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**Pakistan School , Kingdom of Bahrain**

**E- Support and Learning Material / Session 2020-2021**

**Subject: Physics Grade : 9**

 **Book: Physics 9 PTB FIRST TERM**

 **Unit 3: Physical Quantities and measurement Pg. No: 2+3+4**

 **Questions:**

1. **Define science.**

**Ans: The word “Science” is derived from the Latin word “scientia” which means knowledge.**

**The study of nature and behavior of natural things and knowledge gained through observations and experimentations is called Science.**

1. **Define Natural Philosophy. Also describe its branches.**

**Ans: Up to 17th century various aspect of material objects were studied under a single subject called Natural Philosophy.**

**In 18th century it was divided into 2 main branches:**

1. **Physical Science**
2. **Biological Science**
3. **Write the names of some branches of physical science.**

**Ans: Branches of Physical Science are given below:**

1. **Physics ii. Chemistry**

**Iii.  Astronomy iv. Geology**

1. **Differentiate between physical sciences and biological sciences.**

|  |  |
| --- | --- |
| **Physical sciences** | **Biological Sciences** |
| **Physical sciences deal with the study of nonliving things.** |  **Biological Sciences deal with the study of living things.** |

**Ans:**

1. **Define physics.**

**Ans:  The branch of physical science which deals with the study of matter, energy and their interaction.  The laws and principles of physics help us to understand the nature.**

**Q. Define the branches of Physics.**

**Ans: Some branches of Physics are:**

1. **Mechanics: It is the branch of physics that deals with the motion of object, it causes and effects, which influence motion.**
2. **Heat: It is a branch of Physics that deals with the nature of heat, modes of transfer and effects of heat.**
3. **Sound: It is the branch of Physics which deals with the aspects of sound waves, their production, properties and applications.**
4. **Light: It is a study of physical aspects of light, its properties, working and uses of optical instruments.**
5. **Electricity and Magnetism: It is a branch of physics that deals with the charges at rest and in motion with magnetism.**
6. **Atomic physics: It is the study of the structure and properties of atoms.**
7. **Plasma physics: It is the study of production, properties of the ionic state of matter, i.e. the fourth state of matter.**
8. **Geophysics: It is the study of the internal structure of the earth.**
9. **Nuclear physics: The branch of Physics which deals with the properties and behavior of nuclei and the particles with in the nuclei.**

**Q.  Write the importance of Physics in our daily life OR Describe the role of Physics in Science and Technology.**

**Due to the Rapid progress in Science during the recent years has become possible due to the discoveries and inventions in the field of Physics. The technologies are the applications of scientific principles most the Technologies of our modern society throughout the world are related to Physics.**

**Q.  Write some examples of discoveries and inventions of Physics:**

1. **Car:  A car is made on the principle of mechanics.**
2. **Refrigerator:  it is based on the principles of thermodynamics.**
3. **The pulleys: these are also the example of Physics, they make easy to lift heavy loads.**
4. **Electricity:  it is used not only to get light and heat but also mechanical energy that drives fans and electric motors etc.**
5. **The means of transportation:  such as car and aero planes work on the basic principle of Physics.**
6. **Domestic appliances: such as air conditioner refrigerator, vacuum cleaners, washing machines and microwave oven etc .All these work on the basic principles of Physics.**
7. **The means of communication: such as radio, TV, telephone and computer are the result of applications of Physics. These devices have made our**

**ife much easier, faster and more comfortable than the past.**

1. **Mobile phone: it allows us to contact people anywhere in the world and to get latest worldwide information. We can take and save pictures, send and receive messages of our friends, we can also receive transmission and can also use it as a calculator as well. All these are the fruits given by the hard work of Physics.**

 **These devises have made our lives much easier, faster and more comfortable than the past.**

 **Q. What is saying of Lord Kelvin about measurements?**

**Ans: When you can measure what you are speaking about and express it in numbers, you know something about it. When you cannot measure what you are speaking about or you cannot express it in numbers, your knowledge is of a meager and of unsatisfactory kind.**

