## HINTS & SOLUTION

**1.** *b)* "Dilapidated" refers to something in a state of disrepair or ruin.

**2.** *b)* "Immaculate" means perfectly clean or without any flaws.

**3.** *b)* "Indefatigable" describes someone who never gives up or gets tired.

**4.** *b)* "Surreptitious" means secretive, especially because it would not be approved of.

**5.** *b)* "Munificent" means very generous or liberal in giving.

**6.** *c)* "Immutable" means unchangeable; "variable" means capable of changing.

**7.** *c)* "Insipid" means dull or uninteresting; "exciting" is the opposite.

**8.** *a)* "Sagacious" means wise or shrewd; "foolish" is the direct opposite.

**9.** *d)* "Sanguine" means hopeful or positive; "despondent" means discouraged or gloomy.

**10.** *b)* "Munificent" means very generous; "stingy" is miserly or ungenerous.

**11.** *a)* This old British idiom means to show disrespect or mock someone blatantly.

**12.** *b)* It implies the person is so clever that it becomes counterproductive or annoying.

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**14.** *a)* Refers to constantly trying to please or serve someone, often to gain favour.

**15.** *c)* Means being hypocritical—supporting both sides to gain personal benefit.

**16.** *b)* Pantheism equates God with the universe or nature itself.

**17.** *b)* "Soror" means sister in Latin; sororicide is the act of killing one's sister.

**18.** *c)* "Hypo" means under; hypogamy is marrying below one's social rank.

**19.** *c)* Delirium involves disorientation, often due to fever or intoxication.

**20.** *b)* "Poly" means many, and "glot" relates to tongue/language.

**21.** *a)* A recluse deliberately avoids people and lives alone.

**22.** *a)* "Spectro" relates to reflection; spectrophobia is fear of mirrors.

**23.** *d)* Contraband refers to goods that are illegally imported or exported.

**24.** *b)* A mendicant is someone who begs for alms, often with religious association.

**25.** *c)* Uxorious refers to a man showing excessive fondness for his wife.

**26.** *b)* The subject "Each" is singular, so the verb should be "was," not "were."

**27.** *c)* The subject closer to the verb ("students") is plural, so the correct verb is "have," not "has."

**28.** *a)* The correct structure for conditional sentences is "if + past perfect, would have + past participle." It should be "if I had known."

**29.** *b)* "Team" is a collective noun and takes a singular verb. The correct form is "has" instead of "have."

**30.** *a)* "Despite" should be used without "of." The correct phrase is "Despite his hard work."

**31.** *b)* A "pragmatic" approach refers to dealing with issues realistically and practically, balancing economic growth with sustainability. "Archaic," "superficial," and "idealistic" are not suitable in this context.

**32.** *a)* The ethical debate in AI primarily revolves around the limits of "automation" in decision-making, particularly in high-stakes fields like healthcare. The other options do not directly relate to the use of AI.

**33.** *b)* "Thwarted" means obstructed or hindered, which is what nationalism has done to international cooperation. The other options suggest positive effects, which do not fit this context.

**34.** *b)* "Corroboration" means confirmation or support, which is the role of the Higgs boson discovery in reinforcing the Standard Model of particle physics. The other options suggest contradiction or challenge, which are not appropriate here.

**35.** *c)* The debate has been "muddied," or made more complicated, by the disruptions caused by the pandemic. "Clarified," "simplified," and "overlooked" do not accurately describe the effect.

**36.** *b)* The passage discusses the significance of scientific breakthroughs, but it emphasizes the need to balance progress with environmental conservation, suggesting that human advancements must be mindful of their impact on the planet.

**37.** *d)* The author acknowledges the importance of exploring life beyond Earth but implies that such efforts should not come at the expense of addressing Earth's environmental concerns, indicating that space exploration is secondary to sustainability.

**38.** *b)* The phrase "delicate balance" refers to the challenging task of advancing human knowledge and technology while ensuring that these advancements do not damage Earth's ecosystems, which are fragile and need protection.

