

GS SCORE

An Institute for Civil Services

IAS TOPPER'S TEST COPY

SRISHTI MISHRA

AIR 95

CSE 2023

SCIENCE & TECHNOLOGY



8448496262



iascore.in

93½

UPSC

Answer Questions in NOT MORE THAN the Word Limit specified for each in the Parenthesis.
Content of the Question is more important than length.
(Specimen Answer Booklet - For Practice Purpose Only)

Science & Technology Test 25

Q1.

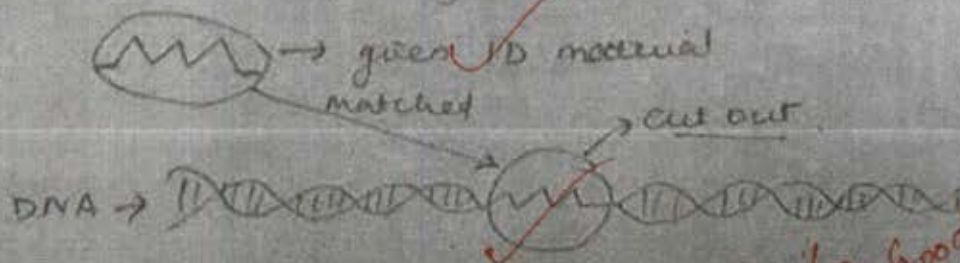
clustered Regularly Interspaced ^{short} Palindromic Repeats (CRISPR) ~~is~~ a gene editing technology representing "molecular scissors" that have become the face of life sciences in the past few years. ^{good intro}

CRISPR Gene Editing Technology

① Based on interaction between bacteria and bacteriophage (virus that kills bacteria).

② Bacteria's defence mechanism has been copied.

③ Involves CAS-9 protein that acts as a molecular scissor that can be given an "identification material" which is then cut out from the DNA strand.



↳ Good

Please do not write anything above the question number in this space.
कृपया इस स्थान में प्रश्न संख्या के अतिरिक्त कुछ न लिखें।

UPSC

Answer Questions in NOT MORE THAN the Word Limit specified for each in the Parenthesis.
Content of the Question is more important than length.
(Specimen Answer Booklet - For Practice Purpose Only)

उम्मीदवारों को इस दफ्तार में नहीं लिखना चाहिए।
Candidates must not write on this margin.

Benefits

- you can diversify it by adding*
- ① Defective material is ^{genes} erased } *treat genetic dis orders*
 - ② ^{with defects} / ^{extrin action} genetic defects can be removed. eg: AIDS removal
 - ③ Changes can be made in babies in embryo - ensure healthy birth
 - ④ ^{etc} medical application can enhance health indicators } *generation of antibiotics*

Challenges / Concerns

① Ethical concerns

- Humans "playing God"
- BioRights
- "Designer Babies"

② Biological Concerns

- changes in DNA ^{could with} destructive features } *can change ecological balance*
- Unknown realm → disastrous consequences

③ Economic inequality in access to benefits derived

CRISPR - CAS 9 is a life changing technology but its use must be controlled and ethical for it to be truly beneficial.

Nice
Need to balance using of technology

UPSC

Answer Questions in NOT MORE THAN the Word Limit specified for each in the Parenthesis.
Content of the Question is more important than length.
(Specimen Answer Booklet - For Practice Purpose Only)

उम्मीदवारों को
इस कॉपी में
कोई लिखना
नाहिए।
Candidates
must not
write on this
margin

improve it
by giving brief
account of features
of this mission

Gaganyaan is set to be India's
first manned mission to space. Currently,
very few countries have achieved this
threshold. ✓

Although people of Indian origin have
been to space (eg. Kalpana Chawala),
no Indian has been to space via Indian
missions ✓

fair

Gaganyaan and Technological Development

① Capability of launching humans into
orbit will be displayed by the
country.

② Involves completely different methods
of rocket development as it must
be made habitable by humans
→ pressure maintenance
→ temperature condition control.

③ Can involve space station development
like US, Russia (GLASSBORO), China
(Tianwen).

link these
points with
fast technology
development
→ astrophysics
→ material
etc

(Please do not write anything except the question number in this space)
कृपया इस स्थान में प्रश्न संख्या के अतिरिक्त कुछ न लिखें।

UPSC

Answer Questions in NOT MORE THAN the Word Limit specified for each in the Parenthesis.
Content of the Question is more important than length.
(Specimen Answer Booklet - For Practice Purpose Only)

उम्मीदवारों को इस कॉपी में नहीं लिखना चाहिए।
Candidates must not write on this margin.

Gaganyaan + Economic Development

- ① Boost to ISRO's viability & credibility
- ② India as a space-power will contribute to its reputation and attract collaboration.
- ③ Push to private sector, FDI, space tourism propensity, enhanced space collaboration.
- ④ Tech transfers can add to potential of India's space program.

here you can add point like
employment generation
hub for space programmes
industry growth

inter national
collaboration

Gaganyaan & Educational Development

- ① Humans in space can do research
- ② In-space (zero gravity) experiments can yield knowledge.
- ③ Space Station can help India enhance space analysis and knowledge of the unknown - gravity waves, blackholes, wormholes etc.

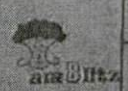
Try to give specific points as per demand

R&D
collaboration b/w industry & Academia
astronomy as career etc

☆

Gaganyaan is the next threshold for the Indian Space Program and can boost India's probability of becoming an accepted & respected global leader.

Nile Conclusion



Please do not
write anything except
the question number
in this space.
कृपया इस स्थान
में प्रश्न संख्या के
अतिरिक्त कुछ
न लिखें।

UPSC

Answer Questions in NOT MORE THAN the Word Limit specified for each in the Parenthesis.
Content of the Question is more important than length.
(Specimen Answer Booklet - For Practice Purpose Only)

उम्मीदवारों
इस कॉपी पर
नहीं लिखना
चाहिए।
Candidate
must not
write on
margin.

Q3.

In India, data suggests that the number of women in scientific fields has been very low. This has various socio-cultural & historical causes.

Use
intro

women in science

- around 40% of those studying STEM subjects are women.
- This number goes further in higher studies and jobs.

Reasons for low no. of women in science

- socio-cultural framework & stereotypes
 - ↳ women are incapable of doing math-based/scientific subjects
 - ↳ much commitment required but women are expected to marry & do childcare.

link it with
Patriarchal
mindset

relevant
points

- Economic restraints ~ people prefer to educate male child when money is limited.



Please do not write anything above the question number in this space.
कृपया इस स्थान में प्रश्न संख्या के ऊपर कुछ न लिखें।

UPSC

Answer Questions in NOT MORE THAN the Word Limit specified for each in the Parenthesis.
Content of the Question is more important than length.
(Specimen Answer Booklet - For Practice Purpose Only)

उम्मीदवारों को इस स्थिति में नहीं लिखना चाहिए।
Candidates must not write on this margin.

