



Chapter # 10

Science and Technology



THIS CHAPTER CONSISTS OF

- ◇ Role of Science and Technology in the development of the Country.
- ◇ Fibre Optics.
- ◇ Radioactivity.
- ◇ Lasers.
- ◇ E.C.G.E.E.G. MRI, C.T. Scan, Angiography.
- ◇ Important Industries of Pakistan.
- ◇ Ultrasound.
- ◇ Satellites and Radar.
- ◇ X rays.

Q.1. What advancement has been attained in Pakistan with reference to science and technology? (BWP 2015 GI, FBD 2019 GII, GUJ 2016 GI)

Ans. ROLE OF SCIENCE AND TECHNOLOGY

It is the age of science and technology. Without the progress in this department, no country can keep the stability of real independence. It always depends on others for its necessities.

SCIENCE AND TECHNOLOGY OF PAKISTAN IN THE PAST

We had extremely limited resources in the beginning when Pakistan came into being. Most of the things of daily use had been imported from other countries. In the field of science and technology we were lagging so much that even a bicycle or a fan was not manufactured.

IN THE FIELD OF MEDICINE

In the medical sector we have made higher achievements.

- (i) In modern diagnosis, ultrasound, CT scan, EEG, MRI and in modern ways of treatment surgery of vital parts of the body. angiography, angioplasty etc. are becoming common.
- (ii) There is also advancement in laser treatment.
- (iii) Radiotherapy is also onto the road of success.

IN THE FIELD OF AGRICULTURE

- (i) Agricultural development is quite evident. In the past, cultivation was done by ploughs. But now almost everyone is cultivating by tractors and modern equipments.
- (ii) Efforts made by agriculture department are appreciable for providing good seeds for good production.
- (iii) Now many universities are linked with this department.

IN THE INDUSTRIES

- (i) Evident Progress is attained in industries such as sugar, cement, glass and ceramics.
- (ii) Sports items, surgery tools and hand made carpets made in Pakistan, are very popular in the world.
- (iii) The use of optical fibre for the improvement of communication system, has placed us among the developed countries.
- (iv) In engineering department besides heavy machinery, the role of cottage industry is exemplary.
- (v) By the grace of God, motorcycles, cars, tractors and even ships are now made in Pakistan.

IN THE FIELD OF DEFENCE

- (i) After achieving the enrichment of uranium Pakistan made a nuclear test and proved to the world that it has full capability of its defense.
- (ii) Pakistan is not lagging behind its opponent in manufacturing long range missiles, tanks and ships also.

Q.2. What is a laser? Describe a few uses of laser?

Ans. LASERS (LHR 2014 GI, FBD 2015 GII, SGD 2016 GI)

Laser is an abbreviation of the light amplification by stimulated emission of radiation.

The first laser ever used is ruby crystal, which is excited by a powerful flash of light.

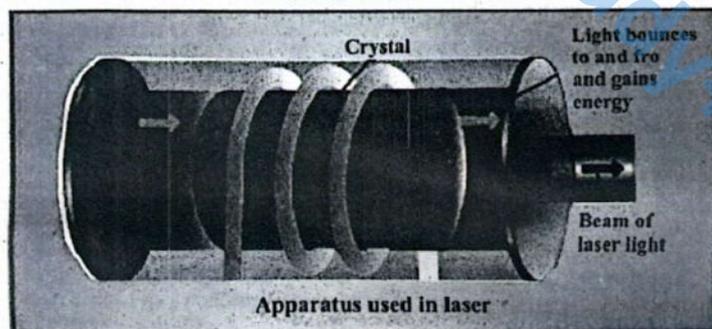
Laser is an intense beam of light in which all the waves have the same wavelength and all are in phase. Such a beam of light is called monochromatic.

CHARACTERISTICS OF LASER BEAM

- (i) Laser beam travels in one direction.
- (ii) Laser beam does not scattered whereas ordinary light spreads out. That is why the ordinary light covers a light distant area while the laser does not spread. Due to this characteristic of laser, different figures can be displayed in space.

PRODUCTION OF LASER

Usually crystals e.g., ruby, glass or semi-conductors are used to make lasers. Beside these, some gases are also used for this purpose.



APPLICATION

Now a days, use of laser has become very common.

A few of the applications are:

- (i) Surgery
- (ii) Ophthalmology
- (iii) Dermatology
- (iv) Dentistry
- (v) Treatment of various diseases

SURGERY

- (i) A Lasers is employed as light scalpel, that is a surgical cutting and coagulation tool.
- (ii) When a laser beam is focussed onto a tissue, it cuts down after being too much hot. Thus only that area is cut on which it is focussed.
- (iii) Laser does not harm the surrounding portion.
- (iv) By laser surgery the blood coagolatics in capillaries so it protects from bleeding.
- (v) Laser surgery is of special importance in liver operation.

OPHTHALMOLOGY

Argon lasers are presently used for operating cataract and glaucoma.

DERMATOLOGY

- (i) Laser radiations are used for many skin diseases.
- (ii) It is also used for the removal of stains and pigments in the skin.

DENTISTRY

In the field of dentistry, laser is used for:

- (i) Fixing of filling material in teeth.
- (ii) Treatment of jaw cancer.
- (iii) Laser presents promising application in clinical dentistry in which by means of photocoagulation nerves a special painted material is fused into teeth cavities.

TREATMENT OF VARIOUS DISEASES

Laser surgery is also used for the following diseases:

- (i) Laser surgery has been used to treat cancer.
- (ii) Lasers are used to crush gallstones and kidney stones without any surgery, the process is called lithotropsy.
- (iii) Lasers are used to mend retina of human eye.
- (iv) Lasers are used to reshape cornea to improve poor vision.
- (v) Laser can be drilled in the hardest material e.g., steel, diamond, etc.
- (vi) In glass or metals precise patterns are made by cutting very precisely.
- (vii) Laser is used to produce three-dimensional images called holograms. This process is called holography.
- (viii) Military purposes are also fulfilled by laser technology e.g., by laser guided missiles and bombs, aircrafts and tanks can be hit accurately.
- (ix) Use of lasers and optical fibres have revolutionized the communication system.
- (x) In super markets, record of prices of items is stored in computer. To sell an item it is scanned by laser and every detail appears on screen.

Q.3. Define optical fibre. Describe its principle, construction, and working (uses).

Ans. FIBRE OPTICS (LHR 2017 GI, SGD 2015 GII, MTN 2015 GI, FBD 2016 GII)
Optical fibres are fine strands of glass. Light passes through optical fibre due to total internal reflection.

PRINCIPLE OF FIBRE OPTICS

When a ray of light passes from a denser to a rarer medium it bends away from the normal to the interface. Now if we go on increasing the angle of incidence then at a particular angle of incidence, the angle of refraction will become 90° . When the angle of incidence is made greater than, the ray does not refract

but reflects into the same medium. It is called the total internal reflection. Light through optical fibre also passes due to the total internal reflection.

CONSTRUCTION

Optical fibres are fine strands of glass. The fibres have a core of pure glass, which is surrounded by a different kind of glass. These days in telecommunication optical fibres are replacing metal cables for transmitting telephone calls in a better way. In this each caller's voice is changed into a light signal.

USES

- (i) Optical fibre enables doctors to look inside the human body.
- (ii) As optical fibres are very thin so it can be easily passed into the body to get the required picture.
- (iii) In eye surgery light is obtained from fibre optic light guide.
- (iv) Optical fibre can transmit thousands of telephone calls.
- (v) T.V. programmes can be transmitted by one or two flexible and thin hair-like optical fibres.

Q.4. What do you mean by satellites? Write down some of its uses.

