**ANSWERS KEYS**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | d | 26 | d | 51 | c | 76 | c |
| 2 | a | 27 | c | 52 | a | 77 | d |
| 3 | d | 28 | d | 53 | d | 78 | c |
| 4 | b | 29 | d | 54 | d | 79 | c |
| 5 | c | 30 | d | 55 | b | 80 | a |
| 6 | d | 31 | a | 56 | a | 81 | c |
| 7 | d | 32 | a | 57 | a | 82 | a |
| 8 | a | 33 | c | 58 | d | 83 | c |
| 9 | a | 34 | d | 59 | b | 84 | d |
| 10 | a | 35 | b | 60 | d | 85 | c |
| 11 | a | 36 | c | 61 | c | 86 | c |
| 12 | a | 37 | d | 62 | a | 87 | d |
| 13 | a | 38 | a | 63 | a | 88 | d |
| 14 | b | 39 | c | 64 | a | 89 | d |
| 15 | a | 40 | c | 65 | d | 90 | c |
| 16 | d | 41 | b | 66 | a | 91 | d |
| 17 | d | 42 | d | 67 | c | 92 | d |
| 18 | c | 43 | c | 68 | b | 93 | b |
| 19 | d | 44 | b | 69 | c | 94 | c |
| 20 | d | 45 | b | 70 | d | 95 | d |
| 21 | d | 46 | b | 71 | c | 96 | d |
| 22 | a | 47 | d | 72 | b | 97 | c |
| 23 | a | 48 | a | 73 | a | 98 | b |
| 24 | a | 49 | a | 74 | b | 99 | b |
| 25 | d | 50 | d | 75 | b | 100 | c |

**1.d**

Microbeads are small, solid, manufactured plastic particles that are less than 5mm and don't degrade or dissolve in water. They may be added to a range of products, including rinse-off cosmetics, personal care and cleaning products.

Microbeads are used as ingredients in these products for a variety of purposes. This includes as an abrasive or exfoliant, a bulking agent, for controlled timed release of active ingredients, and to prolong shelf life. They are also a relatively cheap ingredient.

Microbeads may be found in some products. These include toothpaste, sunscreen, facial scrubs, body wash, cosmetics such as foundation and blush, and other care products.

2.a

Statement 1 is correct. Water has a much **higher heat capacity than air**, meaning the oceans can absorb larger amounts of heat energy with only a slight increase in temperature.

Water's **specific heat capacity** is 4200 Jkg-1K-1 and Air's is 993 Jkg-1K-1 therefore water has 4.23 times more specific heat capacity.

Statement 2 is incorrect. Water is an unusual liquid and has unique properties. Water does indeed **expand when warms**, and it contracts when it cools, but not at all temperatures. An **oddity occurs between 4 and 0 degrees Celsius** (about 40- and 32-degrees Fahrenheit).

3.d

4.b

5.c

**Statement 1 is correct:** Double rainbows are **formed when sunlight is reflected twice within a raindrop with the violet light that reaches the observers eye coming from the higher raindrops and the red light from lower raindrops.**

**Statement 2 is correct:** A key feature of double rainbows is that the **colour sequence in the second rainbow is reversed, ROYGBIV instead of VIBGYOR** order in primary rainbow**.**

6.d

Polycrack technology is **world's first patented heterogeneous catalytic process which converts multiple feed stocks** into hydrocarbon liquid fuels, gas, carbon and water. Polycrack Plant can be fed with all types of Plastic, Petroleum sludge, Unsegregated MSW (Municipal Solid Waste) with moisture up to 50%, E–Waste, Automobile fluff, Organic waste including bamboo, garden waste etc., and Jatropha fruit and palm bunch.

7. (d)

There is a presence of atmosphere at earth's surface which consists of thick and moving layers of air. The dust particles, particulates, smog, water vapour and smoke are also present in air. Stars twinkle when we see them from the Earth's surface because we are viewing them through thick layers of turbulent (moving) air in the Earth's atmosphere.As their light travels through the many layers of the Earth's atmosphere, the light of the star is bent (refracted) many times in random directions (light is bent when it hits a change in density –like a pocket of cold air or hot air). This random refraction results in the star as its twinkling but for a person in spaceship no such refractions are possible as there is vaccum in space. Thus, star will not twinkle.

