

Study Guide Thermal Energy

Answer Key

Energy storage

*salt storage Phase-change material Seasonal thermal energy storage
Solar pond Steam accumulator Thermal energy storage (general)
Chemical Biofuels Hydrated*

Energy storage is the capture of energy produced at one time for use at a later time to reduce imbalances between energy demand and energy production. A device that stores energy is generally called an accumulator or battery. Energy comes in multiple forms including radiation, chemical, gravitational potential, electrical potential, electricity, elevated temperature, latent heat and kinetic. Energy

storage involves converting energy from forms that are difficult to store to more conveniently or economically storable forms.

Some technologies provide short-term energy storage, while others can endure for much longer. Bulk energy storage is currently dominated by hydroelectric dams, both conventional as well as pumped. Grid energy storage is a collection of methods used for energy storage on a...

Grid energy storage

long-duration storage: green hydrogen, produced via electrolysis and thermal energy storage. Energy storage is one option to making grids more flexible. An other

Grid energy storage, also known as large-scale energy storage, are technologies connected to the electrical power grid that store energy for later use. These systems help balance supply and demand by storing excess electricity from variable renewables such as solar and

inflexible sources like nuclear power, releasing it when needed. They further provide essential grid services, such as helping to restart the grid after a power outage.

As of 2023, the largest form of grid storage is pumped-storage hydroelectricity, with utility-scale batteries and behind-the-meter batteries coming second and third. Lithium-ion batteries are highly suited for shorter duration storage up to 8 hours. Flow batteries and compressed air energy storage may provide storage for medium duration. Two forms of storage...

Sustainable energy

Geothermal energy provided less than 1% of global energy consumption in 2020. Geothermal energy is a renewable resource because thermal energy is constantly

Energy is sustainable if it "meets the needs of the present without compromising the ability of future generations to meet their own

needs." Definitions of sustainable energy usually look at its effects on the environment, the economy, and society. These impacts range from greenhouse gas emissions and air pollution to energy poverty and toxic waste. Renewable energy sources such as wind, hydro, solar, and geothermal energy can cause environmental damage but are generally far more sustainable than fossil fuel sources.

The role of non-renewable energy sources in sustainable energy is controversial. Nuclear power does not produce carbon pollution or air pollution, but has drawbacks that include radioactive waste, the risk of nuclear proliferation, and the risk of accidents. Switching from coal...

Thermography

Infrared thermography (IRT), thermal video or thermal imaging, is a process where a thermal camera captures and creates an image of an object by using

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Infrared thermography (IRT), thermal video or thermal imaging, is a process where a thermal camera captures and creates an image of an object by using infrared radiation emitted from the object. It is an example of infrared imaging science. Thermographic cameras usually detect radiation in the long-infrared range of the electromagnetic spectrum (roughly 9,000–14,000 nanometers or 9–14 μm) and produce images of that radiation, called thermograms.

Since infrared radiation is emitted by all objects with a temperature above absolute zero according to the black body radiation law, thermography makes it possible to see one's environment with or without visible illumination. The amount of radiation emitted by an object increases with temperature, and thermography allows one to see variations in temperature...

Renewable energy in Scotland

2022. Geothermal energy is obtained from thermal energy generated

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and stored in the Earth. The most common form of geothermal energy systems in Scotland

The production of renewable energy in Scotland is a topic that came to the fore in technical, economic, and political terms during the opening years of the 21st century. The natural resource base for renewable energy is high by European, and even global standards, with the most important potential sources being wind, wave, and tide. Renewables generate almost all of Scotland's electricity, mostly from the country's wind power.

In 2020, Scotland had 12 gigawatts (GW) of renewable electricity capacity, which produced about a quarter of total UK renewable generation. In decreasing order of capacity, Scotland's renewable generation comes from onshore wind, hydropower, offshore wind, solar PV and biomass. Scotland exports much of this electricity. On 26 January 2024, the Scottish Government confirmed...

