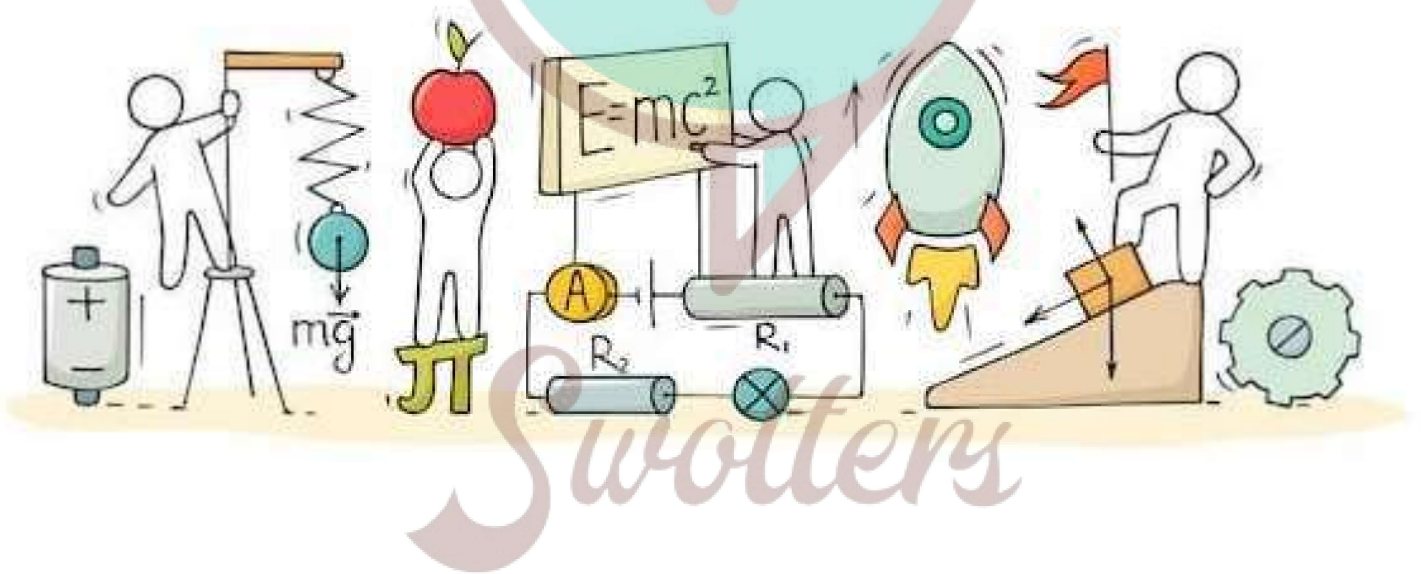


PHYSICS

Chapter 1: Physical World



Important Questions

Multiple Choice questions-

- Atomic and molecular phenomena are dealt with by
 - Newtonian Mechanics
 - fluid Mechanics
 - applied Mechanics
 - Quantum Mechanics
- Which of the following is a possible final step in applying the scientific method
 - Formulating a hypothesis
 - Building a theory
 - Analysis of test results
 - Formulation of a question
- Which of the following is a possible first step in applying the scientific method
 - Conducting tests
 - Formulating a hypothesis
 - Formulation of a question
 - Building a theory
- A scientific theory
 - cannot be changed but can be reformulated
 - is fixed once and for all because it is logical
 - is changed to suit new fashion among scientists
 - can be revised if required to fit new phenomenon or data
- The scientific method is
 - a prescribed method for investigating phenomena, acquiring new knowledge.
 - A procedure for proposing new hypothesis
 - a body of techniques for investigating phenomena, acquiring new knowledge.
 - A method for proposing new theories.
- Newtonian mechanics could not explain
 - fall of bodies on earth

(b) Some of the most basic features of atomic phenomena.

(c) movement of planets

(d) flight of rockets

7. Heliocentric theory proposed by Nicolas Copernicus was

(a) replaced by circular orbits to fit the data better

(b) replaced by elliptical orbits to fit the data better

(c) replaced by elliptical orbits to fit the taste of new rulers of Italy

(d) replaced by parabolic orbits to fit the data better

8. Physics is a

(a) Applied Science

(b) Mathematical Science

(c) Engineering Science

(d) Natural Science

9. The word Science originates from the Latin verb Scientia meaning

(a) to know

(b) to see

(c) to experience

(d) to observe

10. Just as a new experiment may suggest an alternative theoretical model, a theoretical advance may suggest what to look for in some for in some experiments. Which of the following experiments can be considered to support this claim?

