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ANSWER & EXPLANATION:

TEST I (5 JAN, 2017)

HCS PRELIMINARYEXAM 2017

ENVIRONMENT (MOST EXPECTED QUESTIONS)

1.A) A highly refined unleaded fuel for spark ignition engines blended to meet the requirements of modern automotive engines fitted with catalytic converters and designed to run on unleaded petrol. The unleaded petrol, as an automotive fuel, should not have the lead levels exceeding 0.05 g/L.

2.(C) Biodegradable bags are bags that are capable of being decomposed by bacteria or other living organisms. The minimum thickness to be used in biodegradable carry bags should be 15 microns.

3.(D) Lead poisoning (also known as plumbism, colica pictorum, saturnism, Devon colic, or painter's colic) is a medical condition in humans and other vertebrates caused by increased levels of the heavy metal lead in the body. Lead interferes with a variety of body processes and is toxic to many organs and tissues including the heart, bones, intestines, kidneys, and reproductive and nervous systems.

4.(D) Coal mine workers are prone to victims of Silicosis. It is a type of pneumoconiosis caused by inhaling respirable crystalline silica. Quartz is a type of crystalline silica that causes silicosis in coal miners because it is a major component of rocks.Silicosis causes x-ray changes similar to CWP (Coal Workers' Pneumoconiosis); and it is especially seen in coal miners who are exposed to rock dust, such as roof bolters in underground mines and drillers in surface mines.

5.(A) Fluorine is one of the most common elements in the Earth's crust. Fluoride is recognized to be the most effective caries-preventive agent. The main sources of fluoride for people are generally foodand drinking water. In the determination of fluoride and of Na and K, an ion-meter with a combination-fluoride electrode and a flame photometer were used, respectively. The levels of Cr, Cu, Fe, Mn, Ni and Pb in the drinking waters were determined by flame atomic absorption spectrometry (FAAS) utilizing the method optimized previously, except for the Ca, Mg and Zn contents, which were measured directly by FAAS

6.(B) High-altitude nuclear explosions (**HANE**) have historically been nuclear explosions which take place above altitudes of 30 km, still inside the Earth's atmosphere.

7.(A) Solar cells (as the name implies) are designed to convert (at least a portion of) available light into electrical energy. solar cells are based on semiconductor physics-- they are basically just P-N junction

photodiodes with a very large light-sensitive area. The photovoltaic effect, which causes the cell to convert light directly into electrical energy, occurs in the three energy-conversion layers

8.(B) India has lowest per capita green house gas emission.

9.(B) Liquid ammonia can be used in refrigeration because of its high dipole moment.

10.B

Code		Day time	Night time
A	Industrial area	75	70
B	Commercial area	65	55
C	Residential area	55	45
D	Silence Zone	50	40

11.(A) Biogas typically refers to a gas produced by the breakdown of organic matter in the absence of oxygen. The gases methane, hydrogen, and carbon monoxide (CO)can be combusted or oxidized with oxygen. The dominant gas in biogas is CH4.

12.(B) 1986 - The Environment (Protection) Act authorizes the central government to protect and improve environmental quality, control and reduce pollution from all sources, and prohibit or restrict the setting and /or operation of any industrial facility on environmental grounds..

1981 - The Air (Prevention and Control of Pollution) Act provides for the control and abatement of air pollution. It entrusts the power of enforcing this act to the CPCB (Central Pollution Control Board).

1974 - The Water (Prevention and Control of Pollution) Act establishes an institutional structure for preventing and abating water pollution. It establishes standards for water quality and effluent. Polluting industries must seek permission to discharge waste into effluent bodies. The CPCB (Central Pollution Control Board) was constituted under this act.

The Public Liability Insurance act, 1991 is an Act to provide for public liability insurance for the purpose of extending immediate relief to the persons affected by accident occurring while handling any hazardous substance in a project, industry or storage and for matters connected therewith or incidental thereto

13.(A) The interim replacements for CFCs are hydrochlorofluorocarbons (HCFCs), which deplete stratospheric ozone, but to a much lesser extent than CFCs. Hydrofluorocarbons are included in the Kyoto Protocol because of their very high Global Warming Potential and are facing calls to be regulated under the Montreal Protocol due to the recognition of halocarbon contributions to climate change.

