1A It is bar code, in form of strips (black lining), binary coded with secret information about service / product.
· QR code Reader / scanner Read this digital information and convey it to output device (computer, mobile) attatched.

1B It is found in soil naturally or in legume plant (-nuts, pea) which convert atmospheric nitrogen into nitrides, nitrates for plant use. Rhizobium, Rhizobeetor are some examples of nitrogen fixing bacteria.

1C It is one of three ~~autot~~ Attotrops of carbon. It is hexagonal in shape. Electrically non-conductive a chemical substance

1D Cytosine, is plant hormone which need for plant growth, stimulating against external factor, disease resistant..

1E Electric charge = Electric current × Time
Electric charge created in electrically conductive substance like metals. ~~dd~~ Denoted by q. unit is coloumb
electric charge of electron is 1.6×10^{-19} C

1F Wireless Interoperability for Mobile Access. It is wireless technology used for wide area, intercity, country wide communication. It is faster than wi-fi, speed can be achieved upto 1Gbps (Gigabits per second).
It is governed by IEEE 802.16 organisation and its standard.

1G located in Bombay, work in field of biodiversity, environment, flora and fauna conservation.

1H Caused by Cadmium element, found in water (industrial effluent) mixed with river, sea.

1I Main source of Red Blood cell in human body. It is organ which supply blood in case of injury, wound, support in healing. It is located left side above abdomen.

1J It have magnitude and direction both.
for example, velocity. can be positive or negative on basis of direction. denoted by → (arrow) showing direction

1K The missile, speed of order of subsonic or supersonic, like BRAHMOS, missile, used as ASER also. usually speed in range of 2-10 mach. It have cryogenic engine beside solid and liquid propellant.

1L It is tool of interrupting normal function of computer data over internet, intended for data ~~stol~~ stealing, network traffic jamming, or any illegal purpose. It is junk e-mail files in some concept.

1M It is fusion based uncontrolled reaction caused due to neutron multiplication leads to explosion, releasing excessive energy, enough of causing distruction to human, environment.

1N $\frac{20}{100}M + 30 = \frac{32}{100}M - 42$ Maximum marks is 600.

$\frac{12}{100}M = 72$ $M = 600$

10 whole number = 0, 1, 2, 3, — —. infinity (∞)
integer = $-\infty$, — — —2, −1, 0, 1, 2, — —. ∞

2A Mixture is substance of two or more element (combining) which is heterogenous in nature. like soil, sea water, having no fixed concentration of elements in mixture.
seperating ways are — ① Filtration - i.e. fractional or Distillation ② Evaporation i.e. salt from sea water ③ magnetism ④ Dissolution ⑤ crystallization ⑥ manual seperation ⑦ condensation ⑧ Distillation ⑨ Chromatography ⑩ sieving

2B
- Light source is Sun (ultimate source)
- Light travel in straight line
- Required medium (~~solid~~, air)
- Can not travel in vaccum
- Light rays follow sine law.
- Light can be reflected, refracted, polarised, diffraction.
- Light used in many Application in day to day life.
- Optical fibre uses electromagnetic light for data transmission.
- Light follows wave as well as particle nature
- Sun light (white light) made up of seven colours (VIBGYOR)

2C

enzyme	Harmone
① Secreted by Duct glands.	① secreted by ductless Glands.
② These travel through ducts.	② These travel through Blood.
③ More in quantity.	③ less In Quantity
④ Reaction is fast	④ Reaction is slow
⑤ Involve in digestion	⑤ Involved in metabolic activities
⑥ Lypase, Amalyase	⑥ Insulin,
⑦ Do not change with age	⑦ Tend to change with age

2D
Blood Group of Human discovered by Landsteiner.
- Main reason behind difference in blood of human is glyco protein which is found in Red Blood corpuscles called Antigen. Antigen are of two types < Antigen A / Antigen B

There are four group of blood - ~~Anti~~

		Antibody
① That contain Antigen A –	Blood Group A	b
② That contain Antigen B –	Blood Group B	a
③ Contain both Antigen A&B	– Blood Group AB	Absent

(d) contain neither of Antigen - Blood Group O. | Both a and b

Antibody is opposite type of protein (Antigen). is found in blood plasma.

Blood Group O is Universal Blood Donar

Blood Group AB is Universal Blood Receipient

2E Brahmagupta - Indian Mathematician and astronomer
- author of book such as Brahmasphutasiddhanta, theoretical treatise
- He was first to explain how to use numeral zero in mathematical calculation.