(a) Davisson and Germer Experiment

(b) experimental discovery of positron

(c) scattering of alpha particle or the gold foil experiment

(d) Michelson Morley experiment

Very Short:

1. Name that branch of science that deals with the study of Earth.

2. Name that branch of science that deals with the study of stars.

3. Name the scientist and the country of his origin whose field of work was elasticity.

4. The word "Physics" comes from a Greek word. Name the word.

5. The word science has come from a Latin verb. Name the verb.

6. What is the meaning of the verb 'Scientia'?
7. Name the scientist and the country of his origin who received the Nobel Prize for his work on molecular spectra.
8. What is the most incomprehensible thing about the world?
9. Name a great scientist who gave the following comment on science.
"Science is not just a collection of laws, a catalogue of unrelated facts. It is a creation of the human mind, with its freely invented ideas and concepts."
10. Which famous philosopher gave the following comments on science?
"We know very little and yet it is astonishing that we know so much, and still more astonishing that so little knowledge of science can give so much power."

Short Questions:

1. Differentiate between Biological and Physical sciences?
2. What is the relation between Physics and Technology?
3. What is the relation between Physics and society?
4. Is Science on speaking terms with humanities?
5. What is the relation between Physics and Technology?
6. Is Physics more of a philosophy or more of a mathematical science?
7. Define Biophysics.
8. Define Technology?

Long Questions:

1. How Physics is related to other sciences?
2. Write a short note on origin and Fundamental forces in nature.
3. Distinguish between the studies in the fields of science, engineering, and technology. Give an outline of the two or three industrial revolutions brought about by advancements in technology over the last twenty-five years or so.

Assertion Reason Questions:

1. Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) are as given below
 - (a) Both A and R are true, and R is the correct explanation of A.
 - (b) Both A and R are true, but R is not the correct explanation of A.
 - (c) A is true but R is false.
 - (d) A is false and R is also false.

Assertion: The concept of energy is central to Physics and its expression can be written for every physical system.

Reason: Law of conservation of energy is not valid for all forces and for any kind of transformation between different forms of energy.

2. Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) are as given below

- (a) Both A and R are true, and R is the correct explanation of A.
- (b) Both A and R are true, but R is not the correct explanation of A.
- (c) A is true but R is false.
- (d) A is false and R is also false.

Assertion: Physics generates new technology.

Reason: Technology give rise to new physics.

✓ **Answer Key:**

Multiple Choice Answers-

1. Answer: (d) Quantum Mechanics
2. Answer: (c) Analysis of test results
3. Answer: (c) Formulation of a question
4. Answer: (d) can be revised if required to fit new phenomenon or data
5. Answer: (c) a body of techniques for investigating phenomena, acquiring new knowledge.
6. Answer: (b) Some of the most basic features of atomic phenomena.
7. Answer: (b) replaced by elliptical orbits to fit the data better
8. Answer: (d) Natural Science
9. Answer: (a) to know
10. Answer: (b) experimental discovery of positron

Very Short Answers:

1. Answer: Geology.
2. Answer: Astronomy.
3. Answer: Robert Hook, England.
4. Answer: The word is 'fuses meaning 'Nature'.
5. Answer: The name of the Latin verb is 'Scientia'.
6. Answer: To 'know'

7. Answer: C.V. Raman, India.
8. Answer: It is comprehensible.
9. Answer: Albert Einstein.
10. Answer: Bertrand Russel.

Short Questions Answers:

1. Answer:

Biological Sciences	Physical Sciences
(i) They deal with living things.	(i) They deal with non-living things.
(ii) The study of the biological specimens is conducted at the molecular level.	(ii) The study of matter is conducted at atomic or ionic levels i.e. at much smaller levels.

2. Answer: Broadly speaking, physics and technology both constitute science. Physics is the heart and technology is the body of science.

The application of the principles of physics for practical purposes becomes technology, e.g.