8.a

9. (a)

A jet engine combines oxygen from the air with fuel at high temperature. There is usually a spark to ignite the fuel vapor, but once the engine begins turning, it will continue running until it runs out of fuel or air.A rocket, carries its own supply of liquid oxygen for combustion.

10.(a)

A geostationary orbit (or Geostationary Earth Orbit -GEO) is a geosynchronous orbit directly above the Earth's equator (0° latitude), with a period equal to the Earth's rotational period and an orbital eccentricity of approximately zero. It is the part of space about 35,786 km (22,236 miles) above sea level, in the plane of the equator, where neargeostationary orbits may be implemented.

11. (a)

Indian Remote Sensing (IRS) satellites are used in Assessment of crop productivity, Locating ground-water resources and Mineral exploration. This system was launched in 1979 and 1981. This system is used in

agriculture, water resources, forestry and ecology, geology,marine fisheries and coastal management. It is the largest constellation of the remote sensing satellites.

12.a

13.a

A nuclear reactor is a device to initiate and control a sustained nuclear chain reaction. The most common use of nuclear reactors is for the generation of electrical power and for the power in some ships. In every fission reaction in which uranium nuclei splits up to give smaller nuclei three more neutrons are produced which further results into splitting of heavy uranium nuclei and more number of neutrons will be produced. Thus, statement, 1 and 2 are correct. In nuclear reactor all the neutrons produced can not take part in fission reaction, else reaction can turn out extremely violent. Thus, graphite rods are used as a control rods to slow down the speed of fast moving neutrons. Thus,statement 3 is also correct.

14. (b)

The geostationary satellite is a satellite having a time-period of 24 hours. Using this time-period, the height of the satellite comes out to be approximately 35,800 km.

15. (a)

The discovery of Higgs boson is important because it explains why sub atomic particles have mass. According to the scientists, Higgs boson is the only particle which explains how the basic building blocks of matter interact.

16.d

17.d

18.c

19.d

20. d

VoLTE allows an operator to offer both voice and data over a 4G LTE network. The big advantage of VoLTE is that call quality is superior to 3G and 2G connections (through which voice is usually routed) as much more data can be transferred via 4G.

21. d

22.a

23.a

24. (a)

A metallic conductor has a large number of free electrons in it. When a potential difference is applied across the ends of a metallic wire, the free electrons begin to drift from a region of low potential to a region of high potential.These electrons collide with the positive ions (the atoms which have lost their electrons). In these collisions, the energy of the electron is transferred to the positive ions and they begin to vibrate more violently. As a result, heat is produced. The greater the number of electrons flowing per

second, the greater will be the rate of collisions and so greater is the heat produced.

25.d

26. (d)

In case of motor car battery or automotive batteries a nominal 12-volt potential difference is provided by connecting six galvanic cells in series. Capacity of these batteries is expressed in ampere-hour. Electrolyte used is a solution of about 35% sulphuric acid and 65% water and electrodes used are plates of lead and separate plates of lead dioxide

27. (c)

A transformer is a device that transfers electrical energy from one circuit to another through inductively coupled conductors–the transformer's coils. A varying current in the first or primary winding creates a varying magnetic flux in the transformer's core and thus a varying magnetic field through the secondary winding. This varying magnetic field induces a voltage in the secondary winding. By appropriate selection of the ratio of turns, a transformer thus allows an alternating current (AC) or voltage to be "stepped up"

28.d

A new, curious mineral has been discovered inside a diamond unearthed from a **mine in South Africa**.

The **mineral has been named goldschmidtite**, after Victor Moritz Goldschmidt, the Norwegian scientist acknowledged as the founder of modern geochemistry.

• Goldschmidtite has an unusual chemical signature for a mineral from Earth's mantle, according to the University of Alberta, a student of which discovered it.

While the mantle is dominated by elements such as magnesium and iron, **goldschmidtite has high concentrations of niobium, potassium and the rare earth elements lanthanum and cerium**

29. **(d)**

Monosodium Glutamate (MSG) is a flavor enhancer in Chinese food, but leads to obesity and liver inflation..So, 3 is right.

