

ANKUR GUPTA  
MPPSC mains - 2019

Test → Science and Technology (III, Part A)  
Date - 25.01.2021

ankur.gupta1506@gmail.com, 8587027550

प्रश्न 887830  
संख्या

मुख्य परीक्षा उत्तर पुस्तिका  
(Mains Answer Sheet)



भारत का नं. 1 संस्थान  
कौटिल्य एकेडमी  
समृद्धता का प्रवेश द्वार

<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	A	Influenza → is a viral disease which is infectious → symptoms like fever, cough, fatigue.
<input type="checkbox"/>	<input type="checkbox"/>		Examples → Bird flu (H5N1), swine flu. (2)
<input type="checkbox"/>	<input type="checkbox"/>		Treatment - vaccines, or based on symptoms.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	B	
<input type="checkbox"/>	<input type="checkbox"/>		Double salt - that contain more than one ion. Example Mohr's salt and Alum
<input type="checkbox"/>	<input type="checkbox"/>		But in aqueous solution behaves as 2 different salts. (2)
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	C	Angiography
<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/>		
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	D	Copyright → It is property right of person over its creation
<input type="checkbox"/>	<input type="checkbox"/>		Given on → music, literature, paintings etc.
<input type="checkbox"/>	<input type="checkbox"/>		Governed by Copyright Act and under TRIPS of WTO. (2)
<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>	<input type="checkbox"/>		

प्रश्न संख्या

1	E	Gravity - It is force of attraction between 2 objects of any masses.
		Earth - moon, Earth - sun, or other Planetary objects are based on Gravity.
		Kepler's law of motion; $G. force = K \frac{m_1 m_2}{r^2}$ ( $g = 9.8 \text{ ms}^{-2}$ )
1	F	1) Electric field in a path created as closed loop by wire carrying electric current.
		• It is parallel at midline, perpendicular at poles.
		• Faraday's law applies.
		• No two field crosses each other.
1	G	Probability → is in chances of happening of any event, phenomenon.
		→ Eg → chances of head in flip of coin = 50% (.5) = $\frac{1}{2}$ .
		Probability of sure event = 1
		Probability of event that can't happen = 0

1	H	INSAT-3D → It is Indian satellite system
		↳ Launched by ISRO from Satish Dhawan Centre
		↳ Provides <u>Communication</u> capacity.
		↳ Places in <u>Geosynchronous</u> orbits.
1	I	Gene mapping
1	J	Protein synthesis → formation of essential proteins
		in our body.
		↳ It is formed from amino acids
		↳ <u>Ribosomes</u> and <u>Ribonucleic acid</u> help in
		Protein synthesis.
1	K	<u>Bandwidth</u> — It is range over which data
		can be transferred over a network.
		• It is measured in <u>Hertz (Hz)</u> → difference
		between lowest and highest frequency.
		• Bandwidth of 5G is greater than 4G, 3G.



प्रश्न  
संख्या

<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<u>(magnetic flux)</u> → it is measure of intensity of magnetic field strength of a magnetic object. It is closely spaced for strong magnets and distanced for weak magnets.
<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<u>Unit</u>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<u>(GARTOSAT)</u> → It is an Indian remote sensing satellite in polar orbit. Launched by and operated by ISRO
<input type="checkbox"/>	<input type="checkbox"/>	Application → Land mapping, mineral prospecting, Disaster management etc.
<input type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<u>Radio isotope</u> → Are highly radioactive elements having same atomic number but different masses. • Their nucleus is highly unstable, can emit radiation • Example Uranium-235, Uranium-238 • Application in medicine, energy etc.
<input type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<u>(GM crop)</u> → stands for Genetically modified crop. → crop in which foreign genes are added to change its property like pest resistant etc Benefits → Nutrients rich, pest control, Resilient. Example → Bt-Cotton, Bt-Broccoli. Approval by GEAC.
<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	

②



3	A	Renewable energy resources are those that are consumed at rate lower than <u>replenish rate</u> and <u>abundant</u> in nature. where as <u>non-renewable</u> energy sources are used for long and are <u>limited</u> in nature.	
		Renewable	Non-Renewable
		• <del>Do not</del> cause pollution	• cause pollution on burning
		• Abundant	• <del>Limited</del> in nature
		• AS alternative to conventional sources	• Traditionally used for long
		• Includes	• Examples
		↓	↓
		• Solar energy	• Coal energy
		• Wind energy	• Petroleum
		• Geothermal	• Electricity
		• Ocean energy	• Nuclear
		• Biomass energy	• fuel wood etc.



