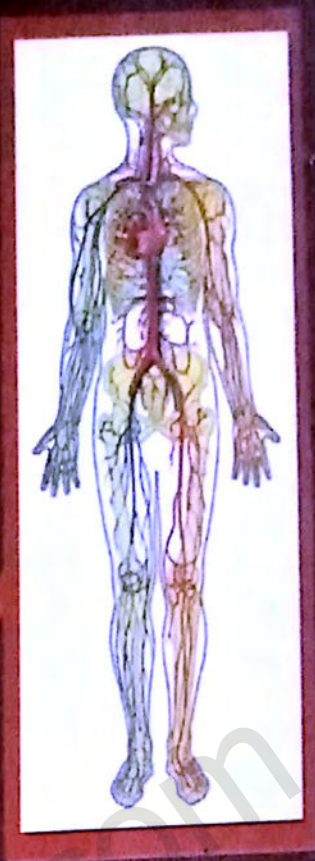




A Hand Book Of

GENERAL SCIENCE 9

**New Classic Publishers
Nowshera**

According to the New Syllabus of all Boards of
Khyber Pakhtunkhwa

A Hand Book of

GENERAL SCIENCE

(New Edition)

FOR CLASS

9

By

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NEW CLASSIC PUBLISHERS
NOWSHERA CANTT

Ph: 610034

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First Edition : 2018

Name of Book : General Science 9

Publishers : New Classic Publishers

Composing : Rashid Muqasir Khan

No of copies : 1000

PRICE: 95/-

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Chapter 1

HISTORY AND NATURE OF SCIENCE

A. Select the best answers for the following questions.

1. Science is originated from a Latin word Scientia, which means to:
a. ✓know
b. Act
c. Teach
d. Behave
2. The Muslim period of science ranges from:
a. 1st to 6th century A.D
b. ✓7th to 13th century A.D
c. 14th to 16th century A.D
d. 17th to 20th century A.D
3. Al-Hawi was the name of book written by:
a. Jabir-bin-Hayyan
b. Bu- Ali-Sina
c. Al-Bairuni
d. ✓Al-Razi
4. Astronomy is the branch of science, which deals with:
a. ✓Heavenly bodies
b. Rocks
c. Living bodies
d. Microorganisms
5. What was the most important approach of Muslim scientists for solving scientific problems?
a. ✓practical and experimentation approach
b. theoretical approach
c. philosophical approach
d. none of these
6. The scientific method of inquiry is different from other methods of inquiry because it:
a. Requires that hypothesis be tested empirically
b. is limited to experimental research
c. does not require revision and retesting of hypothesis that are not fully supported
d. ✓All of the above
7. _____ is a medical test involving the removal of cells or tissues for examination.
a. Sonography
b. X-rays
c. ✓Biopsy
d. M.R.I

8. "Qanoon-al-Masoodi Fil Hayat wan-Najoom" was written by
a. Jabir-bin-Hayyan
b. Bu- Ali-Sina
c. ✓Al-Bairuni
d. Al-Razi
9. "Al- Qanoon Fil-Tib" was written by
a. Jabir-bin-Hayyan
b. ✓Bu- Ali-Sina
c. Al-Bairuni
d. Al-Razi
10. Who was the first physician to describe meningitis?
a. Jabir-bin-Hayyan
b. ✓Bu- Ali-Sina
c. Al-Bairuni
d. Al-Razi
11. Who developed the atomic theory of matter?
a. ✓John Dalton
b. Michael Faraday
c. James Maxwell
d. Charles Darwin
12. Which science deals with matter and energy and describe the material universe in terms of weight, mass etc.
a. Life Science
b. Earth Sciences
c. ✓Physical sciences
d. None of these
13. Dr. Abdul Qadeer Khan was born in
a. ✓1936
b. 1937
c. 1935
d. 1934
14. Which classification of science involves gathering of information through experimentation purely for the pursuit of knowledge?
A. ✓Pure Science
B. Applied Science
C. Technology
15. Which branch of science is also known as biology?
A. Earth Science
B. ✓Life Science
C. Physical Science
16. Which branch of science studies the structure of matter?
A. Chemistry
B. ✓Physics
C. Paleontology

17. Which branch of science studies the relationship of living and non-living things?
A. ☒ Biology B. Chemistry C. Technology
18. The study of weather is called.....
a. Geology b. ☒ Meteorology
c. Biochemistry d. Biology
19. The diameter of Earth was determined by.....
a. Jabir-bin-Hayyan b. Bu- Ali-Sina
c. ☒ Al-Bairuni d. Al-Razi
20. The extraction of iron is a ----- process.
a. ☒ Chemical b. Physical
c. Numerical d. Natural
21. The word science is originated from Latin word "scientia" which means, "to -----".
a. Now b. ☒ Know c. See d. Watch
22. In ---- the World Health Organization (WHO) started a worldwide campaign to eradicate smallpox.
a. 1965 b. 1966 c. ☒ 1967 d. 1968
23. In 1967 the World Health Organization (WHO) started a worldwide campaign to eradicate smallpox.
a. ☒ Smallpox b. TB
c. Diabetes d. Pneumonia
24. Jaber bin Hayyan is considered to be the father of chemistry ----- wrote Kitab al-Mansuri fil-tibb.
a. Jaber bin Hayyan
b. ☒ Muhammad bin Zakriya Al- Razi
c. Ibn-ul-Haitham d. Al- Bairuni
25. ----- is a renowned physicist of all times.
a. Jaber bin Hayyan b. Muhammad bin Zakriya Al- Razi
c. ☒ Ibn-ul-Haitham d. Al- Bairuni
26. "Kitab-Al-Manazir" is famous book of -----.
a. ☒ Jaber bin Hayyan
b. Muhammad bin Zakriya Al- Razi
c. Ibn-ul-Haitham d. Al- Bairuni

27. ----- travelled through subcontinent and recorded his observations in his famous book "Kitab-ul-Hind".
a. Dr. Abdul Qadeer Khan
b. Muhammad bin Zakriya Al- Razi
c. Ibn-ul-Haitham ☒ Al- Bairuni
28. ----- is famous book of
a. ☒ "Qanoon-al-Masoodi Fil Hayat wan-Najoom"
b. Kitab al-Mansuri fil-tibb
c. Kitab-Al-Manazir d. Al- Qanoon Fil-Tib
29. Al- Shifa is the famous book of -----.
a. Jaber bin Hayyan
b. Muhammad bin Zakriya Al- Razi
c. ☒ Bu- Ali- Sina d. Al- Bairuni
30. ----- was also the first physician to describe meningitis.
a. Jaber bin Hayyan b. ☒ Ibn Sina
c. Bu- Ali- Sina d. Al- Bairuni
31. The growth of scientific processes can be divided into ----- periods.
a. One b. Two c. Three d. ☒ four
32. Dr. Abdus -Salam was born in -----.
a. 1925 b. ☒ 1926 c. 1967 d. 1928
33. Dr. Abdul Qadeer Khan was born in -----.
a. ☒ 1936 b. 1937 c. 1938 d. 1939
34. Dr. Ashfaq Ahmad Khan was born in -----.
a. ☒ 1930 b. 1931 c. 1932 d. 1933
35. Dr. Samar Mubarak Mand was born in 1942 in ----.
a. ☒ Rawalpindi b. Lahore
c. Islamabad d. Faisalabad
36. The Islamic world was in the midst of its "-----", between 7th to 13th centuries paving the way for the growth of modern sciences.
a. Mid age b. ☒ Golden Age
c. Historic d. Memorable

- 37.----- Science explains a phenomenon, while applied science determines how a particular phenomenon may be put to use.
- ✓Pure
 - Political
 - Natural
 - Common
- 38.----- is the study of manipulating matter on an atomic and molecular scale.
- Biology
 - Chemistry
 - Physics
 - ✓Nanotechnology
- 39.----- established Global Change Impact Studies Center (GCISC).
- Dr. Abdul Qadeer Khan
 - Muhammad bin Zakriya Al- Razi
 - ✓Dr. Ashfaq Ahmad Khan
 - Al- Bairuni
- 40.----- established Kahuta Research Laboratories (KRL).
- ✓Dr. Abdul Qadeer Khan
 - Muhammad bin Zakriya Al- Razi
 - Dr. Ashfaq Ahmad Khan
 - Al- Bairuni
- 41.----- Established PINSTECH and Centre for Nuclear Studies.
- Dr. Abdul Qadeer Khan
 - Muhammad bin Zakriya Al- Razi
 - Dr. Ashfaq Ahmad Khan
 - ✓Dr Munir Ahmad Khan
- 42.----- travelled through subcontinent and recorded his observations in his famous book "Kitab-ul-Hind".
- Dr. Abdul Qadeer Khan
 - Muhammad bin Zakriya Al- Razi
 - Dr. Ashfaq Ahmad Khan
 - ✓Al- Bairuni

Short Question:

KNOWLEDGE BASE

1. Define Science?

Ans. The word science is originated from Latin word "scientia" which means, "to know". It is an organized form of knowledge obtained by observation and Experimentation. It is the knowledge, which is systematic, tested and brought under general principles

2. Define Chemistry?

Ans. Chemistry: Chemistry deals with the properties, composition, structure and reactions of the matter.

3. What is the meaning of genetics?

Genetics: The study of heredity is called genetics.

4. Enlist some of epidemic diseases?

Ans. Some of epidemic diseases are:

- | | | |
|-----------|--------------|--------------|
| i. Plague | ii. Cholera | iii. Typhoid |
| iv. Polio | v. Pneumonia | |

5. What is genetic engineering?

Ans. Genetic engineering is a process by which the genes of a living thing are modified, or changed.

6. Who was Al- Bairuni and what were his contributions in science?

Ans. Al- Bairuni:

- Al-Bairuni was a great scholar of physics, mathematics, geography and astronomy.
- He travelled through subcontinent and recorded his observations in his famous book "Kitab-ul-Hind".
- In another famous book, "Qanoon-al-Masoodi Fil Hayat wan-Najoom" he has discussed astronomy, solar and lunar motions.
- He has written more than 150 books on various topics.
- His major contribution was to determine the diameter of Earth.

- vi. His observatory was located in district Jhelum of Pakistan.

12. What do you know about Dr. Samar Mubarak Mand?

Ans. Dr. Samar Mubarak Mand:

- i. Dr. Samar Mubarak Mand was born in 1942 in Rawalpindi.
- ii. He joined Pakistan Atomic Energy Commission in 1962.
- iii. During his professional carrier, he earned specialization in Application of Lasers, Fiber Optics Technology, Nuclear Instrumentation, Nuclear Diagnostics and Missile Technology.

13. Explain the work of Dr. Munir Ahmad Khan?

Ans.

Dr. Munir Ahmad Khan:

- i. Dr. Munir Ahmad Khan was born in 1926.
- ii. He participated in various courses of International Institute of Nuclear Technology.
- iii. He also served the International Atomic Energy Agency (IAEA) in Vienna.
- iv. He contributed in the development of Science and Technology by the way of associating himself in the establishment of various research and teaching organizations including PINSTECH and Centre for Nuclear Studies.

14. Define Physical science?

Ans. Physical sciences deal with matter and energy and allow us to describe the material universe in terms of weight, mass, volume and other standard objective measures.

COMPREHENSION BASE

1. Which scientist is known as father of chemistry?

Ans. Jaber bin Hayyan is known as the father of chemistry.

2. Who used opium for anesthesia?

Ans. Muslim scientist Al- Razi was the first man who used opium for anesthesia.

3. What is Meningitis?

Ans. Meningitis is a serious disease in which there is inflammation of the meninges, caused by viral or bacterial infection, and marked by intense headache and fever, sensitivity to light, and muscular rigidity.

4. Nanotechnology is the study of manipulating matter on an atomic and molecular scale.? Briefly elaborate the statement

Ans. Nanotechnology is the study of manipulating matter on an atomic and molecular scale. It deals with developing materials, devices, or other structures possessing at least one dimension sized from 1 to 100 nanometers.

5. Can laser be used to kill the cancer cells?

Ans. Yes Laser technology can be used to kill cancer cells. Lasers can be used in 2 main ways to treat cancer: To shrink or destroy a tumor with heat. To activate a chemical – known as a photosensitizing agent – that kills only the cancer cells.

6. Can human organs be transplanted in other humans?

Ans. Yes, human organs like eye, heart, kidneys and lungs can be transplanted.

Q. Difference b/w pure and applied sciences?

Ans. Pure science, also called basic or fundamental science, has the goal of expanding knowledge in a particular field, without consideration for the practical or commercial uses of the knowledge. By contrast, applied science aims to use scientific knowledge for practical applications, such as curing diseases and developing sources of clean energy.

APPLICATION BASE

1. Which technology is used to kill the cancer cells?

Ans. The Laser technology is used to kill the cancer cells and also has its applications in the field of microsurgery.

2. Who started a worldwide campaign to eradicate smallpox?

Ans. In 1967 the World Health Organization (WHO) started a worldwide campaign to eradicate smallpox. This goal was accomplished in 10 years due to massive vaccination efforts. The last case of smallpox occurred in Somalia in 1977. On May 8, 1980, the World Health Assembly declared the world free of smallpox.

3. How vaccination is useful?

Ans. The primary benefit of vaccination is that it prevents disease. Immunization is considered one of the greatest public health achievements of the 20th century, and experts agree that immunization is key to staying healthy.

4. What instruments help in diagnosis of diseases?

Ans. There are several basic types: Diagnostic equipment includes **medical imaging** machines, used to aid in diagnosis. Examples are **ultrasound** and **MRI** machines, **PET** and **CT** scanners, and **x-ray** machines.

5. Is Jabir Ibn Hayyan father of modern chemistry?

Ans. **Father of Chemistry** is **Jabir ibn Hayyan**, a Persian alchemist living around 800AD who applied scientific principles to his studies. Other people sometimes known as the **Father of Modern Chemistry** are Robert Boyle, Jöns Berzelius and John Dalton.

Long Questions:

1. Define science? Describe how the nature of science makes it different from other modes of knowing?

Ans. **Science:**

The word science is originated from Latin word "*scientia*" which means, "*to know*". It is an organized form of knowledge obtained by observation and experimentation.

It is the knowledge, which is systematic, tested and brought under general principles. It helps to understand and describe various processes and phenomena, which are taking place around us.

How the nature of science makes it different from other modes of knowing:

1. For every branch of knowledge there is a specific way to study it.
2. In order to study Science we use scientific method of study. This systematic approach to the study of science has made it different to other branches of knowledge like history, literature etc.
3. Over the last few hundred years we have seen that the use of the scientific method as a way of learning about the natural world has yielded useful technologies and discoveries.
4. Scientific method involves collecting data, developing hypotheses about that data, and then testing those hypotheses with experimentation. This practical approach in science to issues related to our day to day problems has made it unique from other branches of knowledge.

2. Write the contribution made by three famous scientists of Pakistan.

Ans. **Contribution made by famous Pakistani scientists:**

1. Dr. Abdus -Salam:

- i. Dr. Abdus -Salam was born in 1926.
- ii. He was a world fame physicist and was awarded Nobel Prize.
- iii. His contribution was the presentation of theory of unification of two of four basic forces governing the universe. It was the great achievement in the discipline of physical sciences.

2. Dr. Abdul Qadeer Khan:

- i. Dr. Abdul Qadeer Khan was born in 1936.

- ii. He is the world fame Pakistani nuclear scientist, who excelled in the field of enrichment of uranium.
 - iii. Along with other scientists he successfully tested the nuclear devices at Chaghi in Baluchistan on May 28, 1998.
 - iv. He established Kahuta Research Laboratories (KRL).
3. **Dr. Ashfaq Ahmad Khan:**
- i. Dr. Ashfaq Ahmad Khan was born in 1930.
 - ii. He is an eminent nuclear scientist of Pakistan and remained chairman of Pakistan Atomic Energy Commission for 10 years.
 - iii. He established Global Change Impact Studies Center (GCISC).
 - iv. In recognition of his services, he was awarded the highest civil award of Nishan-i-Imtiaz by the Government of Pakistan.