• Brominated vegetable oils are used as stabilizers in the baked goods, soft drinks, soups, jellies etc. but banned in UK after 1970. so, #2 is right.There is only one combination where 1 and 3 are together i.e. answer "D": 1, 2 and 3 are correct.

30. **(d)**

• Pyrolysis is a process of combustion in absence of oxygen or the material burnt under controlled atmosphere of oxygen. It is an alternative to incineration. The gas and liquid thus obtained can be used as fuels.

31.(a)

32. **(a)**

Fly ash brick (FAB) is a building material, specifically masonry units, containing class C fly ash and water. All fly ash includes substantial amounts of silicon dioxide ($SiO_2$) aluminum oxide ($Al_2O_3$) and calcium oxide (CaO), the main mineral compunds in coal-bearing rock strata. Fly ash can be used as a replacement for some of the Portland cement contents of concrete.

33. **(c)**

Brominated flame retardants used in many household products are highly resistant to degradation in the environment and they are able to accumulate in humans and animals

34. **(d)**

Shell gas contains methane, according to first statement, it contains propane and butane which is wrong. The source of shell gas is available in India. So the statement (2) is also wrong.

35. **(b)**

Ilmenite, Zirecon and Sillimanite are found in kollam district in Kerala but tungsten is not found in the beach sands of Kerala.

36. **(c)**

Acid rain is caused by emissions of sulfur dioxide and nitrogen oxides which react with the water molecules in the atmosphere to produce corresponding sulphuric and nitric acids which falls along with rain droplets on ground.

37. **(d)**

Byproducts of power thermal plant operation need to be considered in both the design and operation. Waste heat due to the finite efficiency of the power cycle must be released to the atmosphere, using a cooling tower, or river or lake water as a cooling medium. The gas from combustion of the fossil fuels is discharged to the air; this contains carbon dioxide and water vapour, as well as other substances such as nitrogen, nitrogen oxides, sulphur oxides, and (in the case of coal-fired plants) fly ash, mercury and traces of other metals.

38.(a)

39. **(c)**

Chlorofluorocarbons are used in the production of plastic foams, in cleaning electronic components and as pressurizing agents in aerosol cans.

40. **(c)**

Bagasse is often used as a primary fuel source as it produces sufficient heat energy. Molasses can be used for the production of Ethanol. Ethanol is produced by the age old technique of fermentation of cereals, grams, molasses and other materials with high starch contents. Molasses is an inexpensive and readily available raw material.

41.(b)

42. **(d)**

Methane is a chemical compound with the chemical formula (CH4). Compared to other hydrocarbon fuels, burning methane produces less carbon dioxide for each unit of heat released. In many cities, methane is piped into homes for domestic heating and cooking purposes. Methane in the form of compressed natural gas is used as a vehicle fuel. Methane is used in industrial chemical processes for the production of hydrogen, methanol, acetic acid, and acetic anhydride, also used as a fuel in factories.

43. **(c)**

The addition of silicates to synthetic detergents has proved very beneficial. Silicates soften water by the formation of precipitates that can be easily rinsed away. Soluble silicates contribute to detergents as cleaning aids, processing aids, and corrosion inhibitors. As cleaning aids, soluble silicates provide alkalinity and promote soil suspension.

44.(b)

45.(b)

46. **(b)**

Formic acid is stronger than acetic acid due to its chemical composition. Formic acid is an organic acid.

47.(b)

48. **(a)** Antiseptic are antimicrobial substances that are applied to living tissue/skin to reduce the possibility of infection, sepsis, or putrefaction. Now phenyl being a phenol derivative possesses effective germicidal properties because phenol is germicidal in strong solution.

49. **(a)**

Welding refers to the process of joining two or more metals together. Approximately 20% of acetylene is consumed for oxyactylene gas welding and cutting due to high temperature of flame. Combustion of acetylene with oxygen produces a flame of over 3600 K (3300°C, 6000°F).

