NEXT IAS

GRADED ASSESSMENT TEST 2025

— (To be filled by candidate) —

TEST CODE : M25GAT03 **TEST NO. : 03**

Name of Candidate: ANANYA RANA

Roll No.: M CAVA25ECL1569 .... Start Time 2:33pm. End Time 4:03 pm

Date of Examination: 6th JULY 2025 .... Mobile N

Q. No.	Maximum Marks	Marks Obtained	Q. No.	Maximum Marks	Marks Obtained
1	10		6	15	
2	10		7	15	
3	10		8	15	
4	10		9	15	
5	10		10	15	
Total Marks : 50			Total Marks : 75		

GRAND TOTAL - ..../ 125   EVAL CODE: .... GRADED DATE: ....

GENERAL INSTRUCTIONS

1. Immediately on receipt of the QCA booklet, please check that this QCA booklet does not have any misprint or torn or missing pages or items, etc. If so, get it replaced by a fresh QCA booklet.

2. Candidates must mention all relevant details like Name, Email, Roll No, Mobile, etc. in the space allocated.

3. Candidate is expected to attempt all 10 questions within the given timeline.

4. Answers must be written in the medium authorized at the time of admission.

5. Candidates must write answers for the specific question under the respective question itself. Any answer written outside the space allotted may not be given credit.

6. Please write neatly. Avoid illegible writing.

7. Do not write/mark irrelevant matters in the QCAB.

8. Only those copies that are submitted on the date of exam till 5 pm will be graded.

REMARKS: ....
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1.

MARKING SCHEME *

Marks Per Ques	Below Average	Average	Above Average
10 Marks	Below 2.50	3.00 - 3.50	4.00 and above
15 Marks	Below 4.00	4.00 - 5.50	6.00 and above

* Subject to change without prior notice.

MACRO COMMENTS

The Purpose of evaluation@nextias.com is to provide constructive suggestions on 'How to improve Answer Writing and thereby score better marks.
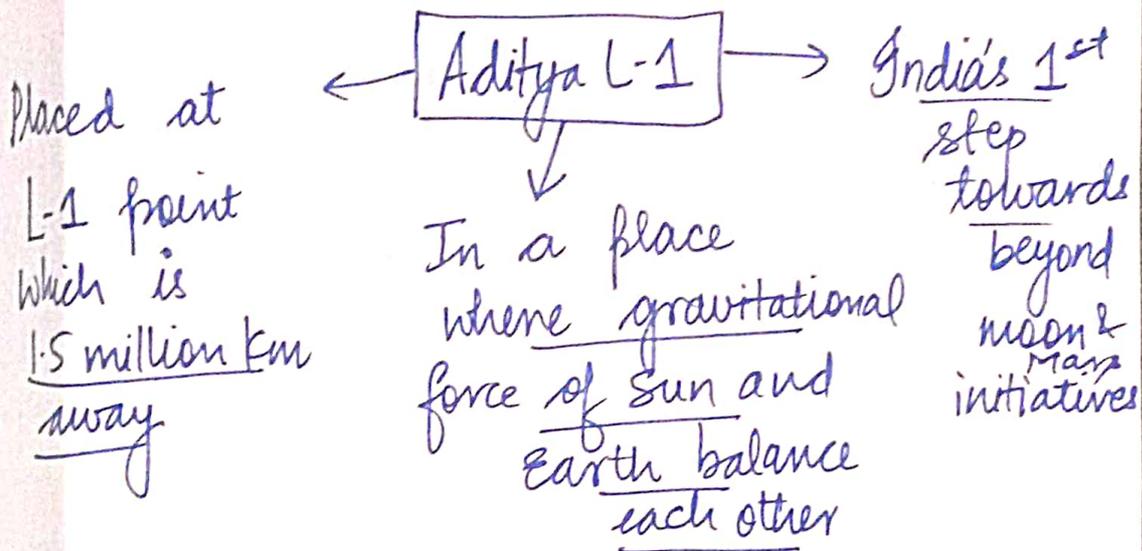
STRENGTHS OF THE CANDIDATE

AREAS OF IMPROVEMENT

IMPROVEMENT SUGGESTIONS

Candidates must not write on this margin

1. Aditya-L1 marks a significant milestone in India's space programme. Discuss its scientific objectives and the broader significance of the mission for India.

(Answer in 150 words) 10 marks

Aditya-L1 is an Indian solar Mission launched by ISRO to enhance understanding about solar phenomenon and its impact on Earth and Universe.

Placed at L-1 point which is 1.5 million km away ← Aditya L-1 → India's 1st step towards beyond moon & Mars initiatives

↓

In a place where gravitational force of Sun and Earth balance each other

Scientific objectives of Aditya L-1 Mission

(1) To study Sun's Corona — Sun's outermost layer.

(2) To enhance understanding about sun spot activity.

③ Close proximity to Sun enabling better data and improved pictures.