14,(D) A **biofertilizer** is a substance which contains living microorganisms which, when applied to seed, plant surfaces, or soil, colonizes the rhizosphere or the interior of the plant and promotes growth by increasing the supply or availability of primary nutrients to the host plant. Blue green algae and N-fixing bacteria are used as components of biofertilisers.

15. **(D) Polar Ice**A polar ice or polar cap is a high-latitude region of a planet, dwarf planet, or natural satellite that is covered in ice. The composition of the ice will vary. For example, Earth's polar caps are mainly water ice, whereas Mars's polar ice caps are a mixture of solid carbon dioxide and water ice.

16. (C) Endogeic: Endogeic earthworms live in and feed on the soil. They make horizontal burrows through the soil to move around and to feed and they will reuse these burrows to a certain extent. Endogeic earthworms are often pale colours, grey, pale pink, green or blue.

17. (C) 17 In alphabetical order, the 17 megadiverse countries are:

Australia	Ecuador	Papua New Guinea
Brazil	India	Peru
China	Indonesia	Philippines
Colombia	Madagascar	South Africa
Democratic Republic of the Congo	Malaysia	United States
	Mexico	Venezuela

18. (D) All the above: Methyl isocyanate (MIC) is an organic compound with the molecular formula CH_3NCO. Synonyms are isocyanatomethane, methyl carbylamine, and MIC. Methyl isocyanate is an intermediate chemical in the production of carbamate pesticides (such as carbaryl, carbofuran, methomyl, and aldicarb). It has also been used in the production of rubbers and adhesives. As a highly toxic and irritating material, it is extremely hazardous to human health. It was the principal toxicant involved in the Bhopal disaster, which killed nearly 2,259 people initially and officially 3,787 people in total.

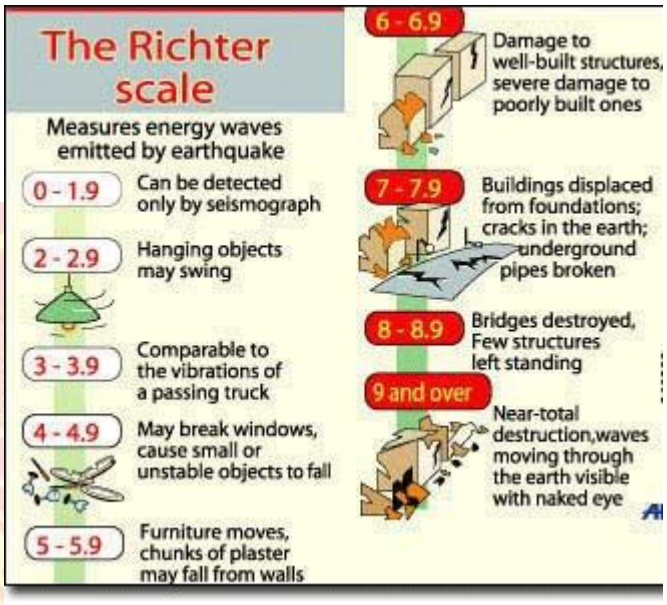
19. (B) Hydrogen, Natural Gas,Petroleum, Coal.

20. (A) 3 4 1 2

21.**(B) 40 – 45%:** Biodegradable waste is any waste that can decomposed in a reasonable amount of time. Common biodegradable wastes are food and kitchen waste, manure, sewage, agricultural and forestry waste, and textiles.

22. (D) 3 1 4 2

23. (C) Great: The Richter magnitude scale (often shortened to Richter scale) is the most common standard of measurement for earthquakes. It was invented in 1935 by Charles F. Richter of the California Institute of Technology as a mathematical device to compare the size of earthquakes. The Richter scale is used to rate the magnitude of an earthquake, that is the amount of energy released during an earthquake.



24. (D) Nitric oxide: Climate change is a change in the statistical distribution of weather patterns when that change lasts for an extended period of time (i.e., decades to millions of years). Climate change may refer to a change in average weather conditions, or in the time variation of weather around longer-term average conditions (i.e., more or fewer extreme weather events). Climate change is caused by factors such as biotic processes, variations in solar radiation received by Earth, plate tectonics, and volcanic eruptions. Certain human activities have also been identified as significant causes of recent climate change, often referred to as global warming.