3. Muslims scientists made significant contributions in the field of Science. Write some of the prominent contributions of Jabir Ibn Hayyan, Bu-Ali-Sina and Ibn-ul-Haitham in the field of Science.

Ans. Contributions of Muslim Scientists:

1) Jaber bin Hayyan (722 – 817 A.D)

- i. Jaber bin Hayyan is considered to be the father of chemistry.
- ii. He had established his own laboratory.
- iii. He invented sulfuric acid, nitric acid, hydrochloric acid and several other important compounds.
- iv. Jaber bin Hayyan defined chemical reactions as union of the elements together in small particles too small for the naked eyes to see without loss of their character, as John Dalton (1766-1844), the English chemist and

- physicist discovered this reality ten centuries later.
- v. His contribution to chemistry also includes some important scientific techniques such as crystallization, distillation, sublimation and evaporation.
- 2) Bu- Ali- Sina (980 – 1037 A.D)**
- i. Bu-Ali-Sina was the greatest scientist of his time.
 - ii. He wrote more than 100 books about medicine, science, philosophy and literature.
 - iii. His famous book about medicine, "*Al-Qanoon Fil-Tib*" was prescribed as a text book in medical institutes of Europe till 17th century.
 - iv. In another famous book "*Al- Shifa*" he made useful contributions to physics, chemistry, arithmetic, biology and even music.
 - v. Ibn Sina was also the first physician to describe meningitis, parts of the eye, and the heart valves, and he found that nerves were responsible for perceived muscle pain.
- 3) Ibn-ul-Haitham (965 – 1039 A.D)**
- i. Ibn-ul-Haitham is a renowned physicist of all times.
 - ii. He gave the basic principles of reflection and refraction of light.
 - iii. He worked on lenses and explained the working of eye.
 - iv. His famous book "*Kitab-Al-Manazir*" was translated into Latin.
 - v. He is considered the father of optics.

4) Do you think the Holy Quran give due importance to the acquisition of knowledge and it compels its reader to ponder over various processes

and phenomena occurring in the universe. Support your answer by quoting some verses of Quran.

The Islamic world was in the midst of its "Golden Age," between 7th to 13th centuries paving the way for the growth of modern sciences.

Following are a few verses from Holy Quran that stress the acquisition of knowledge and search.

The Qur'an calls upon Muslims to look around them and study the physical world, so that they might appreciate the majesty of Allah's creation:

"Behold! in the creation of the heavens and the earth; in the alternation of the night and the day; in the sailing of the ships through the ocean for the benefit of mankind; in the rain which Allah Sends down from the skies, and the life which He gives therewith to an earth that is dead; in the beasts of all kinds that He scatters through the earth; in the change of the winds, and the clouds which they trail like their slaves between the sky and the earth -- (Here) indeed are Signs for a people that are wise. **Surah Al-Baqarah 2:164**

"They ponder over the creation of earth and heavens (skies)"

Sura Al-Imran, Ayat 191

"And He is the Allah, who created every living thing from water, out of them, some crawl, some are tetra-pods (four legged) and some are bipedal (two legged). Allah creates what he pleases. He the almighty and creator"

Sura Ai- Noor, Ayat 45

"Indeed, the Creation of earth and heavens (skies), the difference of day and night, are the indications for the wise and intelligent" (**Sura Al -Imran, Ayah: 190**).

5. Give detail account of different branches of science and their interrelationship with each other.

Ans.

- i. **Physics:** Physics includes the study of time, light and gravity.

- ii. **Chemistry:** Chemistry deals with the properties, composition, structure and reactions of the matter.
- iii. **Astronomy:** Astronomy involves the study of the universe beyond the earth.
- iv. **Geology:** The science of the origin, history, and structure of the Earth, and the physical, chemical, and biological changes that it has experienced or is experiencing.
- v. **Oceanography:** The exploration and study of the ocean.
- vi. **Paleontology:** The science of the forms of life that existed in prehistoric or geologic periods.
- vii. **Meteorology:** The science that deals with the atmosphere and its phenomena, such as weather and climate.
- viii. **Botany:** The study of plants.
- ix. **Zoology:** The science that covers animals and animal life.
- x. **Genetics:** The study of heredity.

Branches of science and their interrelationship with each other.

All branches of science are interrelated with each other. The tools used in scientific research are almost same. In scientific process observations, reasoning and experiments are the basic tools.

Now a days the name of few modern branches itself indicate the interrelation between them. Following are a few such branches.

- i. Biochemistry
- ii. Physical chemistry
- iii. Environmental biology
- iv. Biophysics

6. List down some of the important developments in the medical field which have provided relief to humanity.

Ans. Important Developments in the Medical field which have provided relief to Humanity:

- i. Many epidemic diseases such as, Plague, Cholera, Typhoid, Polio and Pneumonia, which were known as killer diseases, have now been controlled with the help of vaccines and drugs. In the near past these diseases played havoc with the human society.
- ii. The diagnosis of diseases is very important for its proper treatment. The modern scientific studies have analyzed and discovered each and every part of human body and its working.
- iii. Many instruments have been devised for the proper diagnosis of the diseases. X-rays, sonography, biopsy etc. which help in the diagnosis of diseases.
- iv. The Laser technology is used to kill the cancer cells and also has its applications in the field of microsurgery.
- v. Treatment of retina with the help of laser is an example of microsurgery.
- vi. The repair of the heart valves, the bypass grafting and the use of pace maker is very helpful to heart patients.
- vii. The field of transplant of organs has also gained great importance.

Although at present we have not been able to find cure for a number of diseases, yet it was the scientific attitude of the scientists which made possible the control and cure of several fatal diseases. Vaccination against various diseases is considered as a major step towards the development of healthy future.

7. Describe the contributions made in the field of medicine and agriculture for the welfare of humanity.

Ans. Medicine:

Modern technology has played an important role in the field of medicine.

- i. Many epidemic diseases such as, Plague, Cholera, Typhoid, Polio and Pneumonia, which were known as killer diseases, have now been controlled with the help of vaccines and drugs. In the near past these diseases played havoc with the human society.
- ii. The diagnosis of diseases is very important for its proper treatment. The modern scientific studies have analyzed and discovered each and every part of human body and it's working.
- iii. Many instruments have been devised for the proper diagnosis of the diseases. X-rays, sonography, biopsy etc. which help in the diagnosis of diseases.
- iv. The Laser technology is used to kill the cancer cells and also has its applications in the field of microsurgery.
- v. Treatment of retina with the help of laser is an example of microsurgery.
- vi. The repair of the heart valves, the bypass grafting and the use of pace maker is very helpful to heart patients.
- vii. The field of transplant of organs has also gained great importance.

Agriculture:

- i. The modern technology has made the agriculture a profitable business.
- ii. The use of modern machines like tractors, scrapers, harvesters and tube wells has greatly helped the man to get maximum production.
- iii. With the help of modern technology to a certain extent we have been able to overcome the deadly menace of water logging and salinity. By doing so, a vast land has been reclaimed and used for agriculture.
- iv. Tissue culture and genetic engineering techniques are playing prominent roles in increasing the yield

by producing disease and drought resistance varieties.

8. Write some important contributions of Greek in the field of science.

Ans.

- i. Greek philosophers and scientists contributed a lot to the knowledge of science.
- ii. Aristotle, Archimedes, Galen and Pythagoras are a few important names of this period.
- iii. Greeks were the first to try and develop the theory on the basis of their observations.
- iv. Pythagoras concentrated on a mathematical view of the world.
- v. Aristotle and Plato developed logical methods for examining the world around them. Similarly, it was the Greeks who first suggested that matter was made up of atoms fundamental particles that could not be broken down further.

EXTRA QUESTIONS

1. Give a brief overview of the various categories of Pure Science.

Ans. In general, pure science is divided into the following categories:

1). Physical sciences:

- i. Physical sciences, which deal with matter and energy and allow us to describe the material universe in terms of weight, mass, volume and other standard objective measures.
- ii. The physical science is associated with the nature and behavior of energy and matter.
- iii. The physical science is associated with the nature and behavior of energy and matter.
- iv. Physics includes the study of time, light and gravity.
- v. Chemistry deals with the properties, composition, structure and reactions of the matter.

vi. Astronomy involves the study of the universe beyond the earth.

2) Earth sciences:

- i. Earth sciences, which explain the phenomena of Earth, its atmosphere, and the solar system to which it belongs.
- ii. The earth science that involves the study of structure and composition of the earth includes different branches such as geology, oceanography, meteorology, paleontology, etc.

3. Life sciences:

- i. Life sciences, which describe living organisms, their internal processes and their relationship to each other and the environment.
- ii. Life science is also known as biology, which deals with the study of evolution, development, distribution, origin, structure and function of the living things.
- iii. It is categorized into different branches such as botany, genetics, zoology, medicine, etc.

09. What do you know about Muhammad bin Zakriya Al- Razi?

Ans. Muhammad bin Zakriya Al- Razi:

- i. Muhammad bin Zakriya Al -Razi was a great physician of his time.
- ii. Before learning medicine, he studied philosophy, alchemy and music.
- iii. At an early age he gained eminence as an expert in medicine and alchemy.
- iv. Patients and students flocked to him from distant parts of Asia.
- v. One of his landmark contributions is *Al-Hawi*. It was the largest medical encyclopedia ever composed till that time, containing all important information that was available from Greek and Arab sources.

- vi. Another major contribution is *Kitab al-Mansuri fil-tibb*. In this book he has written about the diseases, their symptoms and treatment.
- vii. He was the first to discuss the details of small pox and measles.
- viii. His books were translated into Latin, French and English. Al- Razi was the first man who used opium for anesthesia.

10. What are the three areas of limitation of science?

Ans.

1. Science can't answer questions about value. There is no scientific answer to the questions, "Which of these flowers is prettier?" or "which smells worse, "Which is more valuable, one ounce of gold or one ounce of steel?" Our culture places value on the element gold, but if what you need build a skyscraper with then off course gold, a very soft metal, is pretty useless. So there's no way to scientifically determine value.
2. Science can't answer questions of morality. The problem of deciding good and bad, right and wrong, is outside the determination of science.
3. Science can't help us with questions about the supernatural. The prefix "super" means "above." So supernatural means "above (or beyond) the natural world phenomenon." The toolbox of a scientist contains only the natural laws of the universe; supernatural questions are outside their reach.

11. Explain science in the light of Islam?

Ans. Islamic teachings are of universal and everlasting values. In the Holy book "Quran" great emphasis has been laid on the acquisition of knowledge. We find several verses in Quran that stimulate the man to seek knowledge and to ponder over the various processes and phenomena occurring in the universe and also exploring oceans, space,

Quran invites the man to travel and search the hidden realities of universe. The basic laws that govern the vital processes of life were explained in the Holy Quran.

1. "Indeed, the Creation of earth and heavens (skies), the difference of day and night, are the indications for the wise and intelligent" (Sura Al-Imran, Ayah: 190).
2. "They ponder over the creation of earth and heavens (skies)" (Sura Al -Imran, Ayah: 191).
3. "And He is the Allah, who created every living thing from water, out of them, some crawl, some are tetra-pods (four legged) and some are bipedal (two legged). Allah creates what he pleases. He the almighty and creator" (Sura Nur, Ayah: 45).

There is no better example of close link between Islam and acquisition of knowledge. than the saying of Prophet Muhammad (PBUH), "to acquire the knowledge is the duty of every Muslim man and woman".

12. Write some important contributions of Muslims in the field of science?

Ans.

1. The Muslim thinkers and scientists made valuable contributions to the field of chemistry, physics, medicine, mathematics and astronomy.
2. They took full benefits of the Greek contributions and added their own research and observations to make it more logical.
3. Jaber bin Hayyan, Muhammad bin Zakriya Al-Razi, Ibn-ul-Haitham, Al-Bairuni and Bu-Ali-Sina are a few great names of the Muslim period.
4. The most important contribution of Muslim Scientists was their practical and experimental approach to solve scientific problems.

CHEMISTRY AND LIFE

- A. Select the correct answers for the following questions.
- Plastic chemically refers to as
 - ☒ synthetic high molecular weight chain molecule
 - natural high molecular weight chain molecule
 - synthetic low molecular weight chain molecule
 - natural low molecular weight chain molecule
 - Polyethylene is chemically synthesized from
 - ☒ long chains of ethylene
 - short chains of ethylene
 - some are long and some are short chains of ethylene
 - long chains of ethane
 - Why it is not desirable to wear clothes made up of polyester?
 - ☒ it does not clean easily
 - it is out of fashion
 - it is highly flammable
 - it fibres thread apart easily
 - The polymers from which the nylon is made up of are:
 - polyethylene
 - polyether
 - polyesters
 - ☒ polyamides
 - One of the following is a product of polymerization of ethane gas.
 - polyethylene
 - ☒ polythene
 - polyesters
 - polyamides
 - Latex is a natural source of:
 - ☒ rubber
 - plastics
 - nylon
 - Polyisoprene is a purified form of:
 - ☒ rubber
 - plastics
 - nylon
 - polythene

- A perfect storage container material of chemicals is:
 - plastic
 - polythene
 - rubber
 - ☒ glass
- Sand acts as a natural source for the production of which of the following product?
 - plastic
 - polythene
 - rubber
 - ☒ glass
- Which of the following chemicals make the washing powder dry?
 - ☒ sodium triphosphate or sodium carbonate
 - sodium triphosphate or sodium bicarbonate
 - sodium biphosphate or sodium tricarboxate
 - sodium sulphate and sodium silicate
- Identify the correct statement in the following:
 - hydrogen is inert and helium is explosive
 - ☒ hydrogen is explosive and helium is inert
 - hydrogen is light and helium is explosive
 - hydrogen is gas and helium is solid at room temperature
- If copper, aluminum, iron and lead are left in open air which one will rust?
 - copper
 - aluminum
 - lead
 - ☒ iron
- Which one of the following will have lower life cycle cost if used as electrical cables?
 - ☒ copper
 - aluminum
 - lead
 - iron
- One of the limitations for copper plumbing is
 - it leaks easily
 - ☒ it is capable of carrying water with a specific pH
 - it is not easy to bend and cut
 - it works only in cold environment
- Pure water has a pH of:
 - 8
 - ☒ 7
 - 6
 - 5

16. Thermometer is filled with material which should have:
 a. high freezing point
 b. moderate freezing point
 c. ☒ low freezing point
 d. no fixed freezing point
17. Which one of the following ideal to be used in thermometers:
 a. water
 b. alcohol
 c. benzene
 d. ☒ mercury
18. There are about ----- naturally occurring elements.
 a. 91 b. ☒ 92 c. 93 d. 94
19. Compounds are pure substances made up of ----- or more elements.
 a. ☒ 2 b. 3 c. 4 d. 5
20. The word plastic is derived from Greek "*plastikos*" meaning to ----- or form.
 a. ☒ Mold b. Yield c. Cold d. Hot
21. The first man-made plastic was created by -----
 a. Dr. Abdul Qadeer Khan
 b. ☒ Alexander Parkes
 c. Dr. Ashfaq Ahmad Khan d. Al- Bairuni
22. ----- is mainly used in textile manufacturing.
 a. Nylon
 b. Natural rubber
 c. ☒ Polyester
 d. Ductile
23. Nylon belongs to a family of synthetic polymers known as polyamides.
 a. ☒ Nylon
 b. Natural rubber
 c. Polyester
 d. Ductile
24. ----- is an elastomer.
 a. Nylon
 b. ☒ Natural rubber
 c. Polyester
 d. Ductile
25. ----- is an amorphous solid material.
 a. Nylon
 b. Natural rubber
 c. ☒ Glass
 d. Ductile

Classic

26. Sucrose is the organic compound commonly known as table sugar.
 a. ☒ Sucrose b. Natural rubber
 c. Polyester d. Ductile
27. ----- is the most abundant element in the universe.
 a. Carbon
 b. ☒ Hydrogen
 c. Nitrogen d. Helium
28. Pure ----- is a gas under normal conditions.
 a. Carbon Monoxide
 b. Nitrogen
 c. Helium
 d. ☒ Hydrogen
29. Helium is a member of the noble gas family.
 a. Carbon Monoxide
 b. Nitrogen
 c. ☒ Helium
 d. Hydrogen
30. ----- is ductile, that is, it can be drawn out into thin wire.
 a. ☒ Copper
 b. Aluminum
 c. Lead
 d. Carbon
31. Lead is one of only a few elements known to ancient peoples.
 a. Copper
 b. Aluminum
 c. ☒ Lead
 d. Carbon
32. The ----- is then made into large blocks called ingots.
 a. Copper
 b. ☒ Aluminum
 c. Lead
 d. Carbon
33. ----- iron is an important source for recycling of iron.
 a. ☒ Scrap
 b. Lead
 c. Hard
 d. Liquid
34. Pesticides are designed to kill pests.
 a. Antibiotic
 b. Biotic
 c. Allopathic
 d. ☒ Pesticides
35. Burning or combustion reactions are example of ----- change.
 a. ☒ Chemical
 b. Physical
 c. Natural
 d. Neutral
36. ----- of iron is an example of chemical change.
 a. Boling
 b. Cooling
 c. ☒ Rusting
 d. Eating

1. Lead is a known poison; the mechanical and chemical characteristics of the metal continue to keep lead as an important component in society.
2. Lead is a heavy, soft, gray solid poor electrical conductor, resistant to corrosion.
3. It is both ductile and malleable.
4. It has a shiny surface when first cut, but it slowly tarnishes (rusts) and becomes dull.
5. Lead can be easily bend, cut, shaped, pull and otherwise change shape of the metal.