Ans. SATELLITES

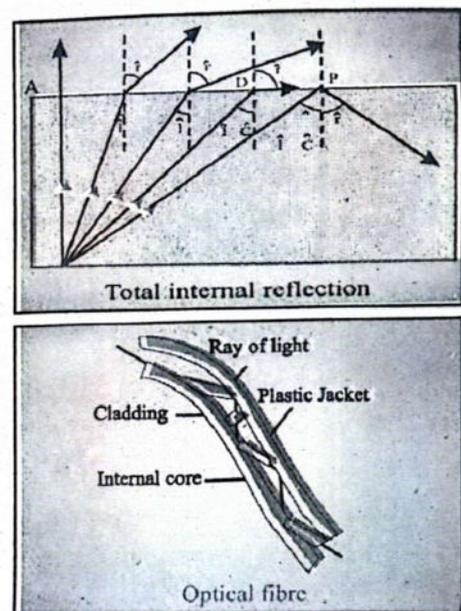
(BWP 2016 GII)

- (i) T.V. displays slides about the address of any celebrity or about different matches, world Olympics, Taravah in Ramazan-ul-Mubarak and sacred occasions of Hajj, are relayed through artificial satellite.
- (ii) There are some communication satellites which relay the telephonic conversation and send the T.V. programmes all over the world. These revolve in particular orbits, which are called geo-stationary orbits. Electrical power for the satellites is provided from panels of solar cells. These panels convert solar energy to electricity. The spacecraft travelling far away from the Sun carry small nuclear reactors with them to generate the required power.

Q.5. What do you mean by radar system? How does it work? Write down waves, which are used. (LHR 2015 GI, LHR 2015 GII, GUJ 2016 GII, RWP 2016 GII)

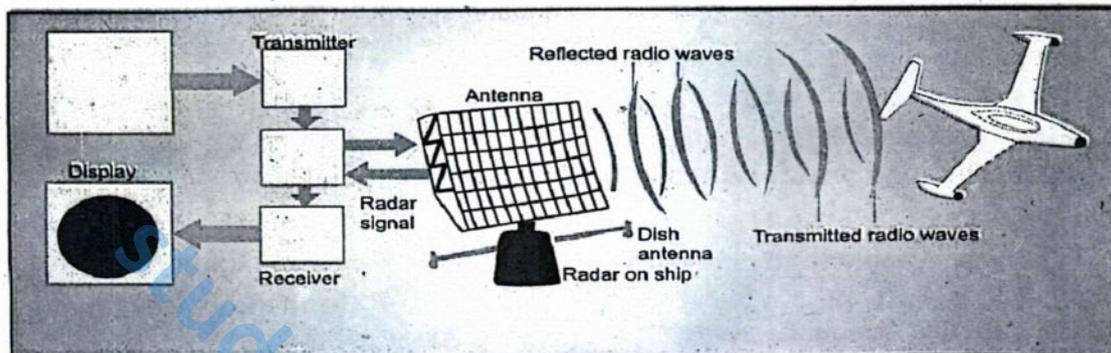
Ans. RADAR

The word radar is derived from radio detection and ranging. Radar is a reliable instrument for sending and receiving electromagnetic waves, which are usually in the form of radio waves or microwaves. Electromagnetic waves are the energy with speed of light. Its characteristics depend on the wavelength. Radar remote detection system is used to locate and identify objects.



RADAR TRANSMITS

Radar transmits, short pluses of high frequency radio waves by means of a revolving aerial. When pulses strike an object, these are reflected, which are received by radar antenna. A trace or shape of that object appears on a screen (shown in Fig). Radar can determine a number of properties of distant objects such as its distance, speed and direction of motion.



IMPORTANCE OF RADAR

- (i) Radar controls air traffic both civilian and military. Large network of ground based radar system helps air traffic controllers to keep track of aircraft to prevent mid-air collisions.
- (ii) Commercial and military ships also use radar to make ships alert of obstacle especially in bad weather and dim light.
- (iii) Military forces around the world take the help of radar to detect aircraft, missiles, troops movement and ships at sea.
- (iv) In this scientific age radar is used to know about weather and to forecast for rain or storm.
- (v) Some spacecrafts also carry radar for mapping the surface of planets covered by thick clouds.

Q.6. What is radioactivity? How many are the types of radiations? Describe their characteristics. (LHR 2016 GII, LHR 2018 GII, RWP 2015 GI)

Ans. RADIOACTIVITY

The elements having atomic number greater than 82, continuously go on emitting radiations. These elements are called radioactive elements.

The phenomenon of emission of radiation from these elements is called radioactivity. These radiations are of three types α , β , γ .

DISCOVERY OF RADIOACTIVITY

In 1896 Henry Becquerel by chance discovered radioactivity. He observed that uranium salt makes the photographic plate foggy. The process continued despite of uranium was covered by black sheet.

TYPES OF RADIATIONS

1. Alpha (α) Radiations.
2. Beta (β) Radiations.
3. Gamma (γ) Radiations.

- 1. ALPHA (α) RADIATIONS** (LHR 2019 GII)
- (i) Alpha Radiation Alpha radiations comprise of fast moving helium nuclei.
 - (ii) Mass of helium is 4 and charge is + 2.
 - (iii) These carry positive charge.
 - (iv) Compared to β and γ -rays the range and penetrating power of α -radiation is small.
 - (v) Velocity of alpha particles ranges from $1.4 \times 10^7 \text{ ms}^{-1}$ to $1.7 \times 10^7 \text{ ms}^{-1}$

2. BETA RADIATION (LHR 2019 GII)

- (i) Beta particles are fast moving electrons.
- (ii) Its mass number is zero.
- (iii) Its charge number is 1.
- (iv) Its penetrating power is greater than that of α -particles.

3. GAMMA RADIATION

Gamma rays are high energy carrying electromagnetic radiations.

- (i) γ -rays are identical with x-rays but gamma rays are of short wavelength, and have high energy.
- (ii) Their range and penetrating power are also greater.
- (iii) γ -rays are ejected from the nucleus.
- (iv) These are not affected by electric or magnetic field.

Q.7. What are isotopes and radioisotopes? Write down some of its uses. Also mention methods of protection and precautions against the radiations.

Ans. ISOTOPES (LHR 2015 GII, LHR 2016 GI, LHR 2017 GI, RWP 2015 GII)

Isotopes are the nuclei of the same atomic number and different mass number and have the same chemical properties, e.g., chlorine 35 and chlorine 37 are the two isotopes of chlorine.

USES

There are many advantages of isotopes in some fields:

- (i) In industries radioisotopes are used as tracers. These are used to check the flow of liquid in chemical plants.
- (ii) The ability of a substance to absorb γ -rays has been adapted to keep automatic control on the thickness of paper, plastic and metal sheets as it is passed through the production plant.
- (iii) Besides this radioisotopes detect the crack or leakage in the underground pipe.
- (iv) Radioisotopes are being used in scientific research to study the chemical reactions on a wide scale phosphorus 32 and sulphur 35 are employed on living system to trace the metabolic path.
- (v) γ -rays are used to detect the flaws and cracks of metal parts.
- (vi) γ -rays are employed to preserve food for a long period. If x-rays are passed through food stuff, bacteria in it get killed. Food without bacteria does not go bad for a long time specially when it is stored in air tight containers. But if there occurs any change in the food it is dangerous to take such food. The treatment for this purpose needs intensive care.

PROTECTION AND PRECAUTIONS AGAINST THE RADIATION

The cells of the body undergo dangerous physical and chemical changes as a result of exposure to radiation.

- i. The extent of the damage depends on nature of radiations, parts of the body exposed to radiation and duration or dose of radiation.
- ii. Radioactive sources should be stored carefully. It should be tagged "R" for radioactive materials.
- iii. Laboratory walls, floor, benches should be hard glass painted.
- iv. Lab should capable to be washed thoroughly so that any crack on the bench, the floor-wall joins should be free of radiations.
- v. Clothings for the lab and out door should be kept separate.
- vi. Use the gloves according to the situation.



Q.8. How are X-ray obtained? Write their properties uses

Ans. X-rays (LHR 2015 GI, LHR 2016 GI, LHR 2017 GII, LHR 2018 GI, LHR 2019 GI)
X-rays is one of the monumental discoveries of mankind, which was discovered accidentally.

When high energy electrons impinge on metal surface, very powerful radiations are emitted. These radiations are called x-rays (Fig.10.5).

X-rays are those high energy photons, which are liberated from the metal due to collision of fast moving electrons.