- Inadequate acceptance / infrastructure to welcome women into these fields → especially in higher education

lacking institutional support

Steps Taken by Government

- various schemes to enhance participation of women in STEM

eg: Vigyan Jyoti Scheme & WIST

- Infrastructure enhancement scheme
eg: CURIE

- KIRAN scheme for encouraging women in these fields.

do elaborate in brief about these step & target

Final conclusion

to improve it & link it with SDG & economic growth of country

India needs a change in mindset and outlook if it is to accept women into these fields. We must be capable enough to nurture our own Kalpna Chawlas in the country instead of encumbering to brain drain.

5

(Please do not
write anything except
the question number
in this space)

कृपया इस स्थान
पर प्रश्न संख्या के
अतिरिक्त कुछ
न लिखें।

UPSC

Answer Questions in NOT MORE THAN the Word Limit specified for each in the Parenthesis.
Content of the Question is more important than length.
(Specimen Answer Booklet - For Practice Purpose Only)

उम्मीदवारों को
इस कॉलम में
कोई लिखना
नाहिए।
Candidates
must not
write on this
margin

84.

Nanotechnology refers to the technological use of nanomaterials which are substances with sizes in the nanometer scale. This technology comes with many uses as well as challenges.

Nanotechnology & Pollution Control

• Soil Pollution ~ use of bioremediation techniques through nanomaterial to remove impurities / heavy metals like lead (Pb), etc.

• Water Pollution ~ use of filtering systems to remove minuscule impurities in water, use as precipitate, etc.

• Air Pollution ~ Nano-filters in cities to suck in and clean polluted city air.

Thus, nanotechnology's benefits are many in the field of pollution control.

fair
you can mention
some specific
properties like
reactivity,
etc.

here you can
add some emerging
areas like nanotechnology
Solar cell where nanotech
has good potential

Nano-filtration
↓
Ag NPs

absorbant
carbon
nanotubes
etc.

UPSC

Answer Questions in NOT MORE THAN the Word Limit specified for each in the Parenthesis.
Content of the Question is more important than length.
(Specimen Answer Booklet - For Practice Purpose Only)

However, it can become a challenge too.

Nanotechnology - threat to pollution

• Nanotechnology particles are very small and hard to locate.

• If lost, they can accumulate in water bodies / air / soil.

• Since most are made of non-biodegradable material, they are a source of pollution.

• Bioaccumulation & Biomagnification in living beings in these ecosystems are threatened by nanoparticles.

Thus, nanotechnology use must be controlled & sustainable to be of net benefit to the environment.
Nevertheless, it is a potential tool for achieving Panch Anuit goals.

U.S.

Please do not
write anything except
the question number
in the space
provided
कृपया इस स्थान
में प्रश्न संख्या को
अतिरिक्त कुछ
न लिखें।

UPSC

Answer Questions in NOT MORE THAN the Word Limit specified for each in the Parenthesis.
Content of the Question is more important than length.
(Specimen Answer Booklet - For Practice Purpose Only)

उम्मीदवारों को
इस स्थान पर
नहीं लिखना
चाहिए।
Candidates
must not
write on this
margin

85.

Plant Genetic Resources refers
to the natural reservoir of genetic
and species diversity in flora.

Why conserve PGRs?

① Floral diversity is of utmost
importance.

↳ Environmentally

- biodiversity
- habitat provider
- niche development
- dependence of various species
eg: bees.
- carbon sink

Vague intro
variety of
seed &
plant both
modern &
traditional

relevant points
here you can add to
diversify your answers
↳ food security
↳ sustainable
agriculture
↳ biotechnology

eg: Neelakurinji on Western Ghats
attracts tourists in large numbers
when it blooms every 12 years.

Trip Gardens, Kashmir

source of income / beekeeping, etc.

↳ Aesthetic → flowers are beautiful
and should be conserved for
their inherent life.

Please do not
write anything except
the question number
in this space!
कृपया इस स्थान
पर प्रश्न संख्या के
अतिरिक्त कुछ
लिखें।

UPSC

Answer Questions in NOT MORE THAN the Word Limit specified for each in the Parenthesis.
Content of the Question is more important than length.
(Specimen Answer Booklet - For Practice Purpose Only)

उम्मीदवारों को
इस हारा में
कोई लिखावा
चाहिए
Candidates
must not
write on this
margin

② Scientific Reasoning for Preservation of PGRs

↳ provide insights into biodiversity,
hotspots, ecosystem frameworks.

↳ can provide historical insight &
evolutionary biology

↳ climate change impact can be
understood by gauging brown shifts,
etc.

↳ can help identify beneficial
genes for plant productivity / weed
immunity etc. → use in agriculture

Nice

Initiatives of Govt. to conserve PGR :-

② Wildlife Protection Act 1972 &
Environmental Protection Act 1986 provide
for National Parks, Wildlife Sanctuaries,
Biosphere Reserves, Community Reserves, etc.
eg. Nilgiri Biosphere Reserve - protects
flora and fauna & in-situ
conservation.

③ Conservation of biodiversity hotspots
ensures safety of threatened species.
Schedule 6 of WPA '72 protects plants.

more needs to be done to preserve rich
fauna of the nation & protect species
from climate impact.

Give equal weightage
to 2nd part of
Question

Add
National Gene
bank
PPV & FR Act
2002
etc

Conclusion
Missing

Page

25

(Please do not
write anything except
the question number
in this space)

कृपया इस स्थान
में प्रश्न संख्या को
अतिरिक्त कुछ
न लिखें।

UPSC

Answer Questions in NOT MORE THAN the Word Limit specified for each in the Parenthesis.
Content of the Question is more important than length.
(Specimen Answer Booklet - For Practice Purpose Only)

उम्मीदवारों को
इस स्थान पर
कहीं लिखना
चाहिए।
Candidate
must not
write on the
margin.

Q6.

Self driving Cars are those that
do not require a driver & work by
automation, artificial intelligence
and machine learning to drive safely.

Purpose of Self-Driving Cars

Good points
as per demand

- ① Reduce accidents due to not
following traffic guidelines.
- ② Reduce time taken to deliver
travellers.
- ③ Enhance road safety.

Obstacles for Autonomous Vehicles

① Technical obstacles

↳ technology is yet to develop
to create reliable cars.

↳ inadequate traffic rules
except in metropolitan city centres.

↳ inadequate infrastructure (unsafe
roads) make investment futile.

all relevant
points
covered

link with
legal &
regulatory
standards

② Economic Obstacles

↳ immense research & development required.

↳ lots of finances could create pressure on government (public sector)

↳ need to align Electric Vehicles (FAETI) aims with need for automation.