8. Define Ductile?

Ans. Ductility is a physical property of a material associated with the ability to be hammered thin or stretched into wire without breaking. A ductile substance can be drawn into a wire.

Examples: Most metals are good examples of ductile materials, including gold, silver, copper etc.

9. What is alcohol?

Ans.

- i. Most of the common alcohols are colourless liquids at room temperature.
- ii. Methyl alcohol, ethyl alcohol, and isopropyl alcohol are free flowing liquids.
- iii. Alcohols have an odour that is often described as "biting" and as "hanging" in the nasal passages.
- iv. Alcohols have applications in industry and science as reagents or solvents.
- v. Due to its low toxicity and ability to dissolve non-polar substances, ethanol can be used as a solvent in medical drugs, perfumes, and vegetable essences such as vanilla.
- vi. Ethanol can be used as an antiseptic to disinfect the skin before injections are given, often along with iodine.

Alcohol is also used as a preservative for specimens

10. What is Polyethylene?

Ans. Polyethylene is a type of polymer which is chemically synthesized from molecules that contain long chains of ethylene, a monomer that provides the ability to double bond with other carbon-based monomers to form polymers.

Comprehension Base

1. What is difference between element and compound?

Ans. Comparison chart

Compound versus Element comparison chart		
	Compound	Element
Meaning	A compound contains atoms of different elements chemically combined together in a fixed ratio.	An element is a pure chemical substance made of same type of atom.
Distinguishing Feature	Compounds contain different elements in a fixed ratio arranged in a defined manner through chemical bonds.	Elements are distinguished by their atomic number (number of protons in their nucleus).
Ability to Breakdown	A compound can be separated into simpler substances by	Elements cannot be broken down into simpler substances by chemical reactions.

Compound versus Element comparison chart

	Compound	Element
	chemical methods/reactions.	
Types	The list of compounds is endless.	There are about 117 elements that have been observed. Can be classified as metal, non-metal or metalloid.
Representation	A compound is represented using a formula.	An element is represented using symbols.
Examples	Water (H_2O), Sodium chloride ($NaCl$), Sodium bicarbonate ($NaHCO_3$) etc.	Iron, copper, silver, gold, nickel etc.

2. What do you know about Polythene environmental hazards?

Ans.

- Polythene may help to make numerous useful and durable products possible, however, it poses harmful impacts on environment.
- It does not readily biodegrade and can reside in a landfill for hundreds of years.
- Scientists are exploring the possibility of employing *Sphingomonas*, a bacterium shown to shorten biodegrading of some forms of polythene to just a few months.

Classic

30

G. Science -9

3. In what process bacteria convert complex compounds into simple one?

Ans. In an ecosystem bacteria are acting as decomposers of dead bodies of plants and animals.

Decomposition is the breakdown of complex bodies into their simpler components. As the bodies of animals and plants are made up of complex chemical compounds and these by the action of bacteria are broken down into simple compounds which are used in the recycling of various elements in nature.

4. Sucrose is the organic compound commonly known as table sugar? Elaborate the statement

Ans.

- Sucrose is the organic compound commonly known as table sugar.
- A white, odourless, crystalline powder with a sweet taste, it is best known for its role in human nutrition.
- The molecule is a disaccharide derived from glucose and fructose with the molecular formula $C_{12}H_{22}O_{11}$.
- Sugar forms a major element in confectionery and desserts.
- It can also act as a food preservative when used in sufficient concentrations.

5. How pesticides are harmful?

Harmful Impact of Pesticides:

- Many pesticides can also pose risks to people.
- Health effects of pesticides depend on the type of pesticide.
- Some, such as the organophosphates and carbonates, affect the nervous system.
- Others may irritate the skin or eyes. Some pesticides may be carcinogens.
- Others may affect the hormone or endocrine system in the body.

6. What is the difference between breathing and respiration?

Breathing is the physical process where you inhale and exhale air in and out of your lungs. ...**Respiration** is a chemical reaction where Oxygen is used to breakdown Glucose in order to generate energy which is then used by the cell to function.

Application Base

1. What do you know about first man-made plastic?

Ans. The first man-made plastic was created by Alexander Parkes who publicly demonstrated it at the 1862 Great International exhibition in London. The material called Parkesine was an organic material derived from cellulose that once heated could be molded, and retained its shape When cooled.

2. Why water is called as "universal solvent"?

Ans. Water is called the "universal solvent" because it dissolves more substances than any other liquid. Pure water has a pH of 7 which is regarded as neutral neither acidic nor basic.

3. Explain rusting of iron?

Ans. Rusting of iron is an example of chemical change. During rusting the iron (Fe) combines with oxygen (O₂) in the atmosphere and produce iron oxide. In iron, the iron atoms are arranged in a metallic crystalline matrix. When rust occurs, oxygen bonds to the iron atoms to create an oxide of iron.

4. Why is mercury best liquid for thermometer?

Mercury is easily the best liquid to use, for 5 important reasons.

- i. It is very reflective, so it's easy to see and to read accurately.

- ii. It doesn't wet the glass, so you don't get inaccurate readings if the temperature is falling.
- iii. It is a metal, so it's a good conductor of heat. This means that it reacts quickly to changes of temperature.
- iv. It expands evenly with temperature, so a linear scale can be used with quite a high degree of accuracy.
- v. There's a large range of temperature for which it is a liquid. However, it freezes at - 39 Celsius, so Mercury cannot be used below this temperature. It boils at 365 Celsius, which is high enough for most purposes.

5. Which gas is best for balloons? Hydrogen or Helium

Hydrogen versus Helium in balloons

Hydrogen is highly flammable, so the slightest spark can cause a huge explosion. Hydrogen is explosive and helium is inert. Helium is less dense. Because helium is lighter than air, a helium balloon rises.

6. Why copper is better than aluminum in wiring?

Copper versus Aluminum in wiring:

Copper is the most efficient and reliable electrical conductor for commercial and industrial wire and cable. When compared to aluminum, copper has a significant ampacity advantage. It is easier to install, and is resistant to corrosion. The true cost of a cable, often referred as its "life cycle cost". While aluminum cable wire is sometimes less expensive to buy than copper, aluminum cable is more difficult to install and is more prone to failure. Therefore, the full life cycle cost of copper cable is lower than aluminum cable.

7. Why is glass strange substance?

Ans. Glass is a strange substance. It is not a solid, not a gas, and not quite a liquid either. Generally, it is classified as a rigid liquid, maintaining liquid properties while acting like

8. How do fish survive in a frozen pond?

Ans. All liquids have a boiling point and a freezing point. When water boils at a certain temperature it turns into steam. When it is cooled to a certain temperature it freezes and becomes ice. Water boils at 100 degree Celsius (100 °C) and freezes at 0 °C. When the outside temperature falls below the freezing point of water, lakes and rivers get frozen.

However, only the top layer of the lake or river freezes. Underneath the frozen upper layer, the water remains in its liquid form and does not freeze. Also, oxygen is trapped beneath the layer of ice. As a result, fish and other aquatic animals find it possible to live comfortably in the frozen lakes and ponds.

9. why doesn't the entire body of water freeze, like a giant, lake-sized ice-cube?

Ans. Generally, all liquids expand on heating, but water is an exception to this rule. If water is heated, its volume gradually decreases. (This decrease in volume continues till the temperature rises to 4 °C.) At temperatures over 4 °C water starts expanding. It then keeps expanding with the further rise in temperature, till finally at 100 °C it turns into steam.

In other words, at 4 °C, water has the least volume (occupies the least amount of space) and maximum density (is at its heaviest). This irregular expansion of water is called anomalous expansion. This anomalous expansion plays an important role by only freezing the upper layer in

10. Why water tapes burst in cold weather?

Ans. Water pipes burst because the water inside them expands as it gets close to freezing and this causes an increase in pressure inside the pipe. When the pressure gets too high for the pipe to contain, it ruptures.

Long Question:

1. Write in detail the chemical composition and some of the prominent chemical and physical properties of the following material.

a. Plastic b. Polythene c. Glass

Ans. Plastic:

- The word plastic is derived from Greek "plastikos" meaning to mold or form.
- Plastic has become a part of our life, and it is present all around us. It forms much of the packaging for our daily use items like foods, drinks etc. Plastic is versatile, lightweight, flexible, moisture resistant, durable, strong and relatively inexpensive material.
- Widespread use of plastic is also causing unprecedented environmental problems, and is causing serious health risks- especially for children.
- Chemically plastic refers to a synthetic high molecular weight chain molecule, or polymer, that may have been combined with other ingredients to modify its physical properties.
- Most plastics are based on carbon or organic materials.
- As plastics are heated to moderate temperatures, the polymer chains are able to flow past each other.

Polythene:

- Polythene is formed when polymers of ethene combined together.
- It is a tough, white, translucent, and waxy thermoplastic.

a solid. Heat can return the glass to a liquid and workable form, making it easy to reuse and recycle.

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- v. Most plastics are based on carbon or organic materials.
- vi. As plastics are heated to moderate temperatures, the polymer chains are able to flow past each other.

Polythene:

- i. Polythene is formed when polymers of ethene combined together.
- ii. It is a tough, white, translucent, and waxy thermoplastic.

polythene can be softened by heating. polythene is produced in two forms: low-density ethene gas, and high-density polythene, which is made at lower pressure by using catalysts.

iv. Polythene is used in the manufacturing of packaging bottles, toys, milk containers and the common plastic bag.

Glass:

- i. Glass is an amorphous solid material.
- ii. Glasses are typically brittle and optically transparent.
- iii. Glass occurs naturally when rocks high in silicates melt at high temperatures and cool before they can form a crystalline structure.
- iv. When manufactured by humans, glass is a mixture of silica (SiO_2), soda, lime and minor additives to add colour.
- v. The elements of glass are heated to 1800° Fahrenheit (982° Celsius).
- vi. The resulting fused liquid can be poured into molds or blown into various shapes, and when cooled, glass is a strong, minimally conducting substance that will not interact with materials stored inside. As a result, glass is frequently used in scientific laboratories.

2. Compare hydrogen with helium. Which element is better to be used in balloons?

Ans. Hydrogen and Helium:

- i. Hydrogen is a diatomic gas, and helium is a monatomic gas.
- ii. Helium has a fully filled s orbital, but in hydrogen, there is only one electron, so it is unstable.
- iii. Compared to hydrogen, helium is an inert gas.

- iv. Helium is lighter than air, but hydrogen is slightly heavier than air.
- v. Hydrogen is reactive compared to helium so hydrogen form many chemical compounds but helium doesn't.
- vi. Hydrogen is extremely flammable, helium is non flammable.
- vii. Hydrogen has a higher boiling point compared to that of helium.
- viii. There are seven isotopes of helium, but for hydrogen, there are only three naturally occurring isotopes.

Hydrogen versus Helium in balloons

Hydrogen is highly flammable, so the slightest spark can cause a huge explosion. Hydrogen is explosive and helium is inert. Helium is less dense. Because helium is lighter than air, a helium balloon rises.

3. Write the chemical and physical properties of copper and compare it with aluminum. Justify which element is better suited to be used in wiring.

Ans. Chemical and physical properties of copper:

- i. Copper is **malleable** that is, it can be bent and shaped without cracking, when either hot or cold.
- ii. Copper is **ductile**, that is, it can be drawn out into thin wire.
- iii. Copper is second only to silver in its ability to conduct electricity.
- iv. It is also excellent conductor of heat.
- v. Copper is resistant to corrosion, that is, it will not rust.
- vi. Copper is a moderately active metal.
- vii. It dissolves in alkalis e.g Sodium hydroxide.
- viii. An important chemical property of copper is the way it reacts with **oxygen**. In moist air, it combines with water and carbon dioxide.

Copper versus Aluminum in wiring:

Copper is the most efficient and reliable electrical conductor for commercial and industrial wire and cable. When compared to aluminum, copper has a significant ampacity advantage. It is easier to install, and is resistant to corrosion. The true cost of a cable, often referred to as its "life cycle cost". While aluminum cable wire is sometimes less expensive to buy than copper, aluminum cable is more difficult to install and is more prone to failure. Therefore, the full life cycle cost of copper cable is lower than aluminum cable.

4. Give a brief description about different materials which can be used in thermometers. Based on their nature justify which is the most suitable material for thermometer.

Ans. Alcohol Thermometers:

The alcohol thermometer or spirit thermometer is an alternative to the mercury-in-glass thermometer and has similar functions.

Advantages of Alcohol thermometer

- Alcohol expands uniformly.
- It has a low freezing point (-115 degree centigrade) therefore it is very suitable for place where the temperature gets very low.
- It has a large expansively
- It is an easily available cheap liquid, which is safe to use

Disadvantages of Alcohol thermometer

- it wets the tube
- it has a low boiling point (cannot be used in places with high temperatures)
- it does not react quickly to changes in temperature
- It needs to be dyed, since it's colourless.

MERCURY THERMOMETER

Advantages of mercury as a thermometric liquid.

- It is a good conductor of heat and therefore the whole liquid reaches the temperature of the surroundings quickly.
- It does not wet (cling to the sides of) the tube.
- It has a high boiling point
- It expands uniformly (linear expansion) and responds quickly to temperature changes, hence is sensitive.
- It has a visible meniscus.

Disadvantages

- Mercury is very poisonous.
- it is expensive
- It has a high freezing point therefore it cannot be used in places where the temperature gets very low.

Mercury is easily the best liquid to use, for 5 important reasons.

- i. It is very reflective, so it's easy to see and to read accurately.
- ii. It doesn't wet the glass, so you don't get inaccurate readings if the temperature is falling.
- iii. It is a metal, so it's a good conductor of heat. This means that it reacts quickly to changes of temperature.
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- v. There's a large range of temperature for which it is a liquid. However, it freezes at - 39 Celsius, so Mercury cannot be used below this temperature. It boils at 365 Celsius, which is high enough for most purposes.

5. Write three examples of chemical changes which we encounter in our daily life.

Ans. Three examples of chemical changes which we encounter in our daily life:

a. **Burning:**

- Burning or combustion reactions are example of chemical change.
- These always involve molecular oxygen O_2 .
- Anytime anything burn, it is a combustion reaction.
- Combustion reactions are almost always exothermic

Example: When wood burns, it must do so in the presence of O_2 and a lot of heat is produced. Wood as well as many common items that combust are organic. When organic molecules combust the reaction products are carbon dioxide and water.

b. **Rusting:**

- Rusting of iron is an example of chemical change.
- During rusting the iron (Fe) combines with oxygen (O_2) in the atmosphere and produce iron oxide.
- In iron, the iron atoms are arranged in a metallic crystalline matrix.
- When rust occurs, oxygen bonds to the iron atoms to create an oxide of iron.

c. **Fermentation:**

- Fermentation is yet another example of chemical change.
- It occurs naturally in some foods, such as dough and curds.
- It is the process of using yeast or bacteria to convert sugar or other carbohydrates into either an acid or alcohol.
- Fermentation only happens in oxygen-free or anaerobic conditions.