50. **(d)**

• Steel slag, an unavoidable by-product in iron and steel production. Developed countries like Japan, USA have taken lead in making fertilisers using steel-making slag

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• Steel Slag is used in road metal and bases,producing portland slag cement. It is also used for soil conditioning. So, All 3 statements correct

51. **(c)**

Sodium metal is generally kept inside kerosene oil because of its extreme reactive nature. In open air it reacts violently and burns vigorously to form sodium oxide

52. **(a)**

Sulphuric acid (H2SO4) reacts very vigorously with water, in a highly exothermic reaction. Thus if you add water to concentrated sulfuric acid, it can boil and you may get a nasty acid burn. That's why for dilution, acid is added to water not water to acid as specific heat of water is quite large and it can absorb large quantity of heat produced by sulphuric acid.

53. **(d)**

Diamonds is the polymorph of the element carbon.Calcium is the basic element of naturally occuring marble.Sand is formed by Silicon and Aluminium is the basic element of naturally occuring Ruby.

54. **(d)**

German silver has a color resembling silver, but is an alloy of primarily copper, nickel and zinc.

Solder is an alloy of tin, antimony, copper and lead. Bleaching powder contains calcium chloride and calcium hypochlorite, used in solution as a bleach. Bleaching powder is sold on the basis of available chlorine, which is liberated when it is treated with a dilute acid. It is used for bleaching paper pulps and fabrics and for sterilizing water.

Hypo solution used in iodometric titration is sodium thiosulphate (Na2S2O3).

55. **(b)**

The electron affinity of a molecule or atom is the energy change when an electron is added to the neutral atom to form a negative ion.

Down a group, the electron affinity decreases because of a large increase in the atomic radius, electron-electron repulsion and the shielding effect of inner electrons against the valence electrons of the

atom. As one moves from left to right across a period in the periodic table, the electronegativity increases due to the stronger attraction that the atoms obtain as the nuclear charge increases. There will be an increase of

ionization energy from left to right in a given period.

56. **(a)**

The oxidation number characterises the oxidation state of an element in a compound. It is a full number, positive or negative, which indicates the amount of electron loss or gain by this element in the given compound, with respect to the neutral atom. Oxidation number of calcium is 2 in calcium oxide (CaO). Oxidation number of Aluminium is +3 in Sodium aluminium hydride (NaAlH4) is a chemical compound used as a reducing agent.

Oxidation number of manganese is 4 in Manganese dioxide (MnO2).

Oxidation number of sulphur is 6 in Pyrosulfuric Acid (H2S2O7)

57. **(a)**

Synthetic detergents are sodium salt of long chain sulphonic acid or alkyl hydrogen sulphate. Hardness in water is due to presence of chlorides, sulphates and nitrates salts of calcium and magnesium. Now detergents are capable of forming soluble salts even with the calcium and magnesium ions present in hard water and forms lather easily in hard water.

58. **(d)**

A trend of decreasing electron affinity going down the groups in the periodic table would be expected. The additional electron will be entering in an orbital farther away from the nucleus, and thus would experience a lesser effective nuclear charge. It is fairly obvious that the atoms get bigger as you go down group with the increase in atomic number

59. **(b)**

Coal based thermal power plants contribute to acid rain because SO2 and NO2 are emitted from these plants which form H2SO4 and HNO3 in atmosphere, that cause acid rain. Oxides of carbon are emitted when coal burns, but it does not contribute to acid rain.

60. **(d)**

Baking soda is a great as a fire extinguisher for electrical fires and grease fires. When baking soda is heated it releases carbon dioxide and produces water.

Since carbon dioxide is heavier than air and does not support combustion like oxygen does, it smothers the fire while water that is formed cools the fire to below ignition temperature.

Calcium oxide, chemical compound, CaO is also called lime,quicklime, or caustic lime. Calcium oxide is widely used in making porcelain and glass.

Plaster of Paris is a type of building material based on calcium sulphate hemihydrate nominally CaSO4.1/2H2O.It is created by heating gypsum to about 300oF (150ºC).

61. **(c)**

*Raja Ramanna* India's Most Eminent Nuclear Physicist,if we have today achieved the status of a "developed country" in nuclear science and technology, it is in large measure a consequence of

Dr. Ramanna's ideals, policies and efforts.