↳ Automobile industry must have enough demand to invest sustainably.

③ Social Obstacles

↳ Resistance from conventional auto drivers / Ola / Ubers.

↳ Issue of automation replacing jobs — create higher unemployment from current 7%.

↳ unequal access to cars (rich-poor divide)

Self driving cars could spell a revolution in India's technological growth & road safety sphere. However it's important to understand priorities and the greater need for employment and road infrastructure development than the need for introducing such cars.

5

diversify your
answers by factors
like

↳ IPR
↳ Privacy concern
↳ Auto insurance
etc

link with
employment

fair
Need of proper
assessment
R&D

Please do not
write anything except
the question number
in the space.

कृपया इस स्थान
में प्रश्न संख्या के
अतिरिक्त कुछ
न लिखें।

UPSC

Answer Questions in NOT MORE THAN the Word Limit specified for each in the Parenthesis.
Content of the Question is more important than length.
(Specimen Answer Booklet - For Practice Purpose Only)

उम्मीदवारों
इस दृष्टि से
नहीं भ्रमित
चाहिए
Candidate
must not
write on
margin

87.

Non Fungible Tokens (NFTs)

are a new commodity introduced after the widespread use of crypto currency and blockchain.

Good intro

Functioning of NFTs

① unique non-interchangeable commodities in the cryptomarket.

their uniqueness is what resulted in the name a digital asset Certificate as it gives a unique identity to the good.

Valid but brief it

② It can be sold/bought in the cryptomarket.

③ Uses blockchain technology to secure its value and transaction.

④ Examples include :- music/artwork (usually are also creations).

⑤ Acts like an intellectual property protector.

Explain mechanism of NFT as per demand

Please do not
write anything except
the question number
in this space.
कृपया इस स्थान
में प्रश्न संख्या के
अतिरिक्त कुछ
न लिखें।

UPSC

Answer Questions in NOT MORE THAN the Word Limit specified for each in the Parenthesis.
Content of the Question is more important than length.
(Specimen Answer Booklet - For Practice Purpose Only)

उम्मीदवारों को
इस हाशिये में
कहीं लिखना
चाहिए
Candidates
must not
write on this
margin

Advantages of NFTs

- ① Store of value and IP right protection
- ② Trustworthy and secure method of safeguarding ~ blockchains are based on end-to-end encryption and fairproof transaction.

} exclusive ownership rights

relevant

- ③ No fear of duplication } link with more rising opportunities
- ④ No government-sourced arbitrary action (because blockchain is decentralized).

Challenges of NFTs

- ① Cybersecurity challenge ~ cybercrime is developing just as fast as cybertech.
- ② Inadequate safety measure (because it doesn't come under any government)
- ③ Instability can lead to severe losses.
- ④ Fraud, organized crime, money laundering is still possible.

} Hacking NFT Frauds etc

Nice points

Conclusion Missing

Thus, NFTs are a technological space for value storage but also have come with risks.

4

88.

Biotechnology is a field that involves the overlap of biology & technology. In a developing nation like India, biotech has great scope in various sectors.

to improve it you can mention sectors like Agriculture, Health, Environmental etc

Biotechnology ~ survive sector

* Agriculture [Economy]

↳ gene editing technology can help create genetically modified organism (GMOs) for greater productivity.
eg: Gm mustard (recently approved by the GEAC)

↳ create pest-resistant, drought resistant crops through alteration of crops, with support from ICAR.

↳ enhanced fertilizers to meet soil nutrition and soil health and sustainability requirements.

eg: PUSA encourages to replace stubble burning

UPSC

Answer Questions in NOT MORE THAN the Word Limit specified for each in the Parenthesis.
Content of the Question is more important than length.
(Specimen Answer Booklet - For Practice Purpose Only)

उम्मीदवारों को इस हद्द में नहीं लिखना चाहिए
Candidates must not write on this margin.

* Nutrition & Health [Human Capital]

bioaugmentation of foods through bio-fertilization.

eg: adding iron to rice/wheat to fight anaemia (around $\frac{1}{9}$ of women aged 15-35 in India are anaemic).

medical implements

① somatic cell development for synthetic organ creation

② in vitro fertilization & healthy surrogacy

③ use of biotech to enhance measurement/survey of body/diseases
eg: cancer treatment through CAR-T cell formula.

④ Treatment of diseases eg COVID 19 with monoclonal antibodies

with enhanced use of biotech, India can gain in terms of economic capital as well as human capital, thereby boosting its progress on the path to a \$5 trillion economy.

relevant points covered

Link these points with intellectual wealth, opportunities, innovation, employment etc as per demand

fair conclusion as per demand

3.5

Please do not
write anything except
question number
in this space.
या इस स्थान
प्रश्न संख्या के
तिरिक्त कुछ
लिखें।

UPSC

Answer Questions in NOT MORE THAN the Word Limit specified for each in the Parenthesis.
Content of the Question is more important than length.
(Specimen Answer Booklet - For Practice Purpose Only)

उम्मीदवारों को
इस हाथिए में
नहीं लिखना
चाहिए
Candidates
must not
write on this
margin

Q3.

Thorium is one of the raw materials used in nuclear reactors for production of nuclear generated energy.

Advantages of Thorium

① less reactive (more controllable reaction) than uranium.

② more naturally available.
eg: thorium sands of monazite in Kerala are a reserve.

③ Naturally extractable as opposed to difficult extraction of other reactive elements like uranium.

④ Technology for use of thorium is well developed.

India has a few nuclear reactors
eg: Rawatbhatta, Kudankulam,
Tarapur.

fair intro
do mention in
brief how
convenient it
is to use as
fuel

diversify
add ↓
it did not
irradiate
U-238
↳ less waste
production
etc

relevant point

Please do not
write anything except
the question number
in this space.

कृपया इस स्थान
में प्रश्न संख्या के
अतिरिक्त कुछ
न लिखें।

UPSC

Answer Questions in NOT MORE THAN the Word Limit specified for each in the Parenthesis.
Content of the Question is more important than length.

(Specimen Answer Booklet - For Practice Purpose Only)

उम्मीदवारों को
इस हाशिए में
नहीं लिखना
चाहिए

Candidates
must not
write on this
margin

Hurdles in large scale Deployment

① Innense initia costs of setting up

② High maintenance costs.

③ Safety / security concerns. (leakage, etc).

④ Inadequate facilities for management of radioactive waste.

⑤ Requires clearing of large areas (deforestation).

⑥ Need to import thorium because inadequate resources in India.

⑦ Replaces coal → may displace employed individuals in PSUs

Need for :-

① Kelkar Committee public private investment in non-conventional sources of energy

② Small-scale nuclear reactors - local energy needs.

Nuclear Energy is the future of

Energy that is clean & sustainable.