6. Describe the harmful impacts of CFCs, pesticides and fertilizers.

Ans. Harmful Impact of CFCs:

- It is being proved that these CFCs when released, reacts with ozone in the upper atmosphere, reducing this layers protective properties against ultraviolet radiation.
- Scientists have found that overexposure to UV radiation can cause skin cancers and it may suppress proper functioning of the body's immune system and the skin's natural defenses.

Harmful Impact of Pesticides:

- Many pesticides can also pose risks to people.
- Health effects of pesticides depend on the type of pesticide.
- Some, such as the organophosphates and carbonates, affect the nervous system.
- Others may irritate the skin or eyes. Some pesticides may be carcinogens.
- Others may affect the hormone or endocrine system in the body

Harmful Impact of Fertilizers:

- The toxic chemicals found in fertilizers can be absorbed into the plants and enter the food chain via vegetables and cereals.
 - The biggest health risk is when the chemicals seep into the ground water which is then extracted for drinking water. This water can contain high levels of nitrates and nitrites which can cause blue-baby syndrome and can also lead to miscarriage in pregnant women.
 - Mercury, lead, cadmium and uranium are some of the toxic heavy metals that have been found in fertilizers and can cause disturbances of the kidneys, lungs and liver.
7. Recycling is the need of the day. Different types of waste material like plastic, glass, rubber etc if not recycled can pose serious threats to environment. Elaborate the statement.

Ans. In today's world the importance of recycling is of great concern both for the general public and in terms of economy. The earth's natural resources are being consumed at an alarming rate. Recycling along with reducing consumption is our best means to counter the damage we have been doing to the earth for centuries. Let's see how can we recycle some of our daily use products and what benefits we can achieve in this process.

Recycling of Plastic:

- With extra effort and energy, plastic can be re-made into the same quality as the original.
- Some plastics can be "up cycled", that is, made into plastic of higher quality than the original. However, much plastic recycling is "down cycling", that is, it is made into materials of lesser quality than the original.
- During the recycling process the plastic recyclables are sorted at the recycling center and baled.
- At the mill they are chopped into little bits and cleaned. They are further washed and purified. They are then melted, extruded and chopped into tiny pellets from these pellets various things like plastic bottles are formed.

Recycling of Glass:

- Recycling of glass is a simple process.
- Used glass in various forms is collected from consumers.
- Glass is then taken to a glass treatment plant.
- The glass is sorted by colour and washed to remove any impurities.
- It is then crushed and melted, then molded into new products such as bottles and jars. Or it may be used for alternative purposes such as decorative uses.
- The glass is then sent back to be used for a variety of purposes again.

- Glass does not degrade through the recycling process, so it can be recycled again and again.

Recycling of Rubber:

- Rubber recovery can be a difficult process.
- There are many reasons, however why rubber should be reclaimed or recovered.
- Recovered rubber can cost half that of natural or synthetic rubber.
- Recovered rubber has some properties that are better than those of virgin rubber.
- Producing rubber from reclaim requires less energy in the total production process than does virgin material.
- It is an excellent way to dispose off unwanted rubber products, which is often difficult. It conserves non-renewable petroleum products, which are used to produce synthetic rubbers.

Extra Questions

1. Write note on table salt and Washing powder?

Ans. Table salt:

- Salt, also known as table salt, or rock salt, is a mineral that is composed primarily of sodium chloride.
- The taste of salt is one of the basic human tastes.
- Salt for human consumption is produced in different forms: unrefined salt, refined salt, and iodized salt.
- It is a crystalline solid, white, pale pink or light gray in colour, normally obtained from sea water or rock deposits.
- Edible rock salts may be slightly grayish in colour because of mineral content.

Washing powder:

- Washing powders are a combination of soaps, detergents and other chemicals.

- ii. Sodium sulphate and sodium silicate are added to keep the powder dry.
- iii. Sodium triphosphate or sodium carbonate is added to make the solution alkaline. This helps to remove dirt and also soften water.
- iv. Carboxy methyl cellulose is added so that the dirt particles removed are kept suspended in the solution.
- v. For obtaining sparkling white clothes, a bleaching agent is added. The bleaching agent is in the form of sodium perborate.

2. Write the chemical and physical properties of aluminum?

Ans.

Physical Properties of Aluminum

Color	Silvery-white with a bluish tint
Hardness	The pure metal is soft, but it becomes strong and hard when alloyed.
Ductility	It can be beaten into extremely thin sheets
Malleability	Capable of being shaped or bent
Conductivity	Good electrical and heat conductors

Chemical Properties of Aluminum

Chemical Formula	Al
Occurrence	Occurs only as a compound
Oxidation	In moist air, it combines slowly with oxygen to form aluminum oxide
Reactivity with acids	Reacts with many hot acids
Reactivity with water	Reacts quickly with hot water

Reactivity with alkalis	It reacts with Alkalis such as Sodium hydroxide and limewater
Compounds	A mixture of aluminum, oxygen and other elements produces Bauxite
Alloys	When combined with elements such as copper, silicon, or magnesium it forms alloys of great strength

3. What are the chemical and physical properties of lead?

Ans.

Physical Properties of Lead

Color	Bluish-White
Malleability	Capable of being shaped or bent
Conductivity	Poor transmission of heat or electricity
Softness	Relatively Soft
Tensile	It can be stretched without breaking
Luster	A shine or glow

Chemical Properties of Lead

Chemical Formula	Pb
Reactivity with water	Dissolves slowly in water
Oxidation	Does not readily react with oxygen in the air
Flammability	Does not burn
Reactivity with acids	Reacts quickly with hot acids but slowly to cold acids
Toxicity	Toxic

4. Write a detail note on Water?**Ans. Water:**

- i. Water is unique in that it is the only natural substance that is found in all three states - liquid, solid, and gas.
- ii. Pure water is colourless and has no taste or smell. A molecule of water (H_2O) is composed of one atom of oxygen bound to two atoms of hydrogen.
- iii. The hydrogen atoms are "attached" to one side of the oxygen atom, resulting in a water molecule having a positive charge on that side where the hydrogen atoms are present and a negative charge on the other side, where the oxygen atom is present.
- iv. Since opposite electrical charges attract, water molecules tend to attract each other, making water kind of "sticky".
- v. Water is called the "universal solvent" because it dissolves more substances than any other liquid.
- vi. Pure water has a pH of 7 which is regarded as neutral neither acidic nor basic.
- vii. Water can absorb a lot of heat before it begins to get hot. This is why water is valuable to industries and in car's radiator as a coolant.

5. What is impact of Aerosols?**Ans. Impact of Aerosols**

- i. Aerosol Spray product are a popular and convenient way to dispense a wide variety of products used in industry today and is one of the most effective and practical packaging methods available.
- ii. Aerosol Spray Cans have a sealed container that is made from more than 25 percent recycled metals and is designed for easy recycling when the Aerosol Spray product is empty.
- iii. Aerosol Products and Aerosol Sprays are easy to use and provide a targeted stream that reduces waste,

saves money and are able to reach both large and small spaces very effectively.

- iv. The use of aerosols products such as air fresheners, polish, deodorants and hair sprays increase the risk of diarrhea, earache and other symptoms in infants as well as headaches and depression in adults.
- v. High levels of Volatile organic compounds may contribute to asthma in toddlers.
- vi. Air fresheners combined with other aerosol and household products contribute to a complex mixture of chemicals and a build-up of Volatile organic compounds in the home environment.

6. Write detail note on the following:**a. Burning****b. Decomposition****Ans.****a. Burning:**

Burning or combustion reactions are example of chemical change. These always involve molecular oxygen O_2 . Anytime anything burns, it is a combustion reaction. Combustion reactions are almost always exothermic.

Example: When wood burns, it must do so in the presence of O_2 and a lot of heat is produced. Wood as well as many common items that combust are organic. When organic molecules combust the reaction products are carbon dioxide and water.

b. Decomposition:

- i. In an ecosystem bacteria are acting as decomposers of dead bodies of plants and animals.
- ii. Decomposition is the breakdown of complex bodies into their simpler components.
- iii. As the bodies of animals and plants are made up of complex chemical compounds and these by the action of bacteria are broken down into simple compounds which are used in the recycling of various elements in nature.

16. The agent that cause typhoid fever is:
 a. ✓ *Salmonella typhi* b. *Escherichia coli*
 c. *Vibrio cholera* d. *shigella*
17. Which symptom of small pox infection appears first?
 a. ✓ Rash b. Fever
 c. Painful muscles d. Bleeding from nose
18. Which of the following is NOT a symptom of polio?
 a. ✓ Runny nose b. Paralysis
 c. Breathing difficulty d. Unable to walk
19. Paramyxovirus causes which one of the following disease?
 a. Typhoid b. ✓ Measles
 c. Polio d. Small pox
20. Which organ does hepatitis affect?
 a. Heart b. Brain
 c. ✓ Liver d. Kidneys
21. HIV is transmitted when the _____ of an infected person comes into contact with the blood or mucous membrane of a healthy person.
 a. clothing or skin
 b. ✓ blood or other body fluids
 c. drugs or alcohol d. blood and hair
22. HIV is _____.
 a. a virus that attacks the immune system
 b. a sexually transmitted virus
 c. the virus that causes AIDS
 d. ✓ all of the above
23. Drug abusers are at risk for HIV infection _____.
 a. only when they inject drugs
 b. because drugs can affect the way people make decisions.
 c. when they share drug injection equipment
 d. ✓ both B and C.

Short Questions:

Knowledge Base

1. Define nutrition?

Ans. Nutrition is the process of taking food into the body and absorbing the nutrients in those foods.

2. Write a short note on Malnutrition?

Ans. Malnutrition:

- Malnutrition is a condition resulting from not consuming enough nutrients.
- It can occur despite overeating. This is because proper nutrition requires a balance of all nutrients not present in all foods.
- Even in the case of over nutrition, when you may be eating too much food, you can still develop a deficiency in certain nutrients if you fail to consume the proper variety foods.
- Other causes of malnutrition, unrelated to the amount of food you eat include digestion or absorption problems and certain medical conditions.

3. What are Bacterial Diseases?

Ans. Bacterial diseases:

- Bacterial diseases include any type of illness caused by bacteria.
- Bacteria are a type of microorganism that can only be seen with a microscope.
- Millions of bacteria normally live on the skin, in the intestines, and in the mouth.
- Bacteria are cause of many diseases such as tuberculosis, whooping cough, diphtheria, tetanus, typhoid and cholera.

4. Write short note on the history of malaria?

Ans. Historical records suggest malaria has infected humans since the beginning of mankind. The name "mal

aria" meaning "bad air" in Italian was first used in English in 1740 by H. Walpole when describing the disease. The term was shortened to "malaria" in the 20th century.

C. Laveran in 1880 was the first to identify the parasites in human blood. In 1889, R. Ross discovered that mosquitoes transmitted malaria.

5. What is first aid?

Ans. First aid is an immediate help given at the place of accident, till the patient is taken to the hospital. It is usually performed by non-expert, but trained personnel to a sick or injured person until definitive medical treatment can be accessed.

6. What is Immunization?

Ans. Immunization (vaccination) is a way to improve your immune system and prevent serious, life-threatening diseases. Various types of vaccines are given to children and adults at different stages of life which prevents them from various fatal diseases. Some of the prominent diseases for which vaccines are administered are polio, measles, hepatitis etc.

OR

Immunisation refers to the process where the body induces immunity to a disease as a result of a vaccine.

A vaccine is a product made from killed or live, weakened strains of viruses or bacteria.

Vaccination refers to the act of giving a vaccine to a person.

7. What do you know about Ultrasound?

Ans. Ultrasound is an imaging technique which uses sound waves that are beamed into the body causing return echoes that are recorded to "visualize" structures beneath the skin. The ability to measure different echoes reflected from a variety of tissues allows a shadow picture to be constructed.

Comprehension Base

1. Differentiate b/w plasma and blood cells?

Ans. Blood is the main bodily fluid and responsible for transporting important nutrients, oxygen, carbon dioxide and waste products to and away from the cells. **Plasma** is the yellow liquid component of blood and constitutes 55% of the total blood volume.

Comparison chart

Differences — Similarities —

Blood versus Plasma comparison chart

	Blood	Plasma
Definition	Blood is the main bodily fluid and responsible for transporting important nutrients, oxygen, carbon dioxide and waste products to and away from the cells.	Plasma is the yellow liquid component of blood and constitutes 55% of the total blood volume.
Composition	Plasma, red blood cells (erythrocytes), white blood cells (leukocytes), and thromobocytes (platelets).	Water (90%), proteins (albumin, fibrinogen and globulins), nutrients (glucose, fatty acids, amino acids), waste products (urea, uric acid, lactic acid, creatinine), clotting factors, minerals, immunoglobulins, hormones and carbon dioxide

Science -9

	Blood	Plasma
Color	Red	Straw-yellow
Cells (Red, white blood cells, thrombocytes)	Yes	No
Clotting factors	Yes	Yes
nature	Plasma is liquid component of blood.	After clotting, remaining fluid protein of plasma except clotting substance

2. Red blood cells are also called erythrocytes?
Elaborate the statement

Ans. Erythrocytes:

- Red blood cells are also called erythrocytes.
- They are the most numerous cells in the blood.
- Each cubic millimeter of blood contains about five million red blood cells in man.
- Red blood cell is biconcave in shape and is without a nucleus.
- These cells contain a special type of protein called hemoglobin.

3. Explain process active in the body during sleep.

Ans. While you rest and sleep your body cleanses, repairs, heals, renew itself. Your body gets revived, the tissues of your brain get restored, new information and memories are stored, and your nerves get recharged.

4. White blood cells are also called leucocytes? Explain
Ans. Leucocytes:

- White blood cells are also called leucocytes.
- These cells are colourless, larger than red blood cells and with a nucleus in each cell.
- They are of many types because of their different shapes and functions.
- Their number is less in blood than that of RBCs.
- One cubic millimeter of blood contains about 7000 to 8000 WBCs.

5. How is malaria transmitted?

Ans. The life cycle of the malaria parasite (Plasmodium) is complicated and involves two hosts, humans and Anopheles mosquitoes. The disease is transmitted to humans when an infected Anopheles mosquito bites a person and injects the malaria parasites into the blood.

6. What is the function of hemoglobin?

Ans. The hemoglobin has the capability to carry oxygen to all cells and tissues of the body. The red colour of the blood is because of hemoglobin which is an iron containing pigment compound.

7. Explain magnetic resonance imaging (MRI)?

Ans. An MRI scan is a radiology technique that uses magnetism, radio waves, and a computer to produce images of body structures. The image and resolution produced by MRI is quite detailed and can detect tiny changes of structures within the body.

8. Explain electrocardiogram (ECG)?

Ans. The electrocardiogram is a diagnostic tool that is routinely used to assess the electrical and muscular functions of the heart. Most often, the ECG assessment includes the determination of the rate, assessment of the rhythm, evaluation of the electrical conduction patterns of the heart.

9. Compare blood cells with platelets?

Ans. Comparison between Blood and Platelets:

	Blood	Platelets
Description	Blood is a reddish fluid that is part of the circulatory system that helps transport oxygen and nutrients to the cells and the removal of waste from those cells.	Platelets are a type of cells that are part of the blood. They mainly help in the clotting of blood.
Part of	The circulatory system	Blood, which is part of the circulatory system
Made up of	• Red blood cells • White blood cells • Blood platelets • All floating in blood plasma	Platelets are created from larger cells in the bone marrow called megakaryocytes.
Function	• To provide oxygen and nutrients to parts of the body • To remove waste nutrients and carbon dioxide. • To regulate body temperature • To maintain a constant pH and water balance	• Help the clotting process by sticking to the lining of blood vessels • Used to treat a condition called thrombocytopenia, in which there is a shortage of platelets • Also used to treat platelet function abnormalities

10. What is difference b/w disorder and disease?

Ans. "Disorder" refers to an unwanted condition that's hard to say what could be wrong. For instance cancer is a **disease** because you can identify the tumors that are causing the symptoms. Alcoholism would be an example of

a **disorder** because, for some reason, the patient doesn't have control and becomes addicted.