④ Studying causes and frequencies of Solar coronal mass ejections

⑤ Employing data to further human space development:

→ ① Better pre-emptive actions against protection from Solar storms

→ ② Boost to Indian Space Agencies - private participation.
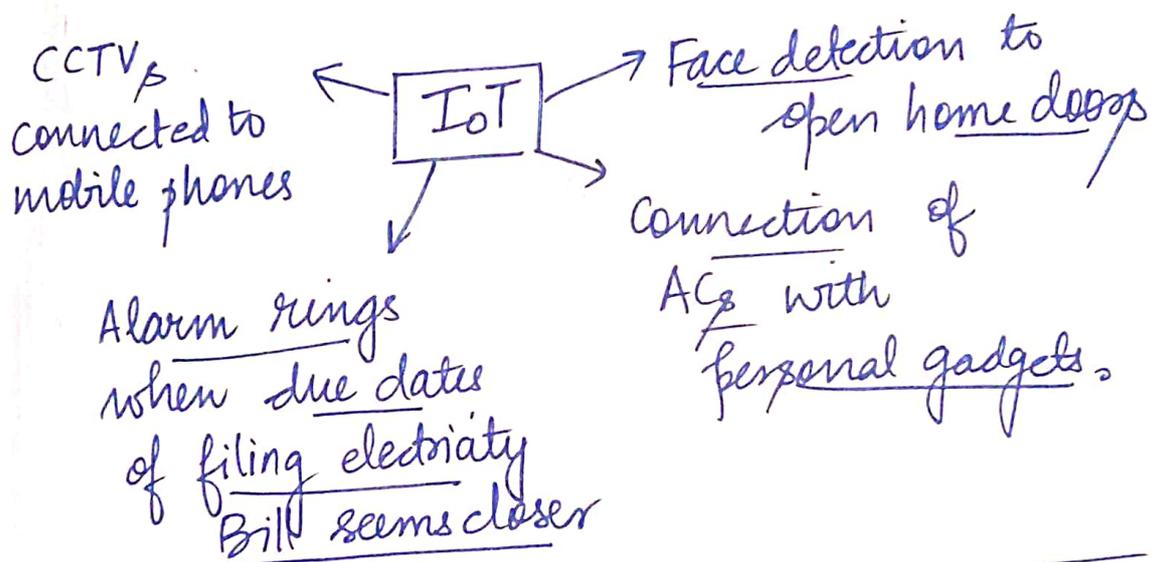
Broader significance of the mission

→ ③ Improved metallurgical research ④ Be panel deployed

→ ④ International collaborations for technological & research exchange ④ USA's NASA.
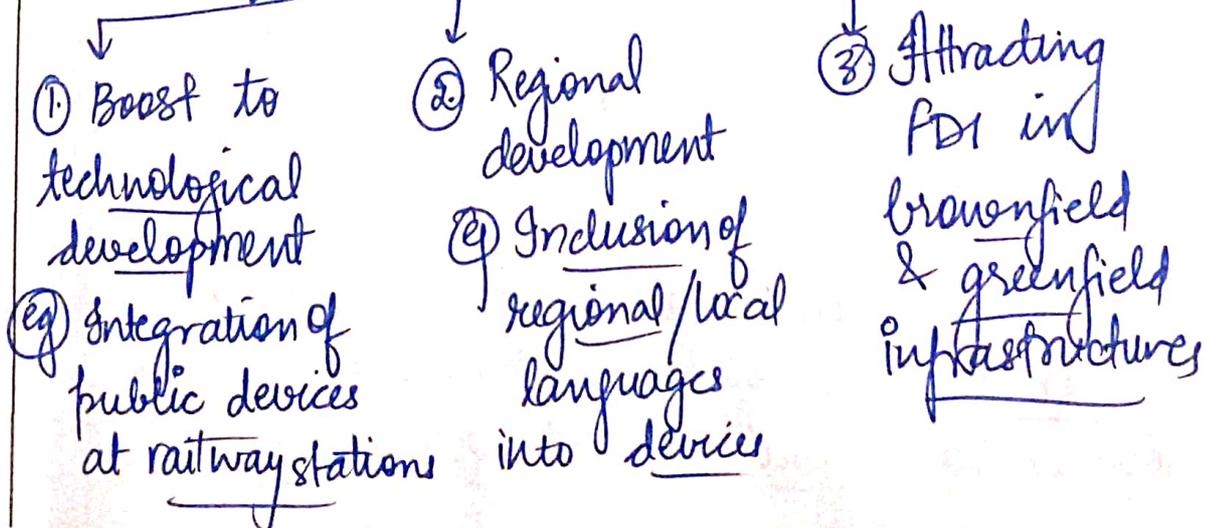
Aditya L-1 is a transforming project for India that upholds the values of innovation and research for 'Good of All'

2. What is the Internet of Things (IoT)? Discuss its transformative potential for India's information infrastructure and evaluate its role in enhancing agricultural productivity.
(Answer in 150 words) 10 marks

Internet of Things refer to the interconnectedness of various digital devices where they function in coordination to implement a particular task.