Adequate support is required in terms of aspect to achieve 2070 Carbon Neutrality goal.

do mention
Some specific
points

↳ shortage of fissile
material to sustain
reaction
↳ Delay in commissioning
of BR

3.5

Nice
conclusion

Need of R & D
as it is cost
effective

(Please do not write anything over the question number in this space)
कृपया इस स्थान में प्रश्न संख्या के अतिरिक्त कुछ न लिखें।

UPSC

Answer Questions in NOT MORE THAN the Word Limit specified for each in the Parenthesis.
Content of the Question is more important than length.
(Specimen Answer Booklet - For Practice Purpose Only)

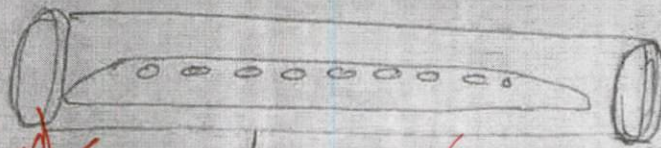
उम्मीदवारों को इस शीट पर से नहीं लिखना चाहिए।
Candidates must not write on this margin.

Q10.

Hyper loop technology is the future of travel by train. It is the futuristic stage after Bullet train.

Good intro

What is hyperloop technology?



Good

↳ magnetic waves used to keep the train in suspension in a 'loop' ~ cylindrical framework

Partial Vacuum tube

Benefits of Hyperloop Over Bullet Train

① no rails, no touch. Use of suspension reduces friction to near zero. therefore speed is even higher than bullet train.

hope you can mention about flexibility of road transport etc

② runs completely on magnetic waves & electricity - uninterrupted movement. Thus, this is more timely & likely to be accurate.

link with energy efficiency

③ modern means of travel.

Please do not
write anything extra
in the question number
in this space.
कृपया इस स्थान
में प्रश्न संख्या को
अतिरिक्त कुछ
न लिखें।

UPSC

Answer Questions in NOT MORE THAN the Word Limit specified for each in the Parenthesis.
Content of the Question is more important than length.
(Specimen Answer Booklet - For Practice Purpose Only)

उम्मीदवारों को
इस हाशिए में
नहीं लिखना
चाहिए
Candidates
must not
write on this
margin

Does India Need Such Investment?

Yes

No

① Hyperloop technology
has economic
benefits ✓

→ greater speed
ensures faster transport
of workers ✓

→ reduced logistic
costs ✓

→ technological
growth creates
employment ✓

→ GDP growth ✓

② Environmental
benefits ✓

→ greater use of public
transport ✓

→ reduced (zero)
emissions ✓

③ Modernization of
Indian economy ✓

① India has other
priorities ✓

• poverty elimination ✓
• human capital
investment ✓

② Very high costs
in infrastructure
development ✓

③ may lead to
inequality / unequal
access → rural-urban
divide ✓

④ Metro systems and
rail already exist -
why build an
overcrowded city? ✓

~~about~~ The development of Hyperloop
Technology could be a substantial part of
National Monetization Pipeline
and modernization of India ✓

Page



Fair
conclusion
Need to
focus on local
capacity
building,
technology
etc.

Please do not
write anything except
the question number
in this space.
कृपया इस स्थान
में प्रश्न संख्या के
अतिरिक्त कुछ
न लिखें।

UPSC

Answer Questions in NOT MORE THAN the Word Limit specified for each in the Parenthesis.
Content of the Question is more important than length.
(Specimen Answer Booklet - For Practice Purpose Only)

उम्मीदवारों को
इस स्थान में
नहीं लिखना
चाहिए।
Candidates
must not
write on this
margin

Q11.

neutrinos are the 2nd most abundant particle in the universe after light particles or photons. Their discovery has opened up a field of new research & applications.

fail
You can
mention some
basic properties

Neutrinos in life

- * countless number of neutrinos pass through and within the human body at any given time.
- * neutrinos are ever present and neutral. Unlike light, they do not interact with the environment in any measurable direct way.
- * It is assumed that neutrinos play a role in maintaining balance in the world.

Nice points

Significance & Potential of Neutrinos

- * Help find what makes up dark matter/ dark energy of the universe.
- * Help explore the origins of the universe.

उम्मीदवारों को
इस स्थिति में
नहीं लिखना
चाहिए
Candidates
must not
write on this
margin

* hook into blackholes / warholes.

* further research into the laws of physics } structure of nucleons, superconductivity, do 1000000

* Research into the "God" Particle / smaller particles that build neutrons, etc.

India's Initiatives in Venture Research

Although research in physics has very little scope in India, there have been some developments.

② Dark Sky Reserve, Hauke, Ladakh

© Collaboration with scientists of NASA
etc.

(2) work at CERN laboratory, Geneva

Neutrons research can provide insights into the science of existence and may also give rise to new technology that can enhance the experience of humanity in the world.

elaborate
in brief
mention about
India's Such
laboratories
in Karnataka
& Othos (1960's)

4

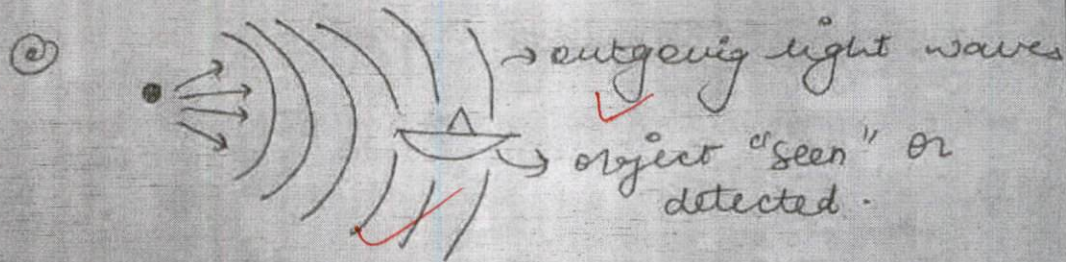
Q12.

Light Detection & Ranging (LIDAR) technology uses light waves to gauge the distance, density, speed, etc. of various objects.

fair intro

in pulsed laser form

LIDAR features



- ② High accuracy in data collection
- ③ Upgradation over radio waves, etc.
- ④ Since speed of light is highest, speed of data collection is also high.
- ⑤ Trustworthy technology due to high precision.

Valid Points & good use of diagrams

Significance of LIDAR

- ① Industrial Significance
 - application in various industrial products eg. ships / drones.