- Airplanes fly on the basis of Bernoulli's theorem.
 - Rockets propulsion is based on Newton's second and third laws of motion.
 - The generation of power from the nuclear reactor is based on the phenomenon of controlled nuclear fission.
 - Lasers are based on the population inversion of electrons and so on. Thus, we can say that to some extent technology is applied to Physics.
3. Answer: Most of the development made in Physics has a direct impact on society, e.g.
 - Exploration of new sources of energy is of great importance to society.
 - Rapid means of transport are no less important for society.
 - society has-been enriched due to the advances in electronics, lasers, and computers.
 - The development of T.V., radio, satellites, telephone, the telegraph has revolutionized the means of communications which have a direct impact on society and so on.
 4. Answer: Yes, there is a deep relation between the development of humanity on account of science. Many socio-economic, political, and ethical problems are being tackled and solved by science. Science has greatly helped in developing art and culture. Many musical

instruments have been developed due to the theories in Physics. The steam engine is inseparable from the industrial revolution which had a great impact on human civilization.

5. Answer: The interplay between physics and technology is the basic to the progress of science which is ever dynamic. Laws in waves and oscillation opened several technological fields which include telescoping, ultrasounds, microscopy, X-rays, and laser. Powerhouses, big cranes, healing devices, etc. work on the principle of electromagnetism. Atomic energy and nuclear weapons are on account of fission. Similarly, Radar, television, the internet, etc. are all based on simple laws of physics. So until there is no theory i.e. physics, there can be no experiment i.e. technology. Hence both are deeply related.
6. Answer: Physics is not a purely abstract science devoid of philosophy. Physicists are natural philosophers and Einstein is an example to quote. So Philosophy has provided the backbone to Physics.
7. Answer: It is defined as the understanding of biological processes based upon the principles of Physics. For example, spectroscopic techniques are used to study the constitution of biological molecules and disorders in them. Laws of thermodynamics are used to explain various biological activities of predators and also the activities of molecules.
Hence the application of Physics to bioscience is now well known to all of us.
8. Answer: It is defined as the study of newer techniques of producing machines, gadgets, etc. by using scientific discoveries and advancements. It is largely dependent on Physics.

Long Questions Answers:

1. Answer: Physics is so important to a branch of science that without the knowledge of Physics, other branches of science cannot make any progress.

This can be seen from the following:

(a) Physics in relation to Mathematics: The theories and concepts of Physics lead to the development of various mathematical tools like differential equations, equations of motion, etc.

(b) Physics in relation to Chemistry: The concept of interaction between various particles leads to understanding the bonding and the chemical structure of a substance. The concept of X-ray diffraction and radioactivity has helped to distinguish between the various solids and to modify the periodic table.

(c) Physics in relation to Biology: The concept of pressure and its measurement has helped us to know the blood pressure of a human being, which in turn is helpful to know the working of the heart. The discovery of X-rays has made it possible to diagnose the various diseases in the body and fracture in bones.

The optical and electron microscopes are helpful in the studies of various organisms. Skin diseases and cancer can be cured with the help of high-energy radiation like x-rays, ultraviolet rays.

(d) Physics in relation to Geology: The internal structure of various rocks can be known with the study of the crystal structure. The age of rocks and fossils can be known easily with the help of radioactivity i.e., with the help of carbon dating.

(e) Physics in relation to Astronomy: Optical telescope has made it possible to study the motion of various planets and satellites in our solar system.

The radio telescope has helped to study the structure of our galaxy and to discover pulsars and quasars (heavenly bodies having star-like structures). Pulsars are rapidly rotating neutron stars. Doppler's effect predicted the expansion of the universe. Kepler's laws are responsible to understand the nature of the orbits of the planets around the sun.

(f) Physics in the relation to Meteorology: The variation of pressure with temperature leads to the forecast of the weather.

(g) Physics in relation to Seismology: The movement of the earth's crust and the types of waves produced help us in studying the earthquake and its effect.

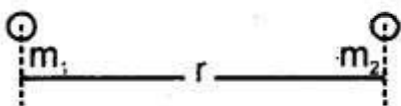
2. Answer: These are the following four basic forces in nature:

- (a) Gravitational forces
- (b) Electromagnetic forces
- (c) Weak forces
- (d) Strong force or nuclear forces.

