CENTRAL POLYTECHNIC COLLEGE,THARAMANI – 600113.

(An Autonomous Institution)

DEPARTMENT OF AUTOMOBILE ENGINEERING (SANDWICH)

QUESTION BANK

EAE51077 – ALTERNATIVE ENERGY SOURCES

U.NO	Q NO	QUESTIONS
1	1	Which of the following is a primary goal of renewable energy? (a) Deplete natural resources (b) Reduce greenhouse gas emissions (c) Increase fossil fuel use (d) Reduce electricity demand **Ans:(B) Reduce greenhouse gas emissions**
1	2	Why is solar energy considered renewable? (a) It requires fuel (b) It is expensive (c) It is continuously available (d) It causes pollution **Ans:(C) It is continuously available**
1	3	What is the main source of geothermal energy? (a) Moon (b) Earth's internal heat (c) Ocean currents (d) Fossil fuels **Ans:(B) Earth's internal heat**
1	4	Biomass energy is derived from: (a) Sunlight directly (b) Wind turbines (c) Organic materials (d) Radioactive materials **Ans:(C) Organic materials**
1	5	Tidal energy is generated by: (a) Sun's heat (b) Moon's gravitational pull (c) Wind flow (d) Earth's magnetic field **Ans:(B) Moon's gravitational pull**
1	6	Which energy source is used in Ocean Thermal Energy Conversion (OTEC)? (a) Temperature difference in ocean layers (b) Ocean salt concentration (c) Wave pressure (d) Oceanic wind speed **Ans:(A) Temperature difference in ocean layers**
1	7	Wind turbine blades convert: (a) Mechanical energy to chemical energy (b) Electrical energy to heat (c) Kinetic energy to mechanical energy (d) Light energy to chemical energy **Ans:(C) Kinetic energy to mechanical energy**
1	8	What does 'sustainability' in energy mean? (a) Maximum usage of coal (b) Unlimited power generation (c) Meeting present needs without harming the future (d) Generating only electricity **Ans:(C) Meeting present needs without harming the future**
1	9	Solar panels convert solar energy into: (a) Mechanical energy (b) Heat energy (c) Electrical energy (d) Nuclear energy **Ans:(C) Electrical energy**

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1	10	Which of the following is not a renewable source? (a) Wind (b) Solar (c) Coal (d) Biomass **Ans:(C) Coal**
1	11	Which Indian state has the highest solar energy potential? (a) Kerala (b) Rajasthan (c) Bihar (d) West Bengal **Ans:(B) Rajasthan**
1	12	Which energy source uses algae and organic waste? (a) Geothermal (b) Biomass (c) Hydropower (d) Tidal **Ans:(B) Biomass**
1	13	The main advantage of wind energy is: (a) High maintenance (b) low emission (c) Constant output (d) Uses fossil fuel **Ans:(B) low emission**
1	14	The concept of IoE is closely related to: (a) Electrical wiring (b) Internet-connected smart energy systems (c) Solar batteries only (d) Manual monitoring of power **Ans:(B) Internet-connected smart energy systems**
1	15	Which source of energy depends on sunlight? (a) Solar (b) Geothermal (c) Hydropower (d) Biomass **Ans:(A) Solar**
1	16	Which is a major environmental benefit of renewable energy? (a) Depletes ozone layer (b) Increases carbon emissions (c) Lowers pollution levels (d) Emits toxic gases **Ans:(C) Lowers pollution levels**
1	17	Which device is used in wind energy conversion? (a) Generator (b) Furnace (c) Reactor (d) Motor **Ans:(A) Generator**
1	18	Which renewable source is region-specific and not widely available? (a) Wind (b) Solar (c) Geothermal (d) Biomass **Ans:(C) Geothermal**

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1	19	What is a common drawback of wind energy? (a) Constant availability (b) High pollution (c) Intermittent supply (d) Excessive cost **Ans:(C) Intermittent supply**
1	20	Which of the following is a social benefit of adopting renewable energy? (a) Increases dependence on imported fuels (b) Leads to widespread deforestation (c) Creates local employment opportunities (d) Causes higher long-term pollution **Ans:(C) Creates local employment opportunities**
1	21	Why is biomass considered carbon-neutral under sustainable conditions? (a) It emits no CO_2 (b) It uses only renewable water (c) CO_2 released is absorbed by plants during growth (d) It contains no carbon **Ans:(C) CO_2 released is absorbed by plants during growth**
1	22	Which is a main component of the Internet of Energy? (a) Steam turbine (b) Smart meter (c) Gasoline engine (d) Wind vane **Ans:(B) Smart meter**
1	23	Which region of the world has the highest installed capacity of solar energy in the year 2024? (a) North America (b) Europe (c) Asia (d) South America **Ans:(C) Asia**
1	24	What is one-way renewable energy can promote social equity? (a) By limiting access to energy in rural areas (b) By reducing the cost of fossil fuel extraction (c) By providing affordable and decentralized power (d) By increasing reliance on non-renewable resources **Ans:(C) By providing affordable and decentralized power**
1	25	Social Implications of renewable energy: (a) Job creation in green technologies (b) Increase in health risks from pollution (c) Energy access in urban areas (d) No community participation in energy production **Ans:(A) Job creation in green technologies**
1	26	Why is integrating solar and wind energy into the grid challenging? (a) Their high voltage (b) Their constant availability (c) Their variable nature (d) They produce too much energy **Ans:(C) Their variable nature**
1	27	Which pair best represents complementary renewable sources? (a) Solar and coal (b) Wind and geothermal (c) Solar and wind (d) Oil shale and biomass **Ans:(C) Solar and wind**

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1	28	Which energy source would be most effective in a desert region? (a) Geothermal (b) Biomass (c) Tidal (d) Solar **Ans:(D) Solar**
1	29	In which case would tidal energy not be a good option? (a) Coastal area (b) High tidal range (c) Deep sea region with no tides (d) Bays and estuaries **Ans:(C) Deep sea region with no tides**
1	30	A region with high wind speed and large open land is ideal for: (a) Tidal energy (b) Wind energy (c) Ocean thermal energy (d) Biomass plants **Ans:(B) Wind energy**
1	31	Which of the following can help in optimizing energy use via IoE? (a) Manual switchboards (b) Mechanical meters (c) Smart grid and sensors (d) Diesel generators **Ans:(C) Smart grid and sensors**
1	32	Why might biomass not be fully sustainable if used excessively? (a) It releases toxic gas (b) It requires electricity (c) Deforestation may occur (d) It cannot be converted to energy **Ans:(C) Deforestation may occur**
1	33	If ocean temperature difference is less than 20°C, OTEC is: (a) More efficient (b) Feasible (c) Not economically practical (d) Similar to wave energy **Ans:(C) Not economically practical**
1	34	Compare fossil fuels and renewables in terms of emissions: (a) Both emit the same CO_2 (b) Renewables emit more (c) Fossil fuels emit more (d) Emissions don’t occur **Ans:(C) Fossil fuels emit more**
1	35	Smart meters in IoE allow users to: (a) Increase power bills (b) Track and optimize energy use (c) Block renewable sources (d) Store data manually **Ans:(B) Track and optimize energy use**
1	36	Which combination is best for remote village electrification? (a) Solar + Diesel (b) Wind + Thermal (c) Solar + Biomass (d) Geothermal + Nuclear **Ans:(C) Solar + Biomass**