Please do not
write anything above
the question number
in this space.
कृपया इस स्थान
में प्रश्न संख्या के
अतिरिक्त कुछ
न लिखें।

UPSC

Answer Questions in NOT MORE THAN the Word Limit specified for each in the Parenthesis.
Content of the Question is more important than length.
(Specimen Answer Booklet - For Practice Purpose Only)

उम्मीदवारों को
इस कॉलम में
कोई लिखना
नाहीं।
Candidates
must not
write on this
margin

- application in Industrial Safety

eg: nuclear power plants - infrastructure security features can employ LIDAR.

structure
civil
engineering

- use by CRPF paramilitary forces to enhance detection of criminals near critical infrastructure regions like DISCOM etc.

real time
surveillance

relevant
points

Commercial Significance

- application in naval ships
eg: INS Vikrant, etc can have LIDAR tech for defence purposes.

here you
can add

- application in house guard systems
- Drones / aircrafts etc can use LIDAR for enhanced navigation.

↳ Entertainment
↳ Agriculture industries

Satellite Application

- Meteorological application

- weather forecasting
- cyclone, etc warnings
- weather phenomena research.

do elaborate
in brief

↳ Mapping
↳ Seafloor & riverbed

UPSC

Answer Questions in NOT MORE THAN the Word Limit specified for each in the Parenthesis.
Content of the Question is more important than length.
(Specimen Answer Booklet - For Practice Purpose Only)

उम्मीदवारों
इस कॉपी पर
नहीं लिखना
चाहिए
Candidate
must not
write on the
margin

• Medical application

→ use of light waves for detection & treatment of disease.

Use of
robotic
arms

• Technical application

→ modernization of detection, prediction and data collection via LIDAR.

Explain limitation
part as well
to fetch good
marks

LIDAR's advantages allow for many practical uses and must be encouraged for societal benefit, along with scientific endeavour.

Good
Conclusion
as per
demand

55

Please do not
write anything else
in this space
कृपया इस स्थान
में प्रश्न संख्या के
अतिरिक्त कुछ
न लिखें।

UPSC

Answer Questions in NOT MORE THAN the Word Limit specified for each in the Parenthesis.
Content of the Question is more important than length.
(Specimen Answer Booklet - For Practice Purpose Only)

उम्मीदवारों को
इस दफ्तरीय में
कोई लिखना
चाहिए
Candidates
must not
write on this
margin

Q13.

India is entering the age of digitization, speeded up by the covid-19 induced lockdown that forced many people online. Digital technology has major application, especially for agriculture.

do link this with aim of doubling farmer's income

Agricultural Transformation through Digital Technology

① modernization

↳ Data collection & survey of land - this can be carried out using drones and e-filing of measurements

eg: SWAMITVA scheme by ministry of Panchayati Raj

relevant points ↳ weather forecast via various apps

↳ labour demand and supply through digital application eg: ASFFM portal

↳ soil health detection for 'aware' agriculture eg: soil health card scheme

to avoid crop loss
monitor demand of irrigation fertilizers, harvest etc

Please do not
write anything except
the question number
in this space.
कृपया इस स्थान
में प्रश्न संख्या के
आवधिक कुछ
न लिखें।

UPSC

Answer Questions in NOT MORE THAN the Word Limit specified for each in the Parenthesis.
Content of the Question is more important than length.
(Specimen Answer Booklet - For Practice Purpose Only)

उम्मीदवारों को
इस हाशिये में
कोई लिखना
चाहिए
Candidates
must not
write on this
margin

↳ sharing of best practices / experiences via net } to improve product quality

↳ sharecropping / tenant money transfers through digital payment.

↳ DBT ~ greater fiscal & digital inclusion of the poor.

↳ online land dispute resolution

↳ using digital world for greater agri-based knowledge & enhancing skill

} crop monitoring
link with
optimization
use of
resources

⊙ Organization of Agriculture

↳ using digital media like Over-the-Top (OTT) platforms for connecting with neighbouring farmers.

↳ collectivization of fields for cooperative farming and using online communication to build trust & stay connected.

↳ sharing / logging of proceeds from farms digitally, to enhance transparency and accountability.

Relevant
Points
covered

UPSC

Answer Questions in NOT MORE THAN the Word Limit specified for each in the Parenthesis.
Content of the Question is more important than length.
(Specimen Answer Booklet - For Practice Purpose Only)

उम्मीदवारों को
इस हार्डिए में
नहीं लिखना
चाहिए
Candidates
must not
write on this
margin

with digital technology various
agricultural goals can be achieved:-

- ① Sustainable agriculture
- ② Community agriculture
- ③ Reduced land disputes
- ④ Enhanced productivity
- ⑤ Reduced uncertainty (and farmer suicides)

Valid
Add some steps taken
by government
→ PMKSY
→ HRS sensor
to monitor
soil health
etc.

modernization & organization of Agriculture
through digital technology is the
route to a sustainable & beneficial
Evergreen Revolution in agriculture.

Pair
to improve
link with
sociality &
livelihood

5

(Please do not write anything except the question number in this space)
कृपया इस स्थान में प्रश्न संख्या के अतिरिक्त कुछ न लिखें।

UPSC

Answer Questions in NOT MORE THAN the Word Limit specified for each in the Parenthesis.
Content of the Question is more important than length.
(Specimen Answer Booklet - For Practice Purpose Only)

मौदकारों को इस शीर्षक में नहीं लिखना चाहिए।
Candidates must not write on this margin

Q14.

Geospatial technology refers to systems that use topography, space, geography to calculate and collate objective data. It involves satellite technology, drones, etc.

Vague intro
Link this with remote sensing, Global information system

Geospatial Technology - Role in Growth

① Economic impact

↳ using geospatial technology to plot and combine infrastructural projects, etc.

eg: GATI shakti

↳ use of geospatial technology for internet dissemination, satellite-web and enhancing inclusion in the digital space.

All relevant points covered

② Agricultural impact

↳ SWAMITVA scheme uses drone imagery to digitalize land records - reduce litigation.

Land Use Management

(Please do not
write anything except
the question number
in this space)
कृपया इस स्थान
में प्रश्न संख्या के
अतिरिक्त कुछ
न लिखें।

UPSC

Answer Questions in NOT MORE THAN the Word Limit specified for each in the Parenthesis.
Content of the Question is more important than length.
(Specimen Answer Booklet - For Practice Purpose Only)

उम्मीदवारों को
इस हॉशियर में
नहीं लिखना
चाहिए
Candidates
must not
write on this
margin

↳ obtaining quality of soil / water /
weather and cropping accordingly

↳ using geospatial tech to connect
agri with industry

→ transport
→ logistics
→ cold storage
→ movement of goods
(real time information).

through
monitoring
via
satellite

② wildlife conservation

↳ assessing forest cover / rate of
deforestation

↳ measuring impact of conservation
on various ecosystems
eg: Himalayas

Link these points
with disaster
management
Biodiversity
conservation
etc

Roadblocks in leveraging GS Tech.

① Requires high level technology
development

② skilled manpower + capital intensive

③ Involves security concerns

eg: use for organized crime /
terrorism.