**39.** *b)* The passage stresses the need for innovation to be balanced with environmental conservation. The author would disagree with the idea of pursuing progress without considering the consequences for the environment.

**40.** *b)* The "delicate balance" referenced in the passage is between technological innovation and environmental protection. Failure to maintain this balance could lead to irreversible damage to Earth's ecosystems, which would limit humanity's future growth and potential.

**41.** *a)* Starts with a general truth about innovation (2), describes the protagonist's efforts (3), the risk-reward dilemma (1), the moment of success (4), and finishes with a philosophical reflection (5).

**42.** *a)* Chronological narration — eruption (5), burial (1), rediscovery (3), findings (2), and modern importance (4).

**43.** *b)* Begins with a general principle (4), introduces the subject (1), details bee strategy (2), then ant strategy (3), and concludes with an observation (5).

**44.** *b)* Starts with a timeless theme (5), cultural context (1), transition to science (2), established theory (3), and finishes with unanswered questions (4).

**45.** a) Begins with AI's reality (1), examples (2), problem (3), implications (4), and closes with a solution-oriented conclusion (5).

**46.** *a)* "Had" is helping the bare infinitive "call" — it acts as a causative auxiliary verb here.

**47.** *b)* "Round" is used as a noun meaning "a cycle" or "a session" of drinks.

**48.** *b)* "Before" joins two clauses and thus functions as a subordinating conjunction.

**49.** *d)* "Fast" describes how he ran — it qualifies the verb, so it's an adverb.

**50.** *c)* Here "even" is modifying the pronoun "he" — it is an adverb expressing surprise/emphasis.

**51.** *b)* Diffuse reflection still follows the law, but irregular surface causes scattered rays.

**52.** *a)* Wavelength changes in refraction and scattering but not in reflection/diffraction.

**53.** *b)* TIR happens from denser to rarer. B, C, D are factually accurate.

**54.** *a)* Polarization has nothing to do with solids; D is false.

**55.** *b)* Refractive index varies with wavelength (dispersion); B, C, D describe standard optical behavior.

**56.** *a)* For a floating body, stability depends on the vertical relationship between the center of gravity (G), center of buoyancy (B), and metacenter (M). When the body tilts, B shifts laterally, and if M lies above G, a restoring couple acts to return the body to equilibrium (stable). If G is above M, the body becomes unstable. The metacentric height (GM) is key to the magnitude of the restoring moment. In neutral equilibrium, G coincides with M, but the effect of B's shift cannot be ignored.

**57.** *d)* Volume of the cylindrical tank, $V = \pi r^2 h = \pi(1)^2(3) = 3\pi\ m^3$
So, $V = 3\pi\ m^3 = 9.42477\ m^3$ (exact value of $3\pi$)
Flow rate, $Q = 0.1\ m^3/min$
Time to empty the tank, $t = V / Q = (3\pi) / 0.1 = 30\pi$ minutes. Thus, $t = 30\pi = 94.2483$ minutes

**58.** *b)* Friction and viscous forces dissipate energy; gravitational and electrostatic forces conserve energy.

**59.** *b)* Torque, energy, and work all have unit joule ($N \cdot m$); power is joule/sec.

**60.** *a)* Displacement, velocity, and acceleration can be negative depending on the direction; kinetic energy is always positive.

**61.** *b)* The pulley system has 2 supporting ropes, giving a mechanical advantage (MA) of 2.
The weight of bucket A is: $W = 5 * 9.8 = 49$ N
The force required at point B is: $F = W / MA = 49 / 2 = 24.5$ N
Convert this force to "kg of effort":$m_{effort} = 24.5 / 9.8 = 2.5$ kg

**62.** *d)* To verify Ohm's Law ($V = IR$), measure voltage (V) across the resistor and current (I) through it.
Setup 1: Voltmeter in parallel, ammeter in series—correct, measures V and I for the resistor.
Setup 2: Ammeter in series, voltmeter in series with circuit—incorrect, measures total voltage, not resistor's voltage.
Setup 3: Ammeter in series, voltmeter in series with resistor—incorrect, voltmeter must be in parallel.
Setup 4: Voltmeter in parallel, ammeter in series—correct, measures V and I.
Setups 1 and 4 are correct; Setups 2 and 3 fail due to improper voltmeter placement.