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1	37	A sudden drop in wind speed affects wind turbines by: (a) Increasing output (b) Causing pollution (c) Reducing power generation (d) Heating the system **Ans:(C) Reducing power generation**
1	38	Which factor negatively impacts solar panel efficiency? (a) High sunlight (b) Dust and shading (c) Clear skies (d) Tilt angle **Ans:(B) Dust and shading**
1	39	Oil shale is considered less favorable because: (a) It is cheap (b) It emits no gases (c) Extraction is energy intensive (d) It is renewable **Ans:(C) Extraction is energy intensive**
1	40	When compared, geothermal is more consistent than: (a) Solar and wind (b) Nuclear (c) Hydropower (d) Biomass **Ans:(A) Solar and wind**
1	41	IoE benefits include: (a) Only cost increase (b) Less grid reliability (c) Energy efficiency and data control (d) Manual energy tracking **Ans:(C) Energy efficiency and data control**
1	42	If a rural area has agricultural waste, the best energy source is: (a) Wind (b) Biomass (c) Tidal (d) Geothermal **Ans:(B) Biomass**
1	43	Which of the following enables real-time communication and monitoring in the Internet of Energy (IoE)? (a) Smart grid (b) Solar panel (c) Diesel engine (d) Battery **Ans:(A) Smart grid**
1	44	A region with volcanic activity can use: (a) Tidal energy (b) Geothermal energy (c) Wind energy (d) Hydropower **Ans:(B) Geothermal energy**
1	45	Which system balances supply and demand in smart grids? (a) Manual switching (b) IoE Algorithms (c) Random scheduling (d) Coal backup **Ans:(B) IoE Algorithms**

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1	46	Renewable energy helps in rural development by: (a) Limiting energy access (b) Increasing pollution (c) Providing local energy solutions (d) Reducing employment **Ans:(C) Providing local energy solutions**
1	47	Solar and wind hybrid systems improve reliability by: (a) Reducing energy (b) Ensuring power in varied conditions (c) Increasing costs (d) Blocking one source **Ans:(B) Ensuring power in varied conditions**
1	48	Which of the following is NOT a challenge of renewable energy? (a) Storage (b) Integration (c) Pollution (d) Intermittency **Ans:(C) Pollution**
1	49	Which renewable energy form is influenced by the moon? (a) Solar (b) Tidal (c) Biomass (d) Wind **Ans:(B) Tidal**
1	50	Internet of Energy (IoE) can help households by: (a) Increasing energy bills (b) Making devices smarter (c) Disconnecting power (d) Using only fossil fuel **Ans:(B) Making devices smarter**
1	51	How does renewable energy benefit rural communities? (a) By reducing access to electricity (b) By increasing dependence on imported fuels (c) By providing decentralized and reliable energy access (d) By increasing fuel transportation costs **Ans:(C) By providing decentralized and reliable energy access**
1	52	Which social benefit can result from the increased use of renewable energy? (a) Increased health problems due to air pollution (b) Improved public health due to reduced pollution (c) Increased dependence on fossil fuels (d) Reduced employment opportunities **Ans:(B) Improved public health due to reduced pollution**
1	53	Which of the following is a non-renewable source of energy? (a) Solar energy (b) Wind energy (c) Oil shale (d) Biomass **Ans:(C) Oil shale**
1	54	Which technology is commonly used in the Internet of Energy to monitor energy consumption? (a) Smart meter (b) Steam engine (c) Mechanical pump (d) Diesel generator **Ans:(A) Smart meter**

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1	55	Which of the following best describes oil shale? (a) A renewable source of energy (b) A rock containing organic material called kerogen (c) A form of solar energy (d) A type of biomass **Ans:(B) A rock containing organic material called kerogen**
2	1	Solar energy is primarily derived from: (a) Earth's core (b) Moonlight (c) Sun's radiation (d) Fossil fuels **Ans:(C) Sun's radiation**
2	2	The term "solar radiation" refers to: (a) Wind energy (b) Light and heat emitted by the sun (c) Ocean tides (d) Nuclear fusion on earth **Ans:(B) Light and heat emitted by the sun**
2	3	Solar radiation received on a horizontal surface is called: (a) Beam radiation (b) Diffuse radiation (c) Global radiation (d) Direct radiation **Ans:(C) Global radiation**
2	4	A pyrheliometer is used to measure: (a) Wind speed (b) Direct solar radiation (c) Humidity (d) Surface temperature **Ans:(B) Direct solar radiation**
2	5	Which instrument measures duration of bright sunshine? (a) Sunshine Recorder (b) Thermometer (c) Barometer (d) Voltmeter **Ans:(A) Sunshine Recorder**
2	6	Which device is used to measure total solar radiation? (a) Thermocouple (b) Pyrometer (c) Hygrometer (d) Pyranometer **Ans:(D) Pyranometer**
2	7	Solar radiation on an inclined surface in higher latitudes is generally: (a) Less than horizontal surface (b) Greater than horizontal surface (c) Always constant (d) Zero **Ans:(B) Greater than horizontal surface**
2	8	A flat plate collector is mainly used for: (a) Electricity generation (b) Cooking food (c) Solar heating (d) Condensing steam **Ans:(C) Solar heating**

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2	9	Solar distillation is used to: (a) Produce hydrogen (b) Purify water (c) Cook food (d) Generate electricity **Ans:(B) Purify water**
2	10	A solar pond works on the principle of: (a) Wind pressure (b) Natural convection (c) Salinity gradient (d) Radiation reflection **Ans:(C) Salinity gradient**
2	11	The top layer in a solar pond is: (a) Cold and salty (b) Hot and clear (c) Cold and less salty (d) Hot and salty **Ans:(C) Cold and less salty**
2	12	A photovoltaic cell converts solar energy into: (a) Heat energy (b) Electrical energy (c) Mechanical energy (d) Chemical energy **Ans:(B) Electrical energy**
2	13	Which semiconductor material is widely used in solar cells? (a) Copper (b) Silicon (c) Iron (d) Zinc **Ans:(B) Silicon**
2	14	A group of connected solar cells is called a: (a) Module (b) Array (c) Battery (d) Inverter **Ans:(A) Module**
2	15	The output of a solar PV system depends on: (a) Wind speed (b) Water level (c) Solar irradiance (d) Mechanical load **Ans:(C) Solar irradiance**
2	16	Solar PV systems are best suited for: (a) Nighttime power generation (b) Areas with high cloud cover (c) Sunny regions (d) Areas near rivers **Ans:(C) Sunny regions**
2	17	One main disadvantage of solar PV is: (a) It emits CO_2 (b) High maintenance (c) High operating cost (d) Intermittent output **Ans:(D) Intermittent output**

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2	18	Which of the following is not part of a solar PV system? (a) Inverter (b) Battery (c) Turbine (d) Charge controller **Ans:(C) Turbine**
2	19	What is the main application of solar PV in rural areas? (a) Nuclear power (b) Water pumping (c) Wind generation (d) Oil extraction **Ans:(B) Water pumping**
2	20	The efficiency of a PV cell depends on: (a) Color of panel (b) Humidity (c) Solar radiation and temperature (d) Pipe diameter **Ans:(C) Solar radiation and temperature**
2	21	The photovoltaic effect is the conversion of: (a) Light to electricity (b) Heat to electricity (c) Sound to heat (d) Electricity to light **Ans:(A) Light to electricity**
2	22	Solar cells generate DC output, which is converted to AC by: (a) Battery (b) Switch (c) Inverter (d) Rectifier **Ans:(C) Inverter**
2	23	Which layer in a conventional solar cell is doped with phosphorus (n-type)? (a) Top layer (b) Bottom layer (c) Middle layer (d) Metal contact **Ans:(A) Top layer**
2	24	Which factor decreases solar cell efficiency? (a) High sunlight (b) Clean surface (c) Dust and shading (d) Proper tilt **Ans:(C) Dust and shading**
2	25	The most efficient angle for a solar panel is based on: (a) Rainfall (b) Wind direction (c) Latitude of location (d) Type of wire **Ans:(C) Latitude of location**
2	26	What is an advantage of solar PV? (a) Uses fuel (b) Pollutes the air (c) Makes electricity from sunlight (d) Works only at night **Ans:(C) Makes electricity from sunlight**