Link with lack
of super computers
& Quantum
computers.

Please do not
write anything except
question number
in this space
कृपया इस स्थान
में प्रश्न संख्या को
अतिरिक्त कुछ
न लिखें।

UPSC

Answer Questions in NOT MORE THAN the Word Limit specified for each in the Parenthesis.
Content of the Question is more important than length.
(Specimen Answer Booklet - For Practice Purpose Only)

उम्मीदवारी को
इस इलाक़े में
नहीं लिखना
चाहिए
Candidates
must not
write on this
margin

② Inadequate market

Elaborate!
No demand for geo spatial services

However, the government has recently released a notice on Drone Rules

Try to give more specific effort by government
Like
↳ National Geo Spatial Policy
↳ Indian Satellite Policy etc

(2021) which
- deregulates the market for drones
- encourages private investment
- pushes indigenous production

The new legislation creates space for the growth of geospatial technology but more incentives are required for the benefits to translate into growth of all sectors of Indian economy

Fail to improve it by mentioning
↳ re-skilling
↳ data security
↳ Privacy enhancement
etc

Give equal weightage to all parts of Question

4.5

Please do not
write anything except
the question number
in this space.
कृपया इस स्थान
में प्रश्न संख्या के
अतिरिक्त कुछ
न लिखें।

UPSC

Answer Questions in NOT MORE THAN the Word Limit specified for each in the Parenthesis.
Content of the Question is more important than length.
(Specimen Answer Booklet - For Practice Purpose Only)

उम्मीदवारों को
इस हाशिए में
नहीं लिखना
चाहिए
Candidates
must not
write on this
margin

Q15.

Robotics is the field of technological development that deals with the use of 'robots' - mechanical devices that carry out machine learning to interact with the human world.

Potential of Robotics

① enhanced precision & accuracy which can save lives in the medical field (medical operation, etc).

② no emotional interference ensures peak performance at all times.

③ Inability to lie / manipulate makes robots trustworthy, transparent.

④ mechanical / repetitive operations can be given to robots → lower effort.

⑤ more labour is left to be skilled and spend effort on entrepreneurship and further creation - thereby enhancing efficiency.

Page

UPSC

Answer Questions in NOT MORE THAN the Word Limit specified for each in the Parenthesis.
Content of the Question is more important than length.
(Specimen Answer Booklet - For Practice Purpose Only)

उम्मीदवारों को
इस खणिक में
नहीं लिखना
चाहिए।
Candidates
must not
write on this
margin

India has progressed immensely in the field of robotics :-

① Application in industry - to carry out basic operations. *ex?*

② Creation of "human" robot that can communicate at basic level with humans.

③ robotics in the field of medicine and senior citizen care.

Some challenges faced in Robotics

① Lack of emotional intelligence creates a communication void between robot & human and may result in social errors.

eg: In Bollywood movie, Reinikant robot saves life of lady in burning building but erodes her dignity because she is unclothed.

② fear of excessive machine learning leading to supreme intelligence and dominance of robots.

Please do not
write anything extra
in this space.
प्रश्न इस स्थान
पर नहीं लिखने
किए।

UPSC

Answer Questions in NOT MORE THAN the Word Limit specified for each in the Parenthesis.
Content of the Question is more important than length.
(Specimen Answer Booklet - For Practice Purpose Only)

उम्मीदवारों को
इस हार्डिप में
नहीं लिखना
चाहिए।
Candidates
must not
write on this
margin

⑥ Ethical concern - should humans
be devising such creations which
should be brought about by God?

⑦ Accessibility to all - inequality
in distribution of benefits makes
this field more divisive than
beneficial.

Despite the challenges, robotics
is a field of great potential.

If done ethically, the progress of
robotics can enhance growth
through efficient & sustainable
use.



Write anything except
the question number
in this space.
कृपया इस स्थान
में प्रश्न संख्या को
अतिरिक्त कुछ
न लिखें।

UPSC

Answer Questions in NOT MORE THAN the Word Limit specified for each in the Parenthesis.
Content of the Question is more important than length.
(Specimen Answer Booklet - For Practice Purpose Only)

इस कॉमिंग में
नहीं लिखना
चाहिए
Candidates
must not
write on this
margin

Q16.

Unmanned Aerial Vehicle (UAVs)

are another name for "drones".
these are used mostly in the military
for the purpose of surveillance and
tracking of enemy movement. But
they can also be used in other fields.

fair
in trap

Other Uses of UAVs:-

① Agriculture ~ surveying land,
soil quality, weather, humidity,
etc.

crop survey
spray pesticide
fertilizers
etc

All valid
Points

② Wildlife Conservation ~ drones are
a good way to track wildlife from
a distance and collect data.

flora &
fauna

here you can
mention areas
like Health,
Disaster management
etc

③ Aerial Seeding ~ use of clay-covered
seeds and spraying these in unreachable
terrain for afforestation -
eg: rugged mountains/hilly area

④ Rural dispute resolution ~ eg. SWAMIVA
is using drones to digitize land records.

Please do not
do anything else
in this space
कृपया इस स्थान
पर प्रश्न संख्या के
अतिरिक्त कुछ
न लिखें।

UPSC

Answer Questions in NOT MORE THAN the Word Limit specified for each in the Parenthesis.
Content of the Question is more important than length.
(Specimen Answer Booklet - For Practice Purpose Only)

उम्मीदवारों को
इस हाशिए में
नहीं लिखना
चाहिए
Candidates
must not
write on this
margin

② surveillance near critical infrastructure
units like industrial regions,
nuclear power plants, etc.

③ illegal uses :- used for organized
crime, terrorism, stalking, etc.

measures by Indian Government

④ legislation, deregulation of drone
usage :-

① Drone Rules 2021

② expands market for drones

③ invites private participation

④ encourages indigenous production,
reduction of imports.

⑤ reduces redtapeism (need for
paperwork, etc)

⑥ Encouraged usage of drones
in varied sectors like agriculture,
industry.

no mention about
Drone regulation
& focus areas
like Digital Sky
Platform
& iXcohen

elaborate your
points in
brief

UPSC

Answer Questions in NOT MORE THAN the Word Limit specified for each in the Parenthesis.
Content of the Question is more important than length.
(Specimen Answer Booklet - For Practice Purpose Only)

① call for make in India and
push for industrialization of
production.

However, more is required for
beneficial use of UAVs:-

- ② Design linked Incentive (DLI)
for drone production and indigenization.
- ③ Incentivize use of drones in
agriculture, industry, etc.
- ④ curtail illegal/harmful use.

UAVs are a technical solution to
various issues faced by sectors in agri
economy, and must be harnessed
to improve it mentioning new & exciting
application which can propel
Indian economy.

