ANKUR GUPTA
MPPSC mains - 2019

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

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मुख्य परीक्षा उत्तर पुस्तिका
(Mains Answer Sheet)

1 A	Influenza → is a viral disease which is infectious → symptoms like fever, cough, fatigue. Examples → Bird flu (H5N1), swine flu. Treatment — Vaccines, or based on symptoms.
1 B	Double salt — that contain more than one ion. Example → Mohr's salt and Alum But in aqueous solution behaves as 2 different salts.
1 C	Angiography —
1 D	Copyright → It is Property right of person over its creation Given on → music, Literature, paintings etc. Governed by Copy right Act and under TRIPS of WTO.

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 = $K \frac{m_1 m_2}{r^2}$.

($g = 9.8\ ms^{-2}$)

1 F

- Electric field in 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 eachother.

1 G

Probability → it is chances of happening of any event, phenomenon.

→ Eg → chance of head in flip of coin = 50% (.5) = 1/2.

→ Probability of sure event = 1

Probability of event that can't happen = 0

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

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1 L

(magnetic flux) → 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.

1 M

(CARTOSAT) → It is a Indian Remote sensing satellite in polar orbit.
- Launched by and operated by ISRO
- Application → Land mapping, mineral prospecting, Disaster management etc

1 N

Radio isotope — Are highly radio active elements having same atomic number but different masses.
- This nucleus is highly unstable, can emit radiation
- Example Uranium-235, uranium-238
- Applications in medicine, energy etc.

1 (O)

(GM crop) → Stands for Genetically modified crop.
- Crop in which foreign genes are added to change its property like pest resistants etc
- Benefits → Nutrients rich, pest control, Resilient.
- Example → Bt-Cotton, Bt-Brinjal.

Approval by GEAC.

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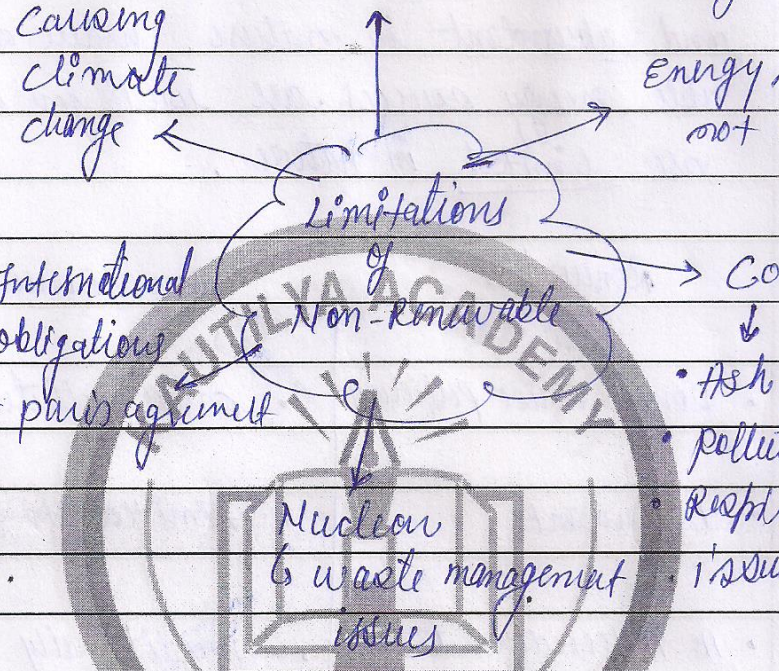
3 A

Renewable energy resources are those that are consumed at rate lower than replenish rate and abundant in nature. where as non-Renewable energy sources are used for long and are limited in nature.

Renewable	Non-Renewable
• Don't cause pollution	• cause pollution on burning
• Abundant	• Limited 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.

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



Solar energy as alternative

* Abundance → India's potential = 35 MW / km² 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 cleanest and don't cause pollution & environment friendly.

* Goverment target under → National solar mission → 100 GW by 2022.
(100 GW (with 40 GW = Rooftop)

* Rewa 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 GW by renewable energy by 2030.

3 B

Solid waste is solid and semi-solid 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.

