

Q1) The benefits of electrifying every sector are reducing the CO₂ emissions upto an extent. There will be less polluting sectors if they are electrified. There will be reduction in the greenhouse gases that can be trapped in the atmosphere. This will also reduce the dependencies on the fossil fuel. It will enhance the energy efficiencies compared to the combustion based technologies. Furthermore, if it is integrated with renewable ② energy like solar or wind then the air quality will also be improved as these are one of the non-polluting sources of renewable energy.

Sectors that are harder to electrify are industries like steel, cement and any chemical production industries as they come under heavy industry categories as their energy requirement is very high.

Q2)

1) Reduced Yields: - Increased temperatures, droughts, abnormal rainfalls pattern will disturb the crop growth

2) Increased Pests:- The hot temperatures will lead to the spread of pests and diseases leading to the damage of crops

3) Less Nutritional Qualities:- The high CO₂ levels will disturb the levels of contents present in the crops like rice and wheat.

Q3) Carbon offset projects are basically initiatives that compensate for carbon emissions by funding the project that reduce the greenhouse gases.

Carbon offset programs are when the business are allowed to invest in projects like carbon offsetting, to be able to balance the carbon footprint.

Q4.) Greenwashing is when the companies falsely claims to be an environment friendly to be able to get more customers. They may not be true to its values of completely being sustainable brand, but they still mention it out like that.

Greenhushing is when the company intentionally under-report or hide their sustainability efforts to be able to avoid any allegations or escape accusations of the green washing.

Q5.) Solar PV solutions

① On-grid - Connected to grid allowing the excess energy to be fed back into grid.

② Off-grid - Standalone system with battery

③ Hybrid - Combination of on and off grid

④ Integrated Photovoltaics - for rooftops and buildings-Building

Q6) Doughnut economy is a model designed by an economist, Dr. Kate which tells about the balance between the human

needs and the planetary limits. It is a socio-economic model that looks like a doughnut when drawn on paper. The inner circle represents the human well being and all the human needs like food, water, healthcare and education. The outer circle represents the planetary boundaries like biodiversity loss and climate change. The purpose of the doughnut economy model is to promote for a more balanced and rather sustainable economic growth. It is a framework provided for circular economy and responsible consumption.

Q7.) The greenhouse effect is when the process by which certain gases trap the heat in the atmosphere and warm up the planet. The more amount of greenhouse gases lead to global warming. Impact on Earth:-

- a) Rise in the global temperature
- b) Extreme weather changes (too hot / heatwaves)
- c) Ocean disruption

Examples of greenhouse gases: CO₂, N₂O, methane

Q9.) Carbon Source :- Emit carbon in the atmosphere (eg: burning of fossil fuels)

Carbon Stock: Where carbon is stored for sometime; (eg; forests, soil)

& Carbon Sinks: Absorb and store carbon, reducing the CO₂ levels.

(eg :- ocean absorbing CO₂)

Q10.) There are total of 4 mental models of which 2 are

- ① Growth vs degrowth
- ② Masculine vs. Feminine.

Q11.) Carbon Removal is when you try to take out the carbon from the environment,

Carbon offset is when you take initiatives to compensate for the carbon Emission.

Two categories of Carbon Dioxide Removal:

- ① Natural method - Soil carbon sequestration, biochar.
- ② Technological method - Direct air capture.

Carbon Dioxide removal is the subset of carbon removal that only focuses on CO₂.

Q12.) Climate sensitivity is measure of how much the Earth's temperature will rise with doubling of CO₂.

Three common measures are:

- ① Equilibrium Climate Sensitivity: When there is a long term temperature increase from ~1.5°C~4.5°C
- ② Transient Climate Response: When there is near term temperature increase from ≈0.5°C~2.5°C
- ③ Effective Climate Sensitivity:

Q13.) $T = 5 (1 - \alpha)^4$

$1372 (1 - 0.7)$

=

$5.67 \times 10^{-8} \times 4$

$= (4.234567901.23)^{1/4}$

$= 255.095 \text{ K } (= -18.05^\circ\text{C})$

This temperature is too low than the actual average temperature.

α = Albedo

σ = Stefan's Boltzmann
constant

S = Solar flux

Q12.) Clean Energy is an energy that does not produce any greenhouse gas emissions. Type of clean energy technologies

① Solar

Positive

- Renewable
- less costly

Negative

- Require external storage
- Use land for installation Space

② Wind

Positive

- Renewable
- less emissions

Negative

- maybe harmful to birds
- Intermittent
- Operational at continuous wind speeds

③ Hydro power

Positive

- Grid stability
- Reliable

Negative

- environmental impact on the ecosystem

Q16.) Feedback loops are the processes that amplify the climate change.

Positive feedback loop is when it increases the warming. For example the ice - albedo effect. This basically is the melting of ice reduces the reflectivity, absorbing more heat and causes more melting.

Negative feedback loop is when it reduces the warming. For example

there is increased plant growth that will absorb the CO₂ which will eventually reduce the atmospheric CO₂ present.

Tipping points are referred to as irreversible climate shifts. Examples are Amazon rainforest where the deforestation and drought are turning the rainforest into savanna. Another example is the Greenland ice sheet melting where there is irreversible ice loss happening and it is leading to the sea-level rise.

Q15.) Carbon offset Challenges:

1) Verification Issue - It is difficult to ensure the claimed offsets that can actually reduce the emissions.

2) Carbon Leakage - If we offset carbon for some particular area, there is a change of emission increasing in the other things. To balance it out at the same time can be difficult to manage.