11. Compare viruses with bacteria?

Ans. **Viruses** are smaller than **bacteria** and can't survive without a living host. A **virus** attaches itself to cells and usually reprograms them to reproduce itself. Also, unlike **bacteria**, most **viruses** do cause **disease**. Some **virus**-caused **diseases** include the common cold, AIDS, herpes, and chickenpox.

Application Base

1. How passive smoking is dangerous?

Ans.

- There are many health-related reasons to give up smoking- not just for smokers, but to protect those people who are around.
- Children who grow up in a home where their parents and relatives smoke have twice the risk of getting asthma and asthmatic bronchitis.
- They also have a higher risk of developing allergies.
- For adults, passive smoking seems to increase the risk of lung cancer.

2. Where the Blood cells are mostly manufactured?

Ans. Blood cells are mostly manufactured in the bone marrow, especially in the bone marrow of bones that make up the spine (vertebrae), ribs, pelvis, skull, and breast bone (sternum).

3. Explain the mechanism of Blood clotting?

Ans. Blood, in addition to platelets, also contains important proteins called clotting factors. These clotting factors are vital for the process of blood clotting. Although platelets alone can plug leaks in small blood vessels and even temporarily stop or slow down bleeding, the action of clotting actors is needed to produce a strong, stable clot.

4. In case of snake bite which measures should be taken?

Ans. In case of snake bite take the following measures.

- First tie up the bitten arm or leg tightly with cloth so that poison may not move further.
- Wash the wound with water and lay down the patient and restricts its movement.
- Avoid sucking the patient's blood from injury because it may be fatal for you.
- Let the wound bleed.
- Take the patient to hospital as soon as possible for medical help.

5. In case of dog bite which measures should be taken?

Ans. If a dog bites or scratches the body of a person, it may be dangerous. The wound may become infected with viruses of rabies present in dog's saliva. In case of bleeding, pressure bandage should be administered until bleeding stops. The damaged area should be covered with clean cotton or piece of cloth.

6. In case of burn which measures should be taken?

Ans. If some part of the body is burnt the cloths from the burnt part should be immediately removed. Run off the tap water on burnt area. In case of severe injury the patient should be rushed to the nearest hospital.

Long Questions:

1. Cleanliness ensures health. Elaborate the statement.

Ans. Cleanliness is the most essential practice for good health. The widely accepted definition of health is that given by the World Health Organization (1948). According to this definition "Health is a state of complete physical, mental and social well being and not merely an absence of disease or infirmity". This definition covers three specific aspects-the physical, the mental and the social. Eating clean food is very important. We shall take care of all the utensils and the raw ingredients of our food as being clean.

Cleanliness in our toilets should also be maintained. A daily bath prevents skin infection and a habit of hand washing, especially after using the toilet and, before eating should be implemented.

In the Holy Quran, there are a number of verses which throw light at the importance of cleanliness:

- "Truly, Allah loves those who turn to Him constantly and He loves those who keep themselves pure and clean." (Al Baqarah 2:222)
- At another place Allah says:
"In it (mosque) are men who love to clean and to purify themselves. And Allah loves those who make themselves clean and pure." (9:108)
- Cleanliness and purity has been also emphasized in Hadith of the Prophet (peace be upon him). In a Hadith he said:
Cleanliness is half of faith. (Sahih Muslim Book 2, Number 0432).

2. Briefly describe the composition of the blood.

Ans. Composition of blood:

Blood is made of three specialized elements called erythrocytes (red blood cells), leukocytes (white blood cells) and platelets that are suspended in complex liquid called plasma. The constant flow of blood keeps the cells evenly distributed in the plasma.

Plasma:

It is the liquid part of the blood which is about 55% by volume of the blood. The main component of plasma is its water part which is about 90% by weight of the plasma. The other components are different types of about 7-8% proteins, e.g. fibrinogen, antibodies etc, about 0.9% salts e.g. sodium chloride, calcium ions etc and about 0.1% glucose. The other components are the products of digestion e.g. amino acid, fatty acids etc, which are about 2-3%.

Blood cells:

It is the part that is about 45 percent by volume of blood. There are following three types of blood cells:

- i. Red blood cells (RBCs)
- ii. White blood cells (WBCs)
- iii. Blood platelets

I. Red blood cells:

- a. Red blood cells are also called **erythrocytes**.
- b. They are the most numerous cells in the blood.
- c. Each cubic millimeter of blood contains about five million red blood cells in man.
- d. Red blood cell is biconcave in shape and is without a nucleus.
- e. These cells contain a special type of protein called hemoglobin.
- f. The hemoglobin has the capability to carry oxygen to all cells and tissues of the body.
- g. The red colour of the blood is because of hemoglobin which is an iron containing pigment compound.
- h. The average life of a red blood cell is about 120 days.

II. White blood cells:

- a. White blood cells are also called **leucocytes**.
- b. These cells are colourless, larger than red blood cells and with a nucleus in each cell.
- c. They are of many types because of their different shapes and functions.
- d. Their number is less in blood than that of RBCs.
- e. One cubic millimeter of blood contains about 7000 to 8000 WBCs.
- f. Most of them have a short life span of only three to four days.
- g. They are also formed in red bone marrow. Their main function is to protect the body against attacking microorganisms and diseases.

III. Platelets:

- a. They are much smaller than red blood cells and white blood cells.
- b. They are oval in shape and without a nucleus.
- c. One cubic millimeter of blood contains about 250,000 - 500,000 blood platelets.
- d. They play an important role in clotting of blood during bleeding.

3. Leukemia and anemia are blood disorders. State their causes and their effects on the body.

Ans. Leukemia:

In Greek the meaning of Leukemia is "white blood". Leukemia is a cancer of blood-forming cells in the bone marrow. These abnormal white cells accumulate the bone marrow and flood the bloodstream, but they cannot perform their proper role of protecting the body against disease because they are defective. As leukemia progresses, the cancer interferes with the body's production of other types of blood cells, including red blood cells and platelets. Studies have found the following risk factors for leukemia:

- i. People exposed to very high levels of radiation.
- ii. Exposure to high levels of chemicals like benzene.
- iii. Cancer patients treated with certain cancer-fighting drugs sometimes later develop leukemia.

Symptoms:

- i. The symptoms of leukemia are numerous but it may not be available in all the persons.
- ii. It varies in many cases.
- iii. Commonly seen symptoms are: weakness or chronic fatigue, headaches, skin rash, non specific bone pain, fever of unknown origin, frequent bacterial or viral infections, weight loss, easy bruising, bleeding from gums or nose.
- iv. Many cases of leukemia can be effectively treated, and some can be cured.

Anemia:

Anemia is a common blood disorder that is caused by an acquired or inherited abnormality of red blood cells to provide adequate oxygen supplies to body tissues. The causes of anemia are numerous, but most can be grouped within three major mechanisms that produce anemia:

- i. Blood loss (excessive bleeding)
- ii. Inadequate production of red blood cells
- iii. Excessive destruction of red blood cells

Symptoms:

- i. Mild anemia often causes fatigue, weakness, and paleness.
- ii. In addition to these symptoms, more severe anemia may produce faintness, dizziness, increased thirst, sweating, a weak and rapid pulse, and rapid breathing.
- iii. Severe anemia may produce painful lower leg cramps during exercise, shortness of breath, and chest pain.

4. Eating behavior is a major cause of health disorders. List down some health issues which have a relationship with our eating behaviors.

Ans.

- a. We all need food for our survival but at the same time merely eating food cannot guarantee us healthy life.
- b. The health of an individual and communities are affected by a wide range of contributory factors. People's good or bad health is determined by their environment and situations.
- c. Dietary intakes, eating habits, physical activities and emotional health all in one way or the other way affects our health.
- d. Health is metabolic efficiency and disease is metabolic inefficiency an abnormal condition of an organism produced as a result of infection, inherent

weakness or environmental stress that impairs normal physiological functioning.

- e. Being healthy is important because it makes you feel good and live longer.
 - f. Getting healthy depends on eating the right food, doing the right exercise and knowing what to do if you have an illness or disability.
 - g. Good health is much more than merely the absence of disease.
 - h. People generally do not go from a healthy condition to a sick condition overnight -although we feel the problem when the symptoms of illness appear.
 - i. Our body is extremely effective at achieving and maintaining good health, if it is given what it needs.
- 5. Differentiate between malnutrition and under nutrition.**

Ans. Difference between malnutrition and under nutrition:

- i. Malnutrition and under-nutrition are terms often used loosely to refer to a condition where a person is not getting a balanced diet. However, malnutrition could technically be both under as well as over nutrition. As such obesity is a condition that is a result of malnutrition.
- ii. Anemia, goiter, scurvy etc. are some of the diseases that are a result of malnutrition.
- iii. Starvation is one of the forms of under-nutrition and is seen in poor countries with high populations.
- iv. In malnutrition, there can be deficiency, excess, or imbalance of nutrients whereas there is only deficiency in under-nutrition.
- v. Malnutrition can include absorption and digestion problems whereas under nutrition specifically refers to people not getting enough food.

6. Proper sleep and physical activities are vital for healthy growth and healthy life. Give your assessment of this statement.

Ans. Physical Activity and Health:

- People of all ages, both male and female, benefit from regular physical activity.
- Significant health benefits can be obtained by doing a moderate exercise e.g., 30 minutes of brisk walking, 15 minutes of running, or 45 minutes of playing volleyball daily.
- Physical activity reduces the risk of premature death in general, and of coronary heart disease, hypertension, colon cancer, and diabetes mellitus in particular.
- Physical activity also improves mental health and is important for the health of muscles, bones, and joints.

Rest and Sleep:

- Humans are not created to work indefinitely.
- Keeping yourself working is great, but there has to be some limits.
- There should be some balance between times when you are being productive and times when you are resting.
- Health really does depend on our ability to get enough rest and sleep.
- If we try to keep going without any breaks, we may start feeling exhausted, tired, and worn out.
- Rest can take different shapes and forms. It can be a relaxing sleep at night.

7. Enlist the viral, bacterial, fungal and parasitic diseases that you have studied in this unit.

Ans.

i. Bacterial Diseases:

Bacteria are cause of many diseases such as tuberculosis, whooping, cough, diphtheria, tetanus, typhoid and cholera.

ii. Viral Diseases:

Some of the common human viral diseases are small pox, polio, measles, hepatitis and aids.

iii. Fungal Diseases:

Some of the common fungal diseases in humans are ringworm, Athlete's foot, histoplasmosis etc.

iv. Parasitic diseases:

Common parasitic diseases are malaria, threadworm and ascariasis.

8. Give a detail note on the causes, symptoms and preventions of the following diseases.

a. AIDS b. Malaria c. Ringworm

Ans.

a. Aids:

Acquired immunodeficiency syndrome (AIDS) is fatal disease caused by a virus called Human immunodeficiency virus (HIV). AIDS was first described in 1981 and HIV was identified as causative agent in 1983. The virus enters the body through the blood products, shared needles and razors and sexual relationship with a patient or carrier of AIDS.

Signs and Symptoms:

The virus destroys the defense system of the body by damaging the white blood cells. The immune system i.e. body defense system is weakened so much that even a mild infection can cause death

.Prevention and treatment:

There is no cure for AIDS as yet. Disease can however be prevented by use of disposable syringes, new razors, use of

blood which has been tested for HIV and avoiding sexual relationship with patient of AIDS

b. Malaria:

Malaria is a particular problem and a major one in areas of Asia, Africa, and Central and South America. Malaria occurs in about 100 countries; approximately 40% of the world population is at risk for contracting malaria. Malaria is an infectious disease caused by a parasite, Plasmodium, which infects red blood cells. Malaria is characterized by cycles of chills, fever, pain, and sweating.

Signs and Symptoms:

The symptoms characteristic of malaria include flulike illness with fever, chills, muscle aches, and headache. Some patients develop nausea, vomiting, cough, and diarrhea. Cycles of chills, fever, and sweating that repeat every one, two, or three days are typical.

Prevention and treatment:

Mild malaria can be treated with oral medication. Drug treatment of malaria is not always easy. Chloroquine phosphate (Aralen) is the drug of choice for all malarial parasites except for chloroquine-resistant Plasmodium strains.

c. Ringworm:

The causative agents of ringworm are collectively known as **dermatophytes**. They may infect skin, hair and nails. If the fungi invade the skin they produce a circular white area, which grows in all directions. Nail destruction and hair loss may occur. Ringworm spreads in the community by direct contact with the patient or infected animals. Use of common showers and swimming pools or sharing of towels and sportswear are the cause of transmission.

Prevention:

Disease can be prevented by:

- 1) Avoiding common baths and poorly managed swimming pools.
- 2) Using the personal towels and sportswear only.

9. Polio can be prevented by vaccination. Pakistan is one of the few countries in the world where polio cases have still been identified. Investigate into causes why people in some parts of the country are hesitant to give polio vaccines to their children.

Answer. Following are a few causes that people are hesitant to give polio vaccines to their children.

Illiteracy

Wrong assumptions that it will make children impotent. Some religious groups negatively propagate against it that it is west conspiracy against Islam.

Substandard vaccination in some parts of the country has proved harmful to some children that too are quoted against it.

10. Smoking is the first step to drug addiction. Enlist some of the health hazards associated with smoking.

Ans. Smoking is regarded as a first step before someone gets into some serious drug addiction. Although the harms related to smoking are not seriously considered and very easily ignored especially among the teenagers who considered it be one of the fashionable things to be proud of, but in fact it is the first step towards self destruction. The damage caused by smoking is influenced by the number of cigarettes smoked and whether the cigarette has a filter or not. Cigarettes contain more than 4000 chemical compounds and at least 400 toxic substances. When you inhale, a cigarette burns and breaks down the tobacco to produce various toxins. The products that are most damaging are:

- i. **Tar:** Tar a carcinogen substance that causes cancer.
- ii. **Nicotine:** Nicotine is addictive and increases cholesterol levels in your body.
- iii. **Carbon monoxide:** Carbon monoxide reduces oxygen in the body.

Major diseases caused by smoking**a. Cardiovascular disease:**

Cardiovascular disease (diseases related to heart and vessels) is the main cause of death due to smoking. Hardening of the arteries is a process that develops over years, when cholesterol and other fats deposit in the arteries makes it narrow, blocked or rigid. When the arteries narrow (atherosclerosis), blood clots are likely to form. Smoking accelerates the hardening and narrowing in arteries. Blood clots in the heart and brain are the most common causes of sudden death.

b. Cancer

Smokers are more likely to get cancer than non-smokers. This is particularly true of lung cancer, throat cancer and mouth cancer, which hardly ever affect non-smokers

11. Explain natural food products, fast food or junk food?**Ans. Natural food products:**

- Natural and organic food diet is a key factor in any nutrition program.
- By eating natural and organic foods and consuming lots of fruits and vegetables one can ensure good health as one can avoid the use of foods that contain artificial sweeteners and other additives.
- It causes the body to build up toxins and generally leads to bad health.
- Use of unnaturally occurring fats and oils can also lead to disease.

Fast food or junk food:

Junk food, also called as fast food, is defined as any food packed with "full of calories", which contains abundance of fat, sugar, sodium, and other chemicals, which has less nutritional value. People especially in big cities take

junk food in addition to their routine lunch, dinner e.g. burgers, chips, pizza etc.

12. What is healthy eating? Explain.

Ans.

- Eat a variety of fresh and green vegetables.
- Drink at least 3 cups of milk daily to fulfill your calcium requirements.
- Make half your grains whole.
- Take a balanced amount of cereals, breads, rice and protein like meat, fish, beans etc.
- Eat at least 3 ounces of whole-grain cereals, breads, rice, or pasta each day.
- Use of saturated fats like banaspati ghee, butter should be limited to 10 percent of your calories used.
- Unsaturated fats like vegetable oils, fish and nuts should be preferred.
- Excessive use of salt should be avoided to reduce the risk of heart diseases.
- Use of less than 1 teaspoon of salt each day is generally recommended.