IB Group 4 subjects

*measurement Mechanics Thermal physics Oscillations and waves
Electric currents Fields and forces Atomic and nuclear physics
Energy, power and climate change*

The Group 4: Sciences subjects of the International Baccalaureate Diploma Programme comprise the main scientific emphasis of this internationally recognized high school programme. They consist of seven courses, six of which are offered at both the Standard Level (SL) and Higher Level (HL): Chemistry, Biology, Physics, Design Technology, and, as of August 2024, Computer Science (previously a group 5 elective course) is offered as part of the Group 4 subjects. There are also two SL only courses: a transdisciplinary course, Environmental Systems and Societies, that satisfies Diploma requirements for Groups 3 and 4, and Sports, Exercise and Health Science (previously, for last examinations in 2013, a pilot subject). Astronomy also exists as a school-based syllabus. Students taking two

or more Group...

Life-cycle assessment

disposal of the materials composing it (grave). An LCA study involves a thorough inventory of the energy and materials that are required across the supply

Life cycle assessment (LCA), also known as life cycle analysis, is a methodology for assessing the impacts associated with all the stages of the life cycle of a commercial product, process, or service. For instance, in the case of a manufactured product, environmental impacts are assessed from raw material extraction and processing (cradle), through the product's manufacture, distribution and use, to the recycling or final disposal of the materials composing it (grave).

An LCA study involves a thorough inventory of the energy and materials that are required across the supply chain and value chain of a product, process or service, and calculates the corresponding

emissions to the environment. LCA thus assesses cumulative potential environmental impacts. The aim is to document and improve the...

Electricity sector in India

harvesting tidal energy is ocean thermal energy technology. This approach harvests the solar energy trapped in ocean waters. Oceans have a thermal gradient,

India is the third largest electricity producer globally.

During the fiscal year (FY) 2023-24, the total electricity generation in the country was 1,949 TWh, of which 1,734 TWh was generated by utilities.

The gross electricity generation per capita in FY2023-24 was 1,395 kWh. In FY2015, electric energy consumption in agriculture was recorded as being the highest (17.89%) worldwide.

The per capita electricity consumption is low compared to most other countries despite India having a low electricity tariff.

The Indian national electric grid has an installed capacity of 467.885 GW as of 31 March 2025. Renewable energy plants, which also include large hydroelectric power plants, constitute 46.3% of the total installed capacity.

India's electricity generation is more carbon-intensive (713 grams...

Photon

and electromagnetic radiation could be in thermal equilibrium with one another, he proposed that the energy stored within a material object should be

A photon (from Ancient Greek φῶς, φωτός (phôs, phōtós) 'light') is an elementary particle that is a quantum of the electromagnetic field, including electromagnetic radiation such as light and radio waves,

and the force carrier for the electromagnetic force. Photons are massless particles that can move no faster than the speed of light measured in vacuum. The photon belongs to the class of boson particles.

As with other elementary particles, photons are best explained by quantum mechanics and exhibit wave-particle duality, their behavior featuring properties of both waves and particles. The modern photon concept originated during the first two decades of the 20th century with the work of Albert Einstein, who built upon the research of Max Planck. While Planck was trying to explain how matter...

Space-based solar power

variants. Solar thermal: Proponents of solar thermal have proposed using concentrated heating to cause a state change in a fluid to extract energy via rotating

Space-based solar power (SBSP or SSP) is the concept of collecting

solar power in outer space with solar power satellites (SPS) and distributing it to Earth. Its advantages include a higher collection of energy due to the lack of reflection and absorption by the atmosphere, the possibility of very little night, and a better ability to orient to face the Sun. Space-based solar power systems convert sunlight to some other form of energy (such as microwaves) which can be transmitted through the atmosphere to receivers on the Earth's surface.

Solar panels on spacecraft have been in use since 1958, when Vanguard I used them to power one of its radio transmitters; however, the term (and acronyms) above are generally used in the context of large-scale transmission of energy for use on Earth.

Various...

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