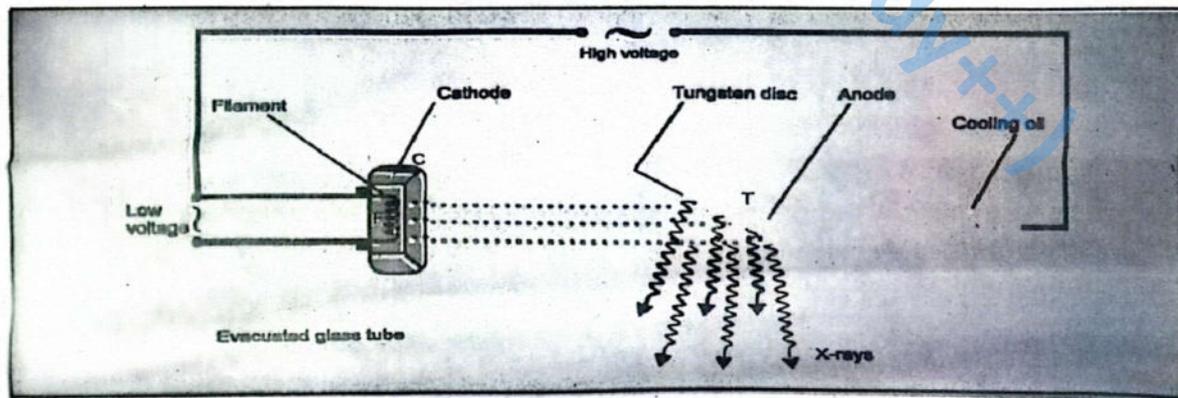
Materials, which contain only light atoms do not absorb much x-rays.

For example, they pass easily through most living things, but not through bones, which contain heavier atoms. This means that x-rays can be used to find defects in the bones and teeth inside the body without surgery.

PROPERTIES OF X-RAYS

(LHR 2014 GII, LHR 2016 GI)

- (i) These rays are not deflected by an electric or a magnetic field.
- (ii) These are highly penetrating strike. Higher the density, lesser is the penetration
- (iii) Compared to light, these are short wavelength electromagnetic waves. Their frequency is greater.
- (iv) These affect the photographic plate more than the light rays.



USES OF X-RAYS

(i) INVESTIGATION OF HARD TISSUES

X-ray technology lets the doctors to see the depth of human tissues, to examine broken bones, cavities and to trace the swallowed objects.

(ii) INVESTIGATION OF SOFT TISSUES

By latest experiments on x-rays, physicians have become expert in locating the diseases in soft tissues e.g., lungs, blood vessels and intestines.

(iii) INDUSTRIAL USE

In the industrial world, even a minute flaw in heavy metallic equipments is detected by x-ray scanner, in twinkling of an eye.

(iv) AIRPORT SECURITY

X-ray scanners are used as standard equipment for airport security.

PRECAUTION

As x-rays can be harmful for the cells of human body, therefore, these should be applied very carefully and used if necessary.

Q.9. What are ultrasounds? How can we obtain them? Also write their uses.

Ans. ULTRASOUND

(DGK 2015 GI, SGD 2015 GII)

Ultrasound is the sound that cannot be heard because its frequency is much greater than the frequency which a normal ear can hear.

Sounds having frequency greater than 20 kHz are said to be ultrasound or ultrasonics

THREE-DIMENSIONAL IMAGES

Usually two-dimensional images are obtained by ultrasound whereas the objects are three dimensional.

Recently such developments have been made in ultrasound machines that two dimensional images

Recently such developments have been made in ultrasound machines that two dimensional images obtained are changed into three dimensional images by special computer software.

WORKING

When the moving object reflects ultrasound then a change occurs in its reflected frequency. When probe moves near to the body, the frequency rises and when probe is away frequency decreases. How much the frequency is changed, depends upon fast or slow movement of the body.

IMPORTANCE OF ULTRASOUNDS

Ultrasound of anybody can be done much faster than x-rays. Without using radiation the structure of the body can be observed. Because, with the help of ultrasound the structure of internal organs of the body or any defect in them can be judged without doing any surgery. Therefore, the importance of ultrasound is increasing in medical diagnosis section.

USES OF ULTRASOUND

(i) Speed of blood flow through kidneys can be determined.

- (ii) The presence of stone can be located, in kidneys, pancreas, gallbladder.
- (iii) In jaundice, condition of liver and arteries can be observed.
- (iv) Internal heart structure and irregularities in blood circulation system can be studied.
- (iv) Tumor in the body or cancer in any organ can be detected.
- (v) Any sort of obstrectries can be located.
- (vi) Ultrasound is helpful in some medical processes, e.g.
 - (a) To break kidney stone by ultrasound.
 - (b) Use in biopsy.
 - (c) Extraction of extra water from lungs and abdomen in different diseases.
- (vii) Besides this, sonar systems are fitted on ships and submarines use ultrasounds, to find the hidden secrets under water.

Tidbits

If dirty object is dipped in water and ultrasound is switched on, the dirt separates from the object due to vibration.

Ans. ELECTROCARDIOGRAM (E.C.G)

Electrocardiogram is the test that measures the electrical activity of the heart. The heart beats in a peculiar way so that blood may be pumped through the whole body.

USE OF ECG

In an E.C.G. test, the electrical impulses, which are produced due to heart beating, get recorded and usually appear on a strip of paper, which is known as an electrocardiogram. Because any heart disease affects the heartbeat, so it records any problem in the regularity of heartbeat.

If one feels difficulty in breathing (dyspnoea), chest pain (angina), feeble or fast (palpitation) heart beat becomes abnormal, then it is better to have an E.C.G. in that state.

IMPORTANCE OF ECG

E.C.G. not only helps to discover the heart disease but also informs how well the patient is responding to the treatment. If E.C.G. recording taken at rest is normal but the patient is feeling suffocation or pressure on chest, then E.C.G. recording may be made when the patient is exercising, this may reveal the problem. From E.C.G. proof of problem in coronary artery can be had. It can be used to assess that the patient is under heart attack or evidence of previous heart attack.

BE CAREFUL

While exercising if the patient complains chest pain or any change in E.C.G. is observed or blood pressure drops, the test may be discontinued.

Q.10. Write a note on electro-encephalo-graphy (EEG).

Ans. ELECTRO ENCEPHALO GRAPHY (E.E.G)

Recording of electrical activity of brain is called brain waves from outer surface of head is said to be E.E.G. To get E.E.G. sixteen electrodes are set on different places for about 10-30 minutes and informations are collected about brain waves.

USES

- i. To diagnose the different types of epilepsy and to enquire about the beginning of this disease into the brain.
- ii. To diagnose different brain diseases e.g., dementia, encephalitis and hypoglycemis.
- iii. To know the effect on brain (Hepetic Encephelogatty) due to liver problem.

iv. To collect informations about brain death and comma condition.

Q.11. What is magnetic resonance imaging (MRI)

Ans. Magnetic Resonance Imaging (LHR 2014 GII, LHR 2017 GII, LHR 2019 GII)

MRI is the special medical diagnostic technique that creates images of the body using the principles of nuclear magnetic resonance. This generates thin section images of any part of the body including the heart arteries and veins from any angle and direction without surgical application and in a relatively short period of time.

IMPORTANCE

- (i) This information may allow early diagnosis of many diseases.
- (ii) These informations may allow early diagnosis of many diseases. These days in medical departments MRI is specially preferred for diagnosing central nervous system.
- (iii) MRI scanner is better than x-ray because it can distinguish both, normal and diseased state of a soft tissue.
- (iv) Provides informations about the existence of cancer in brainhemrage, obstruction in brain artery and pressure on medulla oblongata.

Q.12. What do you mean by C.T. scan? What are the uses of computerized topographic scan? (DGK 2016 GII)

Ans. Computerized Tomograph (C.T.) Scan

DISCOVERY

C.T. scanning technique was discovered by a British scientist Sir Geoferry Hounsfield, for which he got the Nobel award.

DEFINITION

C.T. Scan is a special type of x-ray, which is obtained by sending several beams of x-rays at different angles through the body instead of passing a single x-ray beam.

SCANNER

The machine used for this purpose is called C.T. scanner.

Scanner looks like a doughnut.

PROCEDURE

For scanning, patient is laid in such a way that the body part to be examined is placed in the round tunnel or opening of the scanner.