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2	27	You need hot water in a hostel. Which solar system would you recommend? (a) Solar PV (b) Solar pond (c) Flat plate collector (d) Tidal turbine **Ans:(C) Flat plate collector**
2	28	Why is solar PV good for the environment? (a) It burns coal (b) It produces no harmful gases (c) It uses oil (d) It makes noise **Ans:(B) It produces no harmful gases**
2	29	A school wants to record daily sunshine hours. Which instrument is needed? (a) Sunshine recorder (b) Pyrometer (c) Thermometer (d) Wind meter **Ans:(A) Sunshine recorder**
2	30	Which factor should be considered when installing solar panels on rooftops? (a) Color of roof (b) Slope and shading (c) Weight of residents (d) Plumbing design **Ans:(B) Slope and shading**
2	31	Which material used for the basin in a solar distillation ? (a) Transparent glass (b) Polished metal (c) Blackened surface (d) White ceramic **Ans:(C) Blackened surface**
2	32	To increase solar panel efficiency, you would: (a) Paint it white (b) Install near trees (c) Clean it regularly (d) Add sand on it **Ans:(C) Clean it regularly**
2	33	Which system used for brackish water purification ? (a) Solar pond (b) Solar distillation (c) PV inverter (d) Wind turbine **Ans:(B) Solar distillation**
2	34	A solar pond is ideal for: (a) High-altitude areas (b) Rainy regions (c) Areas with high evaporation and salinity (d) Forested hills **Ans:(C) Areas with high evaporation and salinity**
2	35	A pyrheliometer must always be: (a) Covered (b) Tilted randomly (c) Aligned to the sun (d) Painted black **Ans:(C) Aligned to the sun**

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2	36	Sunshine duration is measured in: (a) Hours (b) Millimeters (c) Centimeters (d) Meters **Ans:(A) Hours**
2	37	What is the main purpose of solar distillation? (a) To generate electricity (b) To purify water (c) To cook food (d) To heat air **Ans:(B) To purify water**
2	38	If a solar panel shows reduced output, what should be checked first? (a) Wire color (b) Surface dust or shadow (c) Number of screws (d) Wind speed **Ans:(B) Surface dust or shadow**
2	39	For solar heating, which collector is commonly used? (a) Flat plate collector (b) Parabolic reflector (c) Solar chimney (d) PV panel **Ans:(A) Flat plate collector**
2	40	Why are batteries used in PV systems? (a) To increase voltage (b) For storing excess energy (c) To reduce heat (d) For cooling panels **Ans:(B) For storing excess energy**
2	41	Which application of solar PV is used in transportation? (a) Solar-powered vehicles (b) Solar water distillation (c) Solar heater (d) Solar still **Ans:(A) Solar-powered vehicles**
2	42	In a solar PV system, the electrical output is strongly affected by: (a) Weight of panel (b) Wire color (c) Solar irradiance (d) Soil type **Ans:(C) Solar irradiance**
2	43	Where is solar PV commonly used? (a) Cars, homes, and street lights (b) Only in factories (c) Only in space (d) Only in computers **Ans:(A) Cars, homes, and street lights**
2	44	What action improves solar collector efficiency in winter? (a) Cleaning and proper tilt adjustment (b) Lowering the system (c) Painting white (d) Covering the panel **Ans:(A) Cleaning and proper tilt adjustment**

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2	45	What type of fluid flows through a flat plate collector? (a) Air or water (b) Oil only (c) Fuel (d) Steam **Ans:(A) Air or water**
2	46	What happens if a solar cell is partly shaded? (a) Output increases (b) No effect (c) Output decreases (d) It glows **Ans:(C) Output decreases**
2	47	Which connection increases current output in a PV array? (a) Series (b) Parallel (c) Reverse (d) Grounded **Ans:(B) Parallel**
2	48	You need to design a solar-powered streetlight. Which components are essential? (a) PV panel, battery, LED lamp (b) Motor (c) AC fan (d) Fuse **Ans:(A) PV panel, battery, LED lamp**
2	49	Which solar system is best for desalinating sea water? (a) Flat plate collector (b) Solar distillation (c) PV panel (d) Wind turbine **Ans:(B) Solar distillation**
2	50	What is the main advantage of a flat plate collector? (a) Works only in summer (b) Simple and low-cost (c) Needs electricity (d) Heavy and expensive **Ans:(B) Simple and low-cost**
2	51	Which component of a pyrheliometer restricts the incoming radiation mainly to direct solar radiation? (a) Hemispherical dome (b) Recording card (c) Aperture and collimating tube (d) Glass sphere **Ans:(C) Aperture and collimating tube**
2	52	What is the main function of the hemispherical glass dome in a pyranometer? (a) To focus sunlight on a card (b) To measure sunshine duration (c) To allow radiation from a wide sky angle to reach the sensor (d) To track the Sun **Ans:(C) To allow radiation from a wide sky angle to reach the sensor**
2	53	Which component of a Campbell–Stokes sunshine recorder focuses sunlight onto the recording card? (a) Thermopile (b) Collimating tube (c) Glass sphere (d) Radiation shield **Ans:(C) Glass sphere**

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2	54	Which instrument is most suitable for measuring global solar radiation on a horizontal surface? (a) Pyrheliometer (b) Pyranometer (c) Sunshine recorder (d) Anemometer **Ans:(B) Pyranometer**
2	55	If the glass sphere of a sunshine recorder is removed, what is the most likely result? (a) The recording card will not receive focused sunlight (b) Direct radiation will increase (c) The thermopile output will increase (d) The instrument will measure wind speed **Ans:(A) The recording card will not receive focused sunlight**
3	1	What is wind energy primarily caused by? (a) Earthquake (b) Sun's uneven heating of the Earth (c) Ocean tides (d) Nuclear reactions **Ans:(B) Sun's uneven heating of the Earth**
3	2	Which of the following is a renewable source of energy? (a) Natural gas (b) Coal (c) Wind (d) Uranium **Ans:(C) Wind**
3	3	Why are wind turbines installed at greater heights? (a) For decoration (b) To avoid birds (c) To catch stronger winds (d) For cooling purposes **Ans:(C) To catch stronger winds**
3	4	What is the function of the rotor blades in a wind turbine? (a) Store energy (b) Cut wood (c) Capture wind energy (d) Control temperature **Ans:(C) Capture wind energy**
3	5	Which of these is a problem associated with wind energy? (a) High fuel cost (b) Noise and visual impact (c) Air pollution (d) Toxic waste **Ans:(B) Noise and visual impact**
3	6	What is a horizontal axis wind turbine? (a) A turbine that lies flat on the ground (b) A turbine with vertical blades (c) A turbine whose axis is parallel to the ground (d) A broken turbine **Ans:(C) A turbine whose axis is parallel to the ground**
3	7	Which part of the wind turbine holds the gearbox and generator? (a) Blade (b) Tower (c) Nacelle (d) Base **Ans:(C) Nacelle**

