Tornado Dissipation Stage:

In the dissipation stage, downdrafts eventually surrounds the tornado, cutting off the supply of warm air. Now, the tornado narrows, and the funnel dissipates.

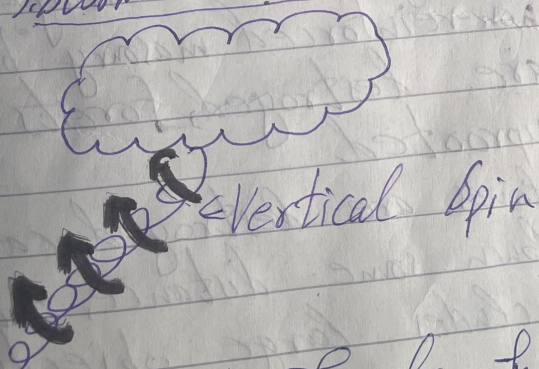
#### 1. Storm Development



#### 2. Storm Organization



#### 3. Storm Maturation



#### 4. Storm Dissipation

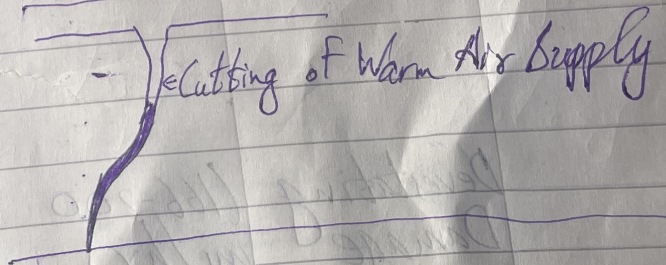


Figure A: Tornado Intensity.

**Effects of Tornadoes:** Devastation from these tornadoes is often complete within the narrow limits of their paths. The enhanced Fujita scale is a scale generally used to measure the intensity of tornadoes destruction based on their speed. It can be classified as:

Damage Intensity	Speed of Tornado (mi/hr)	Damages
Light Damage	(60-85 mi/hr)	Chimneys are damaged, tree branches are broken, shallow rooted trees are top-killed.
Moderate Damage	(86-110 mi/hr)	Roof surfaces are peeled off, some tree trunks are broken, garages and trailer homes are destroyed.
Considerable Damage	(111-135 mi/hr)	Roofs are damaged, trailer homes and outbuildings are destroyed, large trees are uprooted or snapped.
Severe Damage	(136-165 mi/hr)	Roofs and walls are torn from structures, small buildings are destroyed, non-reinforced masonry buildings are destroyed, forests are uprooted.
Devastating Damage	(166-200 mi/hr)	Homes are destroyed, cars are blown some distance, and debris includes large objects.



Damage Intensity	Speed of Tornado	Damages
Incredible Damage	(> 200 mi/hr)	Strong homes are lifted from foundations, concrete structures are damaged, damage from debris the size of automobiles, trees are debarked.

**Table:** Enhanced Fujita intensity scale.