**63.** *c)* To solve this, we use the principle of Pascal's law and the balance of pressures. The pressure due to the mass of 12 kg on the piston is P = mg/A, where m = 12 kg, g = 9.8 m/s², and A = 800 cm² = 0.08 m². This gives P = (12 × 9.8) / 0.08 = 1470 Pa. This pressure is transmitted through the water, causing a height difference h in the narrower tube. The pressure difference is also given by ρgh, where ρ = 1000 kg/m³ (water density) and h is In meters. Equating the pressures: 1470 = 1000 × 9.8 × h, so h = 1470 / (1000 × 9.8) = 0.15 m = 15 cm.

**64.** *d)* For a simple pendulum oscillating without damping, when the displacement of the bob is less than the maximum, the acceleration vector a points toward the equilibrium position (the bottom). Among the options:
Option 4 correctly shows the acceleration vector a pointing downward, toward the equilibrium, as the bob is displaced to the side.

**65.** *b)* The acceleration vs. time graph shows constant acceleration a over time t.
Velocity v is the integral of acceleration: v = at (linear increase).
Displacement s is the integral of velocity: s = (1/2)at^2 (parabolic).
Among the options:
Option 1: v vs. s is linear (incorrect, as v is proportional to the square root of s).
Option 2: v vs. s is parabolic (correct, matches v = sqrt(2as)).
Option 3: v vs. s is parabolic (but wrong orientation).
Option 4: v vs. s is constant (incorrect).

**66.** *b)* First, combine the top two resistors (4 Ω and 8 Ω) in series:
4 + 8 = 12 Ω
Now, 12 Ω is in parallel with 6 Ω:
1/R = 1/12 + 1/6 = ¼
R = 4 Ω
Now, 4 Ω is in series with the remaining 4 Ω and 8 Ω:
R_eq = 4 + 4 + 8 = 16 Ω

**67.** *c)* Young's modulus (stretching), Shear modulus (shape without volume change), Bulk modulus (volume change) — mass changes are unrelated to mechanical moduli.

**68.** *a)* Capillary rise is governed by tube radius, gravity, and surface tension. Viscosity affects flow speed but not the static capillary height.

**69.** *a)*
*1.* Correct:
Mass never changes with location — it's invariant.
2.Correct:
Weight = mass × g → At 0.3g, weight reduces to 0.3 times.
3.Correct:
Thermal expansion increases volume slightly → Density = mass/volume → Density decreases slightly.
4.Incorrect:
Buoyant force depends on gravity too (F_b = ρ × V × g). In lower g (space station), buoyant force decreases, not increases.
5.Correct:
Thermal expansion of liquids → reduced density → reduced buoyant force.

**70.** *a)* The timbre (or quality) of sound is affected by:
Material and shape of the vibrating body (e.g., wood, metal, shape of a guitar body) which impact the harmonic content.
The presence of harmonics affects timbre — different instruments producing the same pitch sound different because of differing harmonic structures.
The frequency of the fundamental tone affects pitch, not timbre.

**71.** *c)*Increasing the distance between the mirrors increases the chance of distortion and may decrease the clarity of the image.

**72.** *b)*Reflecting telescopes are less prone to chromatic aberration, as they do not use lenses, which can cause different wavelengths of light to bend by different amounts.

**73.** *b)* The numerical aperture (NA) of an objective lens determines the angle of light that enters the lens and affects the resolution and clarity of the image produced.