13. What are common signs and symptoms of drug abuse?

Ans. Some of the common signs and symptoms of drug abuse are:

- Neglecting responsibilities.
- Problems in relationships, such as fights with family members etc.
- Nausea, restlessness, insomnia, depression, sweating, shaking, and anxiety.
- Avoiding activities such as hobbies, sports, and socializing
- Red eyes, pupils larger or smaller than usual.
- Changes in appetite and sudden weight loss or weight gain.
- Unusual smells on breath or from body or clothes.

- h. Drop in attendance and performance at work or school.
- i. Sudden change in friends and hobbies.
- j. Frequently getting into trouble (fights, accidents, illegal activities).

14. Write detail note on Hemophilia?

Ans. Hemophilia is a rare bleeding disorder in which the blood doesn't clot normally. The major signs and symptoms of hemophilia are excessive bleeding and easy bruising. Bleeding can occur on the body's surface (external bleeding) or inside the body (internal bleeding).

Signs of external bleeding may include:

- a. Bleeding in the mouth from a cut or bite or from cutting or losing a tooth
- b. Nosebleeds for no obvious reason
- c. Heavy bleeding from a minor cut

Signs of internal bleeding may include:

- a. Blood in the urine (from bleeding in the kidneys or bladder)
- b. Blood in the stool (from bleeding in the intestines or stomach)
- c. Large bruises (from bleeding into the large muscles of the body)
- d. Bleeding in the joints

Hemophilia usually is inherited. "Inherited" means that the disorder is passed from parents to children through genes. People born with hemophilia have little or no clotting factor. Clotting factor is a protein needed for normal blood clotting. There are several types of clotting factors. These proteins work with platelets to help the blood clot.

15. Write a detail note on the causes, symptoms and preventions of TB?

Ans. Tuberculosis (TB)

Tuberculosis (TB) is a bacterial infection caused by a germ called *Mycobacterium tuberculosis*. The bacteria usually attack the lungs, but they can also damage other parts of

the body, like bones, brain, liver, spleen and intestine. TB spreads through the air. The major route of spread of the disease is through infective respiratory droplets. The droplets are formed when a patient coughs or sneezes. A healthy person may get the disease by inhaling these droplets. Intestine may become infected by drinking unpasteurized or unboiled milk.

Signs and Symptoms:

Symptoms of TB in the lungs may include;

- a. A bad cough that lasts 3 weeks or longer
- b. Weight loss
- c. Coughing up blood or mucus
- d. Weakness or fatigue

Prevention and Treatment:

The disease can be prevented by:

- a. Vaccinating infants with BCG vaccine.
- b. Isolating infectious patients.
- c. Improving hygienic condition and housing.
- d. Using pasteurized and properly boiled milk.

16. Write a detail note on the causes, symptoms and preventions of tetanus?

Ans. Tetanus:

Tetanus, also known as lockjaw, is a serious but preventable disease that affects the body's muscles and nerves. It is caused by a spore forming bacteria called *Clostridium tetani*. The bacteria live in soil, saliva, dust and manure.

Signs and Symptoms:

- a. The bacteria usually enter the body through a deep cut, like those you might get from cutting yourself with a knife or stepping on a nail.
- b. Spores are dormant form of the bacterium.
- c. Once inside the body they germinate into multiplicative form called vegetative bacteria. These

vegetative bacteria increase in number by repeated divisions and produce a harmful substance called toxin.

- d. The tetanus toxin causes strong and continuous muscle contraction. When muscles of chest wall undergo such prolonged contraction, the victim is unable to move the air in and out of the lungs, and without breathing the patient soon dies.
- e. A special form of tetanus occurs in newborn babies if they are born in dirty environment and if unsterilized instruments are used during deliveries.

Prevention and treatment:

Every person should be immunized against tetanus by giving vaccine against harmful toxin. If a patient is suspected to have tetanus he is given antitoxin to neutralize the toxin and antibiotics to kill the bacteria.

17. Write a detail note on the causes, symptoms and preventions of hepatitis?

Ans. Hepatitis:

- a. It is a viral disease which damages the liver and its functioning.
- b. There are different agents, which can cause hepatitis.
- c. These include hepatitis A, B and C viruses.
- d. The less dangerous of these is hepatitis A virus.
- e. Hepatitis B and C are more dangerous infections.
- f. The virus enters the body through contaminated water, food, blood products, razors, needles and close personal contact.

Signs and Symptoms:

The patient of hepatitis loses appetite and has jaundice, dark urine and pale stools.

Prevention and treatment:

- a. Vaccines are available against hepatitis A and B.
- b. There is no vaccine for hepatitis C.

- c. Use of screened blood products, disposable syringes and avoiding marital practices with such persons are the mainstay of prevention against hepatitis B and C.

18. Write a detail note on Ringworm?

Ans. Ringworm:

- a. The causative agents of ringworm are collectively known as dermatophytes.
- b. They may infect skin, hair and nails.
- c. If the fungi invade the skin they produce a circular white area, which grows in all directions.
- d. Nail destruction and hair loss may occur.
- e. Ringworm spreads in the community by direct contact with the patient or infected animals.
- f. Use of common showers and swimming pools or sharing of towels and sportswear are the cause of transmission.

Prevention and treatment:

Disease can be prevented by:

- a. Avoiding common baths and poorly managed swimming pools.
- b. Using the personal towels and sportswear only.

Ringworm can be treated by antifungal tablets and ointments.

19. Explain Artificial Respiration?

Ans. Artificial Respiration:

Due to suffocation a person may become breathless. If the patient is breathless lift the chest of the patient slightly upward so that the respiratory tract may become straight. Open the mouth of the patient and remove any blood, vomiting or secretion accumulated in the mouth. Clean the mouth with some clean piece of cloth. The clearance of respiratory pathway may help the patient to breathe. If the patient is still breathless, try to help him breathe artificially. If breathing starts take the patient to the hospital immediately.

Steps to be followed for providing artificial respiration:

- Clear victim's mouth quickly. Tilt head back.
- Cover victim's mouth with your mouth. Pinch nostrils shut and blow hard. For child, place your mouth over his mouth and blow gently.
- Remove your mouth, allowing air to come out. Repeat every 5 seconds for adults, every 3 seconds for children.
- If unable to get air into victim's lungs retilt head into proper position. If you suspect foreign matter in airway, place victim on back, straddle the victim's thighs, perform 6-e. abdominal thrusts, clear matter from mouth, and resume artificial respiration.

20. Explain Insect Bites and Scorpion Sting First Aid?

Ans. Insect Bites:

Insect bites and stings are common and usually cause only minor irritation. However, some stings can be painful and trigger a serious allergic reaction. The venom from a sting often also causes a swollen, itchy, red mark (a weal) to form on the skin. This can be painful, but is harmless in most cases. The affected area will usually remain painful and itchy for a few days.

Most stings like that of wasps are treated by:

- Washing the affected area with soap and water
- Placing a cold compress over the area to reduce swelling.
- Try not to scratch the affected area to avoid infection and if you are in pain or the area is swollen, take painkillers, such as paracetamol or ibuprofen.

21. How polio can be prevented?

Ans. Immunization against the disease through oral vaccine (polio drops) is highly effective. It should be given to all children under the age of 5 years. Once polio occurs and damages neurons its effects cannot be reversed thus immunization is very important.

Chapter 04

POPULATION AND ENVIRONMENT

Select the correct answers for the following questions

- A population with birth rate equal to death rate is:
 - Increasing
 - Decreasing
 - ✓ Stable
 - Spreading
- Each environment supports a limited population depending upon its:
 - Biotic potential
 - ✓ Carrying capacity
 - Birth rate
 - reproductive potential
- Number of births per 1000 is:
 - Growth rate
 - conception rate
 - Reproduction rate
 - ✓ Crude birth rate
- The study of population is called
 - ✓ Demography
 - Population explosion
 - Population dynamics
 - Census
- Removing natural resources and adding to environmental problems through pollution are major factors in a process called _____.
 - The green revolution
 - ✓ Environmental degradation
 - The biotechnological revolution
 - The greenhouse effect
- The changes in population take place primarily due to the changes in:
 - Births
 - Migration
 - Death
 - ✓ All of the above
- Crude death rate is
 - ✓ Total death in a specific year / total population in that year multiplied by 1000
 - Total population in that year - total death in a specific year
 - Total population in that year + total death in a specific year
 - Total death in a specific year / total population in that year multiplied by 100

8. Crude death rate is also known as
 - a. ☒ **Mortality rates**
 - b. Infant mortality rate
 - c. life span
 - d. None of these
9. The maximum number of year that an individual could live
 - a. ☒ **Life span**
 - b. Life expectancy
 - c. Birth rate
 - d. fertility
10. What is the official definition of Sustainable Development?
 - a. Reducing environmental impact
 - b. Using less energy in production
 - c. ☒ **Economic development that takes future generations into account**
 - d. None of these
11. Why is the rate of urban growth in the world's less developed regions so much higher than elsewhere?
 - a. Rates of population growth are higher in developing countries than they are in industrialized nations.
 - b. Rates of population growth are lower in developing countries than they are in industrialized nations.
 - c. There is widespread internal warfare in rural areas.
 - d. ☒ **There is lack of education in the developing countries**
12. As the population of developing countries undergoes a demographic transition in the years to come, what is likely to be the consequence?
 - a. The population of these countries will steadily fall.
 - b. ☒ **There will be rapid growth of cities as more people migrate there in search of employment.**
 - c. There will be less famine and food shortages will decrease.
 - d. There will be a decrease in religiosity.
13. Urbanization mean:
 - a. The overcrowding of immigrant neighborhoods

- b. The result of what happens to an individual when exposed to city life.
- c. Decisions reached about the use of available land in a city
- d. ☒ **Rapid growth of cities**
14. Deforestation brings about:
 - a. Increased sunlight
 - b. Weeds or unwanted plants Control
 - c. ☒ **Soil erosion**
 - d. Increased grazing area
15. A population with natality equal to mortality is
 - a. Increasing
 - b. Decreasing
 - c. ☒ **Stable**
 - d. Growing
16. Consequences of population explosion were explained for the first time by
 - a. De Vries
 - b. ☒ **Malthus**
 - c. Darwin
 - d. Lamarck
17. Demographic features of developing countries are
 - a. High infant mortality, low fertility, young age distribution and uneven population growth
 - b. High fertility, high density, high mortality rate and young age distribution
 - c. ☒ **High fertility, falling mortality rate, rapid population growth and young age distribution**
 - d. High density, high mortality, uneven population growth and very old age distribution
18. Density of a population (D) is
 - (a) $D = S \text{ (size)} / W \text{ (weight)}$
 - (b) $D = S \text{ (space)} / N \text{ (number)}$
 - (c) ☒ **$D = N \text{ (number)} / S \text{ (space)}$**
 - (d) None of the above
19. In a growing population growth in the middle phase is
 - (a) Stabilized growth
 - (b) ☒ **Maximum growth**
 - (c) No growth
 - (d) Declining growth

Short Questions: Knowledge Base

1. Define Infant mortality rate?

Ans. Infant mortality rate (IMR) is the number of deaths per 1,000 live births of children under one year of age.

2. Define immigration?

Ans. Migration into an area, called immigration, is measured as the immigration rate, which is the number of people entering a region per each 1,000 people in the population.

3. Define census?

Ans. Census simply means counting everyone in a particular area and is usually undertaken by government officials.

4. Define Demography?

Ans. Demography is the study of human populations.

5. What is Infant mortality rate?

Ans. Infant mortality rate is the number of deaths among infants under age one for each 1,000 live births in a year.

6. Define migration?

Ans. Migration is the movement of people from one place to another?

7. What is crude birth rate?

Ans. Crude birth rate is the number of live births for every thousand people in a population

8. Define crude death rate?

Ans. Crude death rate is the number of deaths annually per 1,000 people in the population.

9. Define Sustainable development?

Ans. Sustainable development is defined as a development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

10. Define deforestation?

Ans. The unwise and unplanned destruction or removal of trees is called deforestation

Comprehension Base

1. What does a Demographer do?

Ans. Demographers determine a population's natural growth rate by subtracting the crude death rate from the crude birth rate.

2. Overpopulation adversely affects the agriculture?

Elaborate the statement.

Ans. Effects of overpopulation on Agriculture:

- The ever-increasing human population growth requires an effective method for more food growth, which has resulted, in extensive agriculture.
- Bringing more land under cultivation results in the destruction of habitats.
- Extensive agriculture requires supply of water and development of canals, which in turn causes water-logging and salinity.
- In order to increase the yield of agricultural products use of fertilizers and pesticides is a common practice these days.
- Over-use of fertilizers has polluted soil and water.
- In the same way over-use of pesticides and herbicides can make water toxic, which can affect aquatic life.
- Plants in which genes have been altered absorb more nutrients, making soil depletion a problem.

Application Base

1. What are the biggest issues that arise from overpopulation?

Ans. Overpopulation has affected the economic, political, environmental, and social spheres of life.

2. When do you think the world's population will stop growing?

Ans. At current birth rates the world's population will only stop growing if people die at a faster rate, which is what will happen when we run out of natural resources.

3. In what areas of the world is overpopulation having the biggest effects and how?

Ans. China and India are seeing the biggest effects, mostly because of water shortages and deforestation. Africa will soon follow, particularly northern Africa where there is not enough water.

4. When World Population Day is observed?

Ans. World Population Day is observed on July 11. Its purpose is to raise awareness about various global population issues.

5. Can we live without forests?

Ans. Our Life **could not exist** on Earth **without** trees because they produce most of the oxygen that **humans** and wildlife breathe. Trees absorb carbon dioxide from the atmosphere and release oxygen using the process of photosynthesis.

Long Questions:

1. Define demography?

Ans. Demography is a Greek word meaning "description of people".

It is the study of human populations.

The discipline examines the size and composition of populations, as well as their movement of people from one region to another region. Demographers also analyze the effects of population growth and its control. Several demographic variables play central roles in the study of human populations, especially birth rate, mortality and life expectancy, migration, urbanization, and carrying capacity of the environment.

2. Differentiate between birth rate and death rate.

Ans. Three Differences between Birth Rate and death Rate of the Population are as follows:

Birth rate: The number of live births for every thousand people in a population

Death rate: The number of deaths annually per 1,000 people in the population. Demographers calculate this figure by dividing the number of deaths in a year by the total population, and then multiplying the result by 1,000.

3. What do you mean by infant mortality rate?

Ans. Infant mortality rate is the number of deaths among infants under age one for each 1,000 live births in a year.

4. Define the term migration. Differentiate between immigration and emigration.

Ans. Migration:

The movement of people from one place to another is known as migration. While some migration is involuntary, such as when slaves were brought to America, other migration is voluntary, such as when families move from cities into suburbs.

Emigration: Emigration means the movement of people from a country.

The difference between "immigrate" and "emigrate" is that "immigrating" is the act of entering a foreign country to live while "emigrating" is the act of leaving a country to live in another.

5. What is the significance of carrying capacity of an area?

Ans. Carrying capacity is the maximum number of humans an area is capable of supporting in terms of available resources. Calculating carrying capacity for humans is much more complex.

We can use technology to improve our resource production. We can ship in resources from other areas. We can create sanitation systems and other infrastructure to

support higher density. What happens when we reach carrying capacity in an area? There are several options:

- People leave for a different area.
- People become generally less healthy.
- Population pressure leads to war.
- Unsanitary conditions and close proximity lead to a disease outbreak.

6. What do you mean by population growth? Give a comparative account of population growth of Pakistan and its neighbors.

Ans. Population growth:

- Fertility, mortality, and migration all influence the size of a population.
- Poorer countries tend to grow almost completely from internal causes, while richer countries tend to grow from both internal causes and migration.
- Demographers determine a population's natural **growth rate** by subtracting the crude death rate from the crude birth rate.
- The world's low-growth nations tend to be more industrialized, such as the United States and European countries.
- The high growth countries tend to be less industrialized, such as countries of Africa and Latin America.
- Following table gives an overview of the various figures about the different demographic variables of Pakistan along with some of its neighboring countries.

