TNTET STUDY MATERIALS

X – STD PHYSICS

LAWS OF MOTION AND GRAVITATION

1. Force is one which changes or tends to change the state of rest or of uniform motion of a body.
2. Force is a vector quantity. Its SI unit is Newton.
3. First law of motion - An object remains in the state of rest or of uniform motion in a straight line unless compelled to change that state by an applied unbalanced force.
4. The first law of motion is also known as the law of inertia.
5. The inability of a body to change its state of rest or of uniform motion by itself is called inertia.
6. Inertia of body depends mainly upon its mass.
7. The momentum 'p' of an object is defined as the product of its mass 'm' and velocity 'v'. That is p = mv.
8. Momentum has both direction and magnitude. It is a vector quantity. The SI unit of momentum is kg ms-1.
9. Second la w of motion - the rate of change of momentum of an object is proportional to the applied unbalanced force in the direction of force.
10. One unit of force (1N) is defined as the amount of force that produces an acceleration of 1 m s-2 in an object of 1 kg mass.
11. The second law of motion gives us a method to measure the force acting on an object as a product of its mass and acceleration.
12. Third la w of motion – for every action there is an equal and opposite reaction.
13. The force of attraction between objects is called the gravitational force.
14. Mass is the amount of matter present in a body.
15. Mass is a fundamental quantity. The unit of mass is kilogram.
16. Mass remains the same. Mass is measured using physical balance.
17. Weight is a derived quantity. Weight is the gravitational pull acting on the body.

18. Weight is measured in Newton. Weight varies from place to place.
19. Weight is measured using spring balance.
20. Galileo was the first to make a systematic study of the motion of a body under the gravity of the Earth.
21. The velocity of a freely falling body under gravity increases at a constant rate.
22. The acceleration produced in a body on account of the force of gravity is called acceleration due to gravity. It is denoted by g.
23. Cryogenics is the study of the production of very low temperature (below 123k); and the behavior of materials at those temperature.
24. A person who studies elements under extremely cold temperature is called a cryogencist.
25. Cryogenics use the Kelvin scale of temperature.
26. Liquefied gases such as liquid nitrogen and liquid helium are used in many cryogenic applications.
27. Liquid nitrogen is the most commonly used element in cryogenics
28. Liquid helium is also commonly used and allows for the lowest attainable temperature to be reached.
29. Liquid nitrogen and liquid helium are held in special containers called Dewar flasks.
30. Liquid nitrogen is used for specially chilling and freezing applications.
31. The important use of cryogenics is cryogenic fuels.
32. Magnetic Resonance Imaging (MRI) is used to scan inner organs of human body.
33. Cryogenic gases are used in transportation of large masses of frozen food.
34. The freezing of biotechnology products like vaccines require nitrogen freezing systems.
35. A space station is an artificial structure designed for humans to live and work in outer space for a period of time.
36. The only space stations are Almaz and Salyut series, Sky lab and Mir.
37. Space stations are used to study the effects of long-space flight on the human body.
38. Space stations have been used for both military and civilian purposes.
39. The last military-used space station was Salyut 5, which was used by the Almaz program of the Soviet Union in 1976 and 1977.