The bed is then moved slowly backward and forward to allow the scanner to take pictures of the body, without touching it.

Scanning of test depends on the number of pictures and angles selected for pictures.

CAUTION

Scannin, does not hurt, but some people find it uncomfortable to lie in the tunnel, as there is little room inside the tunnel.

In the same way some people get nervous because of the whirling noise of the machine, while working.

Do You Know?

As more x-rays are involved in C.T. Scan than an ordinary x-ray so the doctors recommend C.T. Scan in a sound medical reason.

USES

- i. To detect the blockage in intestines
- ii. To study about the structure of abdominal organs and condition of aorta.
- iii. To get knowledge for the lungs cancer and its spreading, effects on lungs due to cancer or different diseases of lungs. To know about brain diseases e.g., brain cancer, brain constriction or haemorrhage, coagulation of blood due to head injury.

Q.13. What is angiography?

(MTN 2016 GII)

Ans. ANGIOGRAPHY

Angiography is a way to produce inside x-ray pictures of arteries. When arteries are blocked or suffer any loss or any irregularity developed in them, then chest pain, heart attack, stroke or any other problem may occur.

USES

Angiography helps the physician to determine the source of problem and the extent of damage to the arteries segments.

By angiography blockage or constriction in heart arteries are known, by which choice of treatment procedure becomes easy e.g., replacement of valve, by-pass operation or to lay a pace maker.

Q.14. Write a note on sugar industry of Pakistan.

Ans. SUGAR INDUSTRY

(LHR 2018 GII, DGK 2015 GII)

Sugar industry is one of the vital industries. Sugar is naturally present in most of the green plants and fruits. It is formed through a natural process called photosynthesis. Two main sources of sugar are sugarcane and sugar beet.

PREPARATION OF SUGAR FROM SUGARCANE

Sugar is mostly made by sugarcane. Sugar is stored in the stalks of sugarcane. Sugarcane contains sucrose, glucose, fructose, water, fibres and some other materials. From ingredients of sugarcane, sucrose is extracted in white crystals. This is called sugar. Sugar mills are located near fields, because sugarcanes start losing its weight slowly, after it is harvested, therefore it is crushed quickly. Moreover sugarcanes require a large space, so it is difficult and expensive to carry them. Sugarbeet is second major source of commercial sugar in the world. This grows in cold climate. Sugar is also stored in the roots of beets.

SUGAR MANUFACTURING

Sugar is manufactured through the following processes.

(i) EXTRACTION OF JUICE

Sugarcane is cut into small pieces, the rind and nodes of the canes are separated. Then cane is crushed by crusher and juice is extracted leaving the bagasse.

(i) PURIFICATION OF JUICE

Juice is passed through strainers to remove straws and the bagasse. Then impurities are removed from juice so that strained, purified juice is obtained.

(ii) EVAPORATION OF JUICE

Purified juice that contains sucrose, water and certain impurities is sent to evaporator for the removal of surplus water. The obtained syrup is changed into concentrated

syrup for raw sugar. Then from concentrated syrup, white sugar is obtained. In evaporation process the juice is heated from 100°C to 110°C.

(iii) CRYSTALLIZATION

Concentrated syrup is boiled in sugar boiling plant where crystallization is carried out to the desired size of grains.

(v) CENTRIFUGATION

In this process sugar crystals are separated from molasses and washed with steam if necessary.

(iv) DRYING AND BAGGING

Drying sugar with hot air in dryers is then bagged for marketing.

Following by-products are obtained during manufacturing sugar:

1. BAGASSE

This is used as fuel in sugar mills. The surplus is being used in manufacturing of paper, chipboard and boards.

2. MOLASSES

Most of the available molasses is exported. A small percentage is used for production of alcohol and cattle feeds.

Q.15. Highlight the importance and uses of steel mill. (SGD 2015 GI, FBD 2016 GI)

Ans. STEEL INDUSTRY

According to the need, iron is melted, and hot air is passed to make it free of impurities.

ORE

Ore is an important source of iron. By mixing oxygen in it, a compound is made. Ore is mixed with carbon and limestone and on heating it is changed into pig iron. Adding scrap iron and limestone into pig iron, it is sent back to the furnace to get pure iron. Iron is mixed with carbon or sometimes with other elements to produce extra hardness according to necessity. It is called steel.

COMPOSITION OF STEEL

Ordinary steel contains carbon upto 1.7%. It is used for building plazas, factories, ships, airplanes and car bodies. To save from rust these may be coated with paint or plastic or with protective layer of zinc.

STAINLESS STEEL

Stainless steel is a mixture of chromium, nickel, molybdenum, which is used to make surgery tools and home appliances and every type of light and heavy machinery.

IMPORTANCE OF STAINLESS STEEL FOR PAKISTAN

Pakistan steel mill is providing raw material for engineering and construction industries and those lower level industries, which depend upon Pakistan steel mills products, are fed by it.

As Pakistan has iron resources, so steel mill prepares millions of tonnes of steel. Though Pakistan's steel products are very popular but surgery tools are at the top of the list. Gugranwala and Sialkot are famous for these products all over the world.

Q.16. Write a note on:

- 1) Pharmaceutical industry
- 3) Cotton textile industry

- 2) Synthetic fiber industry
- 4) Leather industry

(RWP 2015 GI, LHR 2017 GI)

Ans. 1) Pharmaceutical Industry

Pharmaceuticals are medical products, which are prescribed by doctors for different diseases.

The place where these products are prepared is called pharmacy. Pharmacy simply is the preparation of medicines.

The industry linked with the preparation of medicine is called as pharmaceutical industry.

Earlier we were dependent mostly on imported medicines. But gradually attention was given to pharmaceutical industry.

Now we prepare most of the medicine in our country.

Pharmaceutical industry is based on pharmaceutical chemistry which is of course a branch of chemistry in which preparation of new compounds, its testing and its effects on the human health are examined.

2) SYNTHETIC FIBRE INDUSTRY

(LHR 2019 GI, DGK 2016 GI)

There are two types of fibres: (i) Natural Fibre (ii) Artificial Fibre

(i) NATURAL FIBRE

Natural fibre is obtained by natural resources e.g., cotton, jute, wool, silk etc.

(ii) ARTIFICIAL FIBRE

Artificial fibre, is that fibre which is prepared by the man himself using different raw materials e.g., polyester, nylon, rayon, acetates, viscose, acrylic etc.

These are obtained from petroleum, and are prepared by different methods.

Steel fibre, carbon fibre, Teflon fibre are also fibres.

The formation of synthetic fibres includes the process like polymerization, spinning stretching, cutting and reeling.

3) COTTON TEXTILE INDUSTRY

(LHR 2016 GI, LHR 2019 GI)

Textile is the major sector of Pakistan industry. Textile industry is mostly located in Karachi, Lahore Multan, Faisalabad and Gujranwala.

SECTIONS OF TEXTILE INDUSTRY

Textile industry comprises of the following sections.

- (i) Spinning
- (ii) Weaving and fabric formation
- (iii) Garments manufacturing



(i) SPINNING

Cotton bales are sent to the textile mills where cotton fibres are changed into yarn.

(ii) Weaving and fabric formation Fabric is made from yarn.

Two methods are employed for it. Weaving: Here the fabric is made on looms. Knitting: In this process fabric is knitted on machines.

- (a) First of all, fabric is cleaned, impurities are removed from it
(b) Then fabric is dyed or printed.

(iii) **GARMENTS MANUFACTURING**

Garments from different fabrics are stitched to make it ready.

Here cutting stitching and pressing departments are involved. At the time of independence of Pakistan, textile industry had no base as was the case with almost all industries. Hence Pakistan was entirely dependent upon imported yarn as the hand-made looms were insufficient to meet the country demand. But now, major contributions towards the foreign exchange earned by Pakistan comes from textile industry.