प्रश्न संख्या

Petroleum → 80% demand met by import  
→ Cause heavy pollution

Causing climate change

Energy security not met

Limitations

International obligations - Paris agreement

Non-renewable

Coal

↓  
• Ash - dust - pollution  
• Respiratory issues.

Nuclear waste management issues

Solar energy as alternative

\* Abundance → India's potential

= 35 MW / km<sup>2</sup> as per study

\* India is tropical nation → potential states - Maharashtra, Madhya Pradesh, Rajasthan, Ladakh.

Solar

As photovoltaic  
↓  
directly electricity.

As solar collector  
↓  
heat → steam → electricity.

\* It is ~~cleaner~~ and don't cause pollution & environment friendly.

\* Government target under → National solar mission → 100 GW by 2022.

(100 GW) (with 40 GW = Rooftop)

\* Rewa ultra solar plant (MP) → 750 MW

Government promoting through International solar alliance, creating revenue, KUSUM scheme — with replace.

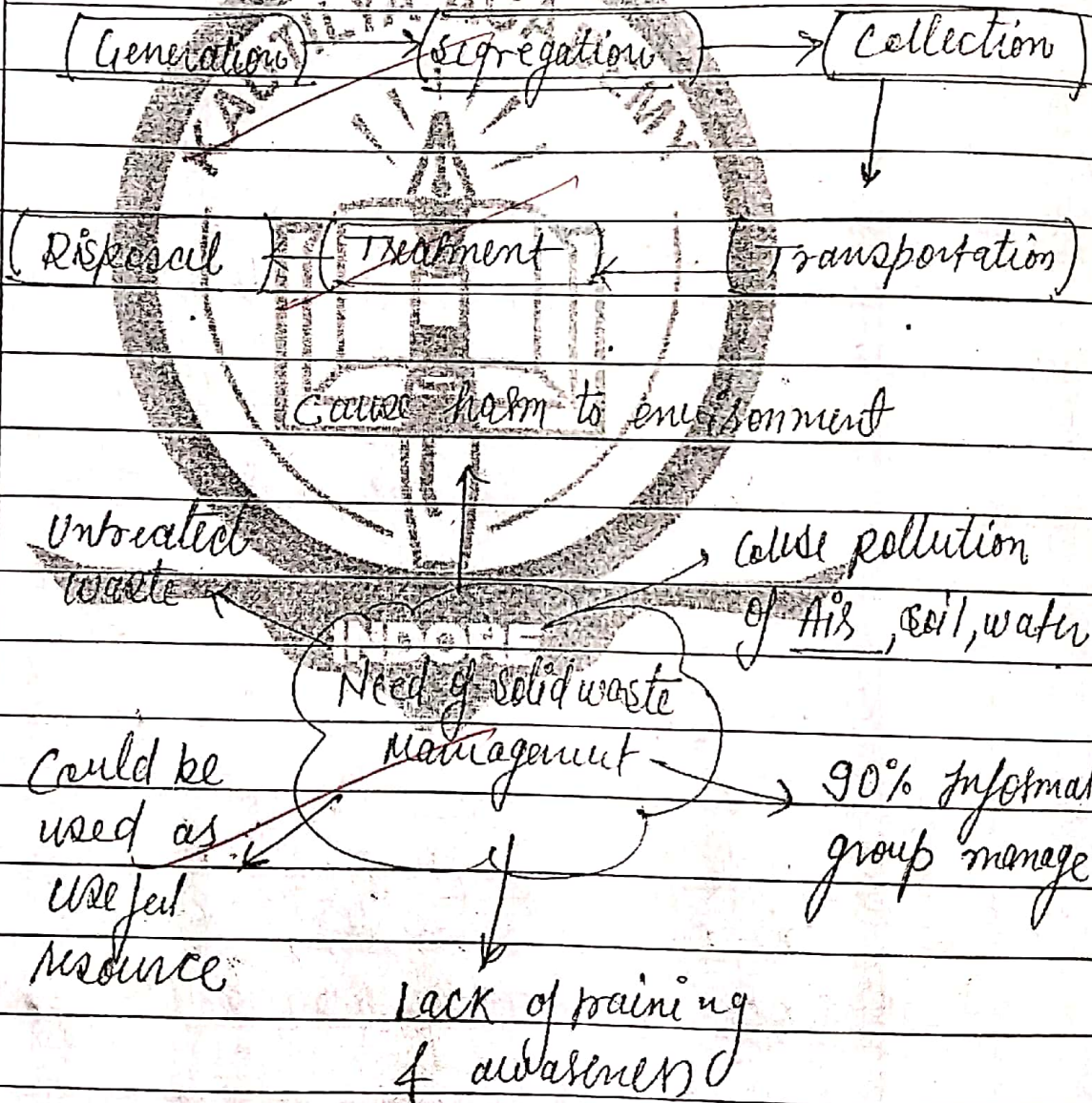
with solar pump. Recently PM in climate summit, assured to create ~~450~~ 450 GW by renewable energy by 2030.