### What is Andromeda?

**Ans: Andromeda is one of the billions of galaxies of known universe.**

### How can we produce pollution free electricity?

**Ans: Wind turbines are used to produce pollution free electricity.**

### What is the function of Hubble Telescope?

**Ans: Hubble Space Telescope orbits around the earth. It provides information about stars.**

**Unit 3: Physical Quantities and measurement Pg. No: 4+5+6**

**Q.  Define physical quantities.  Also write its types.  Or what is the difference between base and derived quantities? Or differentiate between base and derived quantities.**

**Physical quantities: All measurable quantities are known as physical quantities.**

**Such as length, mass, time etc.**

**Characteristics: Physical quantities possess two characteristics in common.**

**1.  Numerical value**

**2.  Unit in which it is measured.**

**For example:**

**If a mass of a body is 40 kilograms then its numerical value is 40 and unit is kilogram.**

**Types of physical quantities:**

**There are two types of physical quantities.**

**1.  Base quantities**

**2.  Derived quantities**

|  |  |  |
| --- | --- | --- |
| **Sr.No** | **Base quantities** | **Derive Quantities** |
| **1.** | **Definition: The quantities which form the foundation of other physical quantities are called base quantities.  There are seven physical quantities.** | **Definition: Derived quantities are the physical quantities which are expressed in terms of base quantities.** |
| **2.** | **For example: length, electric current, temperature, intensity of light and the amount of a substance.** | **For example: area, volume, speed, force, work, energy, power, electric charge etc.** |

**Q. What is meant by unit?**

**Unit: Once a standard is set for a quantity then it can be expressed in terms of that standard quantity. This standard quantity is called a unit.**

**Explanation:**

**Measuring is not simply counting, e.g. If we need milk or sugar, we must also understand how much quantity of milk or sugar we are talking about. Thus there is a need of some standard quantities for measuring or comparing unknown quantities**

**Q. What is international System of units? Or what role SI units have played in the development of science?**

**Ans: The 11th general conference on weight and measures was held in Paris in 1968 adopted a worldwide system of measurements called International System of units.International System of units is commonly named as SI.**

**Q. What are the main advantages of system International SI units? Or why do we prefer SI units?**

**Ans:  Some of the advantages are given below:**

**i. SI system is in use all over the world.**

**ii. Manipulation in the system is quite easy that is the multiple and sub multiple of different units are obtained simply by multiplying or dividing with 10 or powers of 10.**

**Q.   What are base units and derived units? Or What is difference between base units and derived units?  Or differentiate between base and derived units.**

|  |  |  |
| --- | --- | --- |
| **Sr. No** | **Base Units** | **Derived Units** |
|  | **Definition: The units that describe base quantities are called base units.  Each base quantity has its Si units.** | **Definition: The units used to measure derived quantities are called derived units. These are derived in terms of base units and are obtained by multiplying or dividing one or more base units with each other** |
|  | **Example: Unit of mass is kilogram.****Unit of length is metre.****Unit of time is second.** | **Example: The unit of area is m² and the unit of volume is m³, are based on the unit of length which is metre. Thus the unit of length is the base unit while the unit of area and volume are derived units.****Speed is defined as distance covered in unit time therefore its unit is metre per second. In the same way the unit of density, force, pressure, power etc. can be derived using one or more base units.** |

**Q. Draw a table for base quantities along with their symbols and SI units.**

|  |  |
| --- | --- |
|  **Quantity** |  **Unit** |
| **Name** | **Symbol** | **Name** | **Symbol** |
| **Length** |  **L** | **Meter** |  **M** |
| **Mass** |  **M** | **Kilogram** | **Kg** |
| **Time** |  **T** | **Second** |  **S** |
| **Temperature** |  **T** | **Kelvin** |  **K** |
| **Electric current** |  **I** | **Ampere** |  **A** |
| **Intensity of light** |  **L** | **Candela** |  **Cd** |
| **Amount of substance** |  **N** | **Mole** |  **Mol** |

**Q. Draw a table of derived quantities along with their symbols and SI units.**

|  |  |
| --- | --- |
|  **Quantity** | **Unit** |
| **Name** | **Symbol** | **Name** | **Symbol** |
| **Speed** |  **V** | **Meter per second** |  **ms–1** |
| **Acceleration** |  **A** | **Meter per second per second** |  **ms–2** |
| **Volume** |  **V** | **Cubic meter** |  **m3** |
| **Force** |  **F** | **Newton** | **N or kgms–2** |
| **Pressure** |  **P** | **Pascal** | **Pa or Nm–2** |
| **Density** |  **Ρ** | **Kilogram per cubic metre** |  **Kgm-3** |
| **Charge** |  **Q** | **Coulomb** |  **C or (As)** |

### Q. Find the base quantities involved in each of the following derived quantities?

* 1. **speed b) force**

 **Ans: a) Speed:**

**The formula of speed is**

**Speed =disance time**

**Unit of speed = unit of distance**

 **unit of time**

### Conclusion:

**Unit of speed shows that speed is derived quantity and it is derived from base quantities length and time. Moreover unit of length is metre and unit of time is second**.

