

**IAS MAINS
2020**

GS SCORE

An Institute for Civil Services

UPDATED

ANSWER WRITING WORKBOOK

GS PAPER - III

SCIENCE & TECH

70 **QUESTIONS**
With Model Hints

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SCIENCE & TECHNOLOGY

With the increasing unpredictability of the types of questions being asked in the UPSC IAS examination, it becomes very important for IAS aspirants to begin and continue to practice answer writing. This will prove to be very helpful and fruitful while preparing for the most coveted civil services. The workbooks are designed in a way that enables the students to understand their weak areas and improve upon them.

The workbook is a novel concept brought to you by **GS SCORE** for aiding your preparation and helping you achieve 'the IAS dream'. The workbooks contain sets of questions along with their model answers to help students practice at their convenience. Each question in the workbook covers a topic relevant to the UPSC examination. Thus, it will help aspirants to complete their syllabus holistically through questions and answers.

There are **13 booklets** available to all students for the preparation of the Mains examination.

- They will be **categorized subject-wise** for the benefit and convenience of the students.
- This categorization will also help the students practice the topics they are studying without having to search for them from a huge compilation of uncategorized notes.

► **What is the significance of the practicing answer writing for Mains Examination?**

The Workbooks will help students assess themselves and their preparation while aiding them by providing quality questions for practicing answer writing, which is a very important component of the UPSC Civil Services Examination. Answer writing practice will provide aspirants a clarity and coherency in their answers. Along with that, flow of thought and expressions is also important for writing answers in the UPSC Mains examination, which can only be developed with practice and persistence. With the **GS SCORE Workbook for Science and Technology** aspirants will easily be able to cover the entire syllabus along with improving the quality of their answer writing skills.

► **How will the workbook help serious aspirants?**

The Workbooks have been designed in a way that follows the trends of the UPSC IAS Mains examination giving the aspirants only valuable and holistic practice of answer writing. Each set of the Workbook covers significant portions of the subject in 10-11 questions.

The GS SCORE Science and Technology workbook consists of questions from the following topics:

Science and Technology (7 sets in Total)

Biotechnology (2 sets)

IT/Communications/Robotics (2 sets)

Space and Defence (3 sets)

- Science and Technology- developments and their applications and effects in everyday life Achievements of Indians in science & technology; indigenization of technology and developing new technology.
- Indigenization of technology and developing new technology.
- Awareness in the fields of IT, Space, Computers, robotics, nanotechnology, biotechnology and issues relating to intellectual property rights



SCIENCE & TECHNOLOGY WORKBOOK

SET - 1

QUESTION & ANSWER



Science & Technology (Set-1)

QUESTIONS & ANSWERS

- Q1. What do you understand by Biosimilars? How are they different from generics? Examine why Indian market for Biosimilars is an attractive one.(200 words)
- Q2. What is DNA repair mechanism? Discuss its significance and mechanism. (200 words)
- Q3. What is technology transfer? What are necessary scientific know-how and pre-conditions for it? Discuss its key components which make it success or failure. (200 words)
- Q4. What is germline editing? Discuss the ethical, social and regulatory issues that human germline editing raises. Also, highlight how it is being regulated in India and countries across the world. (200 words)
- Q5. What are the salient features of National Policy on Biofuels 2018? Also briefly explain the expected benefits of policy.(250 words)
- Q6. The National Biotechnology Development Strategy -2015-2020 aims to establish India as a world-class bio-manufacturing hub. What are its salient features? Discuss how it seeks to provide impetus to the growth of biotechnology sector in India.(200 words)
- Q7. What is the Biotech-KISAN and Cattle Genomics programme? Explain the direct and positive impacts of Biotech-KISAN on the lives of Small and Women Farmers. (250 words)
- Q8. Biotechnology has shown immense potential for its utility in various facets of life and military. In this context, explain the relevance of biotechnology for bio-weapons and bio-terrorism.(200 words)
- Q9. The DNA Technology (Use and Application) Regulation Bill, 2018 bill seeks to create a national DNA database for use by the police in solving crimes and identifying missing persons. Critically examine the provisions of bill.(200 words)
- Q10. Now days, there is growing demand of transgenic animals. What are the uses, advantages and disadvantages of transgenic animals?(200 words)

1. What do you understand by Biosimilars? How are they different from generics? Examine why Indian market for Biosimilars is an attractive one. (200 words)

APPROACH

1. Define Biosimilars (30 words)
2. Explain how they are different from generics (40 words)
3. Highlight reasons why Biosimilars are attractive for Indian companies (50 words)
4. Way forward (30 words)

HINTS

Biosimilars are biological medical product which is almost an identical copy of an original product that is manufactured by a different company. Biosimilars are officially approved versions of original "innovator" products, and can be manufactured when the original product's patent expires.