CCTVs connected to mobile phones

IoT → Face detection to open home doors

Connection of ACs with personal gadgets.

Alarm rings when due date of filing electricity Bill seems closer

Transformative role of IoT for India's information infrastructure

① Boost to technological development
(eg) Integration of public devices at railway stations

② Regional development
(eg) Inclusion of regional/local languages into devices

③ Attracting FDI in brownfield & greenfield infrastructure

④ High demand and more players leading to better competition and quality

⑤ Over the time, decrease in cost of inception

Role of IoT in enhancing agricultural productivity

Potential	Challenges
① Overcoming problem of disguised unemployment — people can be deployed for managing, designing IoT	① Digital divide ⑨ TRAI : digital density Urban — 138% Rural — 58%
② Precision farming: Save resources.	② Digital literacy & local language integration is low
③ High productivity while reducing costs	③ Majority farmers (86%) are small and marginal
④ Promotion of 'Smart farmers' along with 'Smart villages'	④ Internet penetration to remote areas still a challenge.

IoT can be a booster to India's agricultural process by enhancing quality of services via Bharatnet, PM-GDISHA etc.

3. Reusable launch vehicles (RLVs) present both technological promise and challenges. Discuss the hurdles in developing RLVs and outline India's progress in this field.
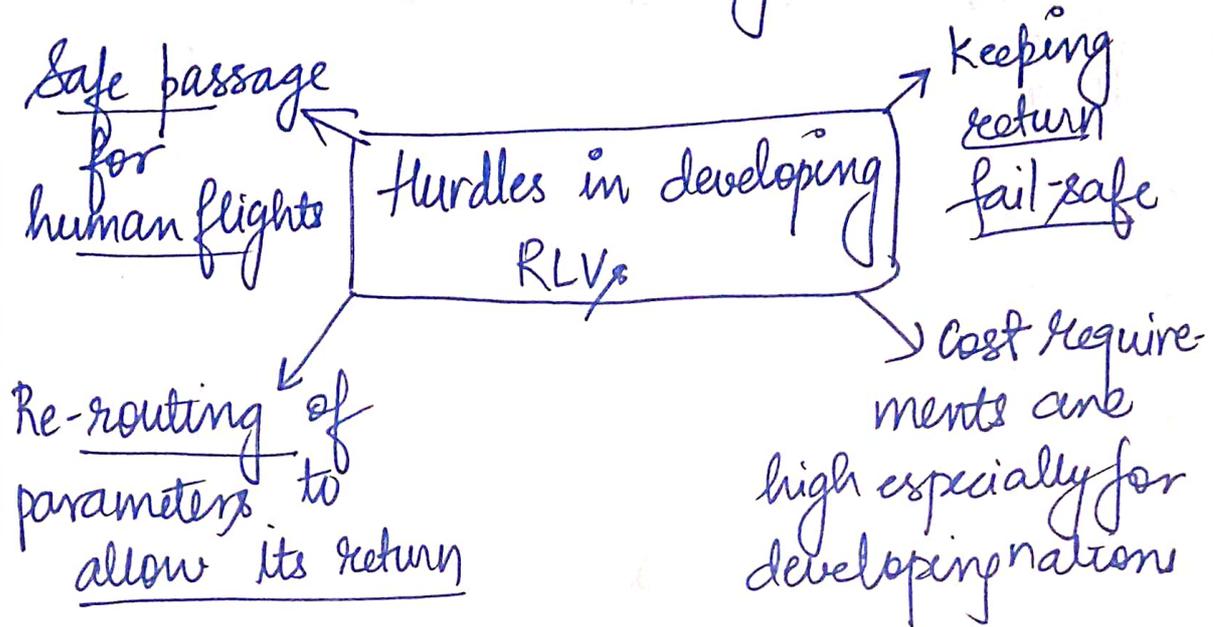
(Answer in 150 words) 10 marks

Reusable launch vehicles are the propelling systems of rockets or spaceships that can be recovered after launch to enable its re-deployment.

eg) Space X has RLVs.

Technological promise presented by RLVs

(1.) Development of metallurgical research that can support high heat and resistance.

(2.) Enhancement in understanding of recovery mechanism

(3.) Reducing costs of launches thus allowing funds for other highend researches.

(4.) International collaboration for better safety mechanisms

(5.) [Reduction in space debris] and prevention of Kessler syndrome.

Safe passage for human flights ← [Hurdles in developing RLVs] → Keeping return fail-safe

Re-routing of parameters to allow its return

Cost requirements are high especially for developing nations

[India's progress in developing RLVs]

(1.) Trials at advanced stage

(2.) Aim to integrate them with Gaganyaan Mission

(3.) National Space Policy – has included development of RLVs as critical part.