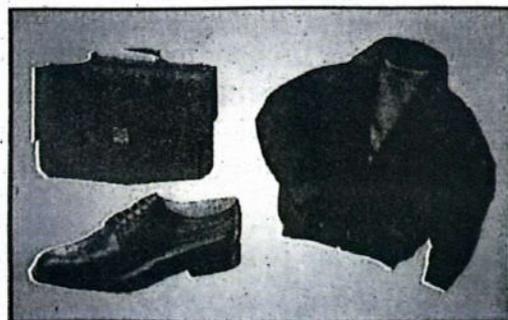
4) **LEATHER INDUSTRY (LHR 2014 GI, (LHR 2014 GI, DGK 2016 GII)**

i. **NATURAL LEATHER**

Leather is usually obtained from the hides (skins) of different animals like horses, buffalos, sheep, camels etc.

ii. **ARTIFICIAL LEATHER**

Apart from this, leather is also prepared from different chemicals. It is called artificial leather.



TANNERY

Skins or hides are passed through different processes, which is called tannery (Fig.10.6).

FINISHED PRODUCTS

Finished leather from tannery is used for different purposes e.g., leather garments purses, jackets, attaché cases etc. Leather garments are mostly made in Kasur, Gujranwala, Faisalabad, and Sialkot and are popular in many foreign countries.

Important Key Points

- 1. What is meant by laser?**
Ans. Laser is the abbreviation of light amplification by stimulated emission of radiation. It is a device to produce an intense beam of light in which all waves have the same wavelength and all waves are in phase.
- 2. What are optical fibres?**
Ans. Optical fibres are fine strands of glass. Light passes through optical fibre due to total internal reflection.
- 3. What are satellites called?**
Ans. Spacecraft is said to be an artificial satellite, which is launched in a particular orbit around the planet.
- 4. What are communication satellites?**
Ans. The satellites in geo-stationary orbit to relay T.V. programmes and messages are called communication satellites.

5. What is radar?

Ans. Radar is a reliable instrument for sending and receiving electromagnetic waves or micro-waves.

6. What are radioactive elements called?

Ans. Elements having atomic number greater than 82 continuously go on emitting radiations. These elements are called radioactive elements. The phenomenon of emission of radiation from these is called radioactivity.

7. What are radio isotopes called?

Ans. The isotopes which emit radiations are called radioisotopes.

8. What are X-rays?

Ans. X-rays are high energy electromagnetic waves which pass through paper, wood, flesh etc.

9. What is ultrasound?

Ans. The sounds having frequency greater than 20 kHz are called ultrasound or ultrasonic.

10. What is done with electrocardiogram?

Ans. Electrocardiogram is a test that measures the electrical activity of heart.

11. What is an EEG?

Ans. Electrical activity of brain recorded from outer surface of head, is said to be E.E.G.

12. What is an MRI?

Ans. MRI is a special type of medical diagnostic technique, which makes images on the principle of nuclear magnetic resonance.

13. What is a CT scan?

Ans. C.T. scan is a special type of x-ray, which is obtained by sending several beams of x-rays at different angles through the body instead of single x-ray beam.

14. What is angiography?

Ans. Angiography is a way to produce x-ray picture from inside the arteries.

15. What are the sources of sugar production in Pakistan?

Ans. In Pakistan sugar is manufactured by sugarcane and beet.

16. What is the pharmaceutical industry?

Ans. The industry linked with medicines is said to be pharmaceutical.

17. How are fibers produced from petroleum?

Ans. Artificial fibres like polyester, nylon, rayon, acrylic etc. are obtained from petroleum.

18. What is produced in the textile industry?

Ans. In textile industries, yarn and fabric is prepared.

19. What is produced in leather industry?

Ans. Leather industries prepare leather and leather articles from skins or hides.

Glossary

Laser :	Form of light having all waves of the same wavelength and inphase as well.
Fibre Optics:	Communication in the form of light signals.
Satellite:	Spacecraft revolving round a planet.
Radar:	A device to detect aeroplanes etc. by means of electromagnetic waves.
Radioactivity:	Emission of radiation from nucleus of an atom.
Isotopes:	Nuclei of the same atomic number and different mass number.
X-ray	High energy electromagnetic waves which pass through paper, wood, flesh etc.
Ultrasound:	Sound waves of frequency greater than 20 kHz.
E.C.C.:	Electrocardiogram, which is the electrical activity test of heart.
E.E.C.	X-ray of brain condition.
MRI:	Magnetic resonance imaging test.
Angiography:	A way of taking pictures from inside the arteries.
C.T. Scan:	A special type of x-ray at different angles through the body.
Sugar Industry:	Mills producing sugar from sugarcane and beets.
Steel Industry	Mills manufacturing steel from raw iron.
Pharmaceutical:	Factories of medicines.
Synthetic Fibre	Industries preparing artificial fibre.
Cotton Textile	Mills to prepare yarn and fabric from cotton.
Industry	
Leather Industry	Factories preparing leather and its articles from skins or hides.

Exercise

Q. 1. Mark (✓) for right and (x) for wrong in the following questions.

- | | | |
|-------|--|---|
| (i) | There is no difference in laser light and ordinary light. | X |
| (ii) | Hearing aid is called radar. | x |
| (iii) | X-rays can pass through flesh. | ✓ |
| (iv) | Rays emitted from radioactive sources are harmless. | x |
| (v) | Ultrasound are the sound waves of frequency greater than 20 kHz. | ✓ |

Q 2. For every statement given below, four answers are given. Select the correct answer.

- (i) Emission of radiations from nucleus is said to be
- | | |
|-----------------------|---------------------|
| (a) chemical reaction | (b) atomic reaction |
| (c) radioactivity | (d) nuclear fission |
- (ii) Frequency of ultrasound is
- | | |
|--------------------|----------------------|
| (a) less than 20Hz | (b) 20Hz |
| (c) 20kHz | (d) more than 20kHz. |
- (iii) X-rays when pass through any gas produce in it

- (a) evaporation (b) ionization
(c) excitation (d) radioactivity

(iv) The principle of light on which the fibre optics works is

- (a) reflection (b) refraction
(c) total internal reflection (d) dispersion

Answers

(i)	(c)	(ii)	(d)	(iii)	(b)	(iv)	(c)
-----	-----	------	-----	-------	-----	------	-----

Q. 3. Fill in the blanks.

- (i) Alpha particles are deflected towards _____ plate.
(ii) The _____ rays are not affected by any field.
(iii) Optical fibres are fine _____ of glass.
(iv) The _____ of all waves of laser is the same.
(v) E.C.G. evaluates the activity of heart

Answers

(i)	Negative	(ii)	Gamma	(iii)	Wires	(iv)	Wavelength	(v)	beat
-----	----------	------	-------	-------	-------	------	------------	-----	------

Q. 4. Give brief answers.

(i) Which objects are used as laser?

Ans. Usually crystals e.g., ruby, glass or semi-conductors are used to make lasers. Besides these, some gases are also used for this purpose.

(ii) From where do the satellites get electrical power?

Ans. Electrical power for the satellites is provided from panels of solar cells. These panels convert solar energy to electricity.

The spacecraft traveling far away from the Sun carry small nuclear reactors with them to generate the required power.

(iii) What are isotopes?

Ans. These elements are called isotopes.

(iv) Differentiate between E.C.G. and E.E.G.

Ans. E.C.G is electrocardiogram while E.E.G electroencephalography.

(v) How steel is made harder?

Ans. Iron is mixed with carbon or sometimes with other elements to produce extra hardness according to necessity.

Q. 5. What is a laser? Describe a few important uses of it.

Ans. See Q. No. 2

Q. 6. Define optical fibre. Describe its construction, principle, and working.

Ans. See Q. No. 3

Q. 7. What do you mean by radar system? How does it work? Write some of its uses.

Ans. See Q. No. 5

Q. 8. Discuss in detail the satellite and its types and highlight its uses.

Ans. See Q. No. 4

Q. 9. What is radioactivity? How many are the types of radiations? Describe their characteristics.

Ans. See Q. No.6

Q.10. What are radioisotopes? Write down some of their uses.

Ans. See Q. No. 7

Q.11. How are x-rays obtained? Write their properties and uses.

Ans. See Q. No. 8

Q.12. What is the difference between x-rays and C.T. scan? Which method is better for treatment?

Ans. See Q. No. 8,12

Q.13. Highlight the importance and uses of steel mill.

Ans. See Q. No. 15

Q.14. Write a note on pharmaceutical industry.