5

UPSC

Answer Questions in NOT MORE THAN the Word Limit specified for each in the Parenthesis.
Content of the Question is more important than length.
(Specimen Answer Booklet - For Practice Purpose Only)

उम्मीदवारों को इस कॉलम में नहीं लिखना चाहिए
Candidates must not write on this margin

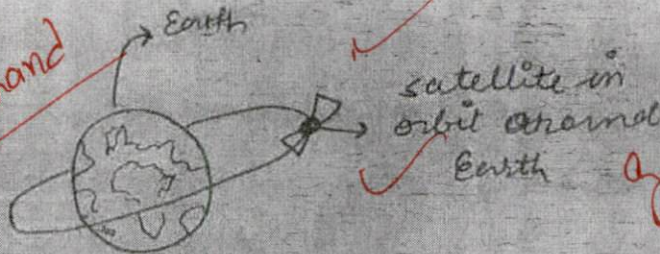
917

Remote sensing satellites are satellites sent into orbit for diversified purposes like imaging, defence, etc.

Mention Basic working principle of Remote sensing Satellite

Advantage & Applications of Remote Sensing Satellites

How it works :-



Types of satellites

- (a) geosynchronous → seem to be above a single point on Earth.
- (b) geostationary → a geosynchronous satellite at 0° latitude
- (c) Polar orbit
↳ near poles
- (d) low earth / lagrange point orbits ~ distance from Earth.

do mention some Advantage of remote sensing as per demand

- ↳ Data acquisition
- ↳ Saving time
- ↳ Monitoring etc

निम्नलिखित में से
एक प्रश्न चुनिए
और इस स्थान
में उत्तर लिखिए।
अतिरिक्त कुछ
न लिखिए।

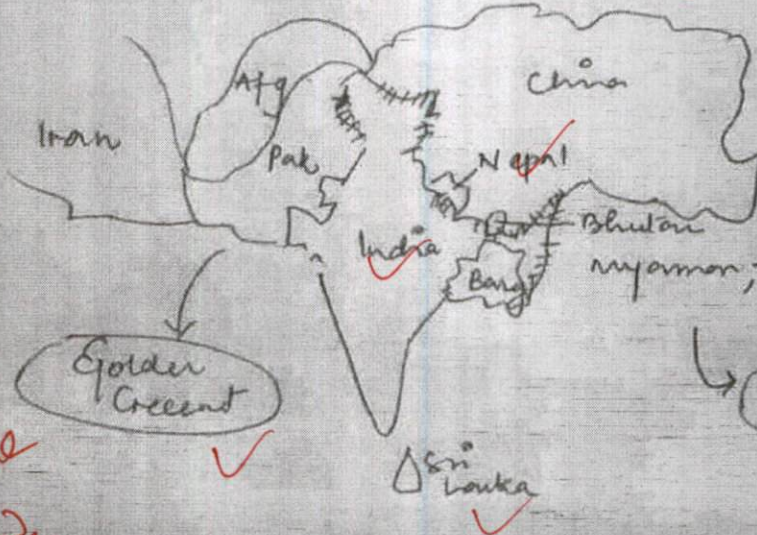
UPSC

Answer Questions in NOT MORE THAN the Word Limit specified for each in the Parenthesis.
Content of the Question is more important than length.
(Specimen Answer Booklet - For Practice Purpose Only)

उम्मीदवारों को
इस स्थान में
उत्तर लिखना
चाहिए।
Candidates
must not
write on this
margin

① Use in defence

↳ A geosynchronous satellite can monitor the neighborhood of India



- Army ✓
- Airforce ✓
- Navy ✓

Nice ✓

all valid
points are
covered ✓

↳ porous borders can be monitored to control illegal movement - means of policing and support to various forces eg: BRO, ITBP, etc.

② Use in weather forecasting, etc. to enhance agricultural development, support Disaster management forces and wildlife conservation.

here you can add
coastal, ocean
application
(sea ice, waves etc)
↳ Agriculture
sector
etc

③ Use in navigation (eg: USA's Global Positioning System) for civilian purposes.

Please do not
write anything except
the question number
in this space)
कृपया इस स्थान
में प्रश्न संख्या के
अतिरिक्त कुछ
न लिखें।

UPSC

Answer Questions in NOT MORE THAN the Word Limit specified for each in the Parenthesis.
Content of the Question is more important than length.
(Specimen Answer Booklet - For Practice Purpose Only)

उम्मीदवारों को
इस हिसाब में
नहीं लिखना
चाहिए
Candidates
must not
write on this
margin

India's Remote Sensing Satellites

NAVIC ~ Navigator with Indian
Constellation ~ group of 7 satellites
for GPS-like services in the Indian
subcontinent region.

NISAR ~ NASA-ISRO satellite with purpose
of geospatial logging to analyze
climate change effects. [Earth Observation]

India continues to aim for more
launches to enhance geospatial technology
through remote sensing, not just for
defence requirements but also for
civilian benefit.

Social, Political
Environmental
development

4

Write anything except
the question number
in this space.
कृपया इस स्थान
में प्रश्न संख्या के
अतिरिक्त कुछ
न लिखें।

UPSC

Answer Questions in NOT MORE THAN the Word Limit specified for each in the Parenthesis.
Content of the Question is more important than length.
(Specimen Answer Booklet - For Practice Purpose Only)

उम्मीदवार को
इस स्थान में
प्रश्न संख्या
नहीं लिखनी
चाहिए।
Candidates
must not
write on this
margin

Q18.

India is ranked 40th worldwide
on the Global Innovation Index by WIPO,
as per 2022 report. It has improved
consistently for around a decade.

Why do we need innovation?

① Economic Benefits

a) innovation leads to indigenization
and domestic production.

b) reduction in import dependence

c) lowers foreign exchange

d) supply chain independence

e) increased industrial efficiency, productivity

② Social Benefits

a) Reduced unemployment due to
greater availability of jobs.

b) Job growth parallel to GDP growth
will ensure best use of demographic
dividend of India.

You can link these
points with how
it help during
COVID.
growth in
investment & GDP
in recent
past

UPSC

Answer Questions in NOT MORE THAN the Word Limit specified for each in the Parenthesis.
Content of the Question is more important than length.
(Specimen Answer Booklet - For Practice Purpose Only)

उम्मीदवारों को
इस हारा में
नहीं लिखना
चाहिए
Candidates
must not
write on this
margin

c) Innovation leads to better policies
for people, better societal results
due to spillover effects of growth.

d) greater prestige from brand name
expansion as India exports its goods

⑥ Other Sectors

a) Agricultural innovation

eg: sprinklers, Happy Seeders,
PUSA decomposers

b) Science & Tech - space

research, satellite development,
environment protection

c) Medicine - biotechnology,

innovation in vaccines, treatment
of NCDs and Neglected Tropical
Diseases.

d) Education, msme, rural/
RURBAN growth, transport, etc.