**74.** *a)* Solid sphere: Radius R/3, density 2ρ, volume (4/3)π(R/3)^3 = 4πR^3/81, mass 2ρ × 4πR^3/81 = 8πR^3ρ/81.
Shell: Volume (4/3)πR^3 – 4πR^3/81 = 104πR^3/81, density ρ/3, mass (ρ/3) × 104πR^3/81 = 104πR^3ρ/243.
Total mass: 8πR^3ρ/81 + 104πR^3ρ/243 = 128πR^3ρ/243.
Total volume: (4/3)πR^3.
Average density: (128πR^3ρ/243) ÷ (4/3)πR^3 = 32ρ/81.

**75.** *a)*

a)Mechanical advantage (M.A.) = Load / Effort = 200 N / 50 N = 4

b)Velocity ratio (V.R.) = Effort arm / Load arm = 5 m / 2 m = 2.5

c)The lever is not a class 1 lever as the effort and load are not on opposite sides of the fulcrum. It's more likely to be a class 2 lever, where the load is between the effort and the fulcrum.

d)Work is conserved in an ideal lever as energy input equals energy output: Effort × Effort arm = Load × Load arm.

e)Load arm = 2 meters, Effort arm = 5 meters, so the load arm is not 2.5 times the effort arm.

**76.** *b)* Formation of multiple oxides and chlorides shows multiple proportions along with constant mass conservation.

**77.** *c)* Dalton proposed that atoms combine in fixed simple ratios and are neither created nor destroyed.

**78.** *b)* In pure compounds like water and sulphuric acid, element ratios are constant; air is a variable mixture.

**79.** *c)* When potassium permanganate is heated, manganese dioxide ($MnO_2$) acts as a catalyst to decompose it into potassium chloride and oxygen.

**80.** *d)* Oxygen is involved in oxidation reactions, like in combustion and rusting, but it does not play a role in calcium carbonate decomposition, which is a thermal decomposition reaction.

**81.** *b)* At low temperatures, oxygen condenses into a pale blue liquid, becoming a strong oxidizer, which is critical in applications like liquid oxygen in hospitals and industry.

**82.** *b)* Diamond's structure is tetrahedral with $sp^3$ hybridized carbon atoms, while graphite has planar sheets with $sp^2$ hybridized carbon atoms.

**83.** *c)*Diamond's structure is tetrahedral with $sp^3$ hybridized carbon atoms, while graphite has planar sheets with $sp^2$ hybridized carbon atoms.

**84.** a) Amorphous carbon is used in various applications, including inks and paints, due to its fine, powdery nature.

**85.** *c)* The primary ingredients for OPC production are limestone, clay, and gypsum. Bauxite is not typically used in the manufacture of OPC but is used in the production of aluminum.

**86.** *b)* Excess lime leads to the formation of a high amount of calcium hydroxide ($Ca(OH)_2$) which is soluble in water and causes cracking and shrinkage.

**87.** *a)* The proper $CaO/SiO_2$ ratio is essential for the formation of $C_3S$, the most important compound in cement responsible for strength development.

**88.** *a)* As altitude increases, the density of the air decreases, causing air pressure to drop at a faster rate than temperature.

**89.** *a)* At 4°C, water molecules form a structure that is less dense, which makes water expand when cooled further, allowing ice to float.

**90.** *b)* The presence of solute particles like salt disrupts the ability of water molecules to form a solid structure, thus lowering the freezing point.

**91.** *b)* Beta-oxidation is the process by which fatty acids are broken down into smaller molecules (acetyl-CoA) to generate ATP.

**92.** *c)* Unsaturated fats (found in oils like olive oil) are considered heart-healthy, unlike saturated or trans fats.

**93.** *b)* Viruses can only replicate within a host cell, which is why they are considered non-living when outside a host organism.

**94.** *c)* While many living organisms exhibit locomotion, this is not a defining characteristic. Some living organisms, such as plants, do not exhibit movement.

**95.** *b)* Pasteur's germ theory established that microorganisms cause many diseases, which laid the groundwork for modern microbiology and immunology.

