CBSE test Paper 01

Chapter 1 Physical World

1. Which of these was a major scientific achievement in ancient India?

    a. silver and copper coin age
    b. making different kinds of swords
    c. Baudhayana Sulba Sutra
    d. None of these

2. Reductionism is

    a. reducing all phenomena to logical consequences of Newton's laws
    b. Deriving the properties of a bigger, more complex, system from the properties and interactions of its constituent simpler parts.
    c. reducing all phenomena to logical consequences of Einstein's laws
    d. Deriving the properties of a bigger, more complex, system from first principles

3. Technology strives

    a. to perfect science
    b. to invent better rat traps
    c. to fulfill a human need such as faster cooking or sewing etc
    d. to use science for application

4. Physics is a

    a. Applied Science
    b. Mathematical Science
    c. Engineering Science
    d. Natural Science

5. Which of these is not a fundamental force?

    a. Strong Nuclear Force
    b. Spring force

c. Weak Nuclear Force
d. Electromagnetic Force

6. Which experiment led to nuclear model of the atom?

7. What is the range of masses with which we may deal in physics?

8. What scale of length do we deal in physics?

9. Name the two most important contributions of Albert Einstein.

10. i. Which force is responsible for revolution of Earth around the Sun?
    ii. Which force is responsible for revolution of an electron around the proton in a hydrogen atom?
    iii. Which force is responsible for binding large number of protons and neutrons together in a small core at the centre of an atom?

11. In science sometimes we observe certain phenomenon experimentally but are unable to give a logical equation or theory for that.
    Sometimes it also happens that we have a scientific theory supported by mathematical formulation yet are unable to test it immediately. Cite one such example.

12. The physicists think at a level far higher than a normal individual. Explain.

13. Why do we express laws of physics in mathematical form?

14. Distinguish between classical physics and quantum mechanics.

15. "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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Answer

1. c. Baudhayana Sulba Sutra
   Explanation: Baudhayana Sulba Sutra which contains examples of simple Pythagorean triples, as well as a statement of the Pythagorean Theorem for the sides of a square

2. b. Deriving the properties of a bigger, more complex, system from the properties and interactions of its constituent simpler parts.
   Explanation: Reductionism is breaking down of a complex system in to simple constituent systems to so that laws of physics can be applied on these systems and we can understand the working of the complex system.

3. c. to fulfill a human need such as faster cooking or sewing etc
   Explanation: Science and technology will continue to generate all sorts of new enhancers, and the quest for enhancement is not necessarily unfair or unethical. We humans are inveterate enhancers, striving to increase our intelligence and to improve our memory and powers of perception.

4. d. Natural Science
   Explanation: The natural sciences seek to understand how the world and universe around us works. There are five major branches (top left to bottom right): Chemistry, astronomy, earth science, physics, and biology.

5. b. Spring force
   Explanation: The fundamental forces (or fundamental interactions) of physics are the ways that individual particles interact with each other. It turns out that for every single interaction that we've observed take place in the universe, they can be broken down to be described by only four (well, generally four - more on that later) types of interactions:

   - Gravity
   - Electromagnetic

- Weak Interaction (or Weak Nuclear Force)
- Strong Interaction (or Strong Nuclear Force)

6. Rutherford's alpha particle scattering experiment is the experiment which led to the nuclear model of the atom.

7. The range of masses goes from 10^{-30} kg (electron mass) to about 10^{55} kg (known observable universe mass).

8. The scale of length goes from nuclear size (10^{-14} m or even less) to the size of galaxies or entire universe of about (10^{26} m).

9. The two most important contributions of Albert Einstein are 'theory of relativity' and 'explanation of photoelectric effect

10. i. The gravitational force is responsible for revolution of Earth around the Sun.
    ii. The electromagnetic force is responsible for revolution of an electron around the proton in a hydrogen atom.
    iii. Strong nuclear force is responsible for binding large number of protons and neutrons together in a small core at the centre of an atom.

11. Einstein worked to establish a relation between the energy and mass of body. He was of the view that these are the two sides of the same coin or two facets of the same physical quantity. He succeeded when he gave his mass energy equation . But its experimental verification came 40 years later in 1945 when atomic bomb was exploded over Japan.

12. For progress every leader has to be a thinker at a higher level in his field than ordinary man. This is more so in case of physicists as the technological development meant for uplifting the living condition of mankind is dependent on the far sight of the physicists in particular. The physicist must think at a level which is philosophical and mathematically quantifying so that they can visualize the requirement of people at least a quarter of century in advance.

13. Expressing laws of physics in the mathematical form helps in an easy formulation. Moreover, development of theoretical physics depends solely on playing with these

mathematical formulae and see what pops out of its manipulation, then we could predict many things without actually carrying out the experiments. The laws of physics are generally expressed as mathematical equations which are then used to make predictions about other phenomena. When a physics law is expressed in mathematical form, it is preferable to the qualitative statement. Moreover, mathematical form permits us to verify the various laws experimentally.

14. Classical physics (or classical mechanics) mainly deals with macroscopic phenomena which may be at the laboratory, terrestrial and astronomical scales. Here the particle size $>10^{-8}$m and particle velocity $<< 10^{8}$m/s. Here we need not consider strong or weak nuclear forces. Gravitational and electromagnetic forces are sufficient to explain these macroscopic phenomena. On the other hand, quantum mechanics (also known as quantum physics or quantum theory) is a branch of physics dealing with the physical phenomena at microscopic scales. It provides mathematical description of dual nature of matter and radiation. Here the strong and weak nuclear forces become dominant.

15. Science is a systematised study of observations. A scientist patiently analyses these observations and comes out with certain laws. As an illustration, Tycho Brahe worked for twenty long years to make observations on planetary motions. It is from this huge reservoir of observations that Kepler formulated his three famous laws of planetary motion. Thus, science is the art of the soluble just as politics is the art of the possible.