Demographics of selected countries

Country	Births per 1,000 population	Deaths per 1,000 population	Population million	Growth rate (percent)
CHINA	12.2	6.9	1,300	0.49
PAKISTAN	25.1	7.1	177.2	1.51
BANGLADESH	23.8	9.1	158.1	1.27
INDIA	21.3	7.5	1,100	1.38

AFGHANISTAN	40	15	29.121	2.21
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7. How do overpopulation has its impact on the agriculture and forests?

Ans. Effects of overpopulation on Agriculture:

- The ever-increasing human population growth requires an effective method for more food growth, which has resulted, in extensive agriculture.
- Bringing more land under cultivation results in the destruction of habitats.
- Extensive agriculture requires supply of water and development of canals, which in turn causes water-logging and salinity.
- In order to increase the yield of agricultural products use of fertilizers and pesticides is a common practice these days.
- Over-use of fertilizers has polluted soil and water.
- In the same way over-use of pesticides and herbicides can make water toxic, which can affect aquatic life.
- Plants in which genes have been altered absorb more nutrients, making soil depletion a problem.

Effects of overpopulation on forests:

- One of the important aspects of rapidly increasing population is the deforestation.
- The unwise and unplanned destruction or removal of trees is called deforestation.
- Overpopulation put a direct impact on environment. Urbanization requires more land, thus forests are cut to build roads and houses etc. More land is required for cultivation.
- Trees are removed to develop pastures for grazing.
- Wood is used both as timber or fuel wood. All these activities lead to removal of trees.
- Forests are our most precious wealth. Our life is greatly dependent on forests.

- g. They are the natural factories for the production of oxygen.
- h. Forests provide green cover to the earth, a living place to wildlife, fuel, timber and recreation to man. They control floods, prevent formation of deserts and keep the air clean.
- i. Deforestation leads to, soil erosion, destruction of habitats, extinction of many species, floods, climatic changes and desertification.

8. Sustainable development is key to survival in this modern day world. Evaluate the statement critically.

Ans. Overpopulation and Sustainable Development:

- a. Planet earth has limited resources like fossil fuels, water, forests, food etc and these are being constantly used and depleted with every passing moment.
- b. Excessive and unwise use of these resources have convinced conservationists and planners that if some urgent measures are not taken in this regard then the world may face extreme shortage or these resources may vanish forever.
- c. One strategy to cope this situation is to use the resource in such a way that it can be used for the present generation but at the same time it is conserved for the coming generations.
- d. The idea of sustainable development grew from numerous environmental movements in earlier decades. Summits such as the Earth Summit in Rio, Brazil, 1992, were major international meetings which introduced the concept of sustainable development to the world.
- e. According to the World commission on Environment and development sustainable development is defined as a development that meets the needs of the present without compromising the ability of

future generations to meet their own needs
Population is key factor in planning.

- f. Any plan for sustainable development requires proper system of check and control of population.
- g. In the present world the idea of sustainable development is facing serious challenges due to rapid growth in population especially in the developing and poor countries of the world.
- h. Unwise and unmanaged environmental exploitation by rapidly growing population is a major hurdle in sustainable management of environmental resources which ultimately lead to environmental degeneration and degradation.
- i. Health facilities and availability of balanced and nutritious diet are some of the problems to which people in the developing world are faced with.
- j. Governments in these countries have to invest more in health and infections and epidemics seriously affect their economic development. of unemployment and inflation in the third world countries of the world which can increase the risks of political instability and conflict and can impact the development process in any region of the world.

Extra Questions

1. Write a short note on Urbanization?

Ans. Urbanization:

- a. More and more people are migrating from rural areas to urban environment.
- b. People migrate from rural areas to big cities in search of jobs and comforts of life.
- c. The shortage of housing facilities becomes acute with this influx of people.
- d. About 80 % of the housing units in big cities are substandard. Such as water, electricity, gas and public transport.

- e. The traffic hazards Increase, health care facilities fall short and the sewage system is distributed.
- f. The migration from rural areas creates shortage of labour in agriculture sector.

2. Explain Overgrazing?

Ans. Overgrazing:

- a. With fast growing population the demand for meat and dairy products are also increasing.
- b. Cattle rearing is a profitable business. Cattle are fed mainly on plants. Grassland can support a specific numbers of cattle. It is called the carrying capacity of that grassland.
- c. Animals consume the upper portion of grasses. The roots are alive, holding the soil particles together and absorbing water and minerals.
- d. The plants recover and again grow to their normal size.
- e. Overgrazing results in barren and exposed soil.
- f. One of the important aspects of rapidly increasing population is the deforestation.
- g. Overpopulation put a direct impact on environment.
- h. Urbanization requires more land, thus forests are cut to build roads and houses etc.
- i. More land is required for cultivation.
- j. Trees are removed to develop pastures for grazing. Wood is used both as timber or fuel wood.
- k. Forests are our most precious wealth. They are the natural factories for the production of oxygen. They control floods, prevent formation of deserts and keep the air clean. Deforestation leads to, soil erosion, destruction of habitats, extinction of many species, floods, climatic changes and desertification.

Chapter 05

ENERGY SOURCES

Select the correct answers for the following question

1. Fuel formed under the earth's surface by the decomposition of organic matter is called _____.
 - a. organic fuel
 - b. biogas
 - d. ☒ fossil fuel
 - c. inorganic fuel
2. Which of the following causes least pollution when burns.
 - a. Petrol
 - b. Diesel
 - c. Coal
 - d. ☒ Natural gas
3. Which of these is not a renewable source of energy?
 - a. ☒ The sun
 - b. Natural gas
 - c. Wind
 - d. Ocean tidal energy
4. A solar cell is made up of-----
 - a. ☒ Silicon
 - b. Teflon
 - c. Titanium
 - d. Magnesium
5. A solar cell converts _____.
 - a. Heat energy into electrical energy
 - b. ☒ Solar energy into electrical energy
 - c. Heat energy into light energy
 - d. Solar energy into light energy
6. The fuel used in the nuclear reactor is _____.
 - a. Cadmium
 - b. ☒ Uranium
 - c. Radium
 - d. Thorium
7. The state of coal, with lowest carbon content is _____.
 - a. ☒ Bituminous coal
 - b. Anthracite coal
 - c. Lignite,
 - d. None of these
8. A unit of electricity means
 - a. Megawatt
 - b. Nanowatt
 - c. ☒ Kilowatt hour
 - d. Joule
9. Which of the following problems is associated with the burning of coal?
 - a. Acid rain
 - b. Carbon dioxide emissions
 - c. Ash with toxic metal impurities
 - d. ☒ All of these

10. Solar energy stored in material such as wood, grain, sugar, and municipal waste is called _____.
a. Fossil fuels
b. ☒ **Biomass**
c. Geothermal energy
d. Natural gas
11. The world faces an energy crisis because _____.
a. World demand for energy will increase
b. World oil production will peak and begin to decline
c. Shortages and the resulting escalation of prices can shock the economic and political order.
d. ☒ **All of the above**
12. A fuel cell combines hydrogen and _____ to produce electricity, heat, and water.
a. Carbon
b. ☒ **Oxygen**
c. Uranium
d. Silicon
13. Fossils are the-----
a. ☒ **Dead remains of living organism**
b. Coal mines
c. Kind of natural resource
d. Living beings
14. Petroleum is mixture of
a. Petrol
b. Diesel
c. Petroleum gas
d. ☒ **All of these**
15. Burning of fossil fuel causes
a. Air pollution
b. Global warming
c. ☒ **Both (a) & (b)**
d. None of these
16. Which of the following is a non-renewable resource?
(a) ☒ **Coal**
(b) Forests
(c) Water
(d) Wildlife
17. Which among the following is not a renewable source of energy?
(a) Solar energy
(b) ☒ **Biomass energy**
(c) Hydro-power
(d) Geothermal energy
18. Identify the non-renewable energy resource from the following:
(a) ☒ **Coal**
(b) Fuel cells
(c) Wind power
(d) Wave power

19. Which of the following is a disadvantage of most of the renewable energy sources?
(a) Highly polluting (b) High waste disposal cost
(c) **Unreliable supply** (d) High running cost
20. Photovoltaic energy is the conversion of sunlight into:
(a) Chemical energy (b) Biogas
(c) **✓Electricity** (d) Geothermal energy
21. A fuel cell, in order to produce electricity, burns:
(a) Helium (b) Nitrogen
(c) **✓Hydrogen** (d) None of the above
22. Fuel cells are:
(a) Carbon cell (b) **✓Hydrogen battery**
(c) Nuclear cell (d) Chromium cell
23. Both power and manure is provided by:
(a) Nuclear plants (b) Thermal plants
(c) **Biogas plants** (d) Hydroelectric plant
24. The one thing that is common to all fossil fuels is that they:
(a) Were originally formed in marine environment
(b) **Contain carbon**
(c) Have undergone the same set of geological processes during their formation
(d) Represent the remains of one living organisms
25. Crude oil is:
(a) Colourless (b) Odourless
(c) **Smelly yellow to black liquid**
(d) Odourless yellow to black liquid

Short Questions:

KNOWLEDGE BASE

- 1. Define Energy?**
Ans. Energy is defined as: "the ability to do work."
2. Explain Coal Reservoir of Pakistan?

Ans. Thar desert gives a look of barren and dry harsh landscape. Hidden deep in it lies what can possibly be called as black gold of Pakistan. Thar coal is one of the 5th largest coal reservoir in the world having a total of about 850 Trillion cubic feet of reserves which can possibly enable Pakistan to produce enough electricity to power the entire country

3. Define petroleum?

Ans. A kind of oil that comes from below the ground and that is the source of gasoline and other products.

4. What is the major Gas Field of Pakistan?

Ans. Sui is a major gas field of Pakistan. The Sui is located at a distance of about 650 kilometres (km) from Karachi in Dera Bugti, Baluchistan. As a major production facility, Sui Gas Field (SGF) has the country's largest gas compressor station and a purification plant at the time of its discovery, SGF was considered among the largest natural gas fields in the world.

Despite diminishing reserves over time, SGF still remains the highest natural gas producing field in Pakistan.

5. What is Thermal process?

Ans. Thermal process is that process in which heat is produced or is converted into other forms of energy.

6. What is a solar cell?

Ans. A device that can change the energy of sun light to electrical energy is called a solar cell.

7. What are the two main nuclear power plants of Pakistan?

Ans. Karachi Nuclear Power Plant (KANUPP) and Chashma Nuclear Power Plant (CHASNUPP-1) are the two main nuclear power plants which are producing electricity.

8. Define electrolysis?

Ans. An electrical current can be used to separate water into its components of oxygen and hydrogen. This process is known as electrolysis.

9. Define work?

Ans. Work is defined as a force applied to some form of matter (object) multiplied by the distance that this object travels.

10. What is nuclear energy?

Ans. Nuclear energy is the energy released from the nucleus of the atom when it is hit or bombarded by a slow moving atomic particle, called neutron.

COMPREHENSION BASE

1. How is petroleum formed?

Ans. Much like coal, petroleum is formed from the remains of biodegraded organic material.

When animals that lived in the sea millions of years ago died underwater, their remains were gradually covered by layers of very fine dirt known as "silt" on the ocean floor. Then, as the years passed, pressure from the layers built up and compressed the organic material, forming the oil.

2. Can you name the pure carbon? How does it form?

Ans. If the coal is heated and compressed even more, the result is "graphite," almost completely pure carbon.

3. Man has utilized the power of water for years.

Elaborate the statement.

Ans. Hydroelectric energy:

- Man has utilized the power of water for years. Hydroelectric systems make use of the energy in running water to create electricity.
- In coal and natural gas systems, a fossil fuel is burned to heat water.
- The steam pressure from the boiling water turns "propellers" called turbines. These turbines spin coils of wire between magnets to produce electricity.
- Hydro powered systems also make use of turbines to generate electrical power; however,

they do so by using the energy in moving water to spin the turbines.

- e. Water has kinetic energy when it flows from higher elevations to lower elevations. This energy spins the turbines and generates electricity.
- f. In Pakistan hydroelectric power projects are contributing significantly to the cause of electricity production. Although Pakistan has huge hydal power generation capacity mainly on river Indus but it has yet to exploit it to its maximum capacity. However, three main dams Tarbela, Mangla, and Warsak constructed for the purpose of generating electricity and irrigating agricultural land

4. Do we have any clean way of electricity generation?

Ans. Wind power is the fastest-growing energy source in the world. Turbines powered by wind are mounted on towers 100 or more feet above the ground, where the wind is faster and less turbulent.

5. Can you convert solar power into energy?

Ans. There are two ways in which solar power can be converted to energy. The first, known as "solar thermal applications," involve using the energy of the sun to directly heat air or a liquid. The second, known as "photoelectric applications," involve the use of photovoltaic cells to convert solar energy directly to electricity.

6. Compare renewable energy with non renewable energy?

Ans. Renewable energy is energy that is collected from renewable resources, which are naturally replenished on a human timescale, such as sunlight, wind, rain, tides, waves, and geothermal heat.

A **nonrenewable** resource is a resource of economic value that cannot be readily replaced by natural means on a level equal to its consumption. Most fossil fuels, such as oil,

natural gas and coal, are considered **nonrenewable resources**.

7. What are three r's of environment?

Ans. "The **three R's** - reduce, reuse and recycle - all help to cut down on the amount of waste we throw away. They conserve natural resources, landfill space and energy. Plus, the **three R's** save land and money communities must use to dispose of waste in landfills.

8. Which energy does NASA use in rockets?

Ans. NASA has used liquid hydrogen since the 1970s to propel the space shuttle and other rockets into orbit. Hydrogen fuel cells power the shuttle's electrical systems, producing a clean byproduct - pure water, which is used by the crew for drinking.

9. How electricity can be measured?

Ans. An **electricity meter**, **electric meter**, **electrical meter**, or **energy meter** is a device that measures the amount of **electric energy** consumed by a residence, a business, or an electrically powered device.

Application Base

1. What is the cheapest source of energy production?

Ans. Hydel power is regarded as the cheapest source of energy

2. Try to find out about Ghazi Barotha Hydropower Project?

Ans. Ghazi Barotha Hydropower Project is a unique power project. It has a generation capacity of 1450 MW and it consists of three main components. The Barrage, the Power Channel and the Power Complex. The Project utilizes the normal Tarbela Dam releases to provide year round maximum power generation.

3. How Hydrogen can be separated from hydrocarbons?

Ans. Hydrogen can be separated from hydrocarbons through the application of heat - a process known as

reforming. Currently, most hydrogen is made in this way from natural gas.

4. How many systems of units of measurement are used worldwide?

Ans. Worldwide, two systems of units of measurement are commonly used today: the Metric System (*System International*) and the British System.

5. How development of a country can be judged?

Ans. The development of a country can be judged by the amount of energy it consumes. Generally we see that the developed country has larger demand for energy compared to a developing or under developed country.

6. How can we conserve energy at homes?

Ans. To conserve energy at homes, we must put off the electrical appliances and close gas and water valves, when not required. We should use electrical appliances that use comparatively lesser energy.

Long questions

1. What would happen if there was no electricity?

Ans. Since our modern-day life has become so much dependent on **electricity**, it seems, virtually, impossible to think if we can ever live without it. When an hour or so of load-shedding, especially on a hot summer day, can make us fret and fume and curse the whole system, what would happen, if this great boon is taken away from us forever?

The whole life would come to a grinding halt, forcing all of us to experience the dull, dark, boring and uneventful period of the stone-age.

As a matter of fact, to conceive of a life without electricity is, virtually, impossible and that too when we have got slavishly addicted to the fruits and comforts electricity

Classic

provides. We realize its importance, when power fails or when there is erratic supply of it.

Don't we start cursing the Electric Supply Undertaking and tend to associate power failure with the failure of the government machinery? Such is the attitude of ours, whenever there is even a pre-scheduled cut in power supply.

It is beyond our thought and imagination to dream how our life would survive in absence of electricity. In that case, the scene would be totally different. Our homes would not be so flooded with the light of electric bulbs or tubes as they are now. Only the dim light of the earthen lamps or lanterns or candlelight's would flicker.

Refrigerators, coolers, air-conditioners, room heaters, electric irons, toasters, T.Vs, etc. would not have been in existence without the invention of electricity. Our kitchens would not have been so well-equipped with the modern electric appliances, as they are these days.