Ans. See Q. No. 16

Q.15. What are synthetic fibres?

Ans. See Q. No. 16

Q.16. What do you know about important sections of textile industry?

Ans. See Q. No. 16

Q.17. Write a note on leather industry.

Ans. See Q. No. 16

Q.18. Describe sugar processing in detail.

Ans. See Q. No. 14

▣ IMPORTANT MULTIPLE CHOICE QUESTIONS (MCQ's)

Each question has four options. Encircle the correct answer.

- Electrocardiogram is the test that measure the electrical activity of:
(a) Brain (b) Heart (LHR 2014 GI)
(c) Kidneys (d) Lungs
- The major sector of Pakistan industry is: (LHR 2014 GI)
(a) Textile industry (b) Sugar industry
(c) Steel industry (d) Cement industry
- The second major source of commercial sugar in the world after sugar-cane is:
(a) Carrot (b) Tomato (LHR 2014 GI)
(c) Sugar-beet (d) Cabbage
- The speed of radio waves is: (LHR 2014 GII)
(a) Equal to light (b) Less than light
(c) More than light (d) Double of light
- The charge on beta particles is: (LHR 2014 GII)
(a) -1 (b) -2
(c) +1 (d) +2
- The distance of hovering satellite from the surface of earth is: (LHR 2014 GII)
(a) 36,000 km (b) 37,000 km
(c) 38,000 km (d) 39,000 km

7. For what purpose, sugar-cane bagasse is not used? (LHR 2014 GII)
 (a) Fuel (b) Formation of paper
 (c) Food (d) Formation of board
8. Fiber optics are: (LHR 2014 GII)
 (a) Very light (b) Very hard
 (c) Very heavy (d) Very dense
9. The process of breaking stones of gallbladder and kidney by Laser is called:
 (a) Surgery (b) Dermatology (LHR 2015 GI)
 (c) Dentistry (d) Lithotripsy
10. The first laser which was used: (LHR 2015 GI)
 (a) Ruby crystal (b) Ruby mirror
 (c) Laser (d) Prism
11. The Helium nucleus consisted of: (LHR 2015 GI)
 (a) Alpha Radiation (b) Beta Radiation
 (c) Gamma Radiation (d) Nuclear Radiation
12. Which is known as Light Knife? (LHR 2015 GII)
 (a) Laser (b) Prism
 (c) Microscope (d) Ruby crystal
13. The three-dimensional images which are obtained by laser are called:
 (a) Hologram (b) Holograph (LHR 2015 GII)
 (c) Graph (d) Optical fiber
14. The test to measure the electrical activity of heart is called: (LHR 2016 GI)
 (a) E.C.G (b) E.E.G
 (c) Ultrasound (d) M.R.I
15. On mixing ORE with carbon and limestone and on heating it is changed into:
 (a) Steel (b) Iron (LHR 2016 GI)
 (c) Pig iron (d) Copper
16. They are high energy carrying electromagnetic radiations: (LHR 2016 GI)
 (a) Alpha radiations (b) Beta radiations
 (c) X-rays (d) Gamma radiations
17. Radioactivity occurs naturally from all the elements with atomic number greater than: (LHR 2016 GII)
 (a) 60 (b) 70
 (c) 80 (d) 82
18. Radar is a reliable instrument for sending and receiving waves:(LHR 2016 GII)
 (a) Sound waves (b) Electromagnetic waves
 (c) Cosmic waves (d) Magnetic waves
19. The charge on beta particles is: (LHR 2016 GII)
 (a) 0 (b) +1
 (c) -1 (d) +2
20. The process in which cotton fibres are changed into yarn is called:
 (a) Spinning (b) Weaving (LHR 2017 GI)
 (c) Knitting (d) Fabric formation

21. The frequency of ultrasound is: (LHR 2017 GI)
 (a) Less than 20Hz (b) 20 Hz
 (c) 20KHz (d) More than 20KHz
22. The industry linked with the preparation of medicines is called: (LHR 2017 GI)
 (a) Leather industry (b) Pharmaceutical industry
 (c) Fibre industry (d) Sugar industry
23. The source of information about the condition of brain death and coma is:
 (a) E.C.G (b) E.E.G (LHR 2017 GI)
 (c) M.R.I (d) X-ray
24. X-rays are having energy: (LHR 2017 GII)
 (a) Protons (b) Neutrons
 (c) Photon (d) Electrons
25. What is used to break kidney stone? (LHR 2017 GII)
 (a) E.C.G (b) E.E.G
 (c) X-rays (d) Ultrasound
26. The mass of alpha particle is: (LHR 2017 GII)
 (a) 4 (b) 6
 (c) 8 (d) 2
27. To raise the intensity of light, we use in laser: (LHR 2018 GI)
 (a) Convex mirror (b) Plane mirror
 (c) Concave mirror (d) Biconvex mirror
28. Which rays were discovered accidentally? (LHR 2018 GI)
 (a) Alpha rays (b) Beta rays
 (c) X-rays (d) Gamma rays
29. The mass of beta radiations is: (LHR 2018 GI)
 (a) Zero (b) One
 (c) Two (d) Three
30. Emission of radiations from nucleus is said to be: (LHR 2018 GII)
 (a) Chemical reaction (b) Atomic reaction
 (c) Radioactivity (d) Nuclear fission
31. A way to produce inside picture of arteries is: (LHR 2018 GII)
 (a) E.C.G (b) Angiography
 (c) M.R.I (d) E.E.G
32. The first laser crystal ever used is: (LHR 2018 GII)
 (a) Glass (b) Fibre
 (c) Ruby (d) Semi-conductor
33. Laser pen is a _____ device: (LHR 2019 GI)
 (a) Writing (b) Storage
 (c) Output (d) Input
34. Recording of electrical activity of brain is called: (LHR 2019 GI)
 (a) E.E.G (b) E.C.G
 (c) M.R.I (d) X-ray

(LHR 2019 GI)

Main source of sugar is:

- (a) Maize (b) Potato
(c) Mango (d) Sugarcane

(LHR 2019 GI)

Optical fibers are made up of:

- (a) Iron (b) Plastic
(c) Glass (d) Steel

(LHR 2019 GH)

It diagnosis epilepsy:

- (a) Angiography (b) M.R.I
(c) E.E.G (d) C.T. Scan

To get E.E.G _____ electrodes are set on different places for about 10-30 minutes.

- (a) Eight (b) Ten
(c) Sixteen (d) Twenty

X-rays when pass through any gas produce in it:

- (a) evaporation (b) ionization
(c) excitation (d) radioactivity

The first laser ever used is:

- (a) Diamond crystal (b) Graphite
(c) Ruby crystal (d) Emerald

Knowledge of skin disease is:

- (a) Ophthalmology (b) Skintology
(c) Dermatology (d) Biology

When a ray of light passes from a denser to a rare medium, it:

- (a) Bends a way from the normal (b) Bends toward the normal
(c) Moves away from origin (d) goes ahead without any change

Electromagnetic waves travel with the speed of:

- (a) Sound (b) Light
(c) Jet (d) None of the above

Mass of helium is 4 and charge is:

- (a) +1 (b) +4
(c) +2 (d) -4

E.E.G stands for:

- (a) Electroeiography (b) Electroencephalography
(c) Electroendoscopy (d) All of the above

Which of the following is not the function of ultrasound?