ELECTRICITY AND ENERGY

1. Electricity is a controllable and convenient form of energy.
2. A switch makes a conducting link between the cell and the bulb.
3. A continuous and closed path of an electric current is called an electric circuit.
4. The S.I unit of electric charge is coulomb. This is equivalent to the charge contained in nearly 6×10^{18} electrons.
5. The electric current is expressed by a unit called ampere (A), named after the French Scientist.
6. Ammeter is used to measure current in a circuit.
7. Electric potential difference between two points in an electric circuit carrying some current as the work done to move a unit charge from one point to the other.
8. Potential difference (V) = work done (W) / charge (Q). $[V = \frac{W}{Q}]$
9. The S.I Unit of potential difference is volt (V). $1\ volt = \frac{1\ joule}{1\ coulomb}$
10. One volt is the potential difference between two points in a current carrying conductor when 1 joule of work is done to move a charge of 1 coulomb from one point to the other.
11. The potential difference is measured by means of an instrument called voltmeter.
12. The Schematic diagram, in which different components of the circuit are represented by the symbols conveniently used, is called a circuit diagram.
13. Conventional symbol used to represent an electric cell
14. Conventional symbol used to represent a battery / a combination of cells
15. Conventional symbol used to represent plug key or switch (open)
16. Conventional symbol used to represent plug key or switch (closed)
17. Conventional symbol used to represent a wire joint
18. Conventional symbol used to represent wires crossing without joining
19. Conventional symbol used to represent electric bulb
20. Conventional symbol used to represent a resistor of resistance R
21. Conventional symbol used to represent variable resistance or rheostat
22. Conventional symbol used to represent ammeter
23. Conventional symbol used to represent voltmeter
24. In 1827, a German Physicist George Simon Ohm found out the relationship between the current flowing in a metallic wire and the potential difference across its terminals.

25. Ohm's law states that at constant temperature the steady **current** (I) flowing through a conductor is directly proportional to the potential difference (V) between its ends. V I (or) $\frac{V}{I} = Constant.$
26. Ohm's law, V ∝ I, V = IR , R is a constant and is called its resistance. Its S.I unit is ohm,
27. If the potential difference across the two ends of a conductor is 1volt and the current through it is 1ampere, then the resistance of the conductor is 1 ohm.
28. Resistors can be connected in series or in parallel.
29. The total potential difference across the combination of resistors in series is equal to the sum of potential difference across individual resistors. That is, V = V1 + V2 + V3.
30. In parallel combination the potential difference across each resistor is the same having a value V.
31. Battery is a source of electrical energy. Its potential difference between the two terminals sets the electrons in motion to flow the current through the resistor.
32. The heat produced in a resistor is directly proportional to the square of current for a given resistance.
33. The heat produced in a resistor is directly proportional to the resistance for a given current
34. The heat produced in a resistor is directly proportional to the time for which the current flows through the resistor.
35. A common application of joules heating is the fuse used in electric circuits.
36. The fuse consists of a piece of wire made of metal or an alloy (37% lead, 63% tin).
37. Fuse has high resistance and low melting point.
38. Over loading can occur when the live wire and the neutral wire come onto direct contact.
39. Over loading makes the current in the circuit abruptly increases. This is called short circuiting.
40. The SI unit of electric power is watt (W). It is the power consumed by a device.
41. The commercial unit of electric energy is kilowatt hour (kWh) – 'unit'
42. When the current is passed through aqueous solutions of inorganic acids, bases and salts, causes chemical decomposition of the solutions (electrolytes).
43. The phenomenon of the conduction of electricity through electrolytes and chemical decomposition is called electrolysis.

44. The cells in which the electrical energy is derived from the chemical action are called electrochemical cells.
45. Voltaic cell consists of two electrodes, one of copper and the other of zinc dipped in a solution of dilute sulphuric acid.
46. A simple cell is a device which converts chemical energy into electrical energy.
47. Primary cell is the cell from which the electric energy is derived by irreversible chemical reaction.
48. The main primary cells are Daniel cell and Leclanche cell. These cells cannot be recharged.
49. In Leclanche cell ammonium chloride solution is acting as electrolyte.
50. In Leclanche cell, carbon rod forms the positive pole and the zinc rod the negative pole.
51. The emf of freshly charged cell is 2.2V.
52. Secondary cells are rechargeable.
53. The chemical reactions that take place in secondary cells are reversible.
54. The chemical process of obtaining current from a secondary cell is called discharge.
55. The process of reproducing active materials is called charging.
56. One of the most commonly used secondary cell is lead acid accumulator.
57. In a lead-acid accumulator, the anode and cathode are made of lead and lead dioxide respectively. In a lead-acid accumulator, the electrolyte is dilute sulphuric acid.
58. The growing demand for energy was largely met by the fossil fuels, coal and petroleum.
59. The fossil fuels are non-renewable sources of energy.
60. Burning fossil fuels has other disadvantages like air pollution, acid rain and production of green house gases.
61. The phenomenon of radioactivity was discovered by Henri Becquerel in 1896.
62. Madame Marie Curie and her husband Pierre Curie discovered the highly radioactive elements radium and polonium.
63. Elements having atomic number greater than 82 is called radioactivity.
64. In 1939, German scientists Otto Hahn and Stresemann discovered nuclear fission.
65. Nuclear fusion is a process in which two or more lighter nuclei combine to form a heavier nucleus.
66. The nuclear fusion reactions are known as thermo nuclear reactions.
67. The radiation exposure is measured by the unit called roentgen(R).