### Force:

**The formula of force is**

**Force = mass x acceleration**

**Unit of force = unit of mass x unit of acceleration**

**= kg x ms-2**

**= kgms–2**

**= N**

### Conclusion:

**Unit of force shows that force is derived quantity and it is derived from base quantities mass, length and time. Moreover unit of mass is kilogram unit of length is metre and unit of time is second.**

**Unit 3: Physical Quantities and measurement Pg. No: 7+8+9**

**Q.** **Define prefixes and give examples.**

**Ans: Prefixes:  the words or letters added before SI units and stands for multiple and sub multiples of that unit are known as prefixes.**

**SI have the advantage that their multiples and sub multiples can be expressed in terms of prefixes.**

**Advantages of prefixes: SI units are useful to express very large or small quantities.**

**For example: kilo, Mega, giga etc.**

**Note:**

1. **Double prefixes are not used. For example no prefix is used with kilogram it already contains the prefix kilo.**
2. **Prefixes are used with both types of units i.e. base and derived units.**

**Examples of prefixes:**

1. **200000m/s**

**=200x103 m/s**

**=200 Km/s**

1. **0.00003Hz**

**= 0.02x 10-³ Hz**

**=20 x106 Hz**

**=20µHz**

**Q. Draw a table of prefixes.**

**Ans: Table of prefixes:**

|  |  |  |
| --- | --- | --- |
| **Prefixes** | **Symbol** | **Multiplier** |
| **Exa** | **E** | **1018****1015****1012****109****106****103****102****101****10–1****10–2****10–3****10–6****10–9****10–12****10–15****10–18** |
| **Peta** | **P** |
| **Tera** | **T** |
| **Giga** | **G** |
| **Mega** | **M** |
| **Kilo** | **K** |
| **Hector** | **H** |
| **Deca** | **da** |
| **Deci** | **D** |
| **Centi** | **C** |
| **Milli** | **M** |
| **Micro** |  |
| **Nano** | **N** |
| **Pico** | **P** |
| **Femto** | **F** |
| **Atto** | **A** |

**Q. Express the following quantities using prefixes.**

**a. 5000g b. 52 x 10-10  Kg Part a is solved for your convenience**

**Ans:**

**a. 5000g**

 **= 5 x 103 g**

 **= 5Kg (1 Kg = 103)**

**Q. Your hair grows at the rate of 1 mm per day. Find their growth rate in nm s-1 .**

### Sol: Given data:

**Required:**

**Growth rate = 1 mm/day**

### As we know

**Growth rate in nm s-1 =?**

**1 milli = m = 10-3**

**1 nano = n = 10-9**

**In one day = 24 x 60 x 60 = 86400**

**Hair growth rate = 1 x 103**

 **86400**

 **= 1 x 10-3  x 10-4 / 8.64 m/s**

 **= 0.1157 x 10-7 m/s**

 **= 11.57 x 10-2 x 10-7 m/s**

 **= 11.57 x 10-9 m/s**

 **= 11.57 nm/s**

**ASSESSMENT**

**Answer the following questions:**

1. **Why do we study physics?**
2. **Name five branches of physics?**
3. **Do survey in your home, enlist some name of devices also write which principles of physics are involved in production of those devices. (Search on internet).**
4. **Identify the base quantities in the following:**

**a)Speed b) Area c) Force d) Distance**

### Identify the following as base or derived quantity:

**Density, force, mass, speed, time, length, temperature and volume**

###  Find the base quantities involved in each of the following derived quantities?

1. **volume b) work**
2. **How can you differentiate between base and derived quantities?**
3. **Pick out the base units in the following:**

 **Joule, newton, kilograms, hertz, mole, ampere, meter, Kelvin, coulomb and watt.**