10



8

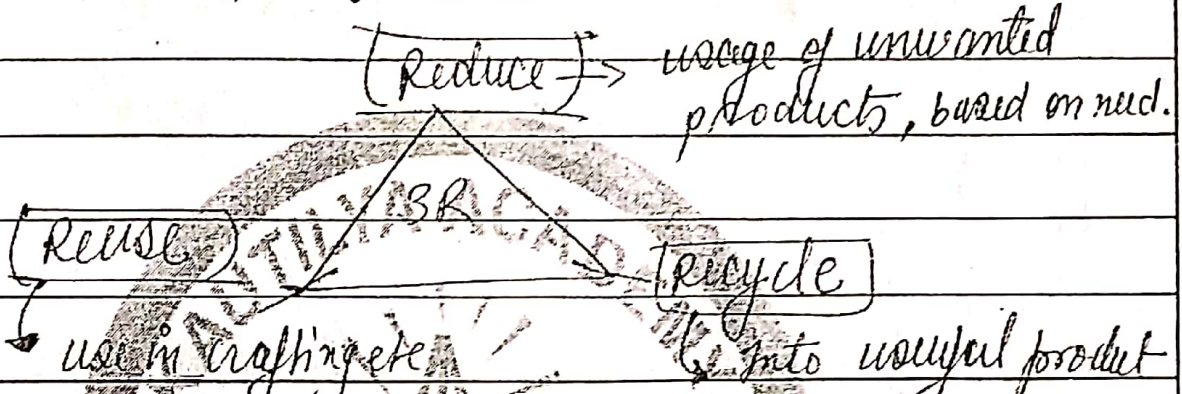
Solid waste is solid and semisolid discarded material in form of e-waste, biomedical waste, hazardous, construction waste. It is managed through solid waste management which is process of handling waste from its generation to disposal in safe manner.





# (various technologies of waste management)

\* Principle of 3R



\* waste to Energy → generating electricity from waste.

\* Biodegradable organic waste

(Composting) — anaerobic/aerobic degradation & forming compost for farm activities

\* (Incineration) — combustion of waste under presence of oxygen.

\* (Gasification) → treating waste without oxygen, producing flue gas like CO, N<sub>2</sub> etc.

प्रश्न  
संख्या

मुख्य परीक्षा उत्तर पुस्तिका  
(Mains Answer Sheet)



भारत का नं. 1 शिक्षा बोर्ड  
कौटिल्य एकेडमी  
उत्कृष्टता का प्रवेश द्वार

\* (Bio remediation) - converting waste into non harmful substance using micro organisms.