Nagarjuna - 2nd century BCE, Indian Buddist philosopher,
- gave doctrine of emptiness (shunyata)
- founder of Madhyamika (Middle way) school
- He was teacher of Aryadeva

2F Climate change is global issue related to unwanted, anthropogenic intervention in behaviour of climate.
• To limit adverse effect of climate change, various agreements were signed Internationally among countries -

① 1992 - UNFCCC (UN framework convention on climate change) was adopted in Rio de Janeiro, Brazil at UN Conference on Environment and Development (Earth Summit)
• The treaty is not legally binding.
• no mandatory limit on GHG emission

② ~~Kyoto Protocol~~ COP 3 (Conference of Parties-3) held in Kyoto, Japan. On Consensus, 11 December 1997 Kyoto protocol was adopted. It is legally binding. It covers targeted reduction for six GHG (Green House Gases) - CO_2, CH_4, N_2O, HFC, SF6, Perfluorocarbon.
Three mechanism - CDM (Clean Development Mechanism)
- JI (Joint Implementation)
• emission trading

③ Bonn Agreement by COP 6 in 2000

④ Marrakesh Accords by COP 7 in 2001
- detailed rules for implementation of Kyoto protocal.
⑤ Delhi Ministrial Declaration by COP 8 in 2002
⑥ REDD+ program [Reducing Emissions from Deforestation and forest Degradation) in warsaw, poland, 2013
⑦ Paris Agreement 2015

2G Fast Breeder Reactor-: It is stage 2 of India's Three stage Nuclear Programme.
- FBR are designed to "breed" more fuel than they consume.
- Moderator is not required in FBR
- Plutonium-239 recovered by reprocessing spent fuel from first stage and natural uranium is fuel used in FBR.
- Plutonium 239 undgoes fission reaction in FBR to produce energy.
- PFBR Prototype fast Breeder Reactor is 500 MWe nuclear reactor constructed by Madras Atomic Power station in Kalpakkam, India.
- Indira Gandhi Centre for Atomic Research (IGCAR) Kalpakkam, Tamilnadu, responsible for design of PFBR.

2H Technology can be used in traffic management in following manner -
① Parking Information system
② Interactive journey planner for all modes
③ Automated vehicle location system
④ Real Time Traffic Information system
⑤ Automated fare collection system
⑥ Car sharing / Cycle sharing system
⑦ Intelligent signalling system
⑧ Multimodal transport -
⑨ Smart card / cashless Transaction

ICT, Remote sensing, GPS, GIS, IoT, mobiles technology helps in congestion in cities.

2I GAGAN - is an Indian Satellite based Augmentation System. GAGAN Stands for GPS Aided GEO Augmented Navigation.

Purpose: The GAGAN is implemented to provide required accuracy, continuity, integrity in Indian Civil Aviation System to enable users (aircraft) to rely on GPS for all flights. It is developed by ~~Ministry of Civil~~ Airport Authority of India (AAI) and Indian Space Research organisation (ISRO)

GAGAN system can also be used in Maritime, Land transport, diverse potential uses, railways, surveying etc. The system is interoperable with other International SBAS Systems.

GSAT-8, GSAT-10, GSAT-15 satellites used in GAGAN system.

2J Nanotechnology is manipulation of matter on an atomic, molecular and supramolecular scale. In simpler terms, any technology dealing with matter whose particle size is less than 100 nanometers.

· Professor Norio Taniguchi coin the term 'Nanotechnology'

Advantage - ① In biological Application - size of nano materials is similar to most of biological molecules, nano material used in in vivo and in vitro biomedical research and applications.

- Drug Delivery at specific cells using nanoparticle
- Tissue engineering, diagnostics, sensing

② In food Processing - nano fibres in Green Packaging, Pesticide Reduction, enhanced nutrient Delivery,

③ Semiconductor and Computing Industries - by reducing size of transisters used in IC, improving display screens, reduced power consumption, increased density of memory chip

④ In Energy production - reducing cost of solar cell, bio-nano generators, sustainable energy
⑤ Textiles - Carbon nanofibres makes stain and wrinkle resistant clothing
⑥ Environment - lighter car, machinery, alternate fuel, low cost detection in filtration of clean drinking water, neutralize harmful chemical or biological agent in air, soil
⑦ Transport - nano engineering of steel, concrete, asphalt and other cement materials, improving their performance, resiliency. ~~using ROS~~
· Nanosensors in monitoring of bridges, rails, tunnels etc.
⑧ Space - Carbon nanotubes to reduce weight of spacecrafts, bio-nano robots in space suits,
⑨ Agriculture - nanocapsules for crop biotechnology
Nanotech Delivery system for Pest, Nutrient, plant Hormones

2K UN SDG 7: Affordable and clean energy targetted sustainable energy initiatives in India by use of innovative technologies by year 2030.