- (a) It breaks kidney stone (b) It is used in biopsy
(c) It is used to dissolve tumors in brain
(d) It is used to extract water from lungs

Products of pharmaceutical companies are:

- (a) Steel (b) Medicines
(c) Sugar (d) Leather

Most of the available molasses is:

- (a) Burnt as waste (b) Burnt as fuel

- (c) Exported (d) Used in paper industry
49. Conversion of cotton fibre into yarn is called:
(a) Spinning (b) Weaving
(c) Knitting (d) none of them
50. Most popular steel products of Pakistan is:
(a) Bridges (b) Surgery tools
(c) Sports goods (d) Vehicle manufacturing
51. The branch of chemistry in which preparation of new chemical compounds, its testing and its effects on the human health are examined, is called:
(a) Biochemistry (b) Pharmaceutical chemistry
(c) Organic chemistry (d) Physical chemistry
52. Which of the following is a resource for the manufacturing of natural fibre?
(a) Jute (b) Cotton
(c) Wool (d) All of them
53. Optical fibres are fine thread of:
(a) Cotton (b) Iron
(c) Glass (d) Fibre
54. High energy electromagnetic waves, which pass through paper, wood, flesh, etc are called:
(a) X-rays (b) Alpha rays
(c) Beta rays (d) Gamma rays
55. Factories of medicines are called:
(a) Medicinal Industry (b) Biochemical Industry
(c) Pharmaceutical Industry (d) none of them
56. Skins (hides) of animals are used to manufacture:
(a) Paper (b) Jeans
(c) Rubber (d) Leather
57. During _____ the fabric is made on looms.
(a) Knitting (b) Weaving
(c) Spinning (d) none of them
58. Stainless steel is a mixture of:
(a) Chromium, nickel, molybdenum (b) Chromium, iron, molybdenum
(c) Chromium, iron, sulphur (d) Chromium, iron, sulphur, molybdenum, nickel
59. Polyester, nylon, acetates, rayon, viscose, acrylic, are some examples of:
(a) Leather (b) Fabric
(c) Plastics (d) Artificial Fibres
60. Pacemaker is used in:
(a) Legs (b) Brain
(c) Heart (d) Liver

Answers

1	(b)	2	(b)	3	(c)	4	(a)	5	(a)
6	(a)	7	(c)	8	(a)	9	(d)	10	(a)
11	(a)	12	(a)	13	(a)	14	(a)	15	(c)
16	(d)	17	(d)	18	(b)	19	(c)	20	(a)
21	(d)	22	(b)	23	(b)	24	(c)	25	(d)
26	(a)	27	(b)	28	(c)	29	(a)	30	(c)
31	(b)	32	(c)	33	(d)	34	(a)	35	(d)
36	(c)	37	(c)	38	(c)	39	(b)	40	(c)
41	(c)	42	(a)	43	(b)	44	(c)	45	(b)
46	(c)	47	(b)	48	(c)	49	(a)	50	(b)
51	(b)	52	(d)	53	(c)	54	(a)	55	(c)
56	(d)	57	(b)	58	(a)	59	(d)	60	(c)

Important Short Questions

Answer the following short questions.

- 1. Define optical fibers. (LHR 2014 G-I)**
Ans. The fiber have a core of pure glass, which is surrounded by a different kind of glass. Fiber optics communicate in the form of light signals.
- 2. What is ophthalmology? (LHR 2014 G-I, LHR 2015 G-I, LHR 2018 G-I)**
Ans. Ophthalmology belongs to eye diseases and to cure them. Argon lasers are presently used for operating cataract and glaucoma.
- 3. Write down two advantages of ultrasound. (LHR 2014 G-I, LHR 2019 G-II)**
Ans. Following are the two advantages of ultrasound.
(i) Speed of blood flow through kidneys can be determined.
(ii) To break kidney stone by ultrasound.
- 4. What is meant by Radar system? (LHR 2014 G-I)**
Ans. Radar is a reliable instrument for sending and receiving electromagnetic waves, which are usually in the form of radio waves or microwaves. Radar remote detection system is used to locate and identify the objects.
- 5. What is difference between E.C.G and E.E.G? (LHR 2014 G-I, LHR 2014 G-II)**
Ans. E.C.G: In an E.C.G test, the electrical impulses, which are produced due to heartbeating, get recorded and usually appear on a strip of paper, which is known as an electrocardiogram. (E.C.G).
E.E.G: Recording of electrical activity of brain called brain waves from outer surface of head is said to be electro-encephalography (E.E.G).
- 6. What is meant by Lithotripsy? (LHR 2014 G-II, LHR 2016 G-I)**
Ans. When lasers are used to crush gallstones and kidney stones without any surgery, the process is called lithotripsy.
- 7. Write uses/ advantages of fibre optics. (LHR 2014 G-II, LHR 2019 G-I)**
Ans. Optical fibre enables doctors to look inside the human body. As optical fibres are very thin, it can be easily passed into the body to get the required picture. In eye surgery, light is obtained from fibre optic light guide. Optical fibre can transmit thousands of telephone calls. T.V. programmes can be transmitted by one or two flexible and thin hair-like optical fibres.

- 8. Write two advantages of isotopes.** (LHR 2014 G-II)
Ans. Two advantages of isotopes are:
(i) In industries, radioisotopes are used as tracers. These are used to check the flow of liquid in chemical plants.
(ii) The radioisotopes detect the cracks or leakages in the underground pipes.
- 9. Write two advantages of E.C.G.** (LHR 2014 G-II)
Ans. Two advantages of E.C.G are:
(i) E.C.G not only helps to discover the heart disease but also informs how well the patient is responding to the treatment.
(ii) It can be used to assess that the patient is under heart attack or evidence of previous heart attack.
- 10. How many types of fiber are? Write their names.** (LHR 2014 G-II)
Ans. There are two types of fibres:
(i) Natural fibre (ii) Artificial fibre
- 11. What is the function of Metostate satellite?** (LHR 2014 G-II)
Ans. Through artificial satellite, Metostate, cloud-making pictures are taken. The meteorologists predict about the weather through the study of these pictures. They also inform people before time about cyclone and its speed and direction.
- 12. Describe the military purpose of Laser.** (LHR 2015 G-I)
Ans. Military purposes are also fulfilled by laser technology e.g., by laser guided missiles and bombs aircraft and tanks can be hit accurately.
- 13. Describe the principle of fibre optics.** (LHR 2015 G-I)
Ans. Principle of fibre optics
Fibre optics works on the principle of total internal reflection. When a ray of light passes from a denser to a rarer medium. It bends away from the normal to the interface. When the angle of incidence is made greater than the critical angle, the ray does not refract but reflects into the same medium.
- 14. What is the purpose of Centrifugation in Sugar industry?** (LHR 2015 G-I)
Ans. In the process of centrifugation, sugar crystals are separated from molasses and washed with steam if necessary.
- 15. What is the use of Laser in Surgery?** (LHR 2015 G-II)
Ans. Lasers are employed as light scalpel, that is surgical cutting and coagulation tool. When a laser beam focussed onto a tissue, it cuts down after being too much hot. Thus only that area is cut on which it is focussed. Laser surgery, the blood coagulates in capillaries so it protects from bleeding. Laser surgery is of special importance in liver operation.
- 16. How does radar work?** (LHR 2016 G-I)
Ans. Radar transmits short pulses of high frequency radio waves by means of a revolving aerial. When pulses strike on object, these are reflected, which are received by radar antenna. A trace or shape of that object appears on a screen. Radar can determine a number of properties of distant objects such as its distance, speed and direction of motion.
- 17. Describe two functions of satellites.** (LHR 2016 G-I)
Ans. Following are the two functions of satellites:
(i) T.V. displays slides about different occasions.