**96.** *b)* Franklin's X-ray images helped Watson and Crick confirm the double helix structure of DNA, making her a key figure in molecular biology.

**97.** *b)* Crossing over during meiosis creates new combinations of alleles, leading to genetic variation in offspring.

**98.** *c)* Binary fission is a type of asexual reproduction in single-celled organisms, not plants.

**99.** *b)* Endocytosis is the process by which cells engulf large particles or molecules to bring them inside.

**100.** a)
Parenchyma tissue stores food and water and is involved in photosynthesis in plant cells.

**101.** *d)* The Constitution does not mention "cooperative federalism"; it evolved through judicial interpretation to harmonize Centre-State relations.

**102.** *c)* Eclipse means temporary invalidity, not void ab initio; law can revive after constitutional amendment removing inconsistency.

**103.** *a)* Right to Property is now a legal right (after 44$^{th}$ Amendment, 1978) and not a Fundamental Right; others are enforceable.

**104.** *b)*Nani Palkhivala famously said the Constitution is so detailed and interpretative that it has become a "lawyer's paradise.

**105.** *b)* Although Magellan died en route, his expedition completed the first global circumnavigation, confirming Earth's roundness and vast size.

**106.** *b)* Florence's bankers and merchants, notably the Medici, had the resources and stability to fund cultural and intellectual projects.

**107.** *c)* Machiavelli's work emphasized realistic and sometimes ruthless political strategies, laying foundations for political realism.

**108.** *b)* Leonardo excelled in painting, anatomy, engineering, and scientific studies, embodying the Renaissance ideal of broad intellectual mastery.

**109.** *c)* Copernicus proposed the heliocentric model (Sun-centered), revolutionizing European understanding of astronomy.

**110.** *b)* The movement began at Pochampally when villagers requested land, and Vinoba Bhave succeeded in obtaining 100 acres donated by a landlord, inspiring a nationwide campaign.

**111.** *a)* Gandhi's Hind Swaraj outlines his vision of Sarvodaya as the upliftment of all through non-exploitative, self-sustaining systems.

**112.** *a)* Operation Polo was the military operation launched in 1948 to annex the princely state of Hyderabad into India. It was a crucial operation for ensuring national integration after independence.

**113.** *a)* Operation Vijay, conducted in December 1961, was the Indian military operation aimed at liberating the Portuguese-held territories of Goa, Daman, and Diu, further strengthening India's national integration.

**114.** *d)* The Beveridge Report focused on the issues of Want, Ignorance, Disease, Squalor, and Idleness, not specifically on gender inequality.

**115.** *b)* Gandhi was deeply influenced by Tolstoy's ideas on non-violence, truth, and passive resistance.

**116.** *c)* Gandhi first used Satyagraha in South Africa to protest the discriminatory treatment of Indian immigrants.

**117.** *c)* Iltutmish institutionalized the "Iqta" system, where land was granted to nobles in exchange for military service.

**118.** *d)* The Fourth Buddhist Council, convened by Kanishka, was pivotal in the spread of Mahayana Buddhism.

**119.** *a)* The invasion of the Huns under Mihirakula caused significant disruption to the Gupta Empire's stability in the 5$^{th}$ century.

**120.** *c)* Modern NH-1 (Delhi to Amritsar) and NH-2 (Delhi to Kolkata) largely follow the old path of the Grand Trunk Road.

**121.** *b)* Sam Altman, CEO of OpenAI and prominent Silicon Valley investor, is widely known for his measured approach to both technological innovation and the complex risks that accompany it.

**122.** *b)* The Director-General of UNESCO, Audrey Azoulay, has decided to designate Rio de Janeiro (Brazil) as World Book Capital for 2025.

**123.** *a)* Indian Navy commissioned INS Nistar on July 12, 2025, at Naval Dockyard, Visakhapatnam. INS Nistar is the first of two indigenously built Diving Support Vessels (DSVs) by Hindustan Shipyard Limited under Ministry of Defence.