25. (B) Cyanobacteria and Algae: There are many types of producers in the marine, but this is only focusing on 5 producers. The first producer is phytoplankton. They are microscopic

organisms that float in water. They also produce oxygen and food. Phytoplankton are the most common marine producer. Diatoms are related to phytoplankton. They are the most common phytoplankton. Diatoms are one celled producers that have a covering of glass called frustule. They are important oxygen producers. Algae is also pretty common in the marine. It is a large and diverse group of simple, typically autotrophic organisms. They range from unicellular to multicellular forms. They are photosynthetic like plants. It can be found in fossils 3 billion years back. Have you ever heard of seaweed? Pretty common, huh? But did you know that seaweed is actually a type of algae? Seaweed may be red, green, or brown algae. Seaweed also resembles non-marine plants. It is somewhat leaf like and flattened. Ever heard of seagrasses? Much rarer. You'd probably be surprised that seagrasses are flowering plants that grow in the marine. But it's true. Seagrasses are long and narrow leaves. They grow in large "meadows". Seagrasses thrive in shallow areas in sand or mud. There is an estimate of about 60 species of seagrasses worldwide. Well, that's all folks.

26. (A) Thiobacillus sp :**Thiobacillus is a genus of Gram-negative Betaproteobacteria.**

27. (D) Arsenic: Arsenicosis or Black foot is caused by exposure over a period of time to Arsenic in drinking water. It may also be due to intake of arsenic via food or air. Kindly note that Itai-itai disease is caused by Cadmium poisoning.

28. (A) 3 4 1 2

29. (A) Aluminium salts: The Nalogonda technique (named after the village in India where the method was pioneered) employs flocculation principle 1. Nalgonda technique is a combination of several unit operations and the process invloves rapid mixing, chemical interaction, floculation, sedimentation, filtration, disinfection and sludge concentration to recover waters and aluminium salts. Alum (hydrated aluminium salts) - a coagulant commonly used for water treatment is used to flocculate fluoride ions in the water. Since the process is best carried out under alkaline conditions, lime is added. For the disinfection purpose bleaching powder is added. After thorough stirring, the chemical elements coagulate into flocs and settle down in the bottom. The reaction occurs through the following equations

$2\ Al2\ (SO4)3\ .\ 18H2\ O + NaF + 9Na2CO3 \rightarrow [5Al(OH)3.Al(OH)2F] + 9Na2SO4 + NaHCO3 + 8\ CO2 + 45\ H2O$
$3\ Al2\ (SO4)3\ .\ 18H2\ O + NaF + 17NaHCO3 \rightarrow [5Al(OH)3.Al(OH)2F] + 9Na2SO4 + 17\ CO2 + 18\ H2O$

30. (C) 1971, 1975: The Ramsar Convention is an international treaty for the conservation and sustainable use of wetlands. It is also known as the Convention on Wetlands. It is named after the city ofRamsar in Iran, where the Convention was signed in 1971

31**. (C) persistent organic pollutants**

32. (A) Zn – Brain tissue damage

33**. (C) Environment (Protection) Act,** 1986

34. (A) 3 4 1 2

35**. (B) 20 – 25 times more**

36**. (D) Mountain gorilla:** The mountain gorilla (Gorilla beringei beringei) is one of the two subspecies of the eastern gorilla. There are two populations. One is found in the Virunga volcanic mountains of Central Africa, within three National Parks: Mgahinga, in south-west Uganda; Volcanoes, in north-west Rwanda; and Virunga in the eastern Democratic Republic of Congo (DRC). It is listed as critically endangered by the IUCN. The other is found in Uganda's Bwindi Impenetrable National Park. Some primatologists consider the Bwindi population in Uganda may be a separate subspecies, though no description has been finalized. As of September 2016, the estimated number of mountain gorillas remaining is about 880.

37**. (C) asbestos :**Mesothelioma is a type of cancer that develops from the thin layer of tissue that covers many of the internal organs (known as the mesothelium). Greater than 80% of mesothelioma cases are caused by exposure to asbestos. Working with asbestos is the most common risk factor for mesothelioma. Many building materials used in both public and domestic premises prior to the banning of asbestos may contain asbestos.