*M. S. Swaminathan* is an Indian agriculture scientist. He is known as the "Father of the Green Revolution in India."

*Udipi Ramachandra Rao* is a space scientist and former chairman of the Indian Space Research Organisation. Prof Rao's experiments on a number of Pioneer and Explorer spacecrafts, led to a complete understanding of the solar cosmic ray phenomena and the electromagnetic state of the

interplanetary space.

*Meghnad Saha* was an Indian astrophysicist, best known for his development of the Saha equation, used to describe chemical and physical conditions in stars.

62. **(a)**

Ammonia is used as a large scale refrigerant because it has highest refrigerating capacity per pound of any refrigerant and a number of other excellent thermal properties that make it popular for a number of refrigeration applications in spite of its being toxic, explosive and flammable within certain conditions. Ammonia is used as refrigerant prominently in the refrigeration systems of food industry

like dairies,ice creams plants, frozen food production plants, cold storage warehouses, processors of fish, meat and number of other applications

63. **(a)**

The Standard Model of particle physics assumed that neutrino are massless.

A quark is an elementary particle and a fundamental constituent of matter. Quarks have fractional electric charge values either –1/3 or +2/3 times the elementary charge.The positron or antielectron is the antiparticle or the antimatter counterpart of the electron. The positron has an electric charge of +1e, a spin of ½, and the same mass as an electron.

In physics, a photon is an elementary particle. Spin of a photon can be –1 or +1

64. **(a)**

Ionic compound is a chemical compound in which ions are held together in a lattice structure by ionic bonds. ionic compounds dissolve in polar solvents, especially those that ionize, such as water

and ionic liquids. They are usually appreciably soluble in other polar solvents such as alcohols, acetone. Solid ionic compounds cannot conduct electricity because there are no mobile ions or electrons present in the lattice.

65. **(d)**

Blue vitriol is blue, crystalline hydrous solution of copper sulphate, $CuSO4·5H2O$, one of the most important industrial copper salts, used in insecticides, germicides, and hair dyes and in the processing of leather and textiles.

Magnesium sulphate is a chemical compound containing magnesium, sulphur and oxygen, with the formula $MgSO4$.

It is often encountered as the heptahydrate epsomite ($MgSO4·7H2O$), commonly called "Epsom salt".

Sodium bicarbonate or sodium hydrogen carbonate is the chemical compound with the formula $NaHCO3$. The salt has many related names such as baking soda, bread soda,cooking soda, bicarbonate of soda.

Caustic soda or sodium hydroxide is an essential ingredient in an array of industrial applications. In addition, consumers use caustic soda when using cleaners, such as oven and drain cleaners.

66. **(a)**

Potassium bromide is used in photography as a restrainer in black and white developer formulas.

Gun powder, also called black powder, is a mixture of sulphur,charcoal, and potassium nitrate. Gun powder can be made by just using potassium nitrate and charcoal (or alternatively without charcoal), but without the sulphur (or coal), the powder is not as strong.Potassium sulfate is primarily used as a fertilizer.

Mono potassium tartrate is used in bakery by combination with baking soda it results in to evolution of $CO2$ which is used for baking cakes.

67.c

68. **(b)**

First statement can be explained on the basis of laws of motion. First statement involves the use of Newton's third law of motion, "For every action there is an equal and opposite reaction". The second statement can be explained on the basis of law of conservation of linear momentum according to which the momentum of body remains conserved until any external force acts upon it.

69**(c)**

Due to the unbalanced force the bob moves towards the mean position. The speed of the bob is maximum at the mean position and is zero at the extreme positions. Thus, it is clear that in each cycle bob velocity increases from zero to maximum That means, a retarding force is acting on the bob thereby reducing the amplitude of oscillation. This retarding force is nothing but air-resistance or air-friction.

At extreme position, acceleration is maximum. So statement 3 is not correct.

70. **(d)**

Statement 1 is false. The temperature dependence of liquid viscosity is the phenomenon by which liquid viscosity tends to decrease (or, alternatively, its fluidity tends to increase) as its temperature increases. Thus, with increase of temperature viscosity of glycerine decrease. Statement 2 is correct because with the rise of temperature in case of liquid, the kinetic energy increases as kinetic energy of liquid molecules is directly proportional to absolute temperature.