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3	8	How many blades does a typical horizontal axis turbine have? (a) One to three (b) Ten (c) None of the above (d) Twenty **Ans:(A) One to three**
3	9	What is the main role of the gearbox in a wind turbine? (a) To slow down the rotor (b) To clean the blades (c) To increase the shaft speed (d) To store energy **Ans:(C) To increase the shaft speed**
3	10	What does an anemometer measure? (a) Humidity (b) Rainfall (c) Wind speed (d) Temperature **Ans:(C) Wind speed**
3	11	Why is wind energy considered environmentally friendly? (a) It is easy to store (b) Produces no direct greenhouse-gas emissions during operation (c) It doesn't use technology (d) It needs fossil fuels **Ans:(B) Produces no direct greenhouse-gas emissions during operation**
3	12	What is the main function of the yaw mechanism? (a) Controls noise (b) Adjusts turbine direction (c) Stores electricity (d) Measures rainfall **Ans:(B) Adjusts turbine direction**
3	13	Which of these is a vertical axis wind turbine? (a) Savonius (b) Triple blade (c) Gearbox (d) Rotor **Ans:(A) Savonius**
3	14	What is biomass made from? (a) Rocks (b) Organic matter like plants and animals (c) Metals (d) Plastics **Ans:(B) Organic matter like plants and animals**
3	15	What is the process of converting sunlight into plant energy called? (a) Respiration (b) Digestion (c) Photosynthesis (d) Incineration **Ans:(C) Photosynthesis**
3	16	Which of the following is a solid biomass fuel? (a) Petrol (b) Coal (c) Wood (d) LPG **Ans:(C) Wood**

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3	17	Which fuel is produced by fermenting sugar-rich plants? (a) Diesel (b) Petrol (c) Ethanol (d) Kerosene **Ans:(C) Ethanol**
3	18	What is the main combustible output of a biogas plant? (a) Solid fuel (b) Electricity (c) Methane gas (d) Oil **Ans:(C) Methane gas**
3	19	Which type of biomass conversion plant is common in rural areas? (a) Solar heater (b) Gas turbine (c) Fixed dome biogas plant (d) Hydro dam **Ans:(C) Fixed dome biogas plant**
3	20	What is the primary gas found in biogas? (a) Hydrogen (b) Oxygen (c) Methane (d) Carbon monoxide **Ans:(C) Methane**
3	21	What is the role of bacteria in a biogas plant? (a) Absorb oxygen (b) Break down organic waste (c) Clean the tank (d) Freeze the water **Ans:(B) Break down organic waste**
3	22	Which of these is not a biomass source? (a) Cow dung (b) Kitchen waste (c) Agricultural waste (d) Natural gas **Ans:(D) Natural gas**
3	23	What is the function of the digester in a biogas plant? (a) Burns waste (b) Mixes gas (c) Decomposes waste to produce gas (d) Stores electricity **Ans:(C) Decomposes waste to produce gas**
3	24	Which of these is a gaseous biofuel? (a) Petrol (b) Biogas (c) Charcoal (d) Biodiesel **Ans:(B) Biogas**
3	25	Which process is used in downdraft gasification? (a) Boiling (b) Anaerobic digestion (c) Thermal breakdown of biomass with limited oxygen (d) Distillation **Ans:(C) Thermal breakdown of biomass with limited oxygen**

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3	26	If the wind speed doubles, the power generated increases by a factor of: (a) 2 (b) 4 (c) 6 (d) 8 **Ans:(D) 8**
3	27	In a horizontal axis windmill, the main shaft is: (a) Horizotal (b) Vertical (c) Inclined (d) Circular **Ans:(A) Horizontal**
3	28	If the nacelle fails, what would be affected most? (a) Blade speed (b) Tower stability (c) Wind alignment and power output (d) Blade shape **Ans:(C) Wind alignment and power output**
3	29	Which is the most suitable site for a wind farm? (a) Low valley (b) Urban area (c) Hilltop with consistent wind (d) Forest area **Ans:(C) Hilltop with consistent wind**
3	30	Which form of energy is produced by generator in a wind turbine? (a) Mechanical (b) Electrical (c) Wind (d) Heat **Ans:(B) Electrical**
3	31	In a vertical axis windmill, the main shaft is: (a) Horizotal (b) Vertical (c) Inclined (d) Circular **Ans:(B) Vertical**
3	32	Which windmill type has its axis rotating perpendicular to the ground? (a) Horizotal Axis (b) Vertical Axis (c) Both a & b (d) None of the above **Ans:(B) Vertical Axis**
3	33	Which part of WECS converts mechanical energy into electrical energy? (a) Rotor blades (b) Generator (c) Hub (d) Gearbox **Ans:(B) Generator**
3	34	Which component of WECS holds the rotor blades high to capture wind? (a) Tower (b) Rotor (c) Generator (d) Foundation **Ans:(A) Tower**

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3	35	Which component increases the rotor speed for the generator? (a) Tower (b) Rotor (c) Gearbox (d) Foundation **Ans:(C) Gearbox**
3	36	For irrigation in a remote area, which wind turbine type is most suitable? (a) Vertical axis (b) Single blade (c) Multi-blade HAWT (d) Offshore HAWT **Ans:(C) Multi-blade HAWT**
3	37	Which component can stop the rotor to prevent damage in strong wind? (a) Tower (b) Rotor (c) Generator (d) Brake system **Ans:(D) Brake system**
3	38	In which scenario is the wind turbine's output lowest? (a) Steady wind of 12 m/s (b) Variable wind between 2-8 m/s (c) Wind speed of 14 m/s (d) Constant 10 m/s wind **Ans:(B) Variable wind between 2-8 m/s**
3	39	What is the main product of gasification? (a) Water (b) Ash (c) Electricity directly (d) Syngas **Ans:(D) Syngas**
3	40	If kitchen waste is used in a biogas plant, the main gas produced will be: (a) CO (b) CH_4 (c) CO_2 (d) H_2 **Ans:(B) CH_4**
3	41	A dairy farm has 20 cows. What biomass energy system is most suitable? (a) Solar PV (b) Fixed dome biogas plant (c) Thermal gasifier (d) Diesel generator **Ans:(B) Fixed dome biogas plant**
3	42	Which biofuel would you recommend for blending with petrol in vehicles? (a) Biodiesel (b) Ethanol (c) Biogas (d) Charcoal **Ans:(B) Ethanol**
3	43	A sugar factory wants to utilize its bagasse waste. Which technology is suitable? (a) Downdraft gasifier (b) Wind turbine (c) Solar dryer (d) Coal combustion **Ans:(A) Downdraft gasifier**

U.NO	Q NO	QUESTIONS
3	44	If the digester is cracked in a fixed dome plant, what is the most likely result? (a) Faster gas production (b) Gas leakage and loss (c) Increased temperature (d) Higher pressure **Ans:(B) Gas leakage and loss**
3	45	Which biomass conversion method is used to convert crop residue to syngas? (a) Anaerobic digestion (b) Gasification (c) Photosynthesis (d) Electrolysis **Ans:(B) Gasification**
3	46	Which of the following is a biomass fuel? (a) Coal (b) Uranium (c) Natural gas (d) Wood **Ans:(D) Wood**
3	47	What is the benefit of using biodiesel instead of diesel? (a) Lower mileage (b) More pollution (c) Reduced greenhouse emissions (d) More engine noise **Ans:(C) Reduced greenhouse emissions**
3	48	Which device is used to produce biogas? (a) Boiler (b) Gasifier (c) Turbine (d) Digester **Ans:(D) Digester**
3	49	Biomass energy is considered renewable because: (a) It never produces carbon (b) Plants can regrow (c) It uses fossil fuels (d) It comes from sunlight only **Ans:(B) Plants can regrow**
3	50	Which factor must be ensured for high methane yield in a biogas plant? (a) High oxygen level (b) Strong sunlight (c) Optimum temperature (d) Strong ventilation **Ans:(C) Optimum temperature**
3	51	During construction of a fixed-dome biogas plant, what is the main purpose of the dome-shaped structure? (a) To collect and store the produced biogas (b) To heat the slurry (c) To mix the raw material continuously (d) To remove moisture from biogas **Ans:(A) To collect and store the produced biogas**
3	52	In a WECS, what is the main function of the generator? (a) Store wind energy (b) Convert mechanical energy into electrical energy (c) Increase wind speed (d) Control blade length **Ans:(B) Convert mechanical energy into electrical energy**