Erionite is a zeolite mineral with similar properties to asbestos and is known to cause mesothelioma.

38. (B) Disaster management : Environmental Impact Assessment (EIA) is the process by which the anticipatedeffects on the environment of a proposed development or project are measured. If the likely effects are unacceptable, design measures or other relevant mitigation measures can be taken to reduce or avoid those effects.

39. (A) Hard data

40. (C) 1989: The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, usually known as the Basel Convention, is an international treaty that was designed to reduce the movements of hazardous waste between nations, and specifically to prevent transfer of hazardous waste from developed to less developed countries (LDCs). It does not, however, address the movement of radioactive waste. The Convention is also intended to minimize the amount and toxicity of wastes generated, to ensure their environmentally sound management as closely as possible to the source of generation, and to assist LDCs in environmentally sound management of the hazardous and other wastes they generate.

The Convention was opened for signature on 22 March 1989, and entered into force on 5 May 1992. As of November 2016, 184 states and the European Union are parties to the Convention. Haiti and the United States have signed the Convention but not ratified it.

41. (A) 1986: Environment Protection Act, 1986 is an Act of the Parliament of India. In the wake of the Bhopal Tragedy, the Government of India enacted the Environment Protection Act of 1986 under Article 253 of the Constitution. Passed in March 1986, it came into force on 19 November 1986.

42. (C) 1988

43. (B**) N2O**

44. (A) ii iii i iv

45. **(B) Vulnerable ì Rare ì**

Endangered ì Extinct

46. **(C) Narmada Bachao Andolan** :Murlidhar Devidas Amte, popularly known as Baba Amte was an Indian social worker and social activist known particularly for his work for the rehabilitation and empowerment of poor people suffering from leprosy. Amte devoted his life to many other social causes, the most notable among which were Knit India movement, generating public awareness towards importance of ecological balance, wildlife preservation, and the Narmada Bachao Andolan.

47. **(A) International Association of Impact Assessment :**The International Association for Impact Assessment (IAIA) is an international association of professionals involved with impact assessment, including both social impact assessment and environmental impact assessment. IAIA has members from over 120 countries, and anybody can join as a member and/or renew membership online.Individual membership costs $55 for students and $110 for other individuals.

48. **(A) Burning of fossil fuels**

49. **(C) 600 mg/L**

50. **(A) Raven:** A raven is one of several larger-bodied species of the genus Corvus. These species do not form a single taxonomic group within the genus.There is no consistent distinction between "crows" and "ravens", and these appellations have been assigned to different species chiefly on the basis of their size, crows generally being smaller than ravens.

51.**(D) PAN – Hypoxemia: Hypoxemia (or hypoxaemia in British English) is an abnormally low level of oxygen in the blood. More specifically, it is oxygen deficiency in arterial blood.**

52. **(C) Silica**

53. (D) Australia

54. (D) 10 years

55**. (A) Textiles**

56. (D) Household pesticides

57**. (A) Bio-intensive agriculture:** Double digging is a gardening technique used to increase soil drainage and aeration. It involves the loosening of two layers of soil, and the addition of organic matter. Double digging is typically done when cultivating soil in a new garden, or when deep top-soil is required.

58. (B) Both (A) and (R) are true,but (R) is not the correct explanation of (A).

59. (D) Liquid Helium

60. (B) Black carbon aerosols: Black carbon (BC) is a primary aerosol emitted directly at the source from incomplete combustion processes such as fossil fuel and biomass burning and therefore much atmospheric BC is of anthropogenic origin. Warming **aerosols** include black carbon and dark soot. Cooling **aerosols** include dust, sulfate particles and sea spray. **Aerosols** can **affect** the **climate** in two ways, through direct or indirect processes. A direct process is the immediate **effect** on radiation absorption. Salt particles tend to reflect all the sunlight they encounter. Black carbon **aerosols**, similar to the soot in a chimney, absorb sunlight rather than reflecting it. This warms the layer of the **atmosphere** carrying the black carbon, but also shades and cools the surface below.

61. (D) Nuclear < Natural gas < Oil < Bituminous coal

62. (A) Both (A) and (R) are correct and (R) is the correct explanation of (A).

63. (C) I, II and III.