Generation → Segregation → Collection → Transportation → Treatment → Disposal

Cause harm to environment

Untreated waste → Need of solid waste Management ← Cause pollution of Air, soil, water

Need of solid waste Management → 90% informal group manage

Need of solid waste Management → Could be used as useful resource

Need of solid waste Management → Lack of training & awareness

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(Mains Answer Sheet)

Various technologies of waste management

* Principle of 3R

(Reduce) → usage of unwanted products, based on need.

(Reuse) → use in crafting etc.

(Recycle) → into useful product

* 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) → heating waste without oxygen, producing flue gas like CO, N_2 etc

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* (Bioremediation) — converting waste into non harmful substance using micro organism.

* (Autoclaving) — used for Biomedical waste for sterilization of harmful waste.

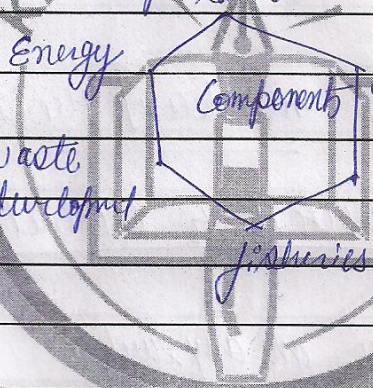
* (Landfilling) → Dumping waste over waste land. But cause soil pollution

Govement brough solid waste management Rules, 2016. Which focus on on site segregation, user fee for collection, polluter pay's principle. Along with this, NGT also stressed to follow these Rules. Swach Bharat mission has promoted & Indore became Cleanest City 4th time In Row.

3 C

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

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



(Measurement) — Global environment Accounting —

* Its 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 Organisation) calculates footprint as

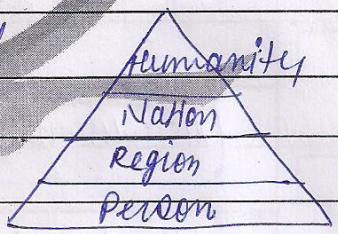
= Amount of material consumed by person in tons per year

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

this gives number of Hectares required

and converted to Global Hectares.

* Can measure at any level



* ~~Ecolo~~ Carbon footprint account for 60% of total.
* In 2010 → world's average Global footprint
= (2.8 Global hactare / person)

* (Earth overshoot Day)
↳ 1.75 Earth required to meet human demand

(E) 07.

Tells cost of ecological spending

help policy formulation

Track use of resources

Importance

shows impact of waste generation

push to increase Bio capacity.

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 missions like National action plan on Climate change (NAPCC), Solar mission – 175 GW by 2022 are aim to reduced Indian footprint and promote sustainable development.

प्रश्न संख्या

मुख्य परीक्षा उत्तर पुस्तिका
(Mains Answer Sheet)

Q2 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)

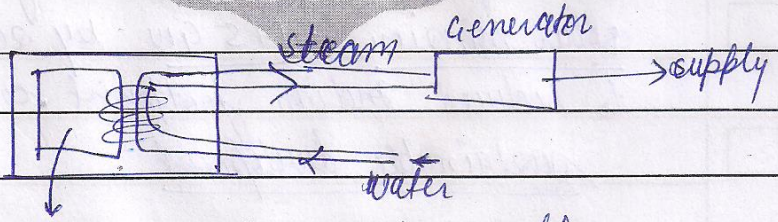
① Generation takes place in Nuclear reactor

② Components are →
Coolant, moderator (Control reaction),
control rods (absorb neutron), fissile material.
(Uranium, Plutonium)

③ Fission process leads to (chain reaction)

$$U_{92}^{235} + n_0^1 \longrightarrow Ba_{56}^{141} + Kr_{56}^{92} + 3n_0^1 + \Delta.$$

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 civillian use, Present capacity of 6500 mw.

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(Mains Answer Sheet)

2 B	Aryabhatta was great astronomer, physicist and mathematician of 5th C. India. in Gupta era.
	(Contributions) —
	(1) wrote Aryabhatiya → Concepts of Khagol-Shastra
	(2) Told Earth rotate on its axis and revolve around SUN. and Sun is immoral.
	(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 Aryabhatta and contributed to astronomy greatly.