Some of the important features of these forces are discussed below:

(a) Gravitational forces: These are the forces of attraction between any two bodies in the universe due to their masses separated by a definite distance. These are governed by Newton's law of gravitation given by

$$F = G \frac{m_1 m_2}{r^2}$$



where m_1 , m_2 are the masses of two bodies

r = distance between them

G = universal gravitational constant

$$= 6.67 \times 10^{-11} \text{ Nm}^2\text{kg}^{-2}$$

Characteristics of gravitational forces:

- They are always attractive. They are never repulsive. They exist between macroscopic as well as microscopic bodies.
- They are the weakest forces in nature.
- They are central forces in nature i.e., they set along the line joining the centres of two bodies.
- They are conservative forces.
- They obey inverse square law i.e., $F \propto \frac{1}{r^2}$ they vary inversely as the square of the distance between the two bodies.
- They are long-range forces i.e., gravitational forces between any two bodies exist even when their distance of separation is quite large.
- The field particles of gravitational forces are called gravitons. The concept of the exchange of field particles between two bodies explains how the two bodies interact from a distance.

(b) Electromagnetic forces: They include the electrostatic and magnetic forces. The electrostatic forces are the forces between two static charges while magnetic forces are the forces between two magnetic poles. The moving charges give rise to the magnetic force. The combined action of these forces is called electromagnetic forces.

Characteristics of electromagnetic forces:

- These forces are both attractive as well as repulsive.
- They are central forces in nature.
- They obey inverse square law.
- They are conservative forces in nature.
- These forces are due to the exchange of particles known as photons which carry no charge and have zero rest mass.
- They are 10^{36} times stronger as compared to gravitational forces and 10^{11} times stronger than weak forces.

(c) Strong forces: They are the forces of nuclear origin. The particles inside the nucleus are charged particles (protons) and neutral particles (neutrons) which are bonded to each other by a strong interaction called nuclear force or strong force. Hence they may be defined as the forces binding the nucleons (protons and neutrons) together in a nucleus. They are responsible for the stability of the atomic nucleus.

They are of three types:

- n-n forces are the forces of attraction between two neutrons.
- p-p forces are the forces of attraction between two protons.

- n-p forces are the forces of attraction between a proton and a neutron.

Characteristics of Nuclear forces:

- They are basically attractive in nature and become repulsive when the distance between nucleons is less than 0.5 fermi.
- They obey inverse square law.

(a) and

(b) types are the forces that we encounter in the macroscopic world while

(c) and

(d) types are the forces that we encountered in the microscopic world.

(c) Weak forces: They are defined as the interactions which take place between elementary particles during radioactive decay of a radioactive substance. In P-decay, the nucleus changes into a proton, an electron, and a particle called anti-neutrino (which is uncharged). The interaction between the electron and the anti-neutrino is known as weak interaction or weak force.

Characteristics of Weak forces:

- They are 10²⁵ times stronger than the gravitational forces.
- They exist between leptons and leptons, leptons, and mesons. etc.

3. Answer:

Science is concerned with the unfolding of the basic aspects of nature. It formulates simple laws and finds the rhythm in nature, materials, and energy. Using basic principles of science, the ways to use them for the production of different kinds of articles is called technology, i.e., it is the application of science.

The execution of the application of technology in engineering. The production of articles using machines and implements in engineering. This involves the design, development, and manufacturing of articles.

The most notable technology development in the last 25 years is in the field of information technology, computers, and electronic media. The revolution in information technology has opened up fields on the internet, satellite linking of information systems and services other peripheral developments in the industry.

Computers have changed the face of society and made life easy in several fields. It has improved work efficiency in many segments of the industry and public life. Computers have touched the lives of children playing video games and adults alike. It has helped big organizations like railways, banks, and financial institutions like the insurance sector.

India has become one of the biggest centres of software exports and a big foreign exchange earner. Advance scientific research and industrial designing are being done by

computers. TV has entered most Indian houses and community centres-courtesy revolution in electronic media.

The younger generation is mad after the stereo music with CD facilities. The transistors and tape recorders are left far behind. Electronic media has changed the face of the entertainment industry as well as information dissemination. Quick transmission of news, views, and comments are accepted as natural ones by listeners and viewers.

Assertion Reason Answer:

1. (c) A is true but R is false.

Explanation:

Law of conservation of energy is always valid for all forces and for any kind of transformation between different forms of energy.

Therefore, A is true, but R is false.

2. (b) Both A and R are true, but R is not the correct explanation of A.

Explanation:

Sometimes physics generates new technology and at others technology gives rise to new physics. Both have desired impact on society. Therefore, both A and R are true, but R is not the correct explanation of A.



Swotters