



PHYSICS

NCERT - NCERT PHYSICS(ENGLISH)

PHYSICAL WORLD

Exercise

1. Some of the most profound statements on the nature of science have come from Albert Einstein, one of the greatest Scientist of all

time. What do you think did Einstein mean when he said : "The most incomprehensible thing about the world is that it is comprehensible"?



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2. "Every great physical theory starts as a heresy and ends as a dogma". Give some examples from the history of science of the validity of this incisive remark.



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3. "Politics is the art of the possible". Similarly, "Science is the art of the soluble". Explain this beautiful aphorism on the nature and practice of science.



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4. Though India now has a large base in science and technology, which is fast expanding, it is still a long way from realizing its potential of becoming a world leader in

science. Name some important factors, which in your view have hindered the advancement of science in India.



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5. No physicist ever "seen" an electron. Yet, all physicists believe in the existence of electrons. An intelligent but superstitious man advances this analogy to argue that 'ghosts' exist even though no one has 'seen' one. How will you refute his argument?



6. The shells of crabs found around a particular coastal location in Japan seem mostly to resemble the legendary face of a Samurai. Given below are two explanations of this observed fact. Which of these strikes you as a scientific explanation ?

(a) A tragic sea accident several centuries ago drowned a young Samurai. As a tribute to his bravery, nature through its inscrutable ways immortalized his face by imprinting it on the

crab shells in that area.

(b) After the sea tragedy, fishermen in that area, in a gesture of honour to their dead hero, let free any crab shell caught by them which accidentally had a shape resembling the face of a Samurai. Consequently, the particular shape of the crab shell survived longer and therefore in course of time the shape was genetically propagated. This is an example of evolution by artificial selection.

[Note : This interesting illustration taken from Carl Sagan's "The Cosmos" highlights the fact that often strange and inexplicable facts

which on the first sight appear 'supernatural' actually turn out to have simple scientific explanations. Try to think out other examples of this kind].



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7. The industrial revolution in England and Western Europe more than two centuries ago was triggered by some key scientific and technological advances. What were these advances ?



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8. It is often said that the world is witnessing now a second industrial revolution, which will transform the society as radically as did the first. List some key contemporary areas of science and technology, which are responsible for this revolution.



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9. Write in about 1000 words a fiction piece based on your speculation on the science and technology of the twenty-second century.



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10. Attempt to formulate your 'moral' views on the practice of science. Imagine yourself stumbling upon a discovery, which has great academic interest but is certain to have nothing but dangerous consequences for the

human society. How, if at all, will you resolve your dilemma ?



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11. Science, like any knowledge, can be put to good or bad use, depending on the user. Given below are some of the applications of science. Formulate your views on whether the particular application is good, bad or something that cannot be so clearly categorized :

Mass vaccination against small pox to curb and finally eradicate this disease from the population. (This has already been successfully done in India).

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

(c) Prenatal sex determination

(d) Computers for increase in work efficiency

(e) Putting artificial satellites into orbits around the Earth

(f) Development of nuclear weapons

(g) Development of new and powerful techniques of chemical and biological

warfare).

(h) Purification of water for drinking

(i) Plastic surgery

(f) Cloning



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12. India has had a long and unbroken tradition of great scholarship - in mathematics, astronomy, linguistics, logic and ethics. Yet, in parallel with this, several superstitious and obscurantistic attitudes and

practices flourished in our society and unfortunately continue even today - among many educated people too. How will you use your knowledge of science to develop strategies to counter these attitudes ?



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13. Though the law gives women equal status in India, many people hold unscientific views on a woman's innate nature, capacity and intelligence, and in practice give them a

secondary status and role. Demolish this view using scientific arguments, and by quoting examples of great women in science and other spheres, and persuade yourself and others that, given equal opportunity, women are on par with men.



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14. "It is more important to have beauty in the equations of physics than to have them agree with experiments". The great British physicist

P. A. M. Dirac held this view. Criticize this statement. Look out for some equations and results in this book which strike you as beautiful.



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15. Though the statement quoted above may be disputed, most physicists do have a feeling that the great laws of physics are at once simple and beautiful. Some of the notable physicists, besides Dirac, who have articulated

this feeling, are : Einstein, Bohr, Heisenberg, Chandrasekhar and Feynman. You are urged to make special efforts to get access to the general books and writings by these and other great masters of physics. (See the Bibliography at the end of this book.) Their writings are truly inspiring !



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16. Textbooks on science may give you a wrong impression that studying science is dry and all

too serious and that scientists are absent-minded introverts who never laugh or grin. This image of science and scientists is patently false. Scientists, like any other group of humans, have their share of humorists, and many have led their lives with a great sense of fun and adventure, even as they seriously pursued their scientific work. Two great physicists of this genre are Gamow and Feynman. You will enjoy reading their books listed in the Bibliography.



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