India needs to upgrade its funding mechanism by involving private players through InSPACE and providing enough avenues of technology collaborations via diplomatic missions (4) with NASA

4. What is Digital Public Infrastructure (DPI)? Examine how DPI can accelerate India's development and evaluate the initiatives taken to build a digital stack for the agriculture sector.

(Answer in 150 words) 10 marks

Digital Public Infrastructure refers to the inculcation of digital platforms — apps, websites etc. — for public service delivery mechanisms.

eg. Digi Yatra, UPI etc.

Role of DPI in accelerating India's development

Potential	Challenges
① Widening accessibility of public services especially in remote areas ⟶ EduSat for SWAYAM	① Rise in number of financial frauds. ② Digital arrests, cyber slavery
② As a pathbreaker in assuring quality health services ⟶ e-Sanjeevani	② Digital hygiene is not being followed by population - lack of awareness
③ Early warning systems for farmers g. KISAN app	③ Lack of adequate internet penetrability

(4) Towards digital and cashless economy. @ NEFT, RTGS	(4) Local languages need integration
(5) Resilience in events of disaster @ COWIN.	(5) Digital literacy remains low.

Initiatives taken to build digital stack for Indian agriculture

	Positives	Challenges
① Agristack — Farmers' Id — Krishi Decision Support System — Crop Registry	• Interoperability of data • Real time support	• Internet literacy with farmers is low
② National Digital Agriculture Mission → to integrate data from various sources related to agriculture	• Promote precision and climate smart agriculture • Increasing farmer's income	• Privacy concerns • Fear of farmer exploitation by insurance companies

Development of digital infrastructural needs integration with physical one to help the population utilise 'phygital' infrastructure for an inclusive and equitable growth

5. India's proposed mission to Venus poses multiple challenges. Discuss the scientific and technological difficulties associated with exploring Venus. (Answer in 150 words) 10 marks

India has proposed 'Shukrayaan' mission to Venus to study its atmosphere and other landforms.

Multiple challenges to Shukrayaan mission

(I•) Scientific

(1) Long distance mission requires precision of parameters and conditions

(2•) Less avenues for international collaborations due to geopolitical turmoil and space race among countries.

(3•) Also Inadequate funding mechanisms for such long-gestational projects.

(4.) Environment of Venus is difficult to study.

Technological

(1.) **Fuel and metallurgical** requirements for such a long distance project.

(2.) Post mission **analytics of complex** data for meaningful research.

(3.) **Cooling systems** as Venus is the ~~most~~ hottest planet of solar system

(4.) Issues of **sustainable missions** for better understanding of the planet.

Measures needed

① Diplomatic balancing to enhance collaborations (4) NASA, ESA etc.

② Taking leaf from prior missions

④ ESA mission.

③ Funding through innovative mechanism like 'Space Bonds'

India can make a breakthrough by working upon its financial and technological impediments and make the 'MOM moment' once again possible.

Operation Sindoor highlighted the decisive role of technology in modern warfare. In this context, examine the technological advancements that contributed to its operational success.
(Answer in 250 words) 15 marks

Operational Sindoor led to a doctrinal shift in India's response to terrorism where deterrence by denial and deterrence by punishment were achieved through India's technological prowess.

No boots on ground ← Modern warfare → Multi-front war

Hybrid warfare

Deployment of electronics
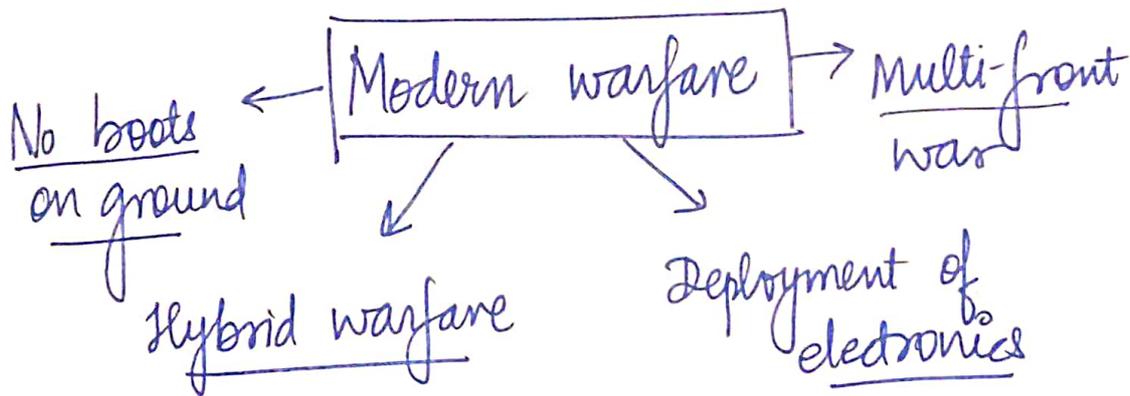
Decisive role of technology in modern warfare

(1) Kinetic capabilities along with non-kinetic mechanisms eg Drones, cyber firewalls

(2) Integration of multiple technological fronts. eg electronic with physical

(3) Precision attacks with minimum collateral damage @ Directed Energy weapons

— Israel's Iron Beam.