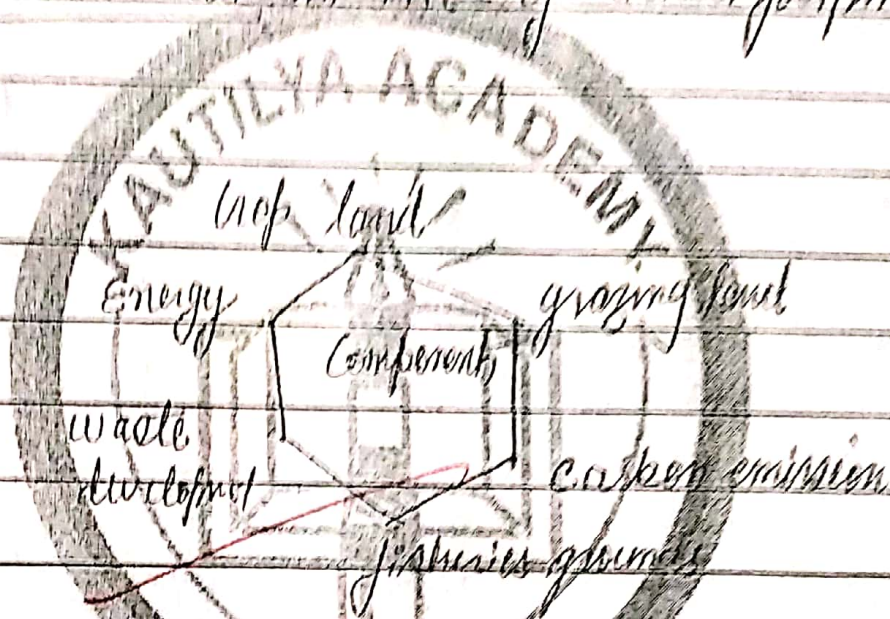
\* (Autoclaving) - used for Biomedical waste for sterilisation of harmful waste.

\* (Landfilling) → Dumping waste over waste land. But causes soil pollution.

Government brought solid waste management rules 2016. Which focus on on site segregation, user fee for collection, polluter pay's principle. Along with this, NGT also started to follow these rules. Swachh Bharat mission - has promoted & Indore became Cleanest City 4th time in Row.

a) Ecological footprint is productive area of land and water that is required to meet human's demand. It is in form of food, shelter, services, timber etc.

The concept was given by William Rees in 1992 of Global footprint network.



(Measurement) — Global environment Accounting —

\* It's Based on a few concepts

① Global Hectare → Represents average productive land & water any entity required to produce all resources it consumes.

② (Biocapacity) → Ability of earth to regenerate ecological resources in a year.

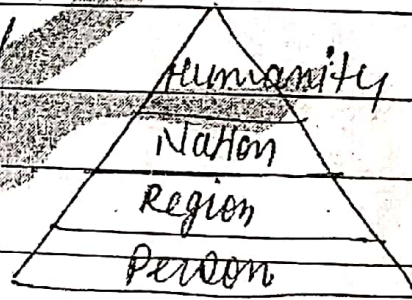
\* Global Footprint Network (Nonprofit organization) calculates footprint as

= Amount of material consumed by person in tons per year

Yield of specific land/ sea (ton/hectare) in a year.

this gives number of hectares required and convert it to Global hectares.

\* Can measure at any level



\* ~~Eco~~ Carbon footprint account for 60% of total.