U.NO	Q NO	QUESTIONS
3	53	Which component supports the nacelle and rotor at a suitable height above the ground? (a) Tower (b) Gearbox (c) Brake (d) Generator **Ans:(A) Tower**
3	54	Which component helps a horizontal-axis wind turbine face the wind direction? (a) Yaw system (b) Brake system (c) Gearbox (d) Generator **Ans:(A) Yaw system**
3	55	In a downdraft gasifier, where is the biomass fuel generally fed into the gasifier? (a) From the bottom (b) From the top (c) From the side only (d) Through the ash outlet **Ans:(B) From the top**
4	1	What causes tides on Earth? (a) Earth's rotation (b) Wind movement (c) Gravitational pull of the Moon and Sun (d) Ocean currents **Ans:(C) Gravitational pull of the Moon and Sun**
4	2	Tidal energy is a form of: (a) Fossil fuel (b) Solar energy (c) Marine / Ocean Energy (d) Geothermal energy **Ans:(C) Marine / Ocean Energy**
4	3	Tides occur due to: (a) Heating by the sun (b) Wind flow over oceans (c) Moon's gravitational force (d) Earthquakes **Ans:(C) Moon's gravitational force**
4	4	Which of the following is a characteristic of tidal energy? (a) Intermittent and unpredictable (b) Constant throughout the day (c) Predictable and periodic (d) Only available during storms **Ans:(C) Predictable and periodic**
4	5	Tidal energy is generated by using: (a) Turbines in rivers (b) Windmills (c) Turbines in estuaries (d) Solar panels **Ans:(C) Turbines in estuaries**
4	6	Tidal barrages are constructed: (a) On hills (b) Across estuaries (c) In deserts (d) On highways **Ans:(B) Across estuaries**

U.NO	Q NO	QUESTIONS
4	7	Which of the following is an advantage of tidal energy? (a) High pollution (b) Inexpensive equipment (c) Predictability of tides (d) Fuel-dependent **Ans:(C) Predictability of tides**
4	8	Which one is a limitation of tidal power? (a) Requires fuel (b) High carbon emission (c) Affects marine life (d) Cannot be stored **Ans:(C) Affects marine life**
4	9	What is the main mechanical component used in tidal power generation? (a) Heat exchanger (b) Solar cell (c) Water turbine (d) Diesel engine **Ans:(C) Water turbine**
4	10	Tidal energy is most suitable for regions with: (a) Strong winds (b) High population (c) High tidal range (d) Low rainfall **Ans:(C) High tidal range**
4	11	Which type of energy conversion takes place in a tidal power plant? (a) Solar to thermal (b) Wind to electrical (c) Kinetic/ Potential of water to electrical (d) Electrical to chemical **Ans:(C) Kinetic/ Potential of water to electrical**
4	12	Which tidal power system uses a difference in water level between high and low tides to generate electricity? (a) Oscillating water columns (b) Tidal stream generators (c) Tidal barrage (d) Floating turbines **Ans:(C) Tidal barrage**
4	13	Which of the following is a limitation of using tidal energy? (a) It can be used in all geographical locations (b) It provides a constant energy output regardless of tides (c) It may affect marine ecosystems and navigation (d) It is the cheapest source of renewable energy **Ans:(C) It may affect marine ecosystems and navigation**
4	14	What is the basic principle behind OTEC? (a) Ocean salinity (b) Temperature difference between surface and deep water (c) Ocean wave motion (d) Tidal movement **Ans:(B) Temperature difference between surface and deep water**
4	15	In OTEC, power is generated by using: (a) Wind velocity (b) Temperature difference in ocean layers (c) Gravitational energy (d) Surface tension of water **Ans:(B) Temperature difference in ocean layers**

U.NO	Q NO	QUESTIONS
4	16	What is the minimum temperature difference needed for a practical OTEC to work efficiently? (a) 5°C (b) 10°C (c) 20°C (d) 50°C **Ans:(C) 20°C**
4	17	Which ocean layer is warmer in OTEC systems? (a) Deep water (b) Bottom sediment (c) Surface water (d) Mid-ocean water **Ans:(C) Surface water**
4	18	Which of the following is an OTEC power generation method? (a) Tidal stream (b) Closed cycle (c) Photovoltaic (d) Combustion **Ans:(B) Closed cycle**
4	19	Which working fluid is commonly used in closed-cycle OTEC systems? (a) Water (b) Methanol (c) Ammonia (d) Ethanol **Ans:(C) Ammonia**
4	20	Which location is well known for experimental and demonstration OTEC development? (a) France (b) India (c) Cuba (d) Hawaii, USA **Ans:(D) Hawaii, USA**
4	21	What is a major technical challenge of OTEC? (a) Overheating (b) Low efficiency (c) Fuel shortage (d) Water pollution **Ans:(B) Low efficiency**
4	22	Why is deep ocean water used in OTEC? (a) It's cleaner (b) It's more pressurized (c) It's colder, creating temperature difference (d) It's more oxygenated **Ans:(C) It's colder, creating temperature difference**
4	23	Which is a limitation of OTEC? (a) Not eco-friendly (b) Works only in cold regions (c) High initial cost and low efficiency (d) High land usage **Ans:(C) High initial cost and low efficiency**
4	24	In OTEC, what drives the turbine to generate electricity? (a) Combustion gases (b) Expanding vapors of the working fluid (c) Water from waves (d) Magnetic field **Ans:(B) Expanding vapors of the working fluid**

U.NO	Q NO	QUESTIONS
4	25	Which of the following is a potential benefit of OTEC? (a) Carbon emissions (b) Base-load renewable power generation (c) Noise pollution (d) Seasonal variability **Ans:(B) Base-load renewable power generation**
4	26	A tidal barrage works similar to a: (a) Dam (b) Fan (c) Motor (d) Heater **Ans:(A) Dam**
4	27	Which location is ideal for installing a tidal barrage? (a) Large mountain pass (b) Desert canal (c) Narrow estuary with high tidal range (d) Flat inland area **Ans:(C) Narrow estuary with high tidal range**
4	28	Which actions help increase the power output from a tidal plant? (a) Use a wider estuary (b) Increase tidal range (c) Reduce turbine size (d) Build it on a beach **Ans:(B) Increase tidal range**
4	29	If a tidal power system uses turbines but no barrage, what kind of system is it? (a) Closed-cycle (b) Floating wave converter (c) Tidal stream generator (d) Offshore wind farm **Ans:(C) Tidal stream generator**
4	30	Which type of turbine is most suitable for bidirectional flow in tidal power? (a) Francis (b) Kaplan (c) Bulb-type (d) Pelton **Ans:(C) Bulb-type**
4	31	Tidal energy is considered: (a) Non-renewable (b) Renewable (c) Exhaustible (d) Fossil-based **Ans:(B) Renewable**
4	32	A tidal barrage causes ecological changes. What mitigation technique can be applied? (a) Increase height of the dam (b) Install fish-friendly turbines (c) Use fossil backup (d) Add chemical treatments **Ans:(B) Install fish-friendly turbines**
4	33	Tidal energy is predictable because: (a) It depends on sunlight (b) Tides follow a fixed pattern (c) It changes randomly (d) It depends on rainfall **Ans:(B) Tides follow a fixed pattern**