68. One roentgen is defined as the quantity of radiation which produces 1.6 x 10^{12} pairs of ion in 1 gram of air.
69. Safe limit of receiving the radiation is about 250 milli roentgen per week.
70. Radioactive materials are kept in thick-walled lead container.
71. Lead aprons and lead gloves are used while working in hazardous area.
72. A small micro-film badge is always worn by the person and it is checked periodically for the safety limit of radiation.
73. Nuclear devices can be operated using remote control system.

MAGNETIC EFFECT OF ELECTRIC CURRENT AND LIGHT

1. The region surrounding the magnet, in which the force of the magnet can be detected, is said to have a magnetic field.
2. The lines along which the iron fillings align themselves represent magnetic lines of force.
3. Magnetic field is a quantity that has both magnitude and direction.
4. The magnitude of the magnetic field produced at a given point increases as the current through the wire, increases.
5. The magnetic field produced by the given current in the conductor decreases as the distance from it increases.
6. The magnetic field produced by a current- carrying straight wire depends inversely on the distance.
7. The magnetic field produced by a current- carrying conductor at a given point, depends directly on the current passing through it.
8. An electric current flowing through a conductor produces a magnetic field.
9. The direction of force on the conductor depends upon the direction of current and the direction of magnetic field.
10. The direction of the current and that of the magnetic field perpendicular to each other.
11. An electric motor is a rotating device that converts electrical energy in to mechanical energy.
12. A device that reverses the direction of flow of current through a circuit is called a commutator.
13. In electric motors, the split ring acts as a commutator.
14. The soft iron core, on which the coil is wound, plus the coils, is called an armature. Armature enhances the power of the motor.
15. Faraday in1831 discovered that an electro motive force is produced in a circuit whenever

the magnetic flux linked with a coil changes.

16. The emf generated by the relative motion between the conductor and a magnetic field. is called an induced emf and the phenomenon is known as electromagnetic induction.

17. The induced emf will cause a current to flow through the conductor. Such a current is known as induced current.

18. Faraday made an important breakthrough by discovering how a magnet can be used to generate electric currents.

19. The phenomenon of electromagnetic induction is employed to produce large currents for use in homes and industry.

20. In an electric generator, mechanical energy is used to rotate a conductor in a magnetic field to produce electricity.

21. The laws of reflection of light - The angle of incidence is equal to the angle of reflection, and the incident ray, the normal to the mirror at the point of incidence and the reflected ray, all lie in the same plane.

22. The curved surface of a shining spoon could be considered as a curved mirror.

23. The most commonly used type of curved mirror is the spherical mirror.

24. The reflecting surface of a spherical mirror may be curved inwards or outwards.

25. A spherical mirror whose reflecting surface is curved inwards is called a concave mirror.

26. A spherical mirror whose reflecting surface is curved outwards is called a convex mirror.

27. The centre of the reflecting surface of a spherical mirror is a point, called the pole. It is represented by the letter P.

28. The centre point of the reflecting surface of a spherical mirror forms the centre of curvature. It is represented by the letter C.