64. (A) 3 1 4 2

65. (B) municipal solid waste dumping site

66. (D) ~ 40 tonnes

67. (A) P-wave, S-wave, L-wave, R-wave.

68. (B) 1952: The Great Smog of 1952, sometimes called The Big Smoke, was a severe air-pollution event that affected the British capital of London in December 1952.

69. (B) 75 dB

70. (A) 1989

71. (C) CH4

72. (C) 300 mg/l

73. (A): Both (A) and (R) are true with(R) being the correct explanation.

74. (C) Nitrous oxide: Pulmonary oedema means an excess collection of watery fluid in the lungs. The fluid collects in the many air sacs of the lung, making it difficult to breathe.Pulmonary oedema is most often caused by heart failure (then called cardiogenicpulmonary oedema).

75. (D) December: The term El Niño (Spanish for "the Christ Child") was originally used by fishermen along the coasts of Ecuador and Peru to refer to a warm ocean current that typically appears around Christmastime and lasts for several months. Fish are less abundant during these warm intervals, so fishermen often take a break to repair their equipment and spend time with their families. In some years, however, the water is especially warm and the break in the fishing season persists into May or even June. Over the years, the term "El Niño" has come to be reserved for these exceptionally strong warm intervals that not only disrupt the normal lives of the fishermen, but also bring heavy rains.

During the past 40 years, nine El Niños have affected the South American coast. Most of them raised water temperatures not only along the coast, but also at the Galapagos Islands and in a belt stretching 5000 miles across the equatorial Pacific. The weaker events raised sea temperatures only one to two degrees Fahrenheit and had only minor impacts on South American fisheries. But the strong ones, like the El Niño of 1982-83, left an imprint, not only upon the local weather and marine life, but also on climatic conditions around the globe.

76. (B) 3 1 2 4

77. (B) State Pollution Control Board and District Collector

78. (C) Article 21

79. (C) Mechanised farming : Mechanised agriculture is the process of using agricultural machinery to mechanise the work of agriculture, greatly increasing farm worker productivity. In modern times, powered machinery has replaced many farm jobs formerly carried out by manual labour or by working animals such as oxen, horses and mules.

80. (A) 5 years :The Kyoto Protocol is an international treaty which extends the 1992 United Nations Framework Convention on Climate Change (UNFCCC) that commits State Parties to reduce greenhouse gas emissions, based on the premise that (a) global warming exists and (b) human-made CO2 emissions have caused it. The Kyoto Protocol was adopted in Kyoto, Japan, on 11 December 1997 and entered into force on 16 February 2005. There are currently 192 parties (Canada withdrew effective December 2012) to the Protocol.