Not only this, our offices, mills, factories, shops and all sorts of public and private institutions would have worn a deserted and dull look. Their operation would come to a stop, depriving millions of workers of the only source of their livelihood and the general public of the items of their daily use. And where would the raw material, produced after so much of hard work, go? Electric fans would have belonged to the forgotten world; people could be seen fanning themselves with only a hand fan, called "Punkha". Life would not have been as hectic as it is today. Machine-made clothes would not have been seen in shops. The

markets of fashion would have been without any hustle and bustle in absence of fascinating items.

Hospitals, dispensaries and health clinics or centers would have been gloomy places. X-ray, electric treatment, heart-surgery, and operations would have been out of question. In summer, the patients would have sweated with heat and winter would have blasted upon them with all fury.

The channels of entertainment would have been nowhere. Radios, cinemas, TVs and videos would have merged into dreams. Civilization would have received a big jolt. Science and technology would have stopped for good.

2. What is Overuse of electricity?

Ans. when electricity is used more than it should be and the energy resources get depleted due to it, the phenomenon is called, "overuse of electricity".

3. What are the advantages and disadvantages of using petroleum?

Ans. Petroleum, or "crude oil," is a liquid fuel that is present in various locations throughout the world. Much like coal, petroleum is formed from the remains of biodegraded organic material.

Advantages:

- It has many uses, from the generation of electricity to the manufacture of medicines, plastics, and other commercial items.
- It can power up almost all types of vehicles.
- It can support constant power use.
- It is a powerful source of energy.

Disadvantages:

- Extracting and burning petroleum generates greenhouse gases that contribute to environmental pollution and, consequently, global warming.
- Production of petroleum, especially refining, produces harmful and toxic materials, including plastic.

c. Once burned to generate electricity, petroleum cannot be replaced.

d. If petroleum spills in bodies of water, adverse effects in marine life are expected. Spills have caused massive ocean pollution.

4. Give two examples of ways to conserve energy at home?

Ans. Conservation of energy in homes:

- To conserve energy at homes, we must put off the electrical appliances and close gas and water valves, when not required.
- We should use electrical appliances that use comparatively lesser energy e.g. tube lights, energy saver bulb etc. We should design our homes such that we get maximum benefits of sun light and proper ventilation.

5. What is a conventional source of energy?

Ans. These sources of energy are also called non renewable sources. These sources of energy are in limited quantity except hydro-electric power.

6. What is the importance of conserving energy?

Ans. Wasting energy isn't good for the environment either. Most of the energy sources we depend on, like coal and natural gas, can't be replaced - once we use them up, they're gone forever. Another problem is that most forms of energy can cause pollution.

7. What is mmbtu?

Ans. MMBTU or MBTU stands for one million British Thermal Units.

A BTU is a measure of the energy content in fuel, and is used in power, steam generation, heating and air conditioning industries.

One BTU is equal to 1.06 Joules.

Natural gas is also measured in BTU.

8. Describe various types of fossil fuels.

Ans. Different types of fossil fuels are:

- a. Coal
- b. Petroleum
- c. Natural gas

Ans.

a. Coal:

- i. About 300 million years back, a large number of ferns and other prehistoric plants were common on the swamp-like earth.
- ii. When those plants died and fell to the ground, they were covered with water and they slowly decomposed.
- iii. As decomposition took place in the absence of oxygen, much of the hydrogen content of the matter was eroded away, leaving a material rich in carbon.
- iv. The material was compressed over the years by sand and dirt, leaving the form of carbon known as coal.
- v. The nature of coal is such that the higher the carbon content, the more cleanly and brilliantly the coal burns.
- vi. The other states of coal, from lowest carbon content to highest, are "lignite," bituminous coal, and anthracite coal. If the coal is heated and compressed even more, the result is "graphite," almost completely pure carbon.
- vii. Coal is used extensively for the generation of electricity for running industries.

b. Petroleum:

- i. Petroleum, or "crude oil," is a liquid fuel that is present in various locations throughout the world.
- ii. It has many uses, from the generation of electricity to the manufacture of medicines, plastics, and other commercial items.

- iii. Much like coal, petroleum is formed from the remains of biodegraded organic material.
- iv. When animals that lived in the sea millions of years ago died underwater, their remains were gradually covered by layers of very fine dirt known as "silt" on the ocean floor. Then, as the years passed, pressure from the layers built up and compressed the organic material, forming the oil.

c. Natural gas:

- i. Natural gas consists primarily of methane (CH_4).
- ii. It is found associated with other hydrocarbon fuel.
- iii. Natural gas is almost always found along with the deposits of petroleum. Wells with only natural gas also exist.
- iv. Many houses, offices, and other buildings are heated by natural gas heaters.
- v. The western hemisphere, Europe, and parts of Africa contain the largest natural gas deposits.
- vi. The gas is usually transported by pipelines.
- vii. Natural gas is relatively clean-burning.

9. Write short note on the following:

- a. Coal as fossil fuel
- b. Petroleum
- c. Wind as source of energy

Ans.

a. Coal as fossil fuel:

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c. Wind as source of energy:

- i. Wind has been used as a source of energy for centuries.
- ii. About 3000 BC ago, people probably first used the force of moving air to push a boat with a sail through the water. This might have led to the invention of the windmills.

- iii. These wind mills were first used in central Asia. More recently wind power is used to turn wind turbines.
- iv. In United States and Europe many wind farms routinely generate several mega watts of electricity a day.
- v. In Pakistan efforts are being made to use wind energy for pumping water and producing electricity.

10. Write in detail the nature and utility of any two non conventional sources of energy?

Ans. The inexhaustible and renewable sources of energy which are being produced continuously in nature are called non conventional sources of energy. They are abundant in nature. They do not produce environmental pollution and they don't require heavy expenditures to produce energy. If they are utilized well, they can help in overcoming energy crisis because of their cheap availability. The two non-conventional sources of energy are:

1. Solar Energy
2. Hydroelectric energy

1. Solar Energy:

- a. Most of the energy known to man is derived in some way from the sun.
- b. When we burn wood or other fuels, we actually release the stored energy of the sun.
- c. In fact, there would be no life on earth without the sun, which provides energy needed for the growth of plants, and indirectly, the existence of all animal life.
- d. Nowadays electric current is obtained from sun's energy.
- e. A device called a solar cell can change the energy of sun light to electrical energy. Such solar cells are frequently used in calculators, watches etc.
- f. Batteries made up of solar cells are used to run radios, television, equipments in artificial satellites going around the earth.

- g. Solar cookers, solar geysers and solar house heating system are successfully working by using solar energy.

2. Hydroelectric energy:

- Man has utilized the power of water for years. Hydroelectric systems make use of the energy in running water to create electricity.
- In coal and natural gas systems, a fossil fuel is burned to heat water.
- The steam pressure from the boiling water turns "propellers" called turbines. These turbines spin coils of wire between magnets to produce electricity.
- Hydro powered systems also make use of turbines to generate electrical power; however, they do so by using the energy in moving water to spin the turbines.
- Water has kinetic energy when it flows from higher elevations to lower elevations. This energy spins the turbines and generates electricity.
- In Pakistan hydroelectric power projects are contributing significantly to the cause of electricity production. Although Pakistan has huge hydal power generation capacity mainly on river Indus but it has yet to exploit it to its maximum capacity. However, three main dams Tarbela, Mangla, and Warsak constructed for the purpose of generating electricity and irrigating agricultural land.

11. Compare renewable energy sources with non-renewable sources.

Ans. Renewable energy:

Sources of energy that can be recycled time and time again are known as renewable energy sources. Abiotic factors like water, sunlight and wind are renewable sources. Biotic factors like forest and wildlife are also renewable resources.

Non-renewable sources: Sources of energy that can't be recycled time and time again are known as non renewable sources. The most common sources are coal, natural gas, petroleum oil and nuclear energy.

12. Differentiate between conventional energy sources and nonconventional energy sources.

Ans.

Conventional Sources of Energy	Non-conventional Sources of Energy
Conventional Sources of Energy have been in use for a long time	Non-conventional Sources of Energy yet in development over the past few years
Conventional Sources of Energy are exhaustible except water	Non-conventional Sources of Energy are inexhaustible.
Conventional Sources of Energy cause pollution.	Non-conventional Sources of Energy are pollution free
Conventional Sources of Energy are expensive to be maintained, stored and transmitted	Non-conventional Sources of Energy less expensive
Conventional Sources of Energy used extensively	Non-conventional Sources of Energy not used extensively as conventional sources
Conventional Sources of Energy meet a major portion of our requirements.	Non-conventional Sources of Energy meet our requirement on a limited scale

Examples of Conventional Sources of Energy are petrol, coal.	Examples of Non-conventional Sources of Energy are solar energy, wind energy.
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13. Briefly write the process of formation of fossil fuels.

Ans.

- About 300 million years back, a large number of ferns and other prehistoric plants were common on the swamp-like earth.
- When those plants died and fell to the ground, they were covered with water and they slowly decomposed. As decomposition took place in the absence of oxygen, much of the hydrogen content of the matter was eroded away, leaving a material rich in carbon.
- The material was compressed over the years by sand and dirt, leaving the form of carbon known as coal.
- When animals that lived in the sea millions of years ago died underwater, their remains were gradually covered by layers of very fine dirt known as "silt" on the ocean floor. Then, as the years passed, pressure from the layers built up and compressed the organic material, forming the oil.

14. Describe the role of energy in the development of a country.

Ans. Role of energy in the development of a country

- Energy has become a fundamental aspect of human existence.
- The development of a country can be judged by the amount of energy it consumes. Generally we see that the developed country has larger demand for energy compared to a developing or under developed country.

- Modern day industries cannot sustain their activities without uninterrupted energy supplies. This in turn, ensures the creation of employment opportunities which ultimately generate economic activities and increases the standard of life of a nation.
- Development in the fields of agriculture, health, education, industry etc require energy and lack of investment in terms of energy in these fields mean no development and low standard of life.
- Access to energy is therefore a prerequisite for sustainable development. Pakistan's economy is growing steadily. This growth demands higher energy consumption.
- Pakistan mainly depends upon oil and gas resources to fulfill energy requirements.
- Indigenous resources of oil are not enough for the growing economy. As a result Pakistan has to import large quantities of oil and oil based products from Middle East countries.

15. How critical is hydel power generation for Pakistan. Discuss.

Ans.

- Although Pakistan is blessed with a huge potential for hydel energy but proper planning and a clear strategy in this regard has yet to devise.
- Pakistan total primary energy supply during the year 2007- 2008 was 62.88 MTOE (million tons of oil equivalent) more than 99% of this energy was supplied through conventional energy sources such as oil, gas, hydel and nuclear, etc. whereas less than 1% supplied through micro/mini renewable energy.
- Today, only 55% of Pakistan's population has access to electricity.
- The nation is currently facing power supply shortage the worst to ever hit the country.

- e. The occurrence of prolonged and frequent power breakdowns has had a negative impact on industry operation, the economy and the livelihood of citizens in general.
- f. While the energy shortage continues to grow, abundant indigenous sustainable energy resources such as wind, solar and biomass remain virtually untapped. Currently, approximately 66% of power generation in Pakistan is derived from fossil fuels followed by hydroelectricity (30%) and nuclear energy (3%).

16. Nuclear power is regarded as one of the strategy for fulfilling the gaps of power shortage. How Pakistan has been able to use nuclear technology successfully and what hazards are associated with the use of nuclear energy?

Ans. NUCLEAR ENERGY:

- a. The diminishing availability of natural resources such as coal, petroleum, and crude oil has left scientists searching for an energy alternative.
- b. Harnessing the power of the atom appears to be one of the solutions.
- c. Fission and fusion reaction are the two types of nuclear reaction with the help of which energy can be produced from an atom.
- d. Nuclear energy is the energy released from the nucleus of the atom when it is hit or bombarded by a slow moving atomic particle, called neutron.
- e. When the atom of Uranium 235 is hit by the neutron, it splits up into several parts.
- f. With the release of enormous amount of energy this process is known as nuclear fission.
- g. It is carried in specially designed nuclear reactors.

- h. Cold water is pushed in the core of nuclear reactor, which carries away heat of the nuclear reactor and turns into steam.
- i. The steam is ejected into the steam turbine which begins to turn the generator to produce electricity.
- j. In Pakistan Karachi Nuclear Power Plant (KANUPP) and Chashma Nuclear Power Plant (CHASNUPP-1) are the two main nuclear power plants which are producing electricity.

EXTRA QUESTIONS

- 1. A boy pushes a box with a force of 10 N. The work done is 60 Joules. Calculate the distance covered by the box.**

Ans. Given that

$$\text{Force } F = 10\text{N}$$

$$\text{Work done } W = 60 \text{ joules}$$

$$\text{Distance } S = ?$$

Solution:

As we know that

$$\text{Work done} = \text{Force} \times \text{Distance}$$

Then

$$\text{Distance} = \frac{\text{Work done}}{\text{Force}}$$

$$\text{Distance} = \frac{60}{10}$$

$$\text{Distance} = 6\text{m (Answer)}$$

- 2. Explain the process of measurement of electricity.**

Ans. Measurement of Electricity:

Electric meter is connected with the livewire of main supply. Livewire is connected with the field coils of the meter. Inside the field coil, there is another coil, which can rotate about its axis. When current passes through meter, magnetic field is produced due to which coil inside the field

rotates. The disc rotating along with coil can be seen from outside. The gears attached to the disc display meter reading on the dial. The reading is in kilowatt -hours (kWh), which is simply called a unit.

3. Explain the process of measurement of natural gas.

Ans. Measurement of Natural Gas:

Gas meter are installed to measure gas consumption. Natural gas is measured in cubic meter (m³). The gas before entering the house passes through the gas meter, which turns a wheel. The gears attached to the wheel display the volume of the gas consumed on the dial. Now a day's gas bills are being charged on the base of British thermal unit (BTU). It is also the unit of energy. One BTU is equal to 1055 joules.

4. Explain Thermal pollution in detail?

Ans. Thermal pollution:

- Thermal process is that process in which heat is produced or is converted into other forms of energy.
- In this process heat exchange between system and surrounding may occur.
- Combustion reaction is an example of thermal process. In combustion reaction carbon dioxide (CO₂), water (H₂O), light and heat are produced.
- If oxygen supply to the reaction is insufficient, then carbon monoxide (CO) may also be produced.
- Certain fuels also contain sulphur. When they burn, sulphur dioxide (SO₂) is given off. Coal and fuel oil contain upto 3% of sulphur and petrol about 0.05%.
- Quite low concentration of SO₂ can damage the leaves of plants and stunt their growth and they can also make people's respiratory illness much worse.
- Carbon monoxide (CO) is poisonous and can cause death, even if its concentration is in decimals.
- High concentration of CO₂ also has adverse effects on the environment. It helps in increasing the

temperature of our atmosphere due to green house effect.

Remedial measures

- Maximizing the efficiency of heat engines to minimize heat loss.
- Less burning of fossil fuels and avoiding energy wastages.
- Industries and factories should follow strict norms to reduce thermal pollution.
- Temperature of industrial waste water from power plants, paper industries, and cement industries should be reduced by the adoption of cooling ponds and towers.

5. What are the three significant accidents in the 50-year history of civil nuclear power generation?

Ans. The three significant accidents in the 50-year history of civil nuclear power generation are:

- Three Mile Island (USA 1979) where the reactor was severely damaged but radiation was contained and there were no adverse health or environmental consequences.
- Chernobyl (Ukraine 1986) on 26 April 1986, reactor no. 4 of the Chernobyl nuclear power station exploded. One hundred times more radiation was released than by the atom.
- Fukushima (Japan 11th March, 2011) Fukushima Daiichi nuclear power plant, 150 miles northeast of Tokyo, was severely damaged by the earthquake and tsunami the world's worst nuclear accident.

6. Write the different types of radiation rays.

Ans. Radioactive materials emit certain radiation. These radiations have the ability to penetrate gases, liquids and even solids. The radiations are:

- Alpha (α) radiations
- Beta (β) radiations
- Gamma (γ) radiations