71. **(c)**

Statement 1 is true but statement 2 is false. Specific gravity is the ratio of the density (mass of a unit volume) of a substance to the density (mass of the same unit volume) of a reference substance. Mercury has a specific gravity of 13.56 whereas specific gravity of iron is 7.21.Thus, iron ball floats on mercury.

72. **(b)**

Weight is basically the measurement of the gravitational force that acts on an object. Weight of any body is given by formula $W = mg$,Earth is not a perfect sphere because its two poles cause it to bulge out in the middle. It spins on its axis and the centrifugal force makes the part at the equator bulge out slightly.

73. **(a)**

In case of object moving along a circular path two types of forces centripetal and centrifugal acts upon it. As they have opposite impact thus, the object remains in balance. When centrifugal force gets disturbed then the object will leave the balance and skid toward an outward direction.

74. **(b)**

1. it would be difficult to use a kerosene lamp
2. the blotting paper would fail to function
3. the big trees that we see around would not have grown on the Earth.

75. **(b)**

Both statement 1 and statement 2 are correct. On heating up to same temperature copper piece is found hotter than in comparison to glass piece because copper being a metal is a good conductor of heat and electricity while glass on the other hand is a poor conductor of heat. The density of copper is 8.92 gm/cm3 and of glass is 2.6 gm/cm3 .

76. **(c)**

The boiling point of an element or a substance is the temperature at which the vapour pressure of the liquid equals the environmental pressure surrounding the liquid. As altitude increases, atmospheric pressure decreases, so boiling point decreases, so the liquid would boil at a lower temperature.

77. **(d)**

Only statement 3 is correct. An air conditioner (often referred to as AC) is a home appliance, system, or mechanism designed to dehumidify and extract heat from an area. Steam (at 100 degree Celsius ) has more energy than water ( at 100 degree Celsius ) because it takes energy to break the bonds that keep it liquid. Latent heat is the heat released or absorbed by a chemical substance or a thermodynamic system during a change of state that occurs without a change in temperature. Latent heat of fusion of water is 334 kJ/kg whereas Latent heat of vaporization of water is 2260kJ/kg.

**78.(c)**

This is a phenomenon of total internal reflection of light, dependent on the`critical angle' of the incidence of light in a material medium at its bounding surface with air.The higher the refractive index of a transparent material the smaller is the critical angle and hence the larger is the range of angles of incidence for more light to be totally reflected.A diamond has a large refractive index and very small critical angle as against glass, which has a lower refractive index and large critical angle.

A skilled diamond cutter exploits the large range of angles of incidence in the diamond to cut multiple faces at suitable angles. Light entering diamond from different faces, suffers multiple total internal reflection and comes out of the diamond as intense beams from selected directions. Hence,a diamond shines brilliantly.

79. **(c)**

Mach number (Ma or M) is the speed of an object moving through air, or any other fluid substance. It is commonly used to represent the speed of an object when it is travelling close to or above the speed of sound.Pressure is the force per unit area applied in a direction perpendicular to the surface of an object. The SI unit for pressure is the pascal (Pa), equal to one newton per square meter (N/m2 ).

In physics, the wavelength of a sinusoidal wave is the spatial period of the wave—the distance over which the wave's shape repeats. The unit for wavelength is the angstrom.

In physics, energy is a quantity that is the ability to do work.

80. **(a)**

Refraction is the change in direction of a wave due to a change in its speed. This is most commonly observed when a wave passes from one medium to another at any angle other than 90° or 0°. Refraction of light is the most commonly observed phenomenon. In both cases the phenomenon of refraction is applicable because there will be a change in the direction and speed as light enters from one media to other. In case 1 light for observer outside water the light ray is travelling from denser medium (water) to rarer medium (air). Thus, image of coin will appear closer due to refraction. Whereas in case 2 for observer under water refraction also takes place but in opposite way as light travels from rarer medium (air) to denser medium (water) .Thus, the image of coin will appear at a higher level than actual position of coin.