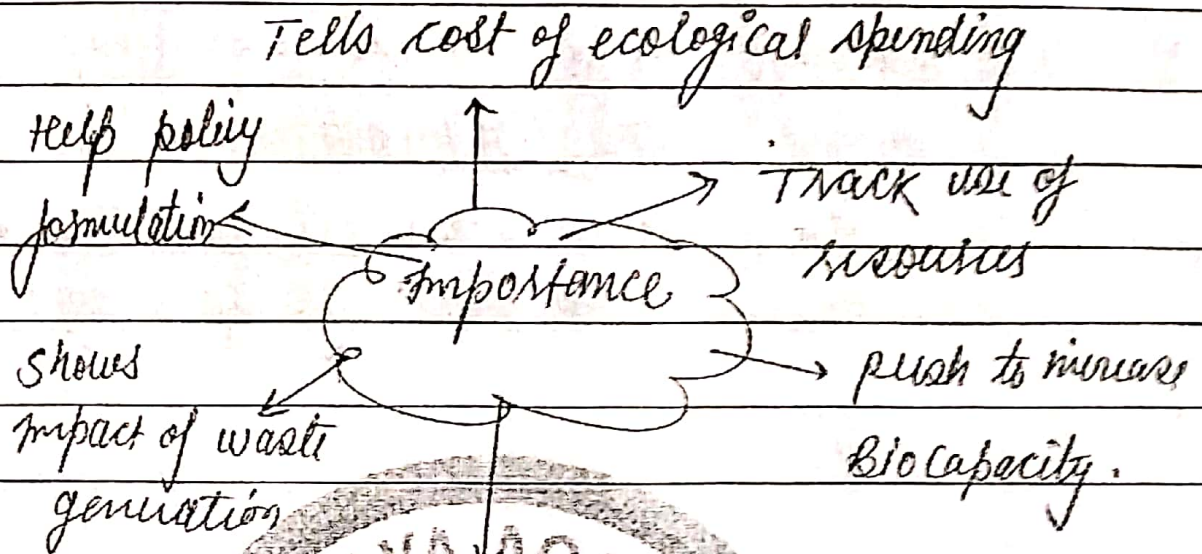
\* In 2019 → world's average Global footprint

$$= \boxed{2.8 \text{ Global hectare / person}}$$

\* (Earth overshoot Day)

↳ 1.75 Earths required to meet human demand

① 1.7



create need for Awareness and change Lifestyle

There is need to adopt Coping strategies in form of Afforestation, 3R - Reduce, Reuse, Recycle & promote sustainable development. India's measures like national action plan on climate change (NAPCC), solar mission - 175 GW by 2022 are aim to reduced Indian footprint and promote sustainable development.

9/5

2 A

Nuclear fission is process of decay of radioactive element into lighter and stable nuclei.

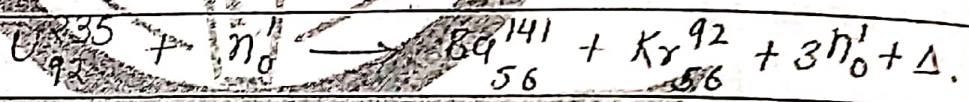
This process produces free neutrons and releases large amount of energy. (exothermic reaction)

(Generation of nuclear energy)

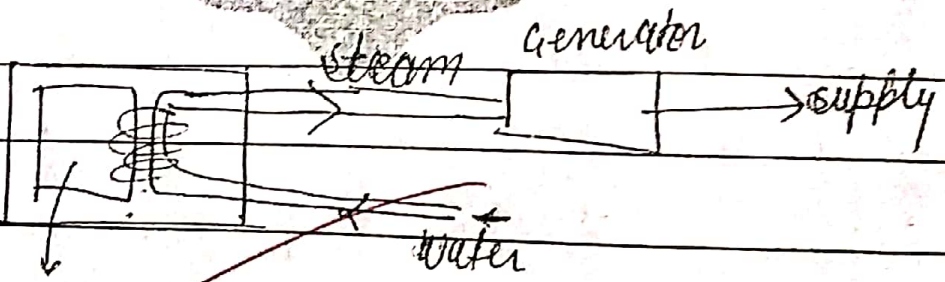
① Generation takes place in Nuclear reactor

② Components are → Coolant, moderator (control reaction), control rods (absorb neutrons), fuel material.  
(Uranium, Plutonium)

③ Fission process leads to (chain reaction)



④ Inside nuclear reactor —



Reactor vessel → fission reaction

⑤ mass defect leads to energy as per  $E = mc^2$

India has 3 phase nuclear programme for civilian use, present capacity of 6500 MW.

3] Aryabhata was great astronomer, physicist and mathematician of 5th C. India. In Gupta era.

### (Contributions)

- ① wrote Aryabhatiya → concepts of trigonometry
- ② Told earth rotate on its axis and revolve around SUN. and Sun is immovable.
- ③ Calculated exact distance between earth and moon.
- ④ He gave concept of zero - as number & symbol.
- ⑤ Scientific explanation of solar and lunar Eclipse
- ⑥ contradicted that Sun move east to west → through relative concepts.

India's 1st satellite was named Aryabhata and contributed to astronomy greatly.

47

प्रश्न  
संख्या

C

Innovative housing is aimed at both inclusiveness and sustainability promoting standard of living.

Innovations in housing are —

\* (3D-printing) — an additive manufacturing

→ Building house possible in one day.

→ Easy customization as per needs

→ less cost — affordability.

→ But more development need for strength.

\* (Green buildings) → use of energy efficiently

↳ Renewable sources → rooftop solar

↳ water harvesting, zero waste generation.

\* (Smart housing) → Artificial intelligence

↳ Internet of things — all devices connect to mobile and together e.g. washing machine, TV etc

↳ sensors, alarms — security & safety.

\* (Virtual and Augmented reality)

↳ Architectural view in 3D

↳ Easy visualisation of structure

↳ Home visits without being at site.

This will revolutionise Real estate & housing.



Endocrine gland are ductless which secretes hormones directly into pt Blood plasma.

Gland	Location	Function
Pituitary	Fore head Control by Hypothalamus.	• Body growth • Controls Gonads, thyroid gland
Thyroid	Below larynx.	• Normal growth of body • Increase speed of Respiration • water balance
Adrenal	2 parts [ Cortex Medulla	• Control blood pressure, heart beat rate • Control metabolism
Gonads (Ovary & Testes)	Reproductive part	• Stimulate thickening of uterus lining - motivate sexual behavior
parathyroid gland	Back side of thyroid gland	- control calcium in blood

These glands are essential for normal functioning of human body.

प्रश्न  
संख्या

2

E

Nanotechnology is cutting edge technology at the size of nanoscale i.e. 1nm to 100 nm.

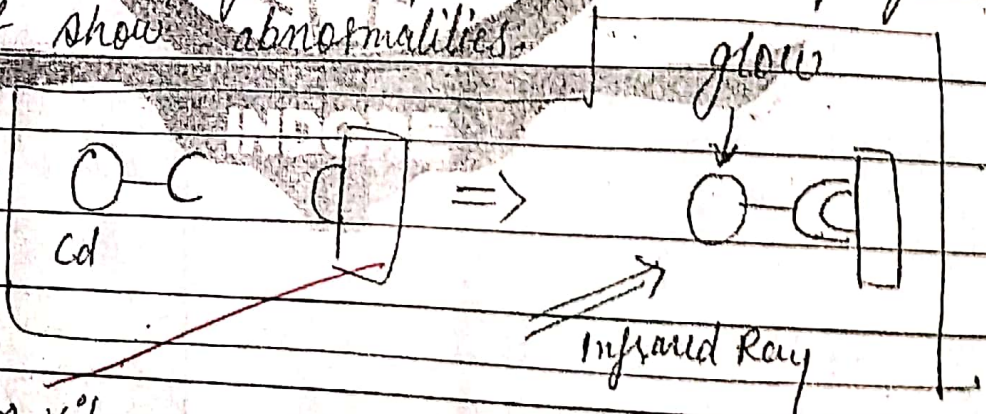
Application in Nanomedicine, in disease diagnosis

\* Quantum dots or Nano crystals →

are Nano sized semiconductor shows fluorescence when attached to diseased part of body.

\* Cancer diagnosis - bind to specific tumor cell.

\* Cadmium and Gold Nanoparticle attached with specific receptor bind to specific tissue & show abnormalities.



\* In vitro → nano chips and arrays are used.

Nanotechnology help in early diagnosis and prevent serious disease.



Petroleum is mixture, crude form of fuel which is formed in region of marine transgression with trees and animal p. under high pressure and temperature for millions of year.

Its types are — Based on fractional distillation.

① (Petroleum) → flammable, used in spark ignited I.C. engine. ~~low~~ turning point high

② (Diesel) → used in electricity generation, diesel based engine, combustion by high compression

③ (Kerosene) — used in Aviation, household cooking

④ Tar → highly viscous, polluting

⑤ Methane / Natural gas → CH<sub>4</sub>, relatively environmental friendly.

⑥ Other products including — butane, propane, Asphalt etc.

In India it's found in region of marine transgression in sedimentary rock of Tertiary period.