(4.) Inter operability of space based and land based surveillance systems
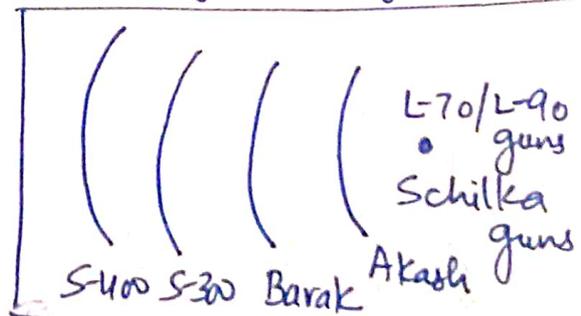
eg AEWCs

(5.) Escalatory dominance via hierarchical improvement of weapon systems.

eg Ballistical missiles, drones etc.

Technological advancements that contributed to operational success of Operation Sindoor

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(1.) Multi-tiered Advanced Air defence system

(2.) A2AD operations via destruction of jammers

S-400 S-300 Barak Akash   L-70/L-90 guns • Schilka guns

(3.) Overwhelming the space via drone swarms eg Harop, Harpy

(4) Kill chain technology deployment

eg Rafale, Su-30oMI9

(5) Managing cyber warfare by

blocking cyber attacks and disinformat

ion campaigns.

(6) SEAD /DEAD missions to ensure

safer path to own planes

(7) Strategic signalling by firing

missiles- Brahmos, Scalpe

(8) Stand off weapons eg Spice 2000

In Operation Sindoor, India
demonstrated credible and complete
dominance over enemy's airspace
which led to the operational
success.

7. Human spaceflight poses unique safety challenges. Discuss the major risks involved in human space missions and outline the steps taken under the Gaganyaan mission to address them. (Answer in 250 words) 15 marks

Recently, Group captain Shubhanshu Shukla became the second Indian to go into space in a mission named 'Axiom 4.0' - Realize the Return along with 3 other astronauts.

Unique safety challenges associated with human space missions

(1.) Disruption to biological mechanisms in micro-gravity environment.

(2.) Safety concerns during upward journey eg sudden jerks during lift off

(3.) Abnormal tissue and cell growth in space due to absence of gravity pull. eg Brain gets fluid accumulation

(4.) [Return to earth] needs the spaceship's passing through extremely heated layer (4) Kalpana Chawla's Colombia met with accident here.

(5.) [Decrease in bone density] of astronauts over longer period of stay.

Steps taken under Gaganyaan Mission to address above challenges

(1.) [Delay in Mission] launch date till ISRO finds all parameters fail-safe.

(2.) [Simulation exercise] of astronauts with Russian facilities.

(3.) [Early flight] of Group Captain Shukla to find any issues of botherance

(4.) Safety of Spaceship being deployed is being checked for all internationally recognised standards.

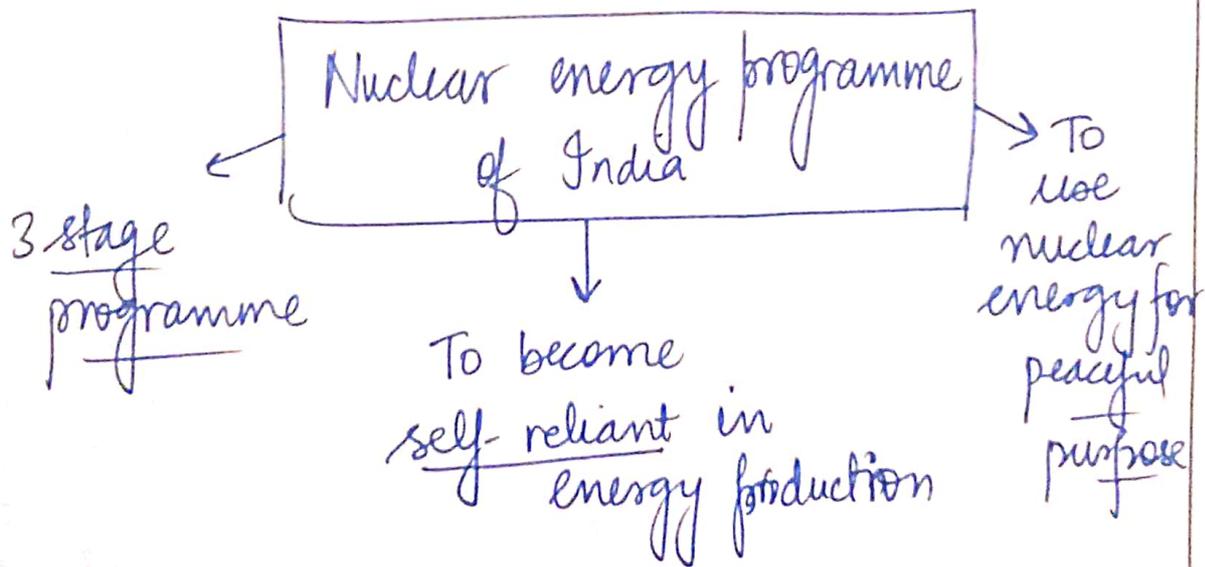(5.) 2 unmanned missions before final manned mission.