· Energy from modern renewable sources - wind, water, solar, biomass, geothermal energy
· Supercritical Ultramega Thermal power plants.
· energy efficiency using LED bulbs, compliance with BEE standards
· use of solar Photovoltaic Technology
· SMART Grid
· low transmission losses technology
· mission on electric mobility (e-vehicle technology)
· Blending of methanol ~~with~~ with petrol.
· Harnessing Ocean thermal energy, Geothermal energy
· waste to energy technology adaption
· energy efficient devices on consumer side using nano-technology, biotechnology

2L $6m+8B = 10$ $2(3m+4B) = 10$ $3m+4B = 5$

$26m+48B = 2$

$15m+20B = ?$ $15m+20b$ do work in 1 day.

$5(3m+4B) = ?$

Answer

3A Sustainable Development is Development which meets the need of present without compromising ability of future generation to meet their own needs.

This above Defination is given by Brundtland Commission in its report "Our common future" (1987)

NITI Aayog Releases second edition SDG Index 2.0 to reveal the progress made by India's state and Union territories towards achieving 17 UN SDG goals by 2030 targets.

* 2020 is 5th anniversary of adoption of SDG by United Nations.

Need of Sustainable Development -

① Over exploitation of Natural Resources -
- decline of more than 60% of world's marine fisheries
- 1 million species on track of extinction

② Scarcity of Resources -
- Almost 23% of world's agricultural land is degraded
- Food production needs to be double over 40 years
- Nearly 2/3 of world's population will be living in water-scarce/water stressed area by 2025

③ Climate change - Increase in atmosphere temperature and extreme weather events
- Rising sea levels - Extinction threats to small

islands nation

④ Deforestation - India have 21.67% forest cover far away from 33% mandatory provisions.

⑤ Desertification and Droughts - frequently in eastern and central Indian states.

⑥ Flood and soil erosion

⑦ loss of Biodiversity

Sustainable Development Goals -

This universal, integrated and transformative agenda aims to accelerate actions that will end poverty and build more sustainable world over next 15 years. 304 Indicators

- They are 17 Goals and 169 target specific targets to be achieved by 2030.
- Reaching the goals requires action on all fronts - government, business, civil society and people
- SDG are not legally binding.

17 SDG Goals are

SDG-1	No poverty
SDG-2	Zero Hunger
SDG-3	Good Health and well being
SDG-4	Quality Education
SDG-5	Gender Equality
SDG-6	Clean water and sanitation
SDG-7	Affordable and clean energy
SDG-8	Decent work and Economic Growth
SDG-9	Industry, Innovation and Infrastructure

SDG-10 Reduced Inequalities
SDG-11 Sustainable cities and Communities
SDG-12 Sustainable consumption and production
SDG-13 Climate action
SDG-14 Life Below water
SDG-15 Life on land
SDG-16 Peace, Justice and strong Institutions
SDG-17 Partnership for the Goals.

Criticism of SDG - · Some countries feel that an agenda consisting of 17 goals is too unwieldly (impractical to implement or sell to public and would prefer narrower brief.
· some feel that 15 year is long duration to end global poverty and Hunger

3B Biotechnology is use of living systems and organisms to develop or make useful products, or 'any technological application that uses biological systems, living organisms or derivatives, to make or modify products or processes for specific use.

Agricultural Biotechnology is need of hour to feed billion-plus mouths.
· Crop biotechnology reduces effect of climate change, degradation of farmlands, increased soil salinity, drop in ground water table, pollution of surface water surfaces, more frequent drought.
· Advances in gene discovery and genomics make effectively tackling problems of biotic/abiotic stresses,

for enhancement of crop productivity and for improvement of their nutritional quality.

- Biotechnology led to molecular breeding, genome sequencing and genomics studies, developing transgenic crop for tackling abiotic and biotic stresses..
- Horticulture crops → specially Apple genomics, Saffron, crop biofortification, chickpea genomics,
- Mycorrhizal biotechnology is part of crop biotechnology where mycorrhizae fungi is introduced in crops to modify its characteristics (desired flavour, colour, growth rate, size of harvested products, resistance to diseases and pests.
- Mycorrhizal Fungi act as Biofertiliser,
- GMO Genetically Modified organism made crops more tolerent to cold, drought, salt, heat, reduced reliance on chemical pesticides, reduce post harvest losses, Vitamin A Rice Golden Rice
- Bt (Bacillus thuringensis) produced by bacteria, example - Bt cotton, Bt - corn, can kill insects such as tobacco budworm, rootworm etc.
- Green technology enhancing production of food, feeds billion mouths and ensure food security.