U.NO	Q NO	QUESTIONS
4	34	Best locations for tidal power plants are: (a) Mountain areas (b) Deserts (c) Coastal regions with high tides (d) Plains **Ans:(C) Coastal regions with high tides**
4	35	Which device is used to convert tidal energy into electricity? (a) Turbine (b) Gear (c) Dam (d) Windmill **Ans:(A) Turbine**
4	36	If turbine blades are not aligned for bidirectional flow in a tidal system, what issue arises? (a) Better efficiency (b) Vibration increase (c) Energy generation drops (d) Salinity reduces **Ans:(C) Energy generation drops**
4	37	Tidal stream generators are best suited for: (a) Deep sea trenches (b) Shallow estuaries with fast currents (c) Mountain rivers (d) High rainfall zones **Ans:(B) Shallow estuaries with fast currents**
4	38	Which power generation method is best for predictable scheduling in a coastal town? (a) Solar (b) Tidal (c) Wind (d) Geothermal **Ans:(B) Tidal**
4	39	If the surface temperature of the ocean is 28°C and deep water is 6°C, can OTEC be used? (a) No, difference is too small (b) Yes, 22°C is sufficient (c) Only with fuel backup (d) Only at night **Ans:(A) Yes, 22°C is sufficient**
4	40	Which working fluid would you select for a closed-cycle OTEC plant? (a) Water (b) Ammonia (c) Air (d) Salt **Ans:(B) Ammonia**
4	41	A region with minimal temperature difference between surface and deep water is unsuitable for OTEC. Why? (a) Salt corrosion (b) Ocean waves interfere (c) Turbines can't run effectively (d) Oil spill risk **Ans:(C) Turbines can't run effectively**
4	42	If you are to install an OTEC plant, which ocean region would be ideal? (a) Arctic Ocean (b) Tropical waters (c) North Sea (d) Baltic Sea **Ans:(B) Tropical waters**

U.NO	Q NO	QUESTIONS
4	43	Which condition improves the performance of an OTEC plant? (a) Small temperature difference (b) Use of dry cooling (c) Large temperature gradient (d) Fast tides **Ans:(C) Large temperature gradient**
4	44	What happens if the warm water intake in OTEC is blocked? (a) Pressure increases (b) Vapor production drops, reducing power output (c) Plant overheats (d) Cooling improves **Ans:(B) Vapor production drops, reducing power output**
4	45	What energy conversion takes place in an OTEC plant? (a) Solar to electrical (b) Tidal to mechanical (c) Thermal to electrical (d) Wind to mechanical **Ans:(C) Thermal to electrical**
4	46	Why is ammonia used in OTEC closed-cycle systems? (a) Easy to store (b) Biodegradable (c) Has a low boiling point (d) High thermal conductivity **Ans:(C) Has a low boiling point**
4	47	What is a practical use for the cold deep seawater drawn in OTEC systems besides power in general? (a) Boiling (b) Desalination (c) Air conditioning and aquaculture (d) Fire control **Ans:(C) Air conditioning and aquaculture**
4	48	What does OTEC stand for? (a) Ocean Thermal Energy Conversion (b) Ocean Tide Energy Conversion (c) Ocean Temperature Energy Conversion (d) Offshore Turbine Energy Circuit **Ans:(C) Ocean Thermal Energy Conversion**
4	49	A useful co-product of an open-cycle OTEC system besides electricity is: (a) Salt (b) Freshwater (c) Ash (d) Petroleum **Ans:(B) Freshwater**
4	50	OTEC is a type of: (a) Non-renewable (b) Renewable (c) Exhaustible (d) Fossil-based **Ans:(B) Renewable**
4	51	What is one of the major problems associated with OTEC systems? (a) High temperature difference between ocean layers (b) Low temperature difference between warm and cold seawater (c) Unlimited availability of fresh water (d) Very high solar radiation at night **Ans:(B) Low temperature difference between warm and cold seawater**

U.NO	Q NO	QUESTIONS
4	52	Why are OTEC plants generally expensive to construct? (a) They require deep-water intake pipes and large heat exchangers (b) They require coal-fired boilers (c) They require nuclear fuel (d) They do not require any special equipment **Ans:(A) They require deep-water intake pipes and large heat exchangers**
4	53	Why is OTEC suitable mainly for tropical ocean regions? (a) They have a large temperature difference between surface and deep seawater (b) They have no seawater (c) They have very cold surface water throughout the year (d) They do not require heat exchangers **Ans:(A) They have a large temperature difference between surface and deep seawater**
4	54	Which feature makes tidal energy a renewable source? (a) Use of coal (b) Continuous availability of tides (c) Burning of biomass (d) Use of diesel generators **Ans:(B) Continuous availability of tides**
4	55	Why is tidal energy considered more predictable than solar and wind energy? (a) Tides are controlled by gravitational forces and follow regular cycles (b) Tides depend on cloud cover (c) Tides depend on wind speed only (d) Tides occur only during daytime **Ans:(A) Tides are controlled by gravitational forces and follow regular cycles**
5	1	What is the main fuel used in hydrogen fuel cells? (a) Methane (b) Hydrogen (c) Propane (d) Coal **Ans:(B) Hydrogen**
5	2	What is the by-product of hydrogen fuel cells when hydrogen and oxygen react? (a) Carbon dioxide (b) Methane (c) Water (d) Ammonia **Ans:(C) Water**
5	3	Which of the following is not a component of a basic hydrogen fuel cell? (a) Anode (b) Electrolyte (c) Combustor (d) Cathode **Ans:(C) Combustor**
5	4	What does PEMFC stand for in fuel cell classification? (a) Positive Electrode Magnetic Fuel Cell (b) Proton Exchange Membrane Fuel Cell (c) Pure Electrolyte Membrane Fuel Cell (d) Permanent Electric Motor Fuel Cell **Ans:(B) Proton Exchange Membrane Fuel Cell**
5	5	Fuel cells convert chemical energy directly into: (a) Heat (b) Mechanical energy (c) Electrical energy (d) Nuclear energy **Ans:(C) Electrical energy**

U.NO	Q NO	QUESTIONS
5	6	The main difference between batteries and fuel cells is: (a) Batteries are heavier (b) Fuel cells store energy (c) Batteries consume fuel continuously (d) Fuel cells generate electricity as long as fuel is supplied **Ans:(D) Fuel cells generate electricity as long as fuel is supplied**
5	7	A key advantage of hydrogen fuel cell is: (a) High carbon emissions (b) Easy to leak (c) Produces only water as direct product (d) Requires fossil fuels to operate **Ans:(C) Produces only water as direct product**
5	8	Hydrogen is considered a low-emission fuel when used in a fuel cell because it: (a) Uses wind for combustion (b) Burns without heat (c) Produces water vapour only (d) Requires no electricity **Ans:(C) Produces water vapour only**
5	9	Which of the following is a classification of fuel cells based on electrolyte type? (a) Combustion fuel cell (b) Solid oxide fuel cell (c) Hydrocarbon fuel cell (d) Magnetic fuel cell **Ans:(B) Solid oxide fuel cell**
5	10	What is the function of an electrolyte in a fuel cell? (a) To burn fuel (b) To filter emissions (c) To conduct ions (d) To generate fuel **Ans:(C) To conduct ions**
5	11	In a hydrogen fuel cell, where is hydrogen gas supplied? (a) Cathode (b) Electrolyte (c) Anode (d) Exhaust **Ans:(C) Anode**
5	12	What technology is commonly used to produce hydrogen? (a) Nuclear fusion (b) Electrolysis (c) Coal combustion (d) Gasoline distillation **Ans:(B) Electrolysis**
5	13	Electrolysis splits water into: (a) Hydrogen and carbon dioxide (b) Hydrogen and oxygen (c) Methane and oxygen (d) Hydrogen and nitrogen **Ans:(B) Hydrogen and oxygen**
5	14	Which of these is a benefit of hydrogen energy? (a) Non-renewable source (b) Emits toxic gases (c) High energy density (d) Causes acid rain **Ans:(C) High energy density**