29. The radius of the sphere of which the reflecting surface of a spherical mirror forms a part, is called the radius of curvature of the mirror. It is represented by the letter R.

30. The straight line passing through the pole and the centre of curvature of a spherical mirror is called the principle axis.

31. The distance of the image from the position of the mirror gives the approximate focal length of the mirror.

32. A number of rays parallel to the principal axis are reflected and meet at a point on the principal axis of the mirror (**principal focus**).

33. In a convex mirror, the reflected rays appear to come from a point on the principal axis. (**Principal focus**).
34. The principal focus is represented by the letter F.
35. The distance between the pole and the principal focus of a spherical mirror is called the focal length. It is represented by the letter f.
36. The diameter of the reflecting surface of spherical mirror is called its aperture.
37. Spherical mirrors of small apertures the radius of curvature is found to be equal to twice the focal length. We put this as R = 2f.
38. In a concave spherical mirror, a ray parallel to the principal axis, after reflection, will pass through principal focus.
39. In a convex spherical mirror, a ray parallel to the principal axis, after reflection, appear to diverge from the principal focus.
40. A ray passing through the principal focus of a concave mirror or a ray directed towards the principal focus of a convex mirror, after reflection, will emerge parallel to the principal axis.
41. A ray passing through the centre of curvature of a concave mirror or directed in the direction of the centre of curvature of a convex mirror, after reflection, is reflected back along the same path.
42. Concave mirrors are commonly used in torches, search-lights and vehicles head lights to get powerful parallel beams of light.
43. Concave mirrors are used as shaving mirrors to see a lager image of the face.
44. The dentists use concave mirrors to see large images of the teeth of patients.
45. Large concave mirrors are used to concentrate sun light to produce heat in solar furnaces.
46. Convex mirrors are commonly used as rear-view mirrors in vehicles.
47. In a spherical mirror, the distance of the object from its pole is called the object distance (u).
48. The distance of the image from the pole of the mirror is called the image distance (v).
49. The distance of the principal focus from the pole is called the focal length (f).
50. The mirror formula is expressed as $\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$
51. It appears that when traveling obliquely from one medium to another, the direction of propagation of light in the second medium changes. This phenomenon is known as refraction of light.

52. Refraction of light is due to change in the speed of light as it enters from one transparent medium to another.
53. The incident ray, the refracted ray and the normal to the interface of two transparent media at the point of incidence, all lie in the same plane.
54. The ratio of sine of angle of incidence to the sine of angle of refraction is a constant, for the light of a given colour and for the given pair of media. This law is also known as Snell's law of refraction.
55. If i is the angle of incidence and r is the angle of refraction, then, $\frac{\sin i}{\sin r} = constant$
56. This constant value is called the refractive index of the second medium with respect to the first.
57. Light travels the fastest in vacuum with the highest speed of 3×10^8 m s^{-1}.
58. A transparent material bound by two surfaces, of which one or both surfaces are spherical, forms a lens.
59. A lens may have two spherical surfaces, bulging outwards. Such a lens is called a double convex lens. It is simply called a convex lens.
60. Convex lens converges light rays. Hence it is called converging lens.
61. A double concave lens is bounded by two spherical surfaces, curved inwards.
62. Double concave lenses diverge light rays and are called diverging lenses.
63. A double concave lens is simply called a concave lens.
64. The centre of curvature of a lens is usually represented by the letter C. (C1 and C2).
65. An imaginary straight line passing through the two centers of the curvature of a lens is called its principal axis.
66. The central point of a lens is called its optical centre.
67. Optical centre is represented by the letter O.
68. A ray of light through the optical centre of a lens passes without suffering any deviation.
69. The effective diameter of the circular outline of a spherical lens is called its aperture.
70. Lenses whose aperture is much less than its radius of curvature are called thin lenses with small aperture.
71. Parallel rays falling on a convex lens, get refracted and converge to a point on the principal axis. This point is called the principal focus of the convex lens.

