

NCERT SOLUTIONS

CLASS-XI PHYSICS

CHAPTER-1

PHYSICAL WORLD

Q 1. Albert Einstein proposed some of the most important statements on the way science works. What was Einstein trying to say when he stated, “The most incomprehensible thing about the world is that it is comprehensible”?

Ans:

The complete physical world is naturally complex. The biological world has its own complexities. Moreover, different orders of magnitudes are involved in space, time and mass. In spite of all this, almost all the physical phenomena can be expressed in terms of few basic laws. By this view in this context, Einstein's statement becomes very clear.

Q 2. “Every great physical theory starts as a hearsay and ends as a dogma”. Mention a few instances from the history of science regarding the credibility of this remark.

Ans:

A common observation in our daily life is that light travels in straight line. When Huygens propounded his wave theory, it was a heresy. However, soon it became a dogma as interference patterns, refraction etc., could be successfully explained on the basis of wave theory.

It was believed that light was only energy but when photoelectric effect was discovered it was proposed that light had a particle nature too, this was greatly debated and treated as a hearsay. However Einstein finally proved it with his quantum theory of light. Henceforth, it has been treated as a dogma.

Q 3. “Politics is the art of the possible”. Similarly, “Science is the art of the soluble”. Justify this aphorism on the practice and nature of science.

Ans:

Politicians make anything and everything possible to win votes. And science is a systematized study of observation. Scientist and researchers study these observations and then work out certain laws from them. There are multitude of natural phenomena taking place in this universe and all of them can be explained in terms of some basic laws. For e.g. $F = mg$ is true for you and me and also for a star. Thus, in science we see that various phenomena are related, they are soluble and can be explained with similar or the same law. This goes on to justify that science is the art of the soluble just as politics is the art of the possible.

Q 4. India is now a key player in the field of technology and science, which is rapidly expanding, however it still has not realized its true potential and is not a world leader in science. State some important factors, which according to you has obstructed the growth of science in India. Ans:

Here are some important factors that have obstructed the growth of science in India:

Lack of infrastructure and funds for quality research work in science. • Poor pay scales and other facilities to scientists as compared to administrators

Science education is neither properly oriented nor directed. It needs specific directions depending on our requirements. • The industrialists are the actual consumers of new technology and research. The industrialists of this country have little confidence in the ability of the Indian scientists. There is practically no co-ordination between the researchers and the industrialists.

The rural based science education is nearly non-existent so that majority of population is deprived of the benefits of advancements in technology and science.

Q 5. An electron has never been ‘seen’ by any physicist, still physicists believe that electrons exist. Another man goes forth with this analogy to state that even though ‘spirits’ haven’t been seen but they exist. How can you disprove his argument?

Ans:

Even though an electron has never been ‘seen’ but its effects have been observed and its practical evidences have been tested and proved. E.g. electricity. However, regarding spirits and ghosts, even though there are many claims and sightings, standardized scientific reading and evidences have never been observed or successfully tested. Thus, we really cannot state with a cent percent surety that they exist.

Q 6. Heikegani is a crab species native to Japan that have shells that bear a pattern resembling the face of a samurai. Provided below are possible explanations to this phenomena. Which according to you is a more logical and scientific explanation? (a) Fishermen in that area set free any crab they caught which accidentally had patterns resembling a samurai's face. As a result, this particular pattern in the crab shell lived longer and in due course of time this pattern was genetically propagated. (This was a hypothesis proposed by Carl Sagan in a TV series as an example of evolution through artificial selection)

(b) Nature imprinted this pattern on the shell of crabs as an honour to the young emperor Antoku of the samurai clan Heike, who drowned in the sea during a battle.

Ans:

(a) More logical and scientific.

Q 7. The industrial revolution in Western Europe and England more than two centuries ago was started by some key scientific and technological progresses. State these progresses?

Ans:

Some of the key advances during that period in science and technology include the application of thermodynamics and heat to form the steam engine. Discovery and implementation of electricity helped in creating motors and dynamos. Study of gravitation led to the study of motion and making cannons and guns. This gave power in the hands of western countries and they ruled over rest of the world. The discovery of explosives not only helped army but also mineral exploration. These are some examples of scientific and technological advances which helped England and Europe to have their prominent positions in the world. In fact, the progress in chemistry, physics and natural sciences brought the industrial revolution in Western Europe and England.

Q8. It is a general belief that the world is now witnessing a 2nd industrial revolution, and it will radically transform our societies just like the first. State some important contemporary areas of technology and science responsible for the current revolution.

Ans:

Some key contemporary areas of technology and science, which are chiefly responsible for a new industrial revolution taking place now and likely to take place in near future are:

Artificial intelligence

Design of super-fast computers.

Biotechnology.

Development of super-conducting materials at room temperature.

Advancements in the field of

→ Electronics,

→ Information technology

→ Nanotechnology.

→ Developments in the field of space sciences.

Q 9. In about 100 words write a fictional piece based on your speculation about the science and technology of the 22nd century.