U.NO	Q NO	QUESTIONS
5	15	Which of the following is not an advantage of hydrogen energy? (a) Renewable source (b) Zero carbon emissions (c) Easily stored under normal conditions (d) Can be used in fuel cells **Ans:(C) Easily stored under normal conditions**
5	16	One limitation of hydrogen energy is: (a) High carbon footprint (b) Low availability of water (c) Storage and transportation challenges (d) High noise pollution **Ans:(C) Storage and transportation challenges**
5	17	The term "Zero Energy Concept" refers to: (a) Producing no electricity (b) Releasing no heat (c) Produces as much energy as it consumes over a specified period (d) Consuming only fossil fuels **Ans:(C) Produces as much energy as it consumes over a specified period**
5	18	Which of the following is a common storage method for hydrogen? (a) Plastic bags (b) Gasoline tanks (c) Pressurized cylinders (d) Wood containers **Ans:(C) Pressurized cylinders**
5	19	A major challenge with hydrogen fuel is: (a) It emits CO2 (b) It is unstable and cannot react (c) It is difficult to store safely (d) It has no applications in industry **Ans:(C) It is difficult to store safely**
5	20	Which sector is a major application of hydrogen energy? (a) Wood manufacturing (b) Aviation (c) Textile (d) Office printing **Ans:(B) Aviation**
5	21	Which device measures the electrical output of a fuel cell? (a) Ammeter (b) Fuel gauge (c) Voltmeter (d) Both A and C **Ans:(D) Both A and C**
5	22	Hydrogen fuel cells are most useful for which type of vehicle? (a) Diesel trucks (b) Hydrogen electric vehicles (c) Coal-powered trains (d) Petrol scooters **Ans:(B) Hydrogen electric vehicles**
5	23	In electrolysis, which electrode does hydrogen gas collect at? (a) Anode (b) Cathode (c) Electrolyte (d) Reservoir **Ans:(B) Cathode**

U.NO	Q NO	QUESTIONS
5	24	Which gas is used with hydrogen in a typical fuel cell? (a) Nitrogen (b) Oxygen (c) Carbon dioxide (d) Helium **Ans:(B) Oxygen**
5	25	What does the Zero Energy Building concept aim to achieve? (a) Use fossil fuels efficiently (b) Maintain zero voltage supply (c) Use renewable sources to meet all energy needs (d) Consume twice the energy it generates **Ans:(C) Use renewable sources to meet all energy needs**
5	26	Which of the following is a common method of hydrogen storage? (a) Liquid storage (b) Gas storage (c) Metal hydride storage (d) All of the above **Ans:(D) All of the above**
5	27	Which storage method provides the highest energy density? (a) Liquid storage (b) Gas storage (c) Metal hydride storage (d) All of the above **Ans:(A) Liquid storage**
5	28	Metal hydride storage means: (a) Storing hydrogen in metals by chemical bonding (b) Freezing hydrogen gas (c) Mixing hydrogen with water (d) Burning hydrogen in air **Ans:(A) Storing hydrogen in metals by chemical bonding**
5	29	A factory using hydrogen fuel cells wants to reduce emission even further. Which of the following will support this goal? (a) Add catalytic converters (b) Use green hydrogen from electrolysis (c) Switch to LPG (d) Install diesel generators **Ans:(B) Use green hydrogen from electrolysis**
5	30	Hydrogen is considered a clean fuel because: (a) It burns to form carbon dioxide (b) It produces water as the main direct product (c) It produces smoke (d) It pollutes the air **Ans:(B) It produces water as the main direct product**
5	31	A building claims to be zero energy. Which combination validates the claim? (a) Uses solar panels + energy-efficient systems (b) Uses diesel backup + electric heaters (c) Uses grid electricity + air conditioners (d) Uses nuclear backup + old light bulbs **Ans:(A) Uses solar panels + energy-efficient systems**
5	32	Hydrogen stored under high pressure is kept in: (a) Plastic bags (b) Wooden boxes (c) Steel or composite cylinders (d) Glass bottles **Ans:(C) Steel or composite cylinders**

U.NO	Q NO	QUESTIONS
5	33	What is electrolysis? (a) Heating a liquid (b) Breaking a compound using electricity (c) Mixing two metals (d) Cooling a gas **Ans:(B) Breaking a compound using electricity**
5	34	Electrolysis requires: (a) Heat energy (b) Light energy (c) Mechanical energy (d) Electrical energy **Ans:(D) Electrical energy**
5	35	Which gas is used as the oxidant in a fuel cell? (a) Oxygen (b) Nitrogen (c) Carbon Monoxide (d) Methane **Ans:(A) Oxygen**
5	36	The main problem of hydrogen storage is: (a) Pollution (b) High cost and safety issues (c) Slow reaction (d) Low availability **Ans:(B) High cost and safety issues**
5	37	A building has high energy demand but wants to be net-zero. What can help? (a) Solar panels + hydrogen fuel cells (b) Diesel generators (c) Gasoline generators (d) Generator **Ans:(A) Solar panels + hydrogen fuel cells**
5	38	To improve safety in hydrogen transport, what should industries adopt? (a) Use plastic tanks (b) Transport in open containers (c) Use certified high-pressure storage tanks (d) Use unsealed pipes **Ans:(C) Use certified high-pressure storage tanks**
5	39	What type of energy conversion occurs in a fuel cell? (a) Mechanical to electrical (b) Chemical to electrical (c) Thermal to electrical (d) Light to electrical **Ans:(B) Chemical to electrical**
5	40	Hydrogen is mainly used as a: (a) Lubricant (b) Fuel (c) Fertilizer (d) Coolant **Ans:(B) Fuel**
5	41	Which vehicle type can use hydrogen as a fuel? (a) Diesel vehicle (b) Bicycle (c) Steam engine (d) Hydrogen fuel cell vehicle **Ans:(D) Hydrogen fuel cell vehicle**

U.NO	Q NO	QUESTIONS
5	42	In a science fair, a student uses a PEM fuel cell kit. What should be provided for the fuel cell to work? (a) Carbon monoxide (b) Salt solution (c) Hydrogen and oxygen (d) Alcohol **Ans:(C) Hydrogen and oxygen**
5	43	If a hydrogen storage facility is located near homes, what safety measure should be prioritized? (a) No ventilation (b) No leak detection system (c) Use of explosion-proof enclosures (d) Use plastic barrels **Ans:(C) Use of explosion-proof enclosures**
5	44	In rockets, hydrogen is used as: (a) Lubricant (b) Fuel (c) Fertilizer (d) Coolant **Ans:(B) Fuel**
5	45	Hydrogen is used in fuel cells to produce: (a) Heat only (b) Smoke and heat (c) Carbon dioxide (d) Electricity and water **Ans:(D) Electricity and water**
5	46	Which real-world challenge affects hydrogen vehicle adoption? (a) Over-supply of hydrogen (b) No pollution control needed (c) Limited refueling infrastructure (d) Vehicles too heavy to run **Ans:(C) Limited refueling infrastructure**
5	47	Green hydrogen is called “green” because it is: (a) It produces carbon (b) Produced using renewable energy with low emissions (c) It is made from coal (d) It reduces oxygen **Ans:(B) Produced using renewable energy with low emissions**
5	48	Hydrogen gas storage requires: (a) High temperature (b) High pressure (c) Low energy (d) Low pressure **Ans:(B) High pressure**
5	49	Hydrogen is highly: (a) Stable (b) Heavy (c) Non-reactive (d) Flammable **Ans:(D) Flammable**
5	50	Hydrogen has very low: (a) Energy content (b) Density (c) Boiling point (d) Volume **Ans:(B) Density**