Difference between Biosimilars and Generics:

Biologics are 200 to 1000 times the size of a small molecule (generic) drug.

Molecular weight of biological similar is greater than generics.

Biosimilars are structurally more complex than the generics whose structure is simple and defined.

Biologics and Biosimilars are manufactured in living cells, then extracted and purified, whereas small molecule drugs and generics are manufactured purely via chemical synthesis.

Generics are relatively more stable than Biosimilars as they are sensitive to handling and storage conditions.

To get approval small clinical trials in healthy volunteers is enough for generics against larger clinical trials required for Biosimilars.

Manufacturing quality tests for generics is way lesser than required for Biosimilars.

There is a higher potential for adverse immune reaction in Biosimilars than generics.

Creating imitations is therefore, very difficult in Biosimilars and many of those production details are highly-guarded intellectual property of the company that develops the initial drug.

Why Biosimilars are attractive for Indian companies?

Indian companies, with their already existing low-cost manufacturing capabilities and strengths in small-molecule generics, have entered the Biosimilars field.

It is estimated that 48 biological with sales of US\$73 billion, will lose patent protection in the next decade, making Biosimilars a lucrative market to enter.

Cost is a major advantage for the Indian bio-similar industry. The manufacture and development of a bio-similar molecule in India requires an estimated investment of US\$10 to 20 million, compared to US\$50 to 100 million in developed countries. With cost reductions of around 40% this makes India a very attractive destination for Biosimilars manufacture.

It would also make bio-generics manufacturing an important part of the Make in India initiative.

Indian regulators allowed companies to make biologicals early with minimum of clinical trials.

With the introduction of insulin and erythropoietin Biosimilars, India has proved its capability to be a major contributor to this market.

Biocon Ltd has got regulatory approval to launch the Biosimilar version of insulin glargine in Japan. Getting a successful biosimilar into a developed world market will be a feather in the cap for any Indian company.

Way forward:

India, with 3% of the biosimilar market currently, will have at least 20-25% market share in Biosimilars market over the next five years as more than 100 major Indian pharmaceutical companies are spending largely on research pertaining to biosimilars.

2. What is DNA repair mechanism? Discuss its significance and mechanism. (200 words)

APPROACH

1. Briefly introduce DNA Repair mechanism (30 words)
2. Mechanism of DNA Repair (40 words)
3. Significance of DNA Repair (50 words)
4. Way forward (30 words)

HINTS

Most kinds of damage create impediments to replication or transcription. Altered base causes impairing and can cause permanent alteration to DNA sequence after replication. In order to maintain the integrity of information contained in it, the DNA has repair mechanisms.

Mechanisms of DNA Repair:**Direct Repair:**

The damage is reversed by a repair enzyme which is called photo reactivation. This mechanism involves a light dependant enzyme called DNA photolysis.

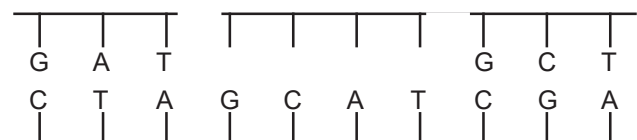
Indirect Repair:

- It includes base excision repair and nucleotide excision repair. Base excision repair system involves an enzyme called N-glycosylase which recognizes the abnormal base and hydrolyses glycosidic bond between it and sugar. Nucleotide repair system includes three steps, incision, excision and synthesis. Incision is done by endonuclease enzyme precisely on either side of the damaged patch of the strand. In this way damaged portion of the strand is cleaved. Endonuclease enzymes involved are UvrA, UvrB which recognize the damaged stretch of the strand. UvrC makes two cuts (incision) on either side. Exonuclease removes the damaged strand. Enzyme involved is UvrD.

- Later, DNA polymerase synthesizes the new strand by using complementary strand as a template. DNA ligase forms phosphodiester bonds which seal the ends on newly synthesized strand.



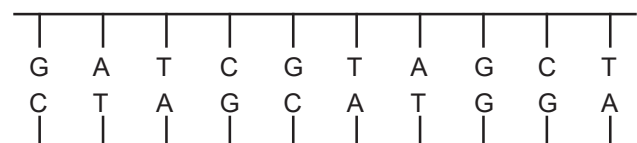
One Strand has a stretch of damaged DNA



Endonuclease cleaves the damaged portion by incision



Exonuclease degrades the damaged stretch. This leaves a gap. In the damaged strand



DNA polymerase synthesizes new strand DNA ligase forms Phosphodiester bonds which seal the ends