81.B).**Many of the birds eggs laid, did not hatch**

82.**C).Estimating the amount of organic matter in sewage water**

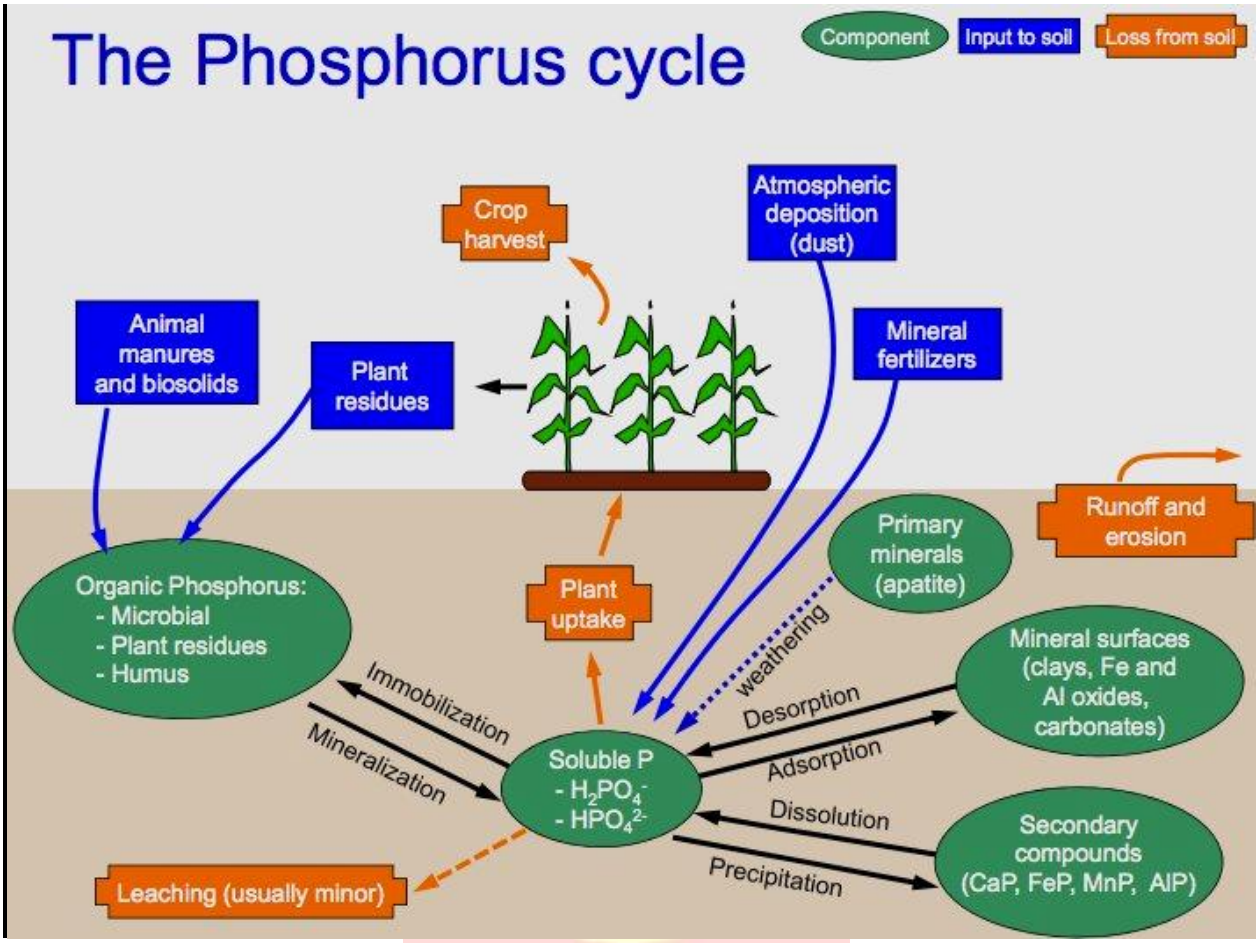
83.A.) **Calmodulin:** Calmodulin (CaM) (an abbreviation for calcium-modulated protein) is a multifunctional intermediate calcium-binding messenger protein expressed in all eukaryotic cells. It is an intracellular target of the secondary messenger Ca^{2+}, and the binding of Ca^{2+} is required for the activation of Calmodulin.

84.A)**Transparent to sunlight but traps heat**

85.D)**Stone flies:** The Plecoptera are an order of insects, commonly known as stoneflies. Some 3,500 species are described worldwide, with new species still being discovered. Stoneflies are found worldwide, except Antarctica.

86.D) **Phosphorus cycle:** The phosphorus cycle is the biogeochemical cycle that describes the movement of phosphorus through the lithosphere, hydrosphere, and biosphere. Unlike many other biogeochemical cycles, the atmosphere does not play a significant role in the movement of phosphorus, because phosphorus and phosphorus-based compounds are usually solids at the typical ranges of temperature and pressure found on Earth. The production of phosphine gas occurs in only specialized, local

conditions.



87.**D)10** :There are ten biogeographic zones in India**.**

1. Trans Himalayan zone.
2. Himalayan zone
3. Desert zone.
4. Semiarid zone.
5. Western ghat zone.
6. Deccan plateau zone.
7. Gangetic plain zone.

8. North east zone.
9. Coastal zone.
10. Islands present near the shore line.

88.B) Western Ghats: Western Ghats is a mountain range that runs parallel to the western coast of the Indian peninsula, located entirely in India. It is a UNESCO World Heritage Site and is one of the eight "hottest hot-spots" of biological diversity in the world. Wikipedia

Elevation: 2,695 m

Area: 160,000 km²

Highest point: Anamudi

Passes: Tamhini Ghat, Naneghat, Palakkad Gap, Kasara ghat

Types of rock: Basalt, Limestone

89.C)**Seed bank:** A seed bank (also seedbank or seeds bank) stores seeds as a source for planting in case seed reserves elsewhere are destroyed. It is a type of gene bank. The seeds stored may be food crops, or those of rare species to protect biodiversity. The reasons for storing seeds may be varied. Seed banks are created to maintain and protect biodiversity, where samples of all species are collected and stored. In case seed reserves elsewhere are destroyed, the seed bank is opened to provide seedsto farmers at defined quantities for growing plants.