(6.) Collaboration with NASA over issues of technology deployment

⑦ ISRO Team is in US as Axiom 4.0 mission is undergoing.

Gaganyaan Mission holds the dreams of 1.46 billion Indians where its successful conduct will not only bring space prowess but will also guide India's ambitious target to have its own Bharat Antariksh station

andidate rite on Intro Body Conc. Total

8. India has made notable progress in nuclear energy. Discuss the technological advancements in this domain and evaluate their contribution to India's developmental goals.

(Answer in 250 words) 15 marks

Union budget 2026 announced the plan to add Small Molecular reactors (SMR) to India's nuclear energy programme and enhance its contribution from 8 GW at present to 100 GW by 2047 in energy mix.

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                    ┌──────────────────────────┐
            ←───────┤  Nuclear energy programme │───────→ To
                    │        of India           │         use
                    └────────────┬─────────────┘          nuclear
  3 stage                        ↓                         energy for
  programme              To become                         peaceful
                     self-reliant in                       purpose
                      energy production
```

Technological developments in nuclear energy by India

(1) Key partner in ITER mission along with other nations to

find breakthrough to <u>nuclear fusion</u>

(2.) |Successful advancement| to <u>2nd stage</u> of <u>nuclear programme</u> .

(3.) Investment in |<u>new nuclear energy plants</u>· (e) Kudankulam in T·N· New announced in Bihar

(4.) |Proposed plan| to <u>include SMRs</u> .

Evaluation of technological advancements in nuclear energy to India's development ·

(I.) |Achievements|

(1.) |Push for energy security| while reducing its <u>import dependence on oil</u>.

(2.) |Commitment to Clean energy| and fulfillment of goal of Net Zero by <u>2070</u>

(3) As a responsible nuclear energy power.