2 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 b waste generation.

* (Smart Housing) → Artificial intelligence
  - → Internet of thing — all devices connect to mobile. and together eg. washing machine, TV etc
  - → Sensors, alarms — security & safety.

* (Virtual and Augmented reality)
  - → Archetural view in 3D
  - → Easy visualisation of structure
  - → Home visits without being at site.

This will revolutionise Real estate & housing.

2 D

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

Gland	Location	Function
Pituitary	Fore head Controlled by Hypothalamus.	• Body growth • controls Gonads, tyroid 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.

2 (c)

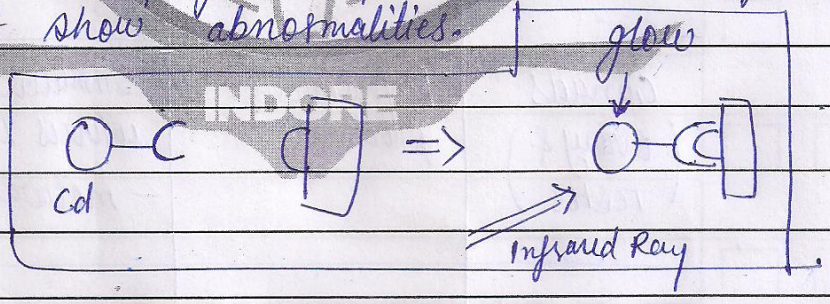
Nanotechnology is cutting edge technology at the size of nanoscale i.e. 1nm to 100 nm.

Application in Nanomedicine, in disease diagnosis —

* Quantum dots as 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.

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2 H

Peboleum 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) (Petrol) → flammable, used in spark ignited IC engine. burning 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 gass → CH_4, relatively environmental friendly.

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

In India its found in region of marine transgression in sedimentary rock of Tertiary period.

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मुख्य परीक्षा उत्तर पुस्तिका
(Mains Answer Sheet)

2 I

GSLV-MK III stands for Geosynchonous Satellite launch vehicle.

Designed and produced by – Indian Space Research Organisation (ISRO)

(As Game changer for ISRO)

① It is three stage medium lift SLV provide high thrust

② ~~Third~~ stages –

1st Stage → Solid, 2nd Liquid, 3rd Cryogenic

⇒ Cryogenic stage reduces weight of fuel. (C-25)

③ It has highest payload carry capacity ⇒ (4 tonnes)

④ ~~will~~ enable to launch heavy satellites → used to place Chandrayan-2.

⑤ will play important role in future expedition

→ Gaganyaan, → Sukra mission

→ Chandrayaan-3 → mangal yaan.

All these future mission possible because of GSLV-MK III, and places India in elite group of few with such capacity.

Q 2 J

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

Obtained from — plants, bacteria, fungi etc.

TYPE
- → Biochemical pesticide — like Neem oil — naturally occuring substances
- → microbial → bacteria, fungicte — Eg Fungi kill specific insects
- → Plant Incosporated → eg GM crops — Bt-Brinjal Bt cotton etc.

Benefits
- → less toxic than conventional
- → effect only target group and not other birds, insects
- → Safe for human consumption.
- → Environmental friendly

Govesment efforts
- → Part of Integrated pest management
- → Paramparagat Krishi Vikas Yojana
  - ↳ Soil health management — better Soil health.

this promotes sustainable agriculture reducing its present impact.

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) → Coast of peru come in high Pressure
→ Less rainfall in peru coast increases
→ Impacts ocean temperature, currents
→ Lowers fishries in peru coast
→ Brings Drought to Australia, Indonesia

(on India) → Linked to Indian monsoon
→ Decreases rainfall in India.
→ Affects agriculture, ramfall, food security.

India saw El Nino year in 1997-98, 2015-16.

Q2 L

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_4) in anaerobic digestor.

③ Fermentation — of sugarcane, corn to produce Ethanol.

(Benefits) → Renewable & environment friendly
→ Reduces waste → cleaniless, landfill
→ No harmful emissions,
→ Energy security, reduce dependence on fossil fuel.

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