81.c

82. **(a)**

Both of the statements are correct and statement 2 is also correct explanation for statement 1. Total internal reflection is an optical phenomenon that happens when a ray of light strikes a medium boundary at an angle larger than a particular critical angle with respect to the normal to the surface. If the refractive index is lower on the other side of the boundary, no light can pass through and all of the light is reflected.

83. **(c)**

Statement 1 is true but statement 2 is false. Yes the stick dipped in water appears to be bent and short but refraction of light by water molecules is the phenomena responsible for this observation not because of scattering of light.

84.d

85. **(c)**

Convection currents of hot air rising off a surface have a lower density than the air directly above it. The difference in density cause light passing through the air to refract differently, which causes the formation of mirage

86.c

87. **(d)**

The flute is a musical instrument of the woodwind family. A flute of smaller length produces waves of higher frequency. Sound waves travels through medium rocks in the form of longitudinal as well as transverse waves

88. **(d)**

Mach number, a useful quantity in aerodynamics, is the ratio of air speed to the local speed of sound. The speed of sound varies with temperature. Since temperature and sound velocity normally decrease with increasing altitude,sound is refracted upward. Mach number is a function of temperature at altitude. With decrease in sound velocity Mach number increases.

89.d

90. **(c)**

Size of the Sun at dusk is an optical illusion because of atmospheric refraction. Colour of the sun appears yellow due to scattering whereas pure sunlight is white in colour.Twinkling of stars is an optical illusion. Air whirlpools make the stars twinkle.

91.d

92. **(d)**

Thunderstorms result from the rapid upward movement of warm, moist air. They can occur inside warm, moist air masses and at fronts. As the warm, moist air moves upward, it cools, condenses, and forms cumulonimbus clouds that can reach heights of over 20 km (12.45 miles). The thunderstorms are associated with the cumulonimbus clouds. These clouds normally form on warm sunny days but they can also be found on cold front. But this question is asking about the Thunder i.e. the sound produced. The lightning generates between 100 million and 1 billion volts of electricity and can heat the air to around 50K°F. The rapid expansion causes the shock waves.Thunder happens because the lightning would heat the air at huge temperatures and the air expands so fast that it make a loud clap of thunder.

93. **b**

- **Virtual Reality:** computer-generated simulation of real life environments that are primarily achieved with the use of headsets. When worn, the user's vision and hearing are stimulated to provide realistic experiences.
- **Augmented Reality**: superimposition of computergenerated images on existing environments to make them more interactive. It is utilised in the form of applications for mobile devices such as Pokemon GO. So, #2 is wrong. This eliminates A and C. Based on the same sentence, #3 is correct.

So, b is the answer

94. **(c)**

Digital Signature means an electronic signature useful to authenticate the identity of the sender of a message or the signer of an electronic document. This ensures that the original content of the document is not changed. So #3 is right..

95. **(d)**

- Wearable devices such as smart watches can track GPS location of a person and monitor his heart rate and sleeping pattern so 1 and 2 are right. There is only one option d where they're together.

96. **(d)**

- Drone used for spraying pesticides on a crop field says the Hindu. So #1 is correct.
- Drone can be used for monitoring active volcanoes,says Science USA news
- Drones can be used for doing statement#3, says reuters.com article
- So all three correct.

97. **(c)**

(i) This OWC technology uses light from lightemitting diodes (LEDs) as a medium to deliver networked, mobile, high-speed communication in a similar manner to Wi-Fi. It is a bidirectional, high-speed and fully networked wireless communication technology similar to Wi-Fi.

(ii) Li-fi gives data transfer rate of 10 gigabytes per second. So 1st statement is right. Li-Fi device circulates data via LEDs that emit an intermittent flicker at a speed imperceptible to the human eye. So, 2nd statement also right..

98. **(b)**

A virtual private network provides a private network across a public network ensuring security by establishing an encrypted layered tunneling protocol.

99. **(b)** Statement 3 is incorrect as the thickness of BD is 1.1 mm while that of DVD is 1.2 mm. The difference lies in capacity so statement 2 is correct. As far as statement 1 is concerned..

100. c