Ans:

In the 22nd century humans will be able to create worm holes allowing people to travel to distant places in the universe. We will be in contact with aliens and have established human settlements outside the earth as well. With advancements in quantum physics we shall be more aware and understanding of the true nature of our universe and existence. Our technologies will not pollute and degrade earth. Artificial intelligence and humans could have some clashes.

Q10. Try to formulate your 'moral' views in practicing science. Imagine that you have stumbled upon a great discovery and it will garner great academic interest but will definitely cause hazardous consequences for the public. What will you do?

Ans:

A scientist works for the truth. Every scientific discovery reveals a certain truth of nature. So, any discovery, bad or good for mankind, must be made public.

But with that being said, we cannot afford to be blind to consequences. Before disclosing it we must ascertain the degree of good or bad consequences it will have. If we know that a certain discovery has nothing but dangerous consequences to offer to the mass, the discovery is best kept limited only to the knowledge of the scientist and researches working on it. This way the discovery can help societies in the long run without completely destroying it now.

Q 11. Science, like any other discipline, can be used in good way or bad way. Provide below are processes and applications made possible through science. State your views on whether the given application is for the good, the bad or it is something that cannot be so definitely categorised:

(a) Prenatal sex determination.

(b) Television to eradicate illiteracy and for mass communication of ideas and news.

(c) Development of new and powerful techniques of chemical and biological warfare.

(d) Computers to increase in efficiency of work.

(e) Cloning.

(f) Plastic surgery.

(g) Mass vaccination against disease to curb and hopefully eradicate them from the population.

(h) Water is purified for drinking.

(i) Development of nuclear weapons.

(j) Putting artificial satellites into orbits around the Earth.

Ans:

(a) Bad, because it leads to practice of abortion in case of female fetus.

- (b) Good, because it helps in literacy campaign and is an effective method of mass communication and entertainment.
- (c) Bad, because these techniques may be used for destructive purposes.
- (d) Good, because it increases work efficiency.
- (e) Cloning is bad because it has the potential to destroy the normal family life of human society.
- (f) Bad, because nuclear weapons may cause mass destruction of mankind.
- (g) Good, because it helped in eradicating a dreaded disease from the Earth.
- (h) Good, because pure water supply will improve the health of people.
- (i) Plastic surgery is something which can't be classified as either good or bad. The technique helps to remove certain type of deformations in needy persons.
- (j) Good, because it helped in worldwide communication process.

Q 12. India has an ancient and unbroken history of great scholars in

- Ethics,
- Linguistics,
- Astronomy,
- Logic and
- Mathematics,

Yet, along with this, superstitious attitudes and practices have flourished in our society and unfortunately they are present to this day. How can the knowledge of science be used to develop strategies to curb these kind of attitudes and beliefs?

Ans:

In order to popularize scientific explanations of everyday phenomena, mass media like

- internet
- Newspapers
- Television and
- Radio,

should be used. Knowledge of science should be educated to the masses so that they learn about the real causes of phenomenon allowing their superstitious beliefs to wash away.

Q 13. Even though the law provides equal status to women in India, a lot of people still hold un-rational ideas on a woman's innate intelligence, capacity and nature. Thus, giving them a secondary status and role in society. Destroy this view with the help of scientific arguments, and by giving examples of great women in science and other spheres. Also, persuade yourself and others that, given equal opportunity, women equal to men.

Ans:

There is no difference in the ability of women and men as far as work, intelligence, decision making is concerned. Nature makes little difference in the anatomy and feeling of men and women. The nutrition content of prenatal and postnatal diet contributes a lot towards the development of a human body. If equal opportunities are provided to both women and men, then the female mind and body will be just as efficient as a man's. The list of great women who have excelled in their respective fields is enormous. Names of

- Madam Curie,
- Indira Gandhi,
- Florence Nightingale,
- Margaret Thatcher,
- Mother Teresa,
- Sarojini Naidu,
- Kalpana Chawla,

been taken from fields varying from sociology to science and they all very well-known for their contribution to the world.

Q 14. Great British physicist P.A.M. Dirac stated that, "It is more important to have beauty in the equations of physics than to have them agree with experiments". Express your judgements on this view. State some equations that strike you as beautiful.

Ans:

Driac's belief holds true. Equations which represent entire concepts and hold up against experimental results are automatically simple, small and symmetrical, making them truly beautiful. Some examples of beautiful equations are:

$$E = mc^2, E = hv, F = mg, P.E = mgh.$$

Q 16. Books on science may give you a wrong misconception that studying science is serious and too boring, and that scientists are socially awkward individuals who do not have fun. This image of science and scientist is clearly false. Scientist are in fact some of the most daring and outgoing individuals, they are taking ice samples in the Himalayas, recording temperatures and magma flow rates in volcanos, collecting data on animals in the wild, and so on and so forth. They are also some of the most selfless people on the planet dedicating their lives to curing diseases and making the world better by creating cleaner and greener technologies. Also there have been ones' who went a bit unorthodox (crazy) by trying to bring dead people to life, let's just hope they weren't successful.

Ans:

This isn't really an exercise, it just aims to debunk some of the misconceptions people have about scientist and science.