U.NO	Q NO	QUESTIONS
5	51	What is meant by green energy? (a) Energy produced only from coal (b) Energy produced from environmentally friendly and renewable sources (c) Energy produced only from petroleum (d) Energy produced from nuclear fuels only **Ans:(B) Energy produced from environmentally friendly and renewable sources**
5	52	Which of the following is a green energy source? (a) Coal (b) Diesel (c) Solar energy (d) Petrol **Ans:(C) Solar energy**
5	53	What is the main objective of a zero-energy building? (a) To consume maximum electrical energy (b) To achieve net-zero annual energy consumption (c) To use only fossil fuels (d) To eliminate all energy-consuming equipment **Ans:(B) To achieve net-zero annual energy consumption**
5	54	Which of the following is a major application of hydrogen energy? (a) Fuel for fuel-cell vehicles (b) Production of coal (c) Manufacturing of cement only (d) Production of crude oil **Ans:(A) Fuel for fuel-cell vehicles**
5	55	Which of the following is an industrial application of hydrogen energy? (a) Hydrogen fuel cells for power generation (b) Burning plastic waste only (c) Coal mining (d) Sand production **Ans:(A) Hydrogen fuel cells for power generation**

UNIT	PART	Q.NO	QUESTION
1	B	1	Discuss the role of renewable energy in achieving sustainable development.
1	B	2	Write about Indian scenario of renewable energy availability.
1	B	3	Discuss the social benefits of using renewable energy over fossil fuels.
1	B	4	How geothermal energy is produced?
1	B	5	Describe the process of energy generation from biomass.
1	B	6	Differentiate between Solar Thermal and Solar Photovoltaic systems with examples.
1	B	7	How does IoE support the integration of renewable energy into the power grid?
1	B	8	Brief about oil shale.
1	B	9	Write about global scenario of renewable energy availability.
1	B	10	Brief about principles of renewable energy.
1	B	11	List any six types of renewable energy sources.
2	B	1	Explain the concept of solar radiation.
2	B	2	Describe how solar radiation is estimated on inclined surfaces. Why is this estimation important for solar panel installation?
2	B	3	Compare the functions of a pyrheliometer and pyranometer in measuring solar radiation.
2	B	4	Draw and label flat plate collector.
2	B	5	Brief about the operation of a solar pond electric power plant.
2	B	6	State the working principle of a solar photovoltaic (PV) cell. Mention the materials used and how electricity is generated.
2	B	7	List advantages of solar photovoltaic systems.
2	B	8	Compare the functions of a pyrheliometer and sunshine recorder in measuring solar radiation.
2	B	9	Draw and label solar distillation.
2	B	10	List disadvantages of solar photovoltaic systems.
2	B	11	List the applications of solar photovoltaic systems.
3	B	1	Explain how wind velocity affects the power output from a wind turbine.
3	B	2	Describe the classification of Wind Energy Conversion Systems (WECS) with examples.
3	B	3	Compare the working principles of Savonius and Darrieus vertical axis wind turbines.
3	B	4	List and briefly explain any three major problems associated with wind power systems.
3	B	5	Write the components of a typical Wind Energy Conversion System (WECS).
3	B	6	What are biofuels? Explain how they are produced from biomass.
3	B	7	Explain the role of photosynthesis in the formation of biomass energy.
3	B	8	Draw and label the fixed dome type biogas plant.
3	B	9	List the basic components of wind energy conversion system (WECS).
3	B	10	Draw and label wind energy conversion system (WECS).
3	B	11	Compare Horizontal-Axis Wind Turbine (HAWT) and Vertical-Axis Wind Turbine (VAWT).

UNIT	PART	Q.NO	QUESTION
4	B	1	Explain the mechanics of tides and how they contribute to tidal energy.
4	B	2	Describe the fundamental characteristics of tidal power that make it a renewable energy source.
4	B	3	Differentiate between wave energy and tidal energy with suitable examples.
4	B	4	Briefly explain how tidal energy is harnessed using a tidal barrage.
4	B	5	List three advantages of tidal energy.
4	B	6	Describe the principle of working of an Ocean Thermal Energy Conversion (OTEC) system.
4	B	7	What are the main problems associated with OTEC systems? Explain briefly.
4	B	8	List the regions of the world where Ocean Thermal Energy Conversion (OTEC) systems are available.
4	B	9	List the methods of harnessing tidal energy.
4	B	10	List the advantages and limitations of tidal energy.
4	B	11	Draw the schematic diagram of a closed-cycle OTEC system.
5	B	1	Explain the working principle of a hydrogen fuel cell .
5	B	2	Classify fuel cells based on electrolyte used.
5	B	3	Describe the “Zero Energy” concept in green energy systems.
5	B	4	List three main benefits of hydrogen energy over conventional fossil fuels.
5	B	5	Explain the electrolysis method of hydrogen production.
5	B	6	Describe any three methods of hydrogen energy storage.
5	B	7	List three problems associated with large-scale use of hydrogen energy.
5	B	8	Discuss about green energy.
5	B	9	Write the applications of hydrogen energy.
5	B	10	Draw and label Hydrogen fuel cell.
5	B	11	Compare a fuel cell and an electrolyser.
1	C	1	Explain the principles of renewable energy and its importance in sustainable development.
1	C	2	Describe the availability of renewable energy resources in the world and in India.
1	C	3	Write a short note on the social implications of renewable energy. Also discuss the concept of Internet of Energy (IoE)
1	C	4	Explain solar energy, wind energy, and biomass energy with working principle and advantages
1	C	5	Explain tidal energy, wave energy, and ocean thermal energy with working principle and advantages.
1	C	6	Explain Geothermal energy, tidal energy, and biomass energy with working principles and advantages.
2	C	1	Explain solar radiation and describe the methods for estimating solar radiation on horizontal and inclined surfaces.
2	C	2	Describe the instruments used for solar radiation measurement such as Pyrheliometer, Pyranometer, and Sunshine Recorder.
2	C	3	Explain the working, advantages, and applications of a flat plate solar collector.
2	C	4	Explain solar thermal systems such as solar distillation in detail with neat sketches.

UNIT	PART	Q.NO	QUESTION
2	C	5	Discuss the photovoltaic system for electric power generation. List its advantages and disadvantages.
2	C	6	Explain the working of a Solar Pond Electric Power Plant with a neat schematic diagram.
3	C	1	Explain the properties of wind and discuss the availability of wind energy in India.
3	C	2	Explain the basic components of a Wind Energy Conversion System (WECS) with a neat sketch.
3	C	3	Classify Wind Energy Conversion Systems (WECS).Explain Horizontal Axis Wind Turbines (double, and multi-blade systems) with advantages.
3	C	4	Discuss the working of a downdraft biomass gasifier with neat sketch.
3	C	5	Explain the working of a fixed dome biogas plant with a neat sketch.
4	C	6	Explain the fundamental characteristics of tidal power and discuss the methods used for harnessing tidal energy.
4	C	1	Discuss the working of OTEC power stations with suitable diagrams.
4	C	2	Discuss the major OTEC power stations in the world. Explain their performance and practical challenges
4	C	3	Discuss the role of tides and waves as energy suppliers. Explain their mechanics and how they can be utilized for power generation
4	C	4	Discuss open-cycle and closed-cycle OTEC systems with suitable diagram.
5	C	5	Discuss the operating principle of hydrogen fuel cells with neat sketch.
5	C	1	Describe hydrogen energy storage methods and explain their applications in various sectors.
5	C	2	Discuss the electrolysis method for hydrogen production with neat sketch.
5	C	3	Explain the benefits of hydrogen energy and applications of hydrogen energy.
5	C	4	Discuss the concept of zero energy buildings and the problems associated with hydrogen energy.
5	C	5	Discuss the benefits, applications and problems associated with hydrogen energy.