(4) Ensuring reliability of power in energy grid against the fluctuations of solar and wind energy.

Challenges remain

① Potential threat of nuclear waste leakage or nuclear disaster.

eg Chernoboyl, Fukushima etc

② Dependence on foreign players

eg Russia, US, Germany for critical technology.

③ Slow advancement towards increasing contribution eg still only 8 GW added.

India's decision to amend Atomic Energy Act and Civil Nuclear Liability Act will be the steps in right direction to enhance private player participation for energy secure India.
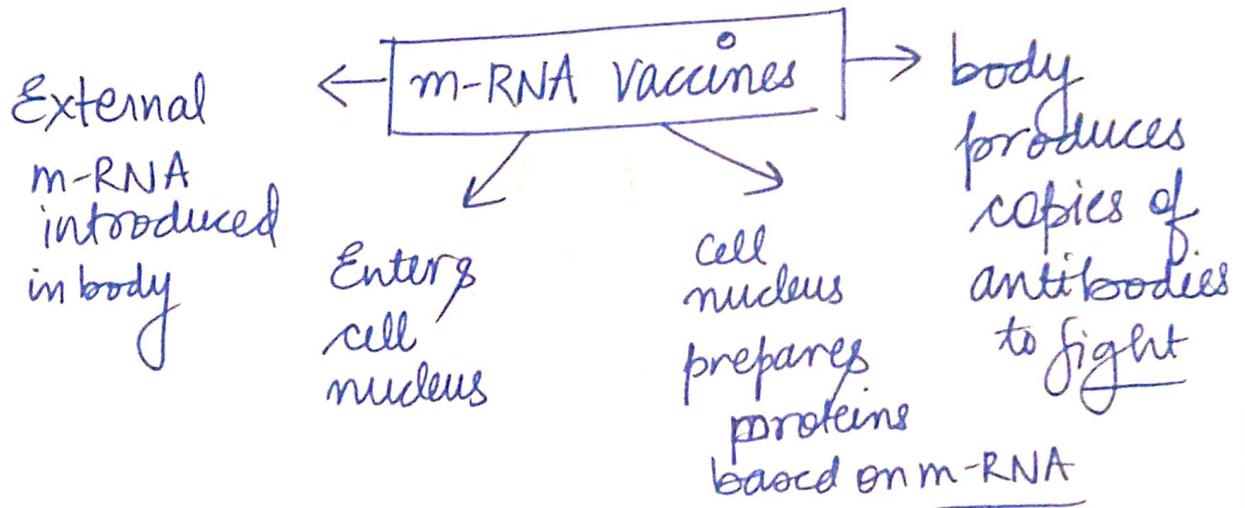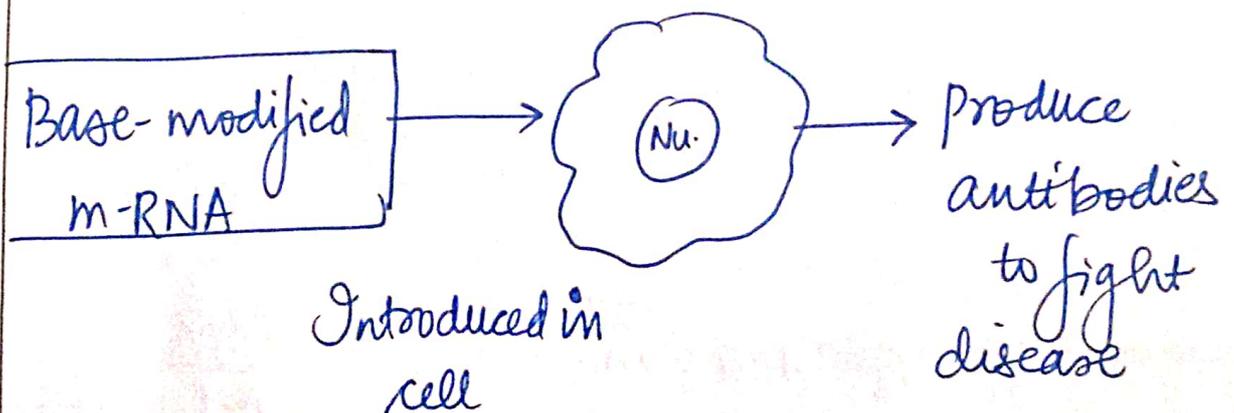
9. What are mRNA vaccines? Explain how they function and highlight how they differ from DNA-based vaccines.
(Answer in 250 words) 15 marks

2023 Noble Prize was given to Kariko and Weissman for their research related to m-RNA that finally led to development of m-RNA vaccines.

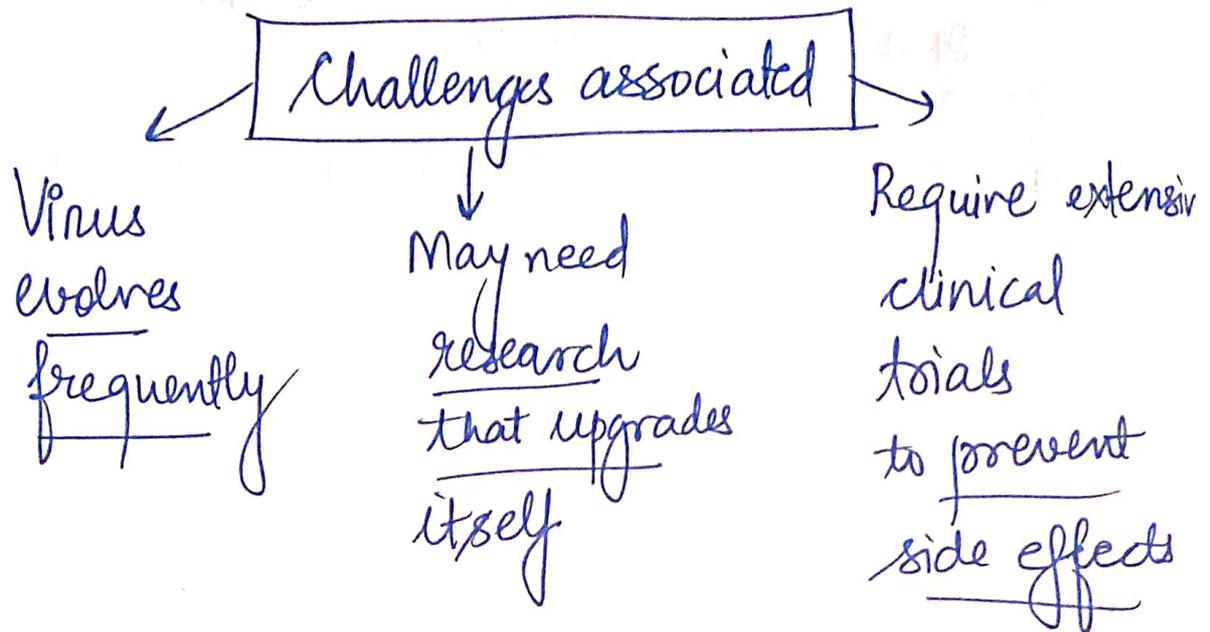External m-RNA introduced in body ← m-RNA Vaccines → body produces copies of antibodies to fight

Enters cell nucleus

Cell nucleus prepares proteins based on m-RNA

Functioning of m-RNA vaccines

Base-modified m-RNA → (Nu.) → Produce antibodies to fight disease

Introduced in cell

Difference between m-RNA and DNA based Vaccines

m-RNA vaccines	DNA based vaccines
(1.) No changes made to genetic structure of the cell.	(1.) Can cause genetic changes which may be passed on to generations
(2.) Easy to modify	(2.) Difficult to make changes
(3.) Modified bases prevent <u>inflammatory response</u> from body.	(3.) They need changes at DNA level.
(4) (eg): Pfizer-Moderna COVID vaccines.	(4)(eg) <u>ZyCOV-D</u> (India's own)

$$\boxed{\text{Challenges associated}}$$

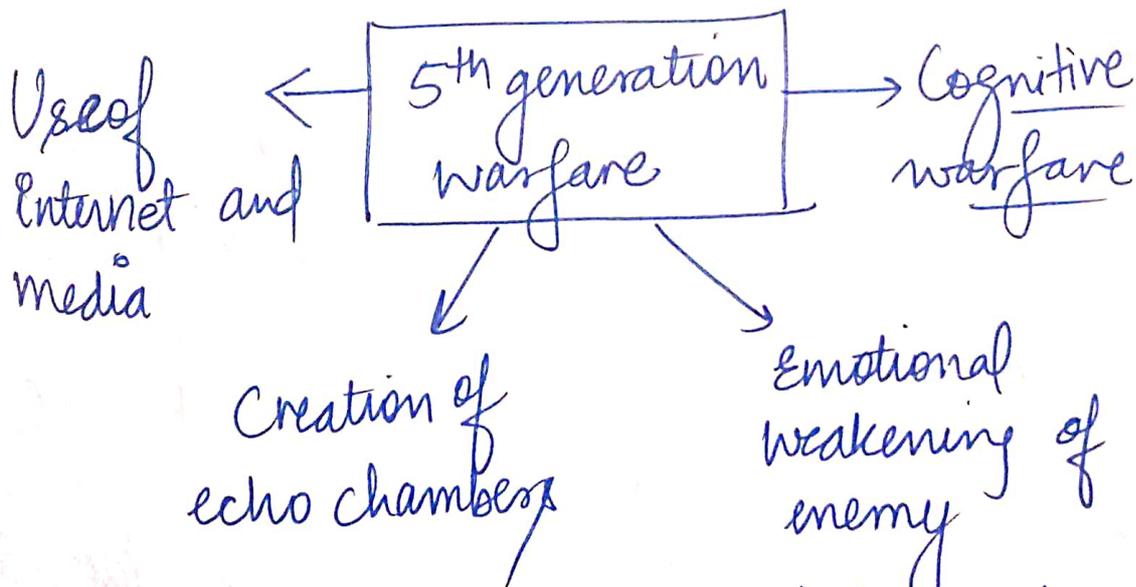| Virus evolves frequently | May need research that upgrades itself | Require extensiv clinical trials to prevent side effects |

Thus, m-RNA vaccines can act as modern day 'Sanjeevani' to prevent attack of viral infections especially in case of pandemics