72. Parallel rays falling on a concave lens, get refracted and diverge from a point on the principal axis. This point is called the principal focus of the concave lens.
73. The distance of the principal focus from the optical centre of a lens is called its focallength (f).
74. The SI unit of power of a lens is 'dioptre'. It is denoted by the letter D.
75. 1 dioptre is the power of a lens whose focal length is 1 meter.
76. The power of a convex lens is positive and that of a concave lens is negative.
77. The band of the coloured component of a light beam is called its spectrum.
78. The hotter air is lighter (less dense) than the cooler air.
79. The hotter air has a refractive index slightly less than that of the cooler air.
80. In human eve, the lens system forms an image on a light sensitive screen called the retina.
81. Light enters the eye through the thin membrane called the cornea.
82. Cornea forms the transparent bulge on the front surface of the eye ball.
83. The eye ball is approximately spherical in shape with a diameter of about 2.3cm.
84. Most of the refraction for the light rays entering the eye occurs at the outer surface of the cornea.
85. Iris is seen behind the cornea.
86. Iris is a dark muscular diaphragm that controls the pupil.
87. The pupil regulates and controls the amount of light entering the eye.
88. The eye lens forms an inverted real image of the object on the retina.
89. The retina is a delicate membrane having enormous number of light-sensitive cells.
90. The three common refractive defects of vision are Myopia or near – sightedness, Hypermetropia or far-sightedness and Presbyopia.
91. A person with myopia can see nearby objects clearly but cannot see the distant objects distinctly.
92. In a myopic eye, the image of a distant object is formed in front of the retina and not at the retina itself.
93. Myopia arisez due to excessive curvature of the eye lens or elongation of the eyeball.
94. Myopia can be corrected by using a concave lens of suitable power.
95. A person with hypermetropia can see distant objects clearly but cannot see nearby objects distinctly.
96. The normal near point is 25 cm.

97. In hypermetropia, the light rays from a close by object are focused at a point behind the retina.
98. Hypermetripia arises if the focal length of the eye lens is too long or the eyeball has become too small.
99. Hypermetripia can be corrected by using a convex lens of appropriate power.
100. The power of accommodation of the eye usually decreases with ageing.
101. Because of aging people find it difficult to see nearby objects comfortably and distinctly. This defect is called Presbyopia.
102. Presbyopia arises due to the gradual weakening of the ciliary muscles and diminishing flexibility of the eye lens.
103. For a person suffering from both myopia and hypermetropia, requires by-focal lenses.
104. A common type of by-focal lenses consists of both concave and convex lenses.
105. In a bifocal lens, the upper portion consists of a concave lens.
106. H.S.T – Hubble space telescope.
107. Hubble telescope is a space telescope that was carried into orbit by a space shuttle in April 1990.
108. H.S.T is named after the American astronomer Edwin Hubble.
109. H.S.T becomes a most popular research tool for astronomy.
110. The H.S.T is collaboration between NASA and the European Space Agency, and is one of NASA's great observatories.
111. Hubble is the only telescope ever designed to be serviced in space by astronauts.
112. The H.S.T design with two hyperbolic mirrors is known for good imaging performance over a wide field of view.
113. After a servicing mission in 1993, the telescope was restored to its intended quality.
114. Four servicing missions where performed from 1993-2002.
115. The fifth was completed in 2009. The telescope is now expected to function until at least 2014.
116. Hubble Deep field and Hubble ultra Deep field images reveals that galaxies are billions of light years away.
117. Many Hubble observations accurately measure the rate at which the universe is expanding.
118. It constrains the value of Hubble's constant and estimates the age of the Universe.

119. Hubble's images of planets were crucial in studying the dynamics of the collision of a comet with Jupiter, an event believed to occur once every few centuries.

120. Hubble's observations found that black holes are common to the centers of all galaxies.

121. The astronomers used the telescope to observe distant supernovae.

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