All these developments enhance
India's self-reliance or Atmanirbharata.

India has taken various steps to
enhance - create a conducive
environment for innovation.

UPSC

Answer Questions in NOT MORE THAN the Word Limit specified for each in the Parenthesis.
Content of the Question is more important than length.
(Specimen Answer Booklet - For Practice Purpose Only)

- ① make in India initiative
- ② Incentive to indigenous products
eg: one district one product (ODOP)
- ③ Start Up India - boost to new ideas
- ④ initiatives like Shark Tank to
give encouragement to innovative ideas
- ⑤ focus on STEM subjects and
incentivizing female participation
through schemes like WEST, Vigyan
Jyoti, CURIE, etc.
- ⑥ Push to public-private partnership,
(PPP) as per Kelkar Committee Report.

Innovation is the future of
development and the panacea for
Atmanirbhar Bharat.

7

here you can
add
Atal innovation
mission / IITs
NIDHI program
Smart India
Hackathons
etc

You can
add effect
of it like
growth of
start up &
unicorns

Please do not
write anything above
the question number
in this space.
कृपया इस स्थान
में प्रश्न संख्या के
अधिकतम कुछ
न लिखें।

UPSC

Answer Questions in NOT MORE THAN the Word Limit specified for each in the Parenthesis.
Content of the Question is more important than length.
(Specimen Answer Booklet - For Practice Purpose Only)

उम्मीदवारों को
इस प्रश्न में
नहीं लिखना
चाहिए,
Candidates
must not
write on this
margin

Q19.

good intro

Genetically modified organism
(Gmos) are synthetically altered
genes meant to enhance various
features of crops like drought resistance,
weed resistance, etc. This has both
solutions & challenges to Indian agrarian
system and condition of nutrition.

Existing Systemic Issues

① agrarian situation

↳ small land size:-

~ 80% of farmers hold small to
marginal sized landholdings of
< 0.5 ha.

relate these
points with
Question how
can crop can solve
these problem
& bring this
part as well

↳ low productivity of land
↳ high dependence on monsoons
↳ monocropping, dependence on
MSP / FFP.

② malnutrition

↳ Anaemia : $\frac{1}{2}$ of Indian women
in age group 15-35 are anaemic.

Please do not
write anything above
the question number
in this space.
कृपया इस स्थान
में प्रश्न संख्या के
अतिरिक्त कुछ
न लिखें।

UPSC

Answer Questions in NOT MORE THAN the Word Limit specified for each in the Parenthesis.
Content of the Question is more important than length.
(Specimen Answer Booklet - For Practice Purpose Only)

उम्मीदवारों को
इस सीट पर से
कोई लिखना
चाहिए।
Candidates
must not
write on this
margin

↳ India ranked 132 on Human
development Index (HDI) and 116
on Global Hunger Index (GHI).

↳ high prevalence of stunting, wasting
amongst children.

~ 28% of world's multi-
dimensional ~~poor~~ poor are in India.

Gm Agriculture ~ Benefits

① Increased productivity of agriculture
(so small landholdings can be
economized)

↳ enhance returns to small farmers.

② Reduced need for fertilizer/pesticide

↳ reduced costs to farmers.

↳ reduced subsidy burden on govt.

③ Reduced dependence on erratic
rainfall & monsoon (El Niño).

④ Proportionate can resolve issue
of malnutrition. eg. iron to reduce
anaemia.

⑤ Introduce multi-cropping - increased
nutritive diversity amongst the poor.

relevant points
discussing it by
adding

↳ high income to farmer
↳ long shelf life
↳ improved taste &
conversion issue

Food security

Pest resistance

Answer Questions in NOT MORE THAN the Word Limit specified for each in the Parenthesis.
Content of the Question is more important than length.
(Specimen Answer Booklet - For Practice Purpose Only)

Challenges with GM crops

① Ethical Concerns :- playing God?
by manufacturing plants. } Health issue

② Fear of development of invasive species, loss of biodiversity, loss of natural habitat, side effects, etc. [One Health concept, WHO]

③ unequal access to benefits may make efforts futile. } monopoly of companies

④ legislative issues ~ India's IP rights, GEAC approval, etc take time.

Fair conclusion
GM crops come with some challenges
India needs much more than just
Bt cotton and GM-mustard to
achieve agrarian goals and solve SDG
1 (Poverty), SDG 2 (Hunger)
and SDG 3 (Health).

55

(Please do not
write anything above
the question number
in this space)
कृपया इस स्थान
में प्रश्न संख्या के
अतिरिक्त कुछ
न लिखें।

UPSC

Answer Questions in NOT MORE THAN the Word Limit specified for each in the Parenthesis.
Content of the Question is more important than length.
(Specimen Answer Booklet - For Practice Purpose Only)

उम्मीदवारों को
इस हॉरियर में
नहीं लिखना
चाहिए
Candidates
must not
write on this
margin

Q20.

Artificial Intelligence is the use
of machines, machine learning, etc
for various tasks like in fields like
medicine, defence, education,
industry etc.

Good in 120

Application of AI

① Used to carry out basic tasks
in industry, eg:- repetitive operation.

Automobile
etc

② Used in recruitment of individuals
for jobs.

③ Interaction with humans in fields
like senior citizen care, etc.

Health

④ Defence applications, security based
on voice, actions, behaviour etc.

⑤ Mapping human behaviour for
industrial ends like market expansion
and price discrimination.

⑥ Medical applications - disease
treatment, etc.

Ethical issues with AI

① Fear of exponential intelligence growth - what if robots become smarter than humans? Ullmann consequences.

② Racial Discrimination - AI tends to work on human patterns - so if a company has been discriminatory in the past, AI will follow the same bias.
Transparency etc

③ Emotional Intelligence and the rights of AI - should they be treated as humans? Should they get some rights as citizens?
digital behaviours

Challenges of AI adoption in India:-

- ① Inadequate spending on Research & development (around 1% of GDP only)
qualified workforce
- ② lack of demand in Indian market & industry
- ③ Absence of legislation in AI

(Please do not
write anything except
the question number
in this space)
कृपया इस स्थान
में प्रश्न संख्या के
अतिरिक्त कुछ
न लिखें।

UPSC

Answer Questions in NOT MORE THAN the Word Limit specified for each in the Parenthesis.
Content of the Question is more important than length.
(Specimen Answer Booklet - For Practice Purpose Only)

उम्मीदवारों को
इस शीट पर वे
नहीं लिखने
चाहिए
Candidates
must not
write on this
margin

② No means of fair distribution
of benefits from AI.

mention
awareness
data quality
management
etc

fair
conclusion

NITI Aayog has provided a framework called "AI for All" that encourages fair development of AI and equitable distribution of its gains. These AI can spell out the future of a Smart India and a Digital India.

6