मुख्य परीक्षा उत्तर पुस्तिका  
(Mains Answer Sheet)

प्रश्न संख्या

<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	GSLV-MK III stands for Geosynchronous Satellite launch vehicle.
<input type="checkbox"/>	<input type="checkbox"/>	Designed and produced by - Indian Space Research Organisation (ISRO)
<input type="checkbox"/>	<input checked="" type="checkbox"/>	(As game changer for ISRO)
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	① It is three stage medium lift SLV provide high thrust.
<input type="checkbox"/>	<input type="checkbox"/>	② Three stages 1 <sup>st</sup> stage → solid, 2 <sup>nd</sup> liquid, 3 <sup>rd</sup> - Cryogenic ⇒ Cryogenic stage reduces weight of fuel. (C-25)
<input type="checkbox"/>	<input type="checkbox"/>	③ It has highest payload carry capacity ⇒ (4 tonnes)
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	④ will enable to launch heavy satellites → used to place Chandrayaan-2.
<input type="checkbox"/>	<input type="checkbox"/>	⑤ will play important role in future expedition → Gaganyaan, → Sukra mission → Chandrayaan-3 → Mangalyaan.
<input type="checkbox"/>	<input type="checkbox"/>	All these future mission possible because of GSLV-MK III, and places India in elite group of few with such capacity.

Discuss  
Game changer

7] Biopesticides are pesticides based on microorganism and natural product to control pest on crops.

Obtained from - plants, bacteria, fungi etc.

Y.P.E. → Biochemical pesticide - like Neem oil - naturally occurring substances

→ Microbial → bacteria, fungi etc - eg Fungi kill specific insects

→ Plant Inoculation → eg, GM crops, Bt-brinjal, Bt cotton etc.

Benefits } → less toxic, than conventional  
                  } → affect only target group and not other birds, insects

                  } → safer for human consumption.  
                  } → Environmentally friendly

Government efforts

→ Part of Integrated pest management

→ Paramparagat Kishi Vikas Yojana

↳ Soil health management - better soil health.

this promotes sustainable agriculture, reducing its present impact.

4

→ Attempt all questions  
 → Discuss current scenario



भारत ज. नं. 1 संस्था  
**कौटिल्य एकेडमी**  
 सफलता का प्रवेश द्वार

प्रश्न संख्या

मुख्य परीक्षा उत्तर पुस्तिका  
 (Mains Answer Sheet)

2	K	El-Nino is phenomenon where temperature in Eastern Pacific ocean rises and western Pacific ocean's lowers near Australian coast.
		(Occurance) → In cycle generally 2 to 7 year.
		It is result of reversal of Walker cell
		(Impact on India) →
		<ul style="list-style-type: none"> <li>→ Coast of Peru come in high pressure</li> <li>→ Less rainfall in Peru coast increases</li> <li>→ Impacts ocean temperature, currents</li> <li>→ Lower fisheries in Peru coast</li> <li>→ Brings Drought to Australia.</li> </ul>
		Indonesia
		(on India) →
		<ul style="list-style-type: none"> <li>→ Linked to Indian monsoon</li> <li>→ Decreases rainfall in India.</li> <li>→ Affects agriculture, rainfall, food security.</li> </ul>
		India saw El Nino year in 1997-98, 2015-16.



It is Renewable Source of energy derived from Biological material including wood, animal fat etc.

(Sources) — (1) wood — energy — eg pulp and paper industry  
(2) waste energy — municipal solid waste, landfills.

(3) Biofuel → ethanol from sugarcane, corn etc.

(Methods used)

(1) Combustion → Burning directly releasing heat.

[Burning] → Heat → [Steam] → [Electricity]

(2) (Decomposition) → Rotting of biomass generating methane gas (CH<sub>4</sub>) in microbic digester.

(3) Fermentation — of sugarcane, corn to produce ethanol.

(Benefits) → Renewable & environment friendly  
→ Reduces waste → climateless, landfill

→ No harmful emissions,

→ Energy security, reduce dependence on fossil fuel.

As Government aim to produce 10 Gigawatt of Biomass energy by 2022. Also promoting ethanol blending.