MARKING GUIDE OF PYSICS FOR S6

MULTIPLE-CHOICE QUESTIONS

Q1. **C.** (iii) Frequency **B.** (iii) Steel

Q2. **B.** Hydrogen **A.** Mitigation

Q3. **B**. Stratosphere **C**. The branch of natural sciences dealing with the application of physics in agriculture and the environment.

Q4. **D**. all of the above **A.** the amount of time it takes for half of the atoms in a sample to decay

Q5. A. increases by 2. **C**. 1.3X1018

Q6. **B**. Equal to **A**. All of the above

Q7. **A**. amplitude **B**. Space

Q8. **D**. electromagnetic force B. Protons, neutrons and electrons

Q9. D. a hadron and a lepton **B**. quarks

Q10. A. hard **B**. 118

STRUCTURED QUESTION

Q11. a) X-rays are a form of electromagnetic radiation. **b**) Main properties of X-rays include high frequency, short wavelength, and the ability to penetrate substances opaque to visible light.

Q12. **a**) Antiparticle is a particle having the same mass but opposite charge or other properties to its corresponding particle. Pauli's exclusion principle states that no two electrons in an atom can have the same set of quantum numbers. Pauli's exclusion principle is known as exclusion because it excludes the possibility of two electrons occupying the same quantum state simultaneously.

Q13. **a)** Transducer in a communication system converts one form of energy into another. b) Replacing analog communication with digital can lead to clearer transmission, better signal integrity, and more efficient use of bandwidth, but may require infrastructure upgrades.

Q14. a) Two optical parts of optical fiber are the core and the cladding. **b)** Monomode type allows only one mode of light to propagate, suited for long-distance transmission with low attenuation, while multimode types allow multiple modes of light to propagate, suitable for shorter distances but with higher attenuation.

Q15. a) The Doppler effect refers to the change in frequency or wavelength of a wave in relation to an observer who is moving relative to the wave source**. b)** As the car approaches the ambulance, the frequency heard increases due to compression of sound waves. As the car moves away, the frequency heard decreases due to rarefaction of sound waves.

SECTION

Q16. (a) Climate change refers to significant and lasting changes in Earth's climate patterns over an extended period, typically decades to millions of years.

(b) Greenhouse gases contribute to climate change by trapping heat in the Earth's atmosphere. These gases, such as carbon dioxide, methane, and nitrous oxide, allow sunlight to enter the atmosphere freely but prevent some of the outgoing infrared radiation from escaping back into space. This trapping of heat leads to the warming of the Earth's surface and atmosphere, causing global temperatures to rise, which alters weather patterns, sea levels, and ecosystems.

(c) Humans can affect land surface albedo, which is the measure of how much sunlight is reflected by the Earth's surface. Land use changes, such as deforestation or urbanization, can alter surface albedo. For example, replacing forests with urban areas or agricultural fields often decreases surface albedo, as urban surfaces or croplands absorb more sunlight compared to forests, which reflect more sunlight.

(d) The loss of land vegetation can modify local climates by disrupting the water cycle and altering the balance of heat and moisture in the atmosphere. Vegetation plays a crucial role in regulating local temperatures through processes such as evapotranspiration, where plants release water vapor into the atmosphere. When vegetation is lost due to deforestation or land degradation, evapotranspiration decreases, leading to drier and warmer local climates. Additionally, the loss of vegetation can also increase soil erosion and decrease carbon sequestration, further exacerbating climate change.

(e) Humans have significantly increased the concentrations of greenhouse gases in the atmosphere through activities such as burning fossil fuels, deforestation, and industrial processes. For example, the burning of fossil fuels for energy production releases large amounts of carbon dioxide into the atmosphere. Additionally, deforestation reduces the number of trees that can absorb carbon dioxide from the atmosphere, further contributing to increased greenhouse gas concentrations

Q17.

(a) Sound waves travel through different mediums via the propagation of mechanical vibrations. When an object vibrates, it causes adjacent particles in the medium to vibrate as well, transferring energy in the form of sound waves. In solids, such as metals, sound waves propagate through the closely packed molecules or atoms, allowing for efficient transmission of energy. In liquids, molecules are less tightly packed, but still transmit sound waves through compression and rarefaction of the medium. In gases, sound waves propagate through the collision of gas molecules, transferring energy through compression waves.

(b) Sound travels faster in solids than in gases primarily due to the higher density and closer arrangement of particles in solids. In solids, the molecules are densely packed and closely bonded, allowing sound waves to propagate more efficiently with less energy loss. Additionally, the elastic properties of solids allow for faster transmission of mechanical vibrations compared to gases, where molecules are more widely spaced and have weaker intermolecular forces.

(c) Temperature affects the speed of sound in air because it alters the average speed of gas molecules. In warmer air, molecules move faster due to increased kinetic energy, leading to more frequent collisions and faster transmission of sound waves. Conversely, in colder air, molecules move slower, resulting in fewer collisions and slower propagation of sound waves. This relationship is described by the ideal gas law, where the speed of sound in air is directly proportional to the square root of the temperature. Therefore, as temperature increases, the speed of sound in air increases, and vice versa

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Q18. a) Fundamental particles can be classified based on their spin as fermions (particles with half-integer spin) and bosons (particles with integer spin). b) The decay violates the conservation of lepton number and charge conservation laws.

Q19. a) Agrophysics is the application of physics principles to agricultural problems. b) Physics helps in understanding soil mechanics, plant growth, climate patterns, and optimizing agricultural practices.

Q20. a) Half-life period is the time taken for half of the radioactive substance to decay, measured in seconds, minutes, etc. The decay constant is the probability of decay per unit time, measured in per second, per minute, etc. b) With a decay constant of 0.693 per minute, the half-life period is 1 minute, and the mean life is 1.44 minutes. c) The half-life period and decay constant are inversely proportional; as the half-life increases, the decay constant decreases, and vice versa