- (ii) Some communication satellites which relay the telephonic conversation and send the T.V programmes all over the world.
- 18. Write two characteristics of beta radiations. (LHR 2016 G-I, LHR 2019 G-I)**
Ans. Beta particles are fast moving electrons. Its mass number is zero and charge number is 1. Its penetrating power is greater than that of α - particles.
- 19. Write two benefits of M.R.I. (LHR 2016 G-II)**
Ans. Following are the two benefits of M.R.I.
MRI (Magnetic Resonance Imaging) is the special medical diagnostic technique that creates images of the body using the principles of nuclear magnetic resonance.
- 20. What is C.T. Scan? (LHR 2016 G-II)**
Ans. C.T. Scan is a special type of X-ray, which is obtained by sending several beams of X-rays at different angles through the body instead of passing a single X-ray beam.
- 21. What is the aim of radar? (LHR 2016 G-II)**
Ans. Radar can determine a number of properties of distant objects such as its distance, speed and direction of motion. It controls air traffic both civilian and military.
- 22. What are gamma radiations? (LHR 2016 G-II)**
Ans. Gamma rays (γ -rays) are high energy carrying electromagnetic radiations. These are identical with X-rays but gamma rays are of short wavelength, and have high energy. Their range and penetrating power are also greater. These are not affected by electric or magnetic fields.
- 23. What is the principle of optical fibres? (LHR 2017 G-I)**
Ans. Optical fibres are fine strands of glass. Light through optical fibre passes due to the total internal reflection.
- 24. What is the use of optical fibres in telephone? (LHR 2017 G-I)**
Ans. These days, in telecommunication, optical fibres are replacing metal cables for transmitting telephone calls in a better way. In this way, each caller's voice is changed into a light signal. A single optical fibre can transmit thousands of telephone calls.
- 25. Define geo-stationary orbit. (LHR 2017 G-I)**
Ans. Satellites are orbiting the Earth. Such satellites which seem to be stationary at some particular positions, are called as hovering satellites. Their orbits are known as geo-stationary orbits.
- 26. What is the function of radar? (LHR 2017 G-I)**
Ans. The word radar is derived from radio detection and ranging. Radar is a reliable instrument for sending and receiving electromagnetic waves, which are usually in the form of radio waves or microwaves. Electromagnetic waves travel with the speed of light. Its characteristics depend on the wavelength. Radar remote detection system is used to locate and identify object.
- 27. What is function of E.C.G? (LHR 2017 G-II)**
Ans. In an E.C.G. test, the electrical impulses, which are produced due to heartbeating, get recorded and usually appear on a strip of paper, which is known as an electrocardiogram. Because any heart disease affects the heartbeat, so it records any problem in the regularity of heartbeat.

28. Define Angeography.

Ans. Angeography is a way to produce inside x-ray pictures of arteries.

29. Write full name of laser.

(LHR 2018 G-II)

Ans. The full name of Laser is:

“Light Amplification by Stimulated Emission of Radiation.”

30. Write two uses of optical fibres.

(LHR 2018 G-II)

Ans. Two uses of optical fibres are:

(i) Optical fibre enables doctor to look inside the human body.

(ii) Optical fibre can transmit thousands of telephone calls.

31. Write the mass and charge of beta radiations.

(LHR 2018 G-II)

Ans. Mass number of beta radiation is zero (0). Its charge number is 1.

32. Define radio isotopes.

(LHR 2018 G-II)

Ans. The isotopes which possess radioactive nature are called radio-isotopes.

33. What is dermatology?

(LHR 2019 G-I)

Ans. Dermatology is the study of skin. Laser radiations are used for many skin diseases and removal of stains and pigments in the skin.

34. Write two uses of laser.

(LHR 2019 G-II)

Ans. Following are two uses of laser:

(i) Argon lasers are presently used for operating cataract and glaucoma.

(ii) Laser radiations are used for many skin diseases and removal of stains and pigments in the skin.

35. What is meant by total internal reflection?

(LHR 2019 G-II)

Ans. When a ray of light passes from a denser to rarer medium, it bends away from the normal to the interface. Now if we go on increasing the angle of incidence then at a particular angle of incidence, the angle of refraction will become 90° . When the angle of incidence is made greater than θ_c , the ray does not refract but reflects into the same medium. It is called total internal reflection.

36. Write two advantages of radio isotopes.

(LHR 2019 G-II)

Ans. Following are two advantages of radio isotopes:

i. In industries, radio isotopes are used as tracers. These are used to check the flow of liquid in chemical plants.

ii. Radio isotopes detect the cracks or leakages in the underground pipe.

37. Define holography.

LHR 2015 G-II, LHR 2018 G-I, LHR 2018 G-II, LHR 2019 G-I, LHR 2019 G-II)

Ans. Laser is used to produce three-dimensional images called holograms. This process is called holography.

38. What is the difference between x-rays and C.T Scan? Which method is better for treatment?

Ans. MRI scanner is better than x-ray because it can distinguish both, normal and diseased state of a soft tissue.

39. What is the important role of science in the advancement of medical field?

Ans. In the medical sector, use of ultrasound, CT scan, EEG and MRI for the diagnosis of diseases; modern ways of treatment surgery through angioplasty, etc. and use of laser treatment and radiotherapy are with the help of advancement in science.

40. Which was the first laser?

Ans. The first laser used is ruby crystal, which is excited by a powerful flash of light.

41. What are isotopes? (LHR 2016 G-I, LHR 2016 G-II)

Ans. Isotopes are the nuclei of the same atomic number and different mass number have the same chemical properties, e.g. chlorine 35 and chlorine 37 are the two isotopes of chlorine.

42. Write the characteristics of Beta radiations. (LHR 2015 G-I)

Ans. Characteristics of Beta radiations are:

- (i) Beta particles are fast moving electrons.
- (ii) Its mass number is zero and charge number is 1.
- (iii) Its penetrating power is greater than that of Alpha particles.

43. Write down any two uses of X-rays?

Ans. Uses of X-rays

- i. X-rays scanners are used as standard equipment for airport security.
- ii. X-ray technology is used to examine broken bones, cavity and to trace swallowed objects.

44. What tag should be given to the radioactive material?

Ans. Radioactive sources should be tagged "R" for radioactive material.

45. What are ultrasounds?

Ans. Sounds having frequency greater than 20 kHz are said to be ultrasounds or ultrasonics.

46. Why we use electrocardiogram (ECG)?

Ans. Electrocardiogram (ECG) is the test that measures the electrical activity of the heart.

47. How does MRI works? (LHR 2014 G-II)

Ans. MRI (Magnetic Resonance Imaging) is the special medical diagnostic technique that creates images of the body using the principles of nuclear magnetic resonance.

48. Name the different sections of textile industry.

Ans. Textile industry comprises of the following sections.

- (i) Spinning
- (ii) Weaving and fabric formation
- (iii) Garment manufacturing

49. What are the different sources of leather?

Ans. Leather is usually obtained from skins of different animals like horses, buffaloes, sheep, camels, etc.

50. How can we prepare artificial leather?

Ans. Artificial leather can be prepared from different chemical compounds.

51. What is laser?

(LHR 2015 G-I, LHR 2017 G-II)

Ans. Form of light having all waves of the same wavelength and all are in phase.

52. For what do we abbreviate laser?

(LHR 2015 G-II, LHR 2017 G-II)

Ans. Laser is an abbreviation of the "light amplification by stimulated emission of radiation".

53. What do you mean by radioactive elements?

(LHR 2019 G-II)

Ans. Elements having atomic number greater than 82 continuously go on emitting radiations. These elements are called radioactive elements.

54. Define radioactivity.

(LHR 2017 G-I, LHR 2017 G-II)

Ans. The phenomenon of emission of radiation from radioactive elements is called radioactivity.

55. What is electroencephalography?

Ans. Electrical activity of brain recorded from outer surface of head is called electroencephalography.

56. Name some important industries of Pakistan.

(LHR 2016 G-II)

Ans. Some important industries of Pakistan are:

- | | |
|-------------------------------|------------------------------|
| (i) Sugar Industry | (ii) Steel Industry |
| (iii) Pharmaceutical Industry | (iv) Leather Industry |
| (v) Synthetic fibre Industry | (vi) Cotton textile Industry |

57. What is sugar?

Ans. Sugar cane juice contains sucrose, glucose, fructose, water and some other substances. From ingredients of sugarcane juice, sucrose is extracted in white crystal. This is called sugar.

58. Write down any two uses of computerized tomograph scans.

Ans. **Uses of computerized tomograph scans**

- They are used to get knowledge for the lung cancer and its spreading effect on lungs due to cancer or different diseases of lungs.
- They are used to know about brain diseases e.g. brain cancer, brain constriction or haemorrhage.

60. What is electrocardiogram?

Ans. Electrocardiogram ECG is the test that measures the electrical activity of the human heart.

61. Write down any two uses of ultrasounds.

(LHR 2018 G-II, LHR 2019 G-I)

- Speed of blood flow through kidneys can be determined.
- Any sort of obstruction throughout the body can be detected through ultrasound.

62. What are X-rays?

Ans. When very high-energy electrons impinge on metal surface, very powerful radiations are emitted. These radiations are called X-rays.

63. Define the process of Lithotripsy?

(LHR 2014 G-II, LHR 2015 G-II)

Ans. Lasers are used to crush gallstones and kidney stones without any surgery. This process is called Lithotripsy.