Navdanya is a network of seed keepers and organic producers spread across 16 states in **India**.It has its 54 **seed banks** across the country.

90.B).**Community and ecosystem diversity:** Alpha diversity is just the diversity of each site (local species pool). Beta diversityrepresents the differences in species composition among sites. Gamma diversity is the diversity of the entire landscape (regional species pool). Among these, alphaand gamma diversity are fairly straightforward.

91.A)**33% for plains and 67% for hills**

92.A) **Reducing deforestation, cutting down use of fossil fuel**

93.C)**Fungi:** A fungus is any member of the group of eukaryotic organisms that includes unicellular microorganisms such as yeasts and molds, as well as multicellular fungi that produce familiar fruiting forms known as mushrooms.

94. (**B) High dipole moment**

95. (b) Eichhornia crassipes: Eichhornia crassipes or water hyacinth (American water plant) has become the most serious weed in many tropical, warm and temperate freshwater habitats worldwide including India. It has the highest growth rate of any saltwater, freshwater or terrestrial vascular macrophvte and can be labelled as an "ecosystem engineer" or an invasive habitat modifier.

In slow-moving to still water bodies it is especially problematic as it forms dense monospecific mats that lower dissolved oxygen levels in the water, alter river hydrology and increase organic sediment. These mats displace native aquatic plant and animal communities; drastically alter the ecosystem and puts native habitats and wildlife at risk. Furthermore, water hyacinth may interfere with the use of a water-body for cultural, social or commercial purposes causing substantial economic hardship and putting livelihoods at risk

96. (d) minimata disease: Mercury gets changed to water soluble dim ethyl mercury which undergoes biomagnifications. Eating poisoned animals causes deformity known as minamata disease (first reported in 1952 due to eating of fish captured from Hg-contaminated Minamata Bay of Japan) which is characterised by diarrhoea, hemolysis, impairment of various senses, numbness of lips, tongue, limbs, deafness, blurring of vision, mental derangement, meningitis and death.

97. (d) sulphur dioxide: The Taj Mahal is built with white marble and is threatened by environmental pollution, especially due to sulphur dioxide. Sulphur dioxide is produced during combustion of fossil fuels, refining of petroleum and smelting of sulphur containing ores. Threat to Taj Mahal from Mathura refinery is due to pollutant gases composing SO2, H2S and nitrogen oxides.They would convert CaCO, (marble) into calcium sulphate and calcium nitrate.

98. (a) fluorine **:** Flourides are given out during refining of materials. Flourides cause flourosis. It is a disease which is defined by mottling of teeth, abnormal bones that are liable to fracture because fluorine replaces Ca and makes the bones brittle. Flouride pollution is a serious problem in many districts of Rajasthan, where excess of flouride in water adversely affects the health of man. Many villagers have aged prematurely or became hunch backs.

99. (b) depletion of ozone layer: Ozone layer or shield is present in stratosphere. It functions as a shield against strong UV radiations. Protection from UV radiations is proportional to thickness of ozone layer. Depletion in the concentration of ozone over a restricted area as spring time decline over Antartica is called ozone hole. Thinning of ozone layer increases the amount of UV-B radiations reaching the earth. It would increase occurrence of cataract, skin cancers, herpes, dimming of eye sight, photo burning, deficient functioning of immune system.

100. Phosphate pollution is caused by

(a) sewage and phosphate rock

(b) sewage and agricultural fertilizers: Phosphate is an important compound of fertilizer which are added to crop fields and then are passed down to water bodies during rainsthrough run off. It is also present in sewage that is dumped into the water body. This nutrient brings about dense growth of water plants especially the algae and cause algal bloom. This algal bloom leads to oxygen depletion in water bodies and causes death of aquatic life.