**124.** *b)* The theme for World Environment Day 2025 is "Beat Plastic Pollution". This theme encourages collective action to tackle plastic pollution, with a focus on sustainable practices and systemic change.

**125.** *b)* Leander Paes and Vijay Amritraj are the first Indian and first Asian male tennis players to be inducted into the International Tennis Hall of Fame

**126.** *d)* In the final, South Africa defeated Australia by five wickets to win their maiden championship. This was also their second ICC trophy after 1998.

**127.** *a)* The Ministry of Home Affairs inaugurated Sankalan app, a digital Criminal Case Management System (CCMS) developed by the National Investigation Agency (NIA) in New Delhi.

**128.** *a)* The scheme has been launched to encourage innovations in critical and strategic defence technologies. Technologies deemed 'Critical and Strategic' encompass Satellite communication applications, advanced cyber technology, autonomous weapons, cyber weapons, nuclear technologies, advancement in semiconductor technology, Artificial Intelligence (AI), Quantum Technologies (QT), advanced underwater surveillance systems and others.

**129.** *a)* Touching lives while touching the moon – India's space saga

**130.** *a)* The Chapchar Kut festival, a celebration of Mizo culture and heritage, is celebrated in the state of Mizoram. It is the biggest festival in Mizoram and is traditionally held in March after the completion of the Jhum operation (clearing of land for cultivation).

**131.** *b)* Precession results from the gravitational pull of both the Sun and the Moon on Earth's equatorial bulge, coupled with the axial tilt.

**132.** *c)* Earth's rotation causes deflection of currents due to the Coriolis effect, forming clockwise gyres in the Northern Hemisphere and counter-clockwise in the Southern Hemisphere.

**133.** *d)* The equatorial bulge changes Earth's radius slightly across latitudes, affecting the velocity required for satellites to maintain stable orbits.

**134.** *b)* A smaller axial tilt would reduce the contrast between seasons by decreasing the angle at which sunlight strikes various latitudes.

**135.** *d)* Pyroclastic flows occur when hot gas and volcanic material are ejected explosively and flow down the volcano's slopes.

**136.** *d)* Elastic rebound refers to the sudden release of stored stress at fault lines, causing the Earth's crust to 'snap' back to its original position, triggering an earthquake.

**137.** *a)* At convergent boundaries, tectonic plates collide, often causing both volcanic activity and earthquakes.

**138.** *b)* P-waves are compression waves that travel fastest through the Earth and are detected first by seismographs.

**139.** *b)* Nitrogen is the most abundant (78%), followed by oxygen (21%), then argon (~0.93%) and carbon dioxide (~0.04%).

**140.** *a)* The troposphere holds about 75% of the atmosphere's mass and is where clouds, rain, and storms occur.

**141.** *b)* The stratosphere (ozone layer) and thermosphere (ionosphere) absorb harmful UV and X-rays.

**142.** *b)* The inner core is hotter than the mantle, solid due to pressure, and under immense pressure. The magnetic field is generated mainly by the outer core, not the inner core directly.

**143.** *c)* Digboi (Assam) in the north, Ankleshwar (Gujarat), Mumbai High (offshore), and Narimanam (Tamil Nadu) southwards.

**144.** *b)* Malanjkhand in Madhya Pradesh is Asia's largest open-pit copper mine, deeper than others like Zawar and Jaduguda.

**145.** *b)* Jaduguda uranium mines lie in the highly mineralized Singhbhum belt of Jharkhand.

**146.** *c)* Kerala's coastal sands contain large monazite deposits rich in thorium.

**147.** *c)* USA is the largest destination for India's engineering goods export. UAE and Hong Kong dominate gems and jewellery. Russia is not a major destination for organic chemicals.

**148.** *b)* Non-oil top imports include gold, electronic goods, and precious stones for re-export.

**149.** *d)* Jamnagar in Gujarat, with the world's largest oil refinery, leads in petroleum product exports.

**150.** *a)* Switzerland is the top source of gold imports, being a global gold refining hub.