10. What is fifth-generation warfare? Examine the emerging challenges associated with it and suggest measures India should adopt to strengthen its preparedness.

(Answer in 250 words) 15 marks

Fifth generation warfare refers to the non-traditional threat of security challenges caused by widespread dissemination of disinformation, management of perceptions etc. to cause hurt to enemy.

(eg) China's psychological warfare.

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Use of                  ┌─────────────────┐              Cognitive
Internet and    ←───────│ 5ᵗʰ generation  │──────→       warfare
media                   │    warfare      │
                        └─────────────────┘
                          ↙            ↘
              Creation of           Emotional
              echo chambers         weakening of
                                    enemy
```

This can be integrated with traditional warfare to implict widespread damage.

(1.) Attack on critical information infrastructure

(eg) Mumbai Power grid attack.

(2.) To downgrade morale of other side's forces

(eg) Pakistan's disinfo campaign (Operation Sindoor)

Emerging challenges associated with 5th generation warfare.

(5.) Quantum computing having threat of breaking into existing fail-safe systems

(4.) Sophisticated attacks by dedicated workforce

(eg) China's cyberarmy

(3.) Creation of law and order situation in country at war time

(eg) Pak's false claim that India targetted mosques

Candidates must not
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| Intro : |
| Body : |
| Conc. : |
| Total : |

Candidates
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(1.) Clear policy on 'Cyberwarfare'

(2.) Establishment and strengthening of cyber army

(3.) Use of advanced firewalls to prevent attacks

Measures India should adopt.

(4.) Managing disinformation campaign by authorized briefings
(↳ Operation Sindoor

(5.) Strengthening Fact check Units (↳ PIB

(6.) Proactive citizenry — digital hygiene.

5th generation warfare can be effectively handled with 'Sabka Sath and Sabka Prayas'.