Challenges to Biotechnology - inter departmental conflict

- lack of publications of Indian scientist in International Journals.
- lack of private participation in Research and Development
- non - availability of costly scientific equipment and reagents

Government Initiatives -

1. Wheat Genome sequencing Programme
2. Rice Functional Genomics
3. National Plant Gene Repository at NIPGR, new delhi
4. establishment of National Biotechnology Board (NBTB) under Department of Biotechnology (DBT)

Biotechnology have potential to ensure food security with sustainable agricultural practices, and India could even achieve target of attaining $ 20 billion by 2020.

3C metal are chemical substance or element occurs in Earth crust with specific properties. ex- Iron, Zinc, Copper,

Physical properties of metal -

1. Physical state - generally solid at room temperature except mercury and gallium
2. Melting point and Boiling point - High except gallium and caesium
3. Density - Generally high
4. Malleability - can be cast in thin sheets
5. Ductility - can cast in thin wires
6. Electrical and thermal conductivity -
7. Luster - Poses shining layer
8. Sonorous sound -
9. Hardness except sodium, Potassium

chemical properties of Metal -

1. Reaction with oxygen

Metal + Oxygen → Metal oxide (Basic)

$4Na + O_2 \rightarrow 2Na_2O$

amphoteric oxide → Both acidic and basic oxides by Zinc and Aluminium

② Reaction with water forms metal oxide or metal hydroxide and H_2 gas released.

$2Na + 2H_2O \rightarrow 2NaOH + H_2 + Heat$

③ Reaction with Dilute Acids

Metal + Acid → Metal salts + Hydrogen gas

$Mg + HCl \rightarrow MgCl_2 + H_2$

④ Reaction with salt solution

more reactive metal displaces less reactive metals from salt solution

$Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$

⑤ Reaction with chlorine forms metal chloride (ionic bond forms)

$2Na + Cl_2 \rightarrow 2NaCl$

⑥ Reaction with Hydrogen, forms Metal Hydrides

$2Na + H_2 \rightarrow 2NaH$

Non-Metal

Physical Properties-

① Physical state – generally exists as solid and gases except Bromine (liquid)

② Melting and Boiling point – low except Diamond and graphite

③ Density – low

④ Neither Malleable nor ductile

⑤ poor conductor of heat and electricity except graphite

⑥ non lustrous except iodine

⑦ non sonorous

⑧ generally soft except Diamond

Chemical Properties

① Reaction with oxygen, forms acidic metal oxides

$C + O_2 \rightarrow CO_2$, $S + O_2 \rightarrow SO_2$

CO is neutral oxide

(2) Reaction with water - Non metal do not react with water,

(3) Reaction with Dilute Acids - do not react

(4) Reaction with salt solutions -
more Reactive Replaces less reactive.

$NaBr + Cl_2 \rightarrow NaCl + Br_2$

(5) Reaction with chlorine forms non metal chloride (Covelent Bond)

$H_2 + Cl_2 \rightarrow HCl$

(6) Reaction with Hydrogen - to form Hydride

$H_2 + S \rightarrow H_2S$

3D Central Nervous System consists of ~~three~~ Brain and spinal cord.

- It is main switch board which controls body actions
- made up of neurons.

Neurons is structural and functional unit of nervous system.

- Neuron is largest cell of body.

Neuron have three component - cell Body, dendrite, axon.

- Synapse is functional juerction between neuron.
- Nervous system only found in animal and absence in plants.
- Study of nervous system is called Neurology

Brain - Brain lies in cranium of skull

- Adult Brain is 2% of their body weight
- weights 1.4 kg and forms 98% of total weight of CNS.
- Brain receives 15-17% of cardiac output.

- Brain consumes 20% oxygen of body.
- Left half of brain controls right side of body and vice-versa
- Cerebrospinal fluid absorb shock or jerk to brain & spinal cord.

Regions of Brain – ① forebrain
- Olfactory lobe
- Cerebrum
- Hypothalamus

- Cerebrum is largest part of human's Brain.
- Hypothalamus responsible for temperature regulation, hunger, thirst, emotional reactions. by releasing hormones

② Midbrain.

③ Hindbrain consist of cerebellum
Cerebellum contains centre for maintaince of poster and equilibrium of body, controls voluntary movement.

- Medulla oblongata is regulating centre for swallowing coughing, sneezing, vomiting.

Spinal cords: Medulla oblongata continues behind as spinal ~~cord~~ cord.

- Spinal cords is located in neural canal of vertebral colourmn.
- In spinal cord, white matter is found outside gray matter (reverse in brain)
- Cavity of spinal cord is known as central canal.
- Spinal cord is cylindrical structure.
- 31 pair of spinal nerves arises from spinal cord.

EEG (electro encephalograph) used to record electrical activity of Brain.

- Diseases of Brain are Parkinson's disease, Alzeimer Disease.