

SCIENCE QUIZ – 2017-2018
CLASS LEVEL IX – XI

ANSWER IN ONE WORD.

- Q.1 What is the full form of MASER?
Ans *Microwave Amplification by Stimulated Emission of Radiation.*
- Q.2 What is the full form of BTU?
Ans *British Thermal Unit.*
- Q.3 What is the nature of sound waves in air?
Ans *Longitudinal.*
- Q.4 Name the principle used in optical fiber.
Ans *Total internal reflection.*
- Q.5 A bird while flying takes a turn. How does it get the centripetal force?
Ans *Air resistance.*
- Q.6 Name the particle which does not exert gravitational force.
Ans *Photon.*
- Q.7 How many nanometres will make one meter?
Ans *10^9*
- Q.8 Which colour of light is least absorbed by plants?
Ans *Green.*
- Q.9 Name the feature of sound waves corresponding to its loudness.
Ans *Amplitude.*
- Q.10 Name the type of velocity with which a paratrooper comes to ground.
Ans *Terminal velocity.*
- Q.11 Name the phenomenon on which Einstein worked and received the Nobel prize in physics in the year 1921.
Ans *Photoelectric effect.*
- Q.12 Name the unit of Luminous intensity.
Ans *Candela.*
- Q.13 Name the principle of heat transfer used in central heating system.
Ans *Convection.*
- Q.14 Name the physicist who invented C language for computer programming.
Ans *Dennis Ritchie.*

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- Q.15 What is common between a crowbar used to lift a heavy stone and the elbow joint in the arm of human body?
Ans *Both are class III lever.*
- Q.16 What is the unit of resistivity?
Ans *Ohm meter.*
- Q.17 Name the pendulum which completes one oscillation in 2 seconds.
Ans *Seconds pendulum.*
- Q.18 Name the force that keeps an object in circular motion.
Ans *Centripetal force.*
- Q.19 The product of frequency and wavelength of light is a universal constant. What is this constant?
Ans *Velocity of light.*
- Q.20 Name the group of finely spaced lines that are found in the spectrum of Sun.
Ans *Fraunhoffer lines.*
- Q.21 What is the speed of our Sun within the Milky way Galaxy?
Ans *Approximately 220km/s*
- Q.22 What is velocity of geostationary satellite with respect to earth?
Ans *Zero.*
- Q.23 Name the hypothetical elementary particle that mediates the force of gravitation in the frame work of quantum field theory.
Ans *Graviton*
- Q.24 What is the minimum achievable temperature by any process?
Ans *-273⁰C*
- Q.25 Name the Italian scientist who developed the first nuclear reactor.
Ans *Enrico fermi*
- Q.26 What is the most abundant protein in human body?
Ans *Collagen*
- Q.27 Which element is the essential constituent of acids?
Ans *Hydrogen*
- Q.28 2, 4-D is sold as a weed killer of the broad leaved weeds. It is a synthetic version of which hormone?
Ans *Auxin Hormone*
- Q.29 Which chemical shows bright red colour due to bursting of crackers - Sr, Na, S, and Mg?
Ans *Sr*

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- Q.30 Which compound is popularly called hypo?
Ans ***Sodium thiosulphate***
- Q.31 Which chemical is responsible for depletion of ozone?
Ans ***CFC***
- Q.32 Which antiknocking compound so far has been phased out in many countries?
Ans ***Tetra Ethyl Lead***
- Q.33 Name the gas which is a major constituent of biogas?
Ans ***Methane***
- Q.34 What is wood alcohol?
Ans ***Methanol***
- Q.35 Aqua regia from the Latin royal water is a chemical which is so reactive that it can dissolve gold.
What is it?
Ans ***3 parts concentrated hydro chloric acid and 1 part concentrated nitric acid.***
- Q.36 Name the chemical which kills the micro-organisms in water and is produced when chlorine is mixed with water.
Ans ***HOCl***
- Q.37 In 1828, Wohler, a German chemist synthesized an organic compound which proved to be a turning point in chemistry. What was the compound?
Ans ***Urea***
- Q.38 What is the full form of BPA?
Ans ***Bis phenol A***
- Q.39 Limestone, chalk, marble and pearl are all different forms of the same chemical substance. Name the substance.
Ans ***Calcium Carbonate.***
- Q.40 Who has been awarded the Nobel Prize for Chemistry in 1932 for detailed studies of adsorption on surfaces?
Ans: ***Irving Langmuir***
- Q.41 Which chemical is related to the word limelight?
Ans ***Quick lime***
- Q.42 NMR spectroscopy is a major tool used by chemists to understand the structure of molecules, etc.
What does the acronym stand for?
Ans ***Nuclear Magnetic Resonance.***

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- Q.43 In 1865, a German chemist Kekule had a revolutionary idea which proved to be of great importance in organic chemistry. He is reported to have got the idea in a dream where he saw a snake biting its tail. What was the remarkable insight of Kekule?
Ans ***Ring structure of Benzene***
- Q.44 Why do some coloured clothes fade when left for a long time in sunlight?
Ans ***U V light***
- Q.45 This organic compound was first synthesized accidentally in 1938 and is now extensively used in industry and also for household utensils among other things. Its chemical name is Polytetrafluoroethylene (PTFE) however it is better known by the brand name. What is the brand name?
Ans ***Teflon***
- Q.46 Carbon dating is a well known method which is used in archaeology to date the ages of biological samples like wood, bones, etc. Which isotope of carbon is used for carbon dating?
Ans ***C – 14***
- Q.47 The process for manufacturing steel from iron by adding carbon has been known for centuries. However, stainless steel, of the kind we use in utensils and other household objects, was made for the first time in 1913 by alloying an element with steel. Name the element.
Ans ***Chromium***
- Q.48 All cars being made in India now have very strict emission standards. This is achieved by using a catalytic converter in the car which is a honeycomb like structure through which the exhaust gases pass and are rendered less damaging. Name the metal which is used inside a catalytic converter.
Ans ***Platinum***
- Q.49 In 1908, Leo Baekeland, a Belgium - born chemist, patented a new material which was the first plastic to be widely used. It was used extensively in electrical equipments since it is a very good insulator of electricity. What is the name of this plastic?
Ans ***Bakelite***
- Q.50 In an unsaturated solution, concentration of each ion of sparingly soluble salt at 298K signifies
Ans ***Solubility product***
- Q.51 Mammals that lay eggs are called as ____
Ans ***Monotremes***
- Q.52 Oncogene is responsible for causing ____
Ans ***Cancer***
- Q.53 What is full form of EEG?
Ans ***Electroencephalo gram***

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- Q.54 Name the host which is considered to be most suitable in genetic engineering for introducing DNA fragment.
Ans ***Escherichia coli***
- Q.55 Element which contaminate the food if wrapped in newspaper is _____
Ans ***Lead***
- Q.56 Name the term used for an organized profile of a person's chromosome.
Ans ***Karyotypes***
- Q.57 Name the protein making machinery which reads mRNA sequence and translate into aminoacids sequence.
Ans ***Ribosome***
- Q.58 Which hormone can be used as a drug to treat cardiac arrest and other cardiac problems?
Ans ***Epinephrine.***
- Q.59 The blood which leaves the liver and moves to the heart has higher concentration of _____
Ans ***Bile pigments.***
- Q.60 Who discovered ABO blood grouping system?
Ans ***Karl Landsteiner***
- Q.61 What is the shape of RBC in sickle cell anemia?
Ans ***Sickle shaped***
- Q.62 What is the difference between nucleotides of RNA and DNA with respect to 'base'?
Ans ***RNA have Uracil instead of Thymine***
- Q.63 Potometer is an instrument used for measuring the rate of _____
Ans ***Transpiration***
- Q.64 Which element is present in chlorophyll?
Ans ***Magnesium***
- Q.65 How many chambers are present in cockroach heart?
Ans ***13***
- Q.66 Name the noble laureate for medicine for the year 2016.
Ans ***Yosinori ohsumi***
- Q.67 What is the pH value for human blood?
Ans ***7.4***
- Q.68 Viti culture is related to _____
Ans ***Grapes***

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- Q.69 Give the common name of *Periplanta americana*.
Ans ***Cockroach***
- Q.70 Name the only Indian scientist who decoded the sequence of genetic code for protein synthesis.
Ans ***Dr. Hargobind Singh Khurana***
- Q.71 Study of sound is called _____
Ans ***Acoustics***
- Q.72 Which vitamin is called niacin?
Ans ***Vitamin B3***
- Q.73 The compound used in antimalarial drug is _____
Ans ***Chloroquin***
- Q.74 What is the full form of ECG?
Ans ***Electro cardio gram.***
- Q.75 *Ramapithecus* and *cro magnon* are ancestors of _____
Ans ***Modern man***
- Q.76 What is full form of **DDT**.
Ans **Dichloro diphenyl trichloro ethane**
- Q.77 What is full form of **LASER**?
Ans **Light Amplification by Stimulated Emission of Radiation**
- Q.78 What is full form of **RRCAT** ?
Ans **Raja Ramanna Centre for Advanced Technology**
- Q.79 What is full form of **CCTV**?
Ans ***Closed -circuit television***
- Q.80 Nuclear sizes are expressed in FERMI. One Fermi = _____ metre.
An: **10^{-15} metre**
- Q. 81 Name the force that separates the cream from milk when churned vigorously.
Ans **Centrifugal Force**
- Q.82 Name a physical quantity that explains the reason behind the difference in shrillness of a man's voice from a woman's voice.
Ans **Frequency**

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- Q.83 Mach is the unit used to express the speed of_____
- Ans **Aeroplane**
- Q.84 Who invented Dynamite?
- Ans **Alfred. B. Nobel**
- Q.85 Who invented cinematography?
- Ans **Thomas Alva Edison**
- Q.86 Which action is involved in absorption of ink by blotting paper?
- Ans **Capillary action**
- Q.87 Which physical quantity is measured in light year?
- Ans **Distance**
- Q.88 What is the time period of revolution of the geostationary satellite around the earth?
- Ans **24 hours**
- Q.89 Which instrument is used to measure altitudes in aircrafts?
- Ans **Altimeter**
- Q.90 Which phenomenon is responsible for colour formation in thin films?
- Ans **Interference**
- Q.91 Who is the writer of ‘A brief history of time’?
- Ans **Stephen Hawking**
- Q.92 Who has been awarded the Nobel Prize for Chemistry in 2015 for mechanistic studies of DNA repair?
- Ans **Paul L. Modrich and Aziz Sancar**
- Q.93 What is the antiparticle of electron ?
- Ans **Positron**
- Q.94 Which Indian physicist along with Albert Einstein developed a type of statistics that is applied over some special particles?
- Ans **Satyendranath Bose**
- Q.95 Name the only Indian physicist who has won Nobel prize in Physics.
- Ans **Sir CV Raman**

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- Q.96 Who said the following:
“**Learn from yesterday, live for today, hope for tomorrow. The important thing is not to stop questioning**”
Ans Albert Einstein
- Q.97 Who said the following:
“**Try not to become a man of success, but rather try to become a man of value.**”
Ans Albert Einstein
- Q.98 NASA's premier X-ray observatory is named Chandra X-ray Observatory. Name the Indian-American Nobel laureate in whose honour observatory is named after.
Ans Subrahmanyan Chandrasekhar
- Q.99 Who said the following:
“**Gravity explains the motions of the planets, but it cannot explain who sets the planets in motion.**”
Ans Isaac Newton
- Q.100 Who said the following:
“**Give me a lever long enough and a fulcrum on which to place it and I shall move the world**”.
Ans Archimedes
- Q.101 What is the full form of LHC?
Ans Large Hadron Collider
- Q.102 Which particle is known as God particle?
Ans Higgs Boson
- Q.103 Who is the writer of “**Mathematical Principles of Natural Philosophy**”?
Ans: Isaac Newton
- Q.104 Which instrument is used to record physical happenings at a distant place?
Ans Telemeter
- Q.105 Which material is used as a moderator well as coolant in nuclear reactors?
Ans Heavy water(D₂O – Deuterium oxide)
- Q.106 Which nuclear reaction is responsible for production of energy in the core of the stars?
Ans Nuclear fusion

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Q.107 What is the colour of the sky when observed from the moon?

Ans Black

Q.108 Who discovered radioactivity of a material?

Ans Henry Becquerel

Q.109 Which law states that the farther the galaxy is from us, the greater is its speed of recession?

Ans Hubble's law

Q.110 Name the principle on the basis of which the working of hydraulic lift is explained.

Ans Pascal's law

Q.111 Who wrote the book "For the love of Physics"?

Ans Walter Lewin

Q.112 Name the physicist who formulated the laws of electromagnetic induction.

Ans Michael Faraday

Q.113 Who received the Nobel Prize in the field of Physics for the invention of efficient blue light-emitting diodes which has enabled bright and energy-saving white light sources?

Ans Shuji Nakamura, Hiroshi Amano , Isamu Akasaki

Q.114 Name the set of spectral lines that appear in the **visible light** region when an electron in a hydrogen atom falls from higher energy state to lower energy state i.e., $n=2$ energy level.

Ans Balmer Series

Q.115 What is the pigment in the skin of oranges that gives it the orange colour?

Ans Carotene

Q.116 Name the principle that expresses an atomic orbital that describes that **at the most** two electrons, each with opposite spin direction can exist in an orbital.

Ans. Pauli's Exclusion Principle

Q.117 Name the dye that can be obtained from the wood plant and has been used for centuries as a blue colorant.

Ans Indigo

Q.118 Eka-Boron was later known as _____

Ans Gallium

Q.119 Name a chemical compound commonly added to foods in order to firm them and give them a salty taste without increasing the sodium content too much.

Ans Calcium Chloride

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Q.120 What is the chemical name of Tear gas?

Ans Chlorobenzalmalononitrile

Q.121 What is the chemical name for vitamin K?

Ans Phylloquinone

Q.122 Name a acid which is common in Coffee and Pineapple.

Ans Citric Acid

Q.123 Henna has been used since ancient times to dye hair. What is the compound present in henna that creates the red colour?

Ans Lawsone

Q.124 Name the rule that states: “ electron pairing in p, d, and f orbitals cannot take place until each orbital of a given subshell contains one electron each”

Ans Hund's Rule

Q.125 What action in paper chromatography separates components from the solution?

Ans Solubility

Q.126 Name the metal that is naturally antibacterial.

Ans Copper

Q.127 Which element found on earth is the densest as well as stable?

Ans Osmium

Q.128 How can tabletop "volcanoes" be created?

Ans Using 'Vesuvian Fire' compound Ammonium dichromate.

Q.129 Name the 'miracle material' that is just one atomic layer thick, and is a better conductor of electricity and heat than any material.

Ans Graphene

Q.130 Name the element that is often called the most expensive substance in the world

Ans Californium (as much as \$68 million for one gram.)

Q.131 Name the hormone that makes women more prone to mosquito-bite than men do.

Ans Estrogen

Q.132 Name the noble gas that can cut through materials that are so tough that even diamond tipped blades cannot cut.

Ans Xenon lasers

Q.133 How much common salt is contained in an average adult body?

Ans 250 g (1/2 lb) of salt.

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Q.134 By what percentage water expands when frozen?

Ans 10%

Q.135 Name the letter that does not appear in the **Periodic Table**.

Ans The letter J.

Q.136 What is the IUPAC name for water, (H₂O)?

Ans Dihydrogen monoxide

Q.137 Which element is artificially made in laboratory for the first time?

Ans Technetium

Q.138 Name the element that can be used to alter the thinking and has been known to “cure” certain mental illnesses.

Ans Lithium

Q.139 Name the metallurgical process in which a metal is obtained in a fused state.

Ans: Smelting

Q.140 What does the formula C₆H₅-CO-CH₃ represents?

Ans Acetophenone

Q.141 Give the synonym for the material paraffin which is used for making candles.

Ans Alkane

Q.142 Which branch of science deals with the study of the production and the behaviour of materials at low temperature?

Ans Cryogenics

Q.143 Name the chemical generally used for artificial ripening of fruits.

Ans Calcium carbide

Q.144 Name the metal oxide that is often added to paint to make it bright white.

Ans Titanium dioxide (TiO₂)

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MCQ's

- Q.1 The international unit used in biology to measure the size of living microorganism is
a. **um (micrometer)** b. nm (nanometer)
c. A (Angstrom) d. All are used
- Q.2 Pyrenoids are responsible for
a. Fat storage b. **Starch storage**
c. Protein formation d. Enzyme formation
- Q.3 Which one of the following is a pseudo cereal?
a. Wheat b. Rice
c. **Buck Wheat** d. *Pisum sativum*
- Q.4 Which one is not an intra-cellular compartment in the cell?
a. Nucleus b. Mitochondria
c. Chloroplast d. **Centriole**
- Q.5 A lichen which is fodder for Reindeers is
a. Lecanora b. Usnea
c. **Cladonia** d. Ramalina
- Q.6 Which of the following are likely to be present in deep sea water?
a. Brown algae b. Green algae
c. Blue green algae d. **Red algae**
- Q.7 The term synergistic action of hormones refers to
a. When two hormones act together but bring opposite effects
b. **When two hormones act together and contribute to the same function**
c. When one hormone affects more than one function
d. When many hormone bring about any one function
- Q.8 Biotic potential refers to
a. **Natural increase of population under optimum condition**
b. Potential of organisms in a biome
c. Number of organisms in a biome
d. Number of organisms in a population
- Q.9 The statistical and quantitative study of human population is called
a. **Demography** b. Kalology
c. Mastology d. Nephilology
- Q.10 Colles' fracture is associated with
a. Humerus b. **Radius**
c. Ulna d. Femur

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- Q.11 Gull's disease is associate with
a. Myxedema b. Bright's disease
 c. Acromegaly d. None of these
- Q.12 Which of the following is least dangerous form of skin cancer?
a. Basal-cell carcinoma b. Teratocarcinoma
 c. Sarcomas d. Myelomas
- Q.13 The painful skin conditions known as shingles is associated with
a. Chicken Pox b. Influenza
 c. Rabies d. Polio
- Q.14 Basket cells are found in
 a. Cerebrum **b. Cerebellum**
 c. Hypothalamus d. Medulla oblongata
- Q.15 Probiotics are
 a. Cancer inducing microbes b. New kind of food allergens
c. Live microbial food supplement d. Safe antibiotics
- Q.16 The scientific name of Java man is
 a. *Homo habilis* b. *Homo sapiens neanderthalensis*
c. *Homo erectus erectus* d. *Australopithecus boisei*
- Q.17 Severe Acute Respiratory Syndrome (SARS)
 a. is caused by *Pneumococcus pneumoniae*
b. is caused by a corona virus
 c. is an acute form of asthma
 d. is characterized by replacement of lung tissue by fibrous connective tissue
- Q.18 DNA finger printing technique was first developed by
a. Jeffreys, Wilson and Thien b. Boysen and Jensen
 c. Schleiden and Schwann d. Edward and Steptoe
- Q.19 The state, during which the respiratory centre is inhibited is termed as
a. Anoxia b. Asphyxia
 c. Suffocation d. Choking
- Q.20 The book *Historia Naturalis* was written by
 a. Linnaeus b. John Ray
c. Pliny the Elder d. Theophrastus
- Q.21 The name – 'Drosophila of plant kingdom' is given to
 a. Aspergillus b. Claviceps
c. Neurospora d. Trichoderma

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- Q.22 Living fossils means:
 a. Primitive organized organisms
 b. Extinct organisms
c. Organisms with ancestral characters and time has not changed them
 d. Connecting link between, two groups
- Q.23 The cell cultured in vitro gives rise to complete plant. This ability of plant cell is known as:
 a. Growth
 b. Development
 c. Regeneration
d. Totipotency
- Q.24 Devove's membrane is
a. Layer of connective tissue cells
 b. Layer of epithelia tissue cells
 c. Layer of muscular cells
 d. None of these
- Q.25 If the human blood pH falls below 7.0 or rises above 7.8, which of the following will not function properly?
a. Heart
 b. Liver
 b. Nerves
 d. All of these
- Q.26 The eyes of which of the following mollusc group resemble the vertebrate eye?
 a. Bivalvia
 b. Gastropoda
 c. Scaphopoda
d. Cephalopoda
- Q.27 *Acne vulgaris*, which affects face of most teenagers and many adults is caused by the infection of:
 a. Ceruminous glands
 b. **Sebaceous glands**
 c. Meibomian glands
 d. None of these
- Q.28 Most dinosaurs became extinct during
 a. Late Triassic
 b. Late Jurassic
c. Cretaceous
 d. Early Tertiary
- Q.29 Demineralization of bones is caused by over secretion of
 a. Epinephrine
 b. **Parathormone**
 c. Thyroxine
 d. Melatonin
- Q.30 Argentaffin may arise in
 a. Intestinal tract
 b. Bile duct
 c. Pancreas
d. All the above
- Q.31 Solar constant is
 a. 140 Wm^{-2}
 b. 1.4 Wm^{-2}
c. $1.4k \text{ W m}^{-2}$
 d. 1.4 M W m^{-2}
- Q.32 What is the term used in the field of nano-technology to describe a device which is yet theoretical that "will be able to bond atoms together virtually in any stable pattern?"
 a. Replicator
 b. Constructor
c. Assembler
 d. Stacker

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- Q.33 What is the name given for information sent from robot sensors to robot controllers?
a. Signal
c. Feedback
b. Pressure
d. Temperature
- Q.34 Consider the following statements with respect to jet engine and rocket:
1. A jet engine uses the surrounding air for its oxygen supply and so is unsuitable for motion in space
2. A rocket carries its own supply of oxygen in the gas form and fuel.
Choose the correct options:
a. Only 1
c. Only 2
b. Only 1,2
d. None of the above
- Q.35 Which one of the following laser types is used in a laser printer?
a. Dye laser
c. Semiconductor laser
b. Gas laser
d. Excimer laser
- Q.36 Consider the following statements:
1. Lithosphere is the solid or the hard top layer of the earth.
2. Hydrosphere comprises various sources of water and different type of water bodies.
3. The atmosphere is the thin layer of air that surrounds the earth.
4. Gravitational force of the earth holds the atmosphere around it.
Choose the correct options:
a. Only 1,2 and 4
c. Only 2,3 and 4
b. Only 1, 2 and 3
d. **All are correct**
- Q.37 Consider the following statements regarding the CFL (Compact Fluorescent Lamp)
1. CFL use less power and have longer life.
2. CFLs emit light from a mix of phosphors inside the bulb.
3. A phosphor is a substance that exhibits the phenomenon of luminescence.
Choose the correct options:
a. Only 1
c. Both 2 and 3
b. Only 2
d. **All are correct.**
- Q.38 Consider the following natural phenomena:
1. Terrestrial heating
2. Reflection of light
3. Refraction of light
4. Diffraction of light
Due to which of the above stated phenomenon is mirage formed?
Choose the correct options:
a. Only 1 and 3
c. Only 3 and 4
b. Only 2 and 3
d. Only 4

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- Q.39 Microwave oven consumes less power due to-
1. Small frequency of radiation.
 2. Short wavelength of radiation.
 3. Large frequency as well as wavelength of radiation.

Choose the correct options:

- | | |
|-----------|------------------|
| a. Only 1 | b. Only 2 |
| c. 1,2,4 | d. Only 3 |

- Q.40 Which of the following types of waves are used in a Night vision apparatus?
- | | |
|--------------------------|----------------------|
| a. radio waves | b. Microwaves |
| c. Infrared waves | d. None of the above |

- Q.41 Which of the following are true regarding transmission of television programmes?
1. Picture is transmitted with the velocity of light.
 2. Sound is transmitted with the velocity of sound.
 3. Sound is transmitted with the velocity of light.
 4. Different colours of the pictures are transmitted with different velocities.

Choose the correct option:

- | | |
|-------------------|------------------------|
| a. Only 1 and 2 | b. Only 1 and 3 |
| c. Only 1,2 and 3 | d. Only 2 and 4 |

- Q.42 Consider the following statements regarding the photovoltaic energy:
1. Photovoltaic cells direct produce electricity from sunlight.
 2. Photovoltaic cells are made up of two separate layers of silicon, each of which contains an electric charge.

Choose the correct options

- | | |
|------------------------|-----------------------|
| a. Only 1 | b. Only 2 |
| c. Both 1 and 2 | d. None of the above. |

- Q.43 “Joule Melter Technology” is :
1. Used to slow down the speed of neutrons.
 2. Used for the light water nuclear reactor.
 3. Used to increase the speed of neutrons.
 4. Used for nuclear waste management.

Choose the correct options:

- | | |
|------------------|-----------------|
| a. Only 4 | b. Only 2 and 3 |
| c. 1, 2 and 4 | d. Only 2 and 4 |

- Q.44 Consider the following statements regarding Chandrayan-2:
1. It is our second manned mission to moon.
 2. It is totally indigenous mission.

Which of the statements above is /are correct?

- | | |
|-----------------|--------------------|
| a. 1 only | b. 2 only |
| c. Both 1 and 2 | d. Neither 1 nor 2 |

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- Q.45 The Ocean Energy systems were launched in
a. 2001 b. 2005
 c. 2008 d. 2006
- Q.46 With reference to polar orbit satellites consider the following statements:
 1. These are useful in monitoring local storms and tropical cyclones.
 2. These provide more global view of the earth.
 Choose the correct options:
 a. Only 1 b. *Only 2*
 c. Both 1 and 2 d. None of the above.
- Q.47 Which one of the following elements is essential for the construction of nuclear reactors?
 1. Cobalt 2. Nickel 3. Zirconium 4. Tungsten
- Choose the correct options:
 a. Only 1 b. Only 2,3
 c. Only 2,4 d. *Only 3*
- Q.48 Which of the following has the highest energy?
 1. Blue light 2. Green light 3. Red light 4. Yellow light
 Choose the correct options:
 a. *Only 1* b. Only 2
 c. Only 3 d. Only 4
- Q.49 Which of the following parameter does not characterise the thermodynamic state of the matter?
 a. *Energy* b. Pressure
 c. Volume d. Temperature
- Q.50 When we hear a sound ,we can identify its source from
 a. amplitude of sound b. intensity of sound
 c. wavelength of sound d. *overtones present in the sound*
- Q.51 In vacuum, speed of light depends upon
 a. colour b. wavelength
 c. frequency d. *none of these*
- Q.52 Which of the following phenomenon is not common to the sound and light waves?
 a. Interference b. Diffraction
 c. *Polarisation* d. Reflection
- Q.53 When current is passed through a junction of two dissimilar metals, heat is evolved or absorbed at the junction. This process is called
 a. Seebeck effect b. *Peltier effect*
 c. Joule effect d. Thomson's effect.

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- Q.54 Which of the following are electromagnetic waves?
a. **Gamma rays** b. Beta minus rays
c. Beta plus rays d. alpha ray
- Q.55 Young's Modulus of a perfectly rigid body is
a. Unity b. zero
c. **Infinity** d. None of these
- Q.56 The alcohol used in the preparation of dynamite is
a. Ethyl alcohol **b. Glycerol**
c. Glycol d. Methyl alcohol
- Q.57 Epsom salt is chemically known as
a. Copper sulphate **b. Magnesium sulphate**
c. Ferrous sulphate d. Copper sulphate
- Q.58 Oil of vitriol is
a. Nitric acid b. Hydrochloric acid
c. Phosphoric acid **d. Sulphuric acid**
- Q.59 Which one of the following is also called Stranger Gas?
a. Neon b. Argon
c. **Xenon** d. Nitrous oxide
- Q.60 Which one of the following has maximum density?
a. Ice **b. Water**
c. Benzene d. Chloroform
- Q.61 The reaction between methane and chlorine in diffused sunlight is
a. Oxidation b. Reduction
c. Polymerisation **d. Substitution**
- Q.62 Which one of the following is an element?
a. Ruby b. Topaz
c. Sapphire **d. Diamond**
- Q.63 What is a mixture of potassium nitrate, powdered charcoal and sulphur called?
a. Paint b. Glass
c. **Gun powder** d. Cement
- Q.64 Bleaching action of chlorine is by
a. Oxidation b. Reduction
c. **Decomposition** d. Hydrolysis
- Q.65 Which one of the following does not contain silver?
a. Horn silver b. Ruby silver
c. **German silver** d. Lunar caustic

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- Q.66 Which one of the following gases is readily soluble in water at room temperature?
 a. Chlorine
 b. Nitrogen
 c. Ammonia
 d. **Carbon dioxide**
- Q.67 Cassiterite is an ore of
 a. Copper
 b. Zinc
 c. **Tin**
 d. Iron
- Q.68 Ruby is an oxide of
 a. Silver
 b. Gold
 c. Platinum
 d. **Aluminium**
- Q.69 Tobacco is preserved from drying out in
 a. Acetone
 b. Glycol
 c. Ethanol
 d. **Glycerol**
- Q.70 Natural rubber is a polymer derived from
 a. **Isoprene**
 b. Ethylene
 c. Propylene
 d. Butadiene
- Q.71 Which substance is obtained by the hydrolysis of oil?
 a. Ethanol
 b. Glycol
 c. Acetic acid
 d. **Glycerol**
- Q.72 The concept of an electrolyte in water was described by
 a. Faraday
 b. Ohm
 c. Debye
 d. **Arrhenius**
- Q.73 Rare gases are
 a. **Mono atomic**
 b. Di atomic
 c. Tri atomic
 d. None of the above
- Q.74 Human bone does not contain
 a. Calcium
 b. Carbon
 c. **Flourine**
 d. Phosphorous
- Q.750 Homo nuclear molecules contain
 a. Polar bond
 b. **Covalent bond**
 c. Ionic bond
 d. Coordinate bond
- Q.76 Which is used to produce artificial rain?
 a. Sand
 b. Copper oxide
 c. **Silver iodide**
 d. Silver nitrate
- Q.77 The concept of elliptical orbital was suggested by
 a. Thomson
 b. Neil Bohr
 c. Rutherford
 d. **Somerfield**

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- Q.78 Water drops are spherical because of
 a. Polarity
 c. **Surface tension**
 b. Viscosity
 d. Density is one
- Q.79 Aspirin is
 a. Ethyl salicylate
 c. Sodium salicylate
 b. **Methyl salicylate**
 d. Acetyl salicylic acid
- Q.80 Out of the given elements which is not a lanthanoid
 a. **Sm**
 c. Hf
 b. Ce
 d. Pm
- Q.81 Which one of the following is an element?
 a Ruby
 c. Sapphire
 b. Topaz
 d. **Diamond**
- Q.82. Which one of the following is also called stranger gas?
 a. Neon
 c. **Xenon**
 b. Argon
 d. Nitrous Oxide
- Q.83. Who discovered circulation of blood in human body?
 a. Edward Jenner
 c. **William Harvey**
 b. Joseph Lister
 d. Jonon Esals
- Q.84 Match the following columns:
- | Column 1 | | | | Column 2 | | | |
|-----------------|----------------|--|--|-----------------|------------|--|--|
| A. | Radioactivity | | | 1. | Planck | | |
| B. | Periodic Table | | | 2. | Thomson | | |
| C. | Quantum Theory | | | 3. | Rutherford | | |
| D. | X-Rays | | | 4. | Mendeleev | | |
| | | | | 5. | Roentgen | | |
| | | | | 6. | Becquerel | | |
- | | | | | |
|----|-----------|-----------|-----------|-----------|
| a. | A1 | B3 | C5 | D2 |
| b. | A6 | B5 | C3 | D5 |
| c. | A3 | B2 | C1 | D5 |
| d. | A6 | B4 | C1 | D5 |
- Q.85 Study of life in outer space is known as
 a. Endobiology
 c. Enterobiology
 b. **Exobiology**
 d. Neobiology
- Q.86 Which one of the following does not contain silver?
 a. Horn silver
 c. **German silver**
 b. Ruby silver
 d. Lunar caustic

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- Q.97 Super conductors are those substance which
 a. conduct electricity at low temperature
 b. offer high resistance to the flow of currents
c. offer no resistance to the flow of electricity
 d. conduct electricity at high temperature
- Q.98 Light from the star alpha-centauri which is nearest to the earth after the sun reaches the earth in
 a. 4.2 sec
 b. 42 sec
c. 4.2 years
 d. 42 years
- Q.99 The main use of salt in the diet is to
 a. make the taste of food better
b. produce in small amounts the hydrochloric acid required for the digestion of food
 c. ease the process of cooking
 d. increase the solubility of food particles in water
- Q.100. The material which can be deformed permanently by heat and pressure is called
 a. thermoplastic
b. thermoset
 c. chemical compound
 d. polymers
- Q.101 The graphite rods in the nuclear reactor
 a. reacts with U to release energy
 b. produce neutron
 c. under go combustion which triggers nuclear fission
d. convert fast moving neutrons into thermal neutron
- Q.102 The most extensive commercially useful source of Thorium as monazite sand occurs in India at
 a. Orissa coast
b. Travancore coast
 c. West Bengal coast
 d. Gujrat coast
- Q.103 The national chemical laboratory is situated in
 a. New Delhi
 b. Bangalore
c. Pune
 d. Patna
- Q.104 Argon gas was discovered by-
a. William Ramsay
 b. Charles
 c. Cavendish
 d. John Davy
- Q.105 Identify the laughing gas
 a. Carbon dioxide
 b. Sulphur dioxide
c. Nitrous oxide
 d. Hydrogen peroxide
- Q. 106 Formaldehyde is used as starting material for the manufacture of
 a. D.D.T.
 b. rayon
c. Bakelite
 d. nylon

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- Q.107 Name the main chemical constituent of the oil of cardamom responsible for the flavour of this oil.
- a. *Cileole*
 - b. argemone
 - c. Aldehyde
 - d. clemant
- Q.108 The following are the half lives of four active isotopes: Which one of the following is most dangerous to handle?
- a. 3 billion years
 - b. 100 years
 - b. *0.01 min*
 - d. 13 days
- Q.109 The characteristics of sound which enables us to distinguish one sound from another having the same pitch and loudness
- a. amplitude
 - b. shrillness
 - c. *timber*
 - d. intensity
- Q. 110 Magnetism at the center of the bar magnet is
- a. minimum
 - b. maximum
 - c. *zero*
 - d. none of the above
- Q.111 Bring out the only correct statement in context with Uranium:
- a. Both U-235 and U-238 are fissile but only U-235 can sustain chain reactions
 - b. *Only U-235 is fissile and can sustain chain reaction but U-238 is fertile*
 - c. U-238 can be used in chain reactions only after extracting U-235 from it
 - d. Uranium enrichment is a process where concentration of U-238 is increased using some chemical processes
- Q.112 Identify the non-metallic mineral from the given options:
- a. Manganese
 - b. Magnesium
 - c. *Silica*
 - d. Bauxite
- Q.113 Which among the following methods can be used to remove the permanent hardness in water due to calcium or magnesium sulphates?
- a. Sulphonate method
 - b. Nitrate method
 - c. *Zeolite method*
 - d. None of these
- Q.114 Which among the following acids is abundant in Grapes, Bananas and Tamarind?
- a. Lactic Acid
 - b. Oxalic Acid
 - c. Salicylic Acid
 - d. *Tartaric Acid*
- Q.115 Which among the following gas was leaked at Bhopal during the Bhopal gas tragedy at 2-3 December 1984?
- a. Methyl isocyanide
 - b. *Methyl isocyanate*
 - c. Methyl isochloride
 - d. Methyl isochlorate

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- Q.116 In which among the following categories, Radon (Rn) can be placed?
1. Radioactive Element 2. Inert Gas 3. Noble Gas
Choose the correct option:
a. Only 1 b. 1 & 2
c. 2 & 3 d. **1, 2 & 3**
- Q.117 When a tubelight breaks, a cracking sound is produced because ____?
a. Pressure inside the lamp is less than atmospheric pressure
b. Pressure inside the lamp is more than atmospheric pressure
c. The lamp is filled with reactive gases
d. The lamp is filled with mercury vapour
- Q.118 Which among the following is the most abundant organic compound in nature?
a. Glucose b. Fructose
c. Sucrose **d. Cellulose**
- Q.119 Which among the following elements are generally find in free state?
a. **Group 11 elements** b. Group 12 elements
c. Group 13 elements d. Group 14 elements
- Q.120 Highest percentage of nitrogen is found in which among the following fertilizers among the given options?
a. Calcium ammonium nitrate b. Ammonium nitrate
c. Calcium nitrate **d. Urea**
- Q. 121 Which of the following is an anti-knocking compound, that has been phased out in many countries so far?
a. Lead tetrachloride b. Lead tetrachloride
c. Tetra Ethyl Lead d. Ethyl acetate
- Q. 122 The Alkali metals are called good reducing agents. This implies that__:
a. They easily capture electrons b. They are not stable at room temperature
c. They easily lose electrons d. They don't act with dilute acids
- Q. 123 Which among the following correctly denotes Mycorrhiza?
a. Fungus + Roots b. Fungus + Stem
c. Bacteria + Roots d. Bacteria + Stem
- Q. 124 Which among the following is the source of Ricin, a toxic substance?
a. Khesari Dal **b. Castor bean**
c. Soya bean d. Guar gum

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- Q. 125 What is the number of essential amino acids?
 a. 15
 b. **20**
 c. 25
 d. 29
- Q.126 Karyotype or Idiogram represents the shape of the _____?
 a. Nucleus
 b. Cell wall
 c. **Chromosomes**
 d. Nucleolus
- Q.127 Which among the following is also known as gonophore?
 a. Algal DNA
 b. Fungal DNA
 c. Bacterial DNA
 d. **Bacterial RNA**
- Q.128 In which of the following cell organelle a Tubulin protein is found?
 a. Golgi apparatus
 b. Endoplasmic reticulum
 c. Ribosomes
 d. **Flagella**
- Q. 129 Consider the following:
 1. Cell walls of Fungi are made up of Chitin
 2. Cell walls of Diatoms are abundant in Silica
 which among the above statements is / are correct ?
 a.]1 only
 b. 2 only
 c. **1 & 2**
 d.]none of them
- Q130. How many millimicrons are in an Angstrom?
 a. 1
 b. **0. 1**
 c. 0. 01
 d. 10
- Q131 Who discovered a Nucleus in a cell?
 a. Shimper
 b. Palade
 c. **Robert Brown**
 d. Schwann and Schleiden
- Q.132 Lysosomes which digest excess or worn-out organelles are formed by the _____?
 a. Cell membrane
 b. **Golgi apparatus**
 c. Cell Membrane
 d. Nucleus
- Q.133 Which among the following is an endergonic reaction?
 a. Conversion of ATP to ADP
 b. Conversion to ATP to AMP
 c. **Conversion of AMP to ATP**
 d. None of them
- Q.134 In which of the following cells, the number of mitochondria would be maximum?
 a. Nerve cells
 b. **Muscle Cells**
 c. Bones
 d. White Blood cells

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Q.135 Bring out the only incorrect statement:

- a. Carotenes are Hydrocarbons
- b. Xanthophylls give yellow color
- c. Beta carotene is the precursor of Vitamin A
- d. Retinal is a beta carotene**

Q.136 The Chlorophylls absorb which portion of the electromagnetic spectrum to the maximum extent?

- a. Red
- b. Green
- c. Blue**
- d. Yellow

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REASONING QUESTIONS

Q.1 Are two atoms of the same element identical?

Ans . No.

EXPLANATION 1:

Two atoms of the same element can be different if their electrons are in different states. If one copper atom has an electron in an excited state and another copper atom has all of its electrons in the ground state, then the two atoms are different. The excited copper atom will emit a bit of light when the electron relaxes back down to the ground state, and the copper atom already in the ground state will not. Since the states of the electrons in an atom are what determine the nature of the chemical bonding that the atom experiences, two atoms of the same element can react differently if they are in different states.

QUERY 2: *What if two atoms are of the same element, have electrons in the same state, are traveling and rotating at the same speed, and have the same number of neutrons then are they identical?*

EXPLANATION 2:

No. Just like the electrons, the neutrons and protons in the nucleus can be in various excited states. In addition, the nucleus as a whole can rotate and vibrate at various speeds. Therefore, even if all else is identical, two gold atoms can have their nuclei in different excited states and behave differently in nuclear reactions.

Q.2 Can water stay liquid below zero degrees Celsius?

Ans . Yes.

EXPLANATION 1: *The phase of a material (whether it is gas, liquid, or solid) depends strongly on both its temperature and pressure. For most liquids, applying pressure raises the temperature at which the liquid freezes to solid. A solid is formed when the loose, meandering molecules of a liquid get slow enough and close enough to form stable bonds that pin them in place. When we apply pressure to a liquid, we force the molecules to get closer together. They can therefore form stable bonds and become a solid even if they have a higher temperature than the freezing point at standard pressure. Water is somewhat unique, though. Water molecules spread out when they are bonding into a solid crystalline structure. This spreading-out action leads ice to be less dense than liquid water, causing ice to float. This spreading-out action of the water molecules during freezing also means that applying pressure to water lowers the freezing point. If you apply enough pressure (making it hard for the water molecules to spread out into the solid structure), you can have liquid water several degrees below zero degrees Celsius.*

EXPLANATION 2:

If you don't apply pressure, you can still have liquid water at sub-zero temperature using additives. Additives such as salt can interfere with the chemical bonding needed to form a solid and they therefore can lower water's freezing point. Salt is composed of strong sodium and chlorine ions. When dissolved in water, the water molecules tend to stick to the salt ions instead of to each other, and they therefore don't freeze as readily. As you add more salt to water, its freezing point continues to drop until the water reaches saturation and cannot hold any more salt. If you add enough salt, the freezing point of water can be dropped as low as -21 degrees Celsius. This fact means that water at -21 degrees Celsius can still remain liquid if enough salt is added. Instead of keeping liquid water from freezing, this powerful property of salt can also be used to turn ice back

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into water. Sprinkling salt on icy sidewalks lowers the freezing point of the ice below the ambient temperature and the ice melts.

Q. 3 What kind of crystal are crystal drinking glasses made out of?

Ans. "Crystal" glasses are not made out of crystal at all.

A crystal is any material that has its molecules aligned spatially into regularly repeating patterns. Metals, ceramics, salts, ice, sugar, and rocks are all crystal. By definition, glasses are materials that have their molecules unordered. In other words, the very definition of glass is a material that is not a crystal.

Query:

What is "crystal" glass made of if not crystal? "Crystal" glass was just regular glass where the calcium is replaced with lead oxide. A more accurate name is therefore "lead glass". Adding lead to glass raises its index of refraction. The index of refraction measures the amount that a material bends light. Materials with a higher index of refraction sparkle more because they bend light more. Adding lead to glass makes it look more like diamond, hence lead glass became identified as crystal-looking glass, which got shortened to "crystal glass".

Q.4 What makes a "fluorescent" highlighter marker so bright?

Ans. Fluorescent highlighter markers are so bright because they are fluorescent. Fluorescence is the phenomenon where a material absorbs light of a certain color and then emits light of a different color with a longer wavelength. The most striking type of fluorescence involves the absorption of ultraviolet rays (which humans can't see) and the subsequent emission of light in the visible spectrum (which humans can see). Because humans can't see the original ultraviolet light, a fluorescent object looks like it is glowing mysteriously on its own when it is illuminated only by ultraviolet rays in a dark room. For this reason, ultraviolet lights and fluorescent materials can add an intriguing look to darkened rooms. When a fluorescent object is illuminated by both visible light and ultraviolet light (such as when illuminated by sunlight), the object will still convert the ultraviolet light to visible light. Fluorescent highlighter ink is unusually bright because it converts some of the incident ultraviolet light that is invisible to humans into visible light.

Q.5 Why doesn't the planet Uranus explode if it contains so much hydrogen and methane?

Ans. The atmosphere of the planet Uranus contains mostly hydrogen, helium, and methane. Interestingly, the methane in the atmosphere is what gives Uranus its distinctive blue colour. Since Uranus contains effectively zero free oxygen, the hydrogen and methane in the atmosphere does not burn or explode.

Q.6 Why is ice slippery?

Ans. On its own, ice is not slippery.

When we step onto an icy sidewalk, we do indeed feel a slippery surface. But the slipperiness is caused by a thin layer of liquid water and not directly by the solid ice itself. Water on a smooth surface is slippery because water is a low-viscosity liquid. As such, there are no permanent intermolecular bonds in liquid water, and the transient intermolecular bonds are weak. This means that water molecules can move about freely, slide past each other easily, and fill any microscopic holes or cracks that would snag an object.

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Ice has been found to always have a thin liquid layer on its surface, even at temperature well below freezing, and even in the absence of contact with any objects. The formation of a surface liquid layer is therefore a property of ice itself and not a property of interacting with an object.

Q.7 What is the main evolutionary innovation presented by nematodes? What is the advantage of that innovation?

Ans. The main evolutionary innovation of nematodes is their complete digestive system, which contains two openings (a mouth and anus).

Since the ingestion and the defecation processes can occur at different extremities of the digestive tube, organisms with a complete digestive system have the advantage of being able to ingest new food while the residue of already eaten food is still inside the body and has not yet been eliminated.

Q.8 Compared to platyhelminthes, which physiological problem caused the cylindrical body of nematodes? How was that problem solved?

Ans. The cylindrical shape of nematodes made it impossible for them to use respiration exclusively via simple diffusion between cells, since they contain tissues far from their exterior. This problem was solved by the presence of an inner cavity in the body filled with fluid, called the pseudocoelom. The pseudocoelom has the function of distributing gases and nutrients to the body as well as collecting waste. In addition, it serves as a hydrostatic base to maintain the shape of the worm.

(Due to the fact that the pseudocoelom fluid and the pseudocoelom do not constitute a true circulatory system with blood and a heart, the respiration in nematodes is not considered to be cutaneous; rather, scientists consider that these animals still carry out respiration via diffusion).

Q 9: Why is acetic acid called a weak acid though there are four 'H' atoms in the molecule?

Ans: Acetic acid is called a monobasic acid because only one of the 4 'H' atoms of the acid is released as H⁺ ion in solution.

Q 10: Though NaHSO₄ solution releases H⁺ ions, why is it not called an acid?

Ans: NaHSO₄ solution is not called an acid because an acid should release only H⁺ ions as positive ions and not any other positive ions. But NaHSO₄ solution releases H⁺ ions as well as Na⁺ ions also as positive ion.

Q 11: Why do acids not show acidic behavior in the absence of water?

Ans: Acids do not show acidic behaviour in absence of water because the dissociation of hydrogen ions from an acid occurs in presence of water only. It is hydrogen ions that are responsible for the acidic behaviour.

Q.12: What would have happened if the greenhouse gases were totally missing from the earth's atmosphere?

Ans: Earth's most abundant greenhouse gases are CO₂, CH₄, O₃, CFCs, and water vapour. These gases are present near the Earth's surface. They absorb solar energy that is radiated back from the surface of the Earth. The absorption of radiation results in the heating up of the atmosphere. Hence, greenhouse gases are essential for maintaining the temperature of the Earth for the sustenance of life.

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In the absence of greenhouse gases, the average temperature of the Earth will decrease drastically, making it uninhabitable. As a result, life on Earth would be impossible.

Q.13: A large number of fish are suddenly found floating dead on a lake. There is no evidence of toxic dumping but you find an abundance of phytoplankton. Suggest a reason for the fish kill.

Ans: The amount of dissolved oxygen present in water is limited. The abundance of phytoplanktons causes depletion of this dissolved oxygen. This is because, phytoplanktons are degraded by bacteria present in water. For their decomposition, they require a large amount of oxygen. Hence, they consume the oxygen dissolved in water. As a result, the BOD level of water drops below 6 ppm, inhibiting the growth of fish and causing excessive fish-kill.

Q 14. Gelatine is generally added to ice creams. Why?

Ans : Ice cream is an emulsion of milk or cream in water. Gelatine is generally added to act as emulsifier to form the stable emulsion.

Q 15. Why is sodium chloride added during preparation of soap?

Ans: This help to decrease solubility of soap and help in precipitation of soap from aqueous solution. This preparation is known as salting out.

Q 16. Why do fire flies glow at night?

Ans: Fire flies have a protein which in the presence of an enzyme undergoes aerial oxidation. This is a chemical reaction which involves emission of visible light. Therefore, fire flies glow at night.

Q.17 Grapes hanging on the plant do not ferment but after being plucked from the plant can be fermented. Under what conditions do these grapes ferment? Is it a chemical or a physical change?

Ans: Grapes when attached to the plants are living and therefore their own immune system prevents fermentation. The microbes can grow in the plucked grapes and under anaerobic conditions these can be fermented. This is a chemical change.

Q18 An iron nail floats on mercury but sinks in water. Give reasons.

Ans: The specific density of iron is lower than of mercury, hence it floats on mercury, while it is higher than that of water, and hence it sinks in water.

Q19. How does a refrigerator keep food fresh?

Ans: Food is kept fresh so long as fermentation does not set in; refrigeration prevents fermentation by providing low temperature.

Q 20. Where does the water present in the egg go after boiling the egg?

Ans. When an egg is boiled, the proteins present inside the egg get denatured and coagulate. After boiling the egg, the water present in it is absorbed by the coagulated protein through H-bonding.

Q 21. Why cannot vitamin C be stored in our body?

Ans. Vitamin C cannot be stored in our body because it is water soluble. As a result, it is readily excreted in the urine.

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Q 22. Why do we apply alum on bleeding wound?

Ans. *The chemical formula of alum is $K_2SO_4 \cdot Al_2(SO_4)_3 \cdot 24 H_2O$*

Blood is a colloid containing negatively charged particles. On the other hand, alum contains positively charged particles Al_{3+}

On applying alum on fresh wound, coagulation of negatively charged particles with Al_{3+} ions takes place and bleeding stops.

Q.23 Pluricellular organisms are formed through serial mitosis. Would this formation be possible if each cell produced by mitosis was identical to its parent cells? How did evolution solve that problem?

Ans. *The formation of complex and distinct pluricellular organisms would not be possible if mitosis in embryos produced only daughter cells identical to their parent cell, since there would be no differentiation or structural or functional specialization among cells.*

Evolution solved this problem by creating the cellular differentiation process by which, provoked by stimuli not yet well-known by science, different and specialized cell lineages produce different tissues, organs and systems, which, as a whole, form pluricellular organisms.

Cellular differentiation likely is a very intricate process that activates and inactivates some genes within the cell in response to some stimulus.

Q.24 Can two normal individuals of the same species with sexual reproduction have identical genomes and identical karyotypes? How the human karyotype is usually represented?

Ans. *Except for clones (individuals created from nucleus transplantation, like Dolly the sheep) and monozygotic twins, it is very improbable that the genomes of two individuals of the same species generated by sexual reproduction will be identical. Nevertheless, the karyotypes of two normal individuals of the same species and of the same sex are always identical. The normal human karyotype is represented by the formula $44+XX$ for women and $44+XY$ for men.*

Q.25 Do phylogenetically close species have cells with similar chromosome counts?

Ans. *The number of chromosomes typical of each species is similar for phylogenetically close species (for example, orangutans, gorillas, chimpanzees and humans). However, it is not impossible for evolutionarily distant species, such as rats and oats, to have similar karyotypes and the same total number of chromosomes.*

Even if they present equal number of chromosomes, evolutionarily distant species have radically different characteristics, since the quantity and the sequence of nucleotides that make up their DNA molecules are quite different.

Q.26 Why is DNA twisted?

Ans. *DNA is known for its familiar twisted shape. This shape is often described as a spiral staircase or twisted ladder. DNA is a nucleic acid with three main components: nitrogenous bases, deoxyribose sugars, and phosphate molecules. Interactions between water and the molecules that compose DNA cause this nucleic acid to take on a twisted shape. This shape aids in the packing of DNA into chromatin fibers, which condense to form chromosomes. The helical shape of DNA also makes DNA replication and protein synthesis possible. When necessary, the double helix unwinds and opens to allow DNA to be copied.*

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Q.27 How are fingerprints formed?

Ans.*Fingerprints are patterns of ridges that form on our fingers, palms, toes, and feet. Fingerprints are unique, even among identical twins. They are formed while we are in our mother's womb and are influenced by several factors. These factors include genetic makeup, position in the womb, amniotic fluid flow, and umbilical cord length. Fingerprints are formed in the innermost layer of the epidermis known as the basal cell layer. Rapid cell growth in the basal cell layer causes this layer to fold and form various patterns.*

Q.28 Your eyes can see bunches of photons, but can they see a single, isolated photon?

Ans.*Each rod cell in your eye is indeed capable of detecting a single, isolated photon. However, the neural circuitry in your eye only passes a signal along to the brain if several photons are detected at about the same time in neighboring rod cells. Therefore, even though your eye is capable of detecting a single, isolated photon, your brain is not capable of perceiving it.*

Q.29 Why are veins blue?

Ans.*The veins themselves are not blue, but are mostly colorless. It is the blood in the veins that gives them color. Furthermore, the blood in human veins is also not blue. Blood is always red. Blood that has been oxygenated (mostly flowing through the arteries) is bright red and blood that has lost its oxygen (mostly flowing through the veins) is dark red. Anyone who has donated blood or had their blood drawn by a nurse can attest that deoxygenated blood is dark red and not blue. The blood in your veins appears blue because you are looking at your veins through layers of skin and fat according to Alwin Kienle in his paper “Why do veins appear blue? A new look at an old question” published in the Journal of Applied Optics. Skin scatters a lot of the red portion of white light before it can reflect off the blood, leaving the blue light to reflect off the blood and back to our eyes. It is a similar effect to how the white sun appears red at sunset due to the blue colors being scattered away by the atmosphere.*

Q.30 Why do camera flashes make your eyes turn red?

Ans.*Camera flashes do not make your eyes turn red. The inside of your eyes are always red. The bright light of the camera flash just makes the color more obvious. Your eye is essentially a hollow ball filled with clear fluid. The hole at the front of your eye, the pupil, lets light into the hollow space inside the eye. The light passes through this space and then strikes the inner back surface of the eye, known as the retina. The retina is packed with cells that detect the light, change it to electrical signals, and pass the signals on to the brain where the pattern of light is experienced as a visual image. The approximately 100 million light-sensitive cells on the human retina give us an amazing visual resolution, but they also require a prodigious amount of blood to keep them going. This blood is what gives the retina its red color.*

Q.31 What part of the brain is hurt when you get headaches?

Ans.*Most headaches have nothing to do with the brain being damaged or strained. There is more to your head than your brain. Surrounding your brain are meninges, bones, muscles, skin layers, lymph nodes, blood vessels, the eyes, ears, mouth, nose and cavities called sinuses. Most headaches are caused by strain or pressure buildup in these other areas and not in your brain. Brain tumors and strokes can cause headaches, but they usually cause other more serious symptoms such as unconsciousness, seizures, paralysis, and vision loss. For people with tumors or strokes, headaches are typically the least of their concerns. And even when a brain tumor does cause a headache, it does so indirectly by applying pressure to the skull and other parts of the head. In fact, the brain itself*

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lacks pain receptors, so it is literally impossible to have pain in your brain. Surgeons can perform operations on the brain without numbing it for this reason. The brain is the place where we process and experience bodily sensations, so all pain ends up getting experienced in the brain. But all pain originates outside the brain. Sometimes a headache seems to be coming from deep within your head, but that is just a psychological/physiological trick where intense pain seems to spread out and come from other places than where it is really occurring. There are hundreds of types of headaches, all with different causes. For generally healthy people, the most common sources of headache are tension and head colds.

Q.32 Why don't dark-skinned people get sunburns?

Ans. Dark-skinned people do get sunburns. While it's true that the higher pigment levels that make certain people's skin look dark helps protect against sunlight, the pigments do not block 100% of the light. The skin pigment melanin is produced by special skin cells called melanocytes to protect the body from the damaging effects of ultraviolet light. Higher levels of melanin mean less sunburn and less skin cancer. But even the darkest-skinned person is not protected 100% from sunlight.

Q.33 How does ice cream in your stomach cause a headache?

Ans. An ice cream headache has nothing to do with your stomach, but is rather the result of the roof of your mouth (your palate) getting cold too quickly. In fact, you can get an ice cream headache before even swallowing the ice cream. Ice cream headaches occur whenever you eat or drink something cold too rapidly, and they last about 20 seconds. Eating cold food slowly can give your palate time to cool down normally and adjust to the low temperatures without causing a headache. According to the Mayo Clinic, the exact mechanism at work in ice cream headaches is not currently known, but it is believed that the headache is a case of referred pain. When the roof of your mouth gets cold too quickly, the pain signal sensed in your mouth is passed on to the trigeminal nerve, which then passes it on to the brain where it is processed and experienced. The trigeminal nerve senses pain from the entire face and forehead, so when it gets overloaded, pain from your mouth seems to be coming from your forehead.

Q.34 How does the outer layer of skin cells on my finger detect when I am touching an object?

Ans. The outer layer of skin cells on your finger does not detect anything. The outer layer of your skin contains cells that are dead. In fact, the outermost 25 to 30 cell layers of your skin consist of dead cells that do nothing beyond providing a physical barrier that keeps water in and chemicals out. Furthermore, all regular skin cells (keratinocytes), whether alive or dead don't detect physical sensations since they are not designed to do this. Physical sensations that are experienced when touching an object are detected by special receptors that sit in lower layers of the skin. Such sensations include pressure, temperature, vibration, and skin stretching. Therefore, in order for you to detect a physical effect, it must first pass through all the layers of dead skin. For instance, in order for you to feel that a frying pan is hot, heat from the pan must travel through the outer layers of dead skin before it can reach the thermo receptors nestled in the lower layers of the skin. The thermo receptors then detect the heat and in response send an electrical signal along your nerves to your brain.

Q.35 Why are bats blind?

Ans. Bats are not blind and can in fact see quite well using their eyes. While most bats do have advanced ears that give them a form of vision in the dark known as echolocation, these good ears do not require them to have bad eyes. Bats use their good hearing to find food in the dark of night, and

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their good eyes to find food during the light of day. The vision of bats is tuned to low-light conditions such as is present during dawn and dusk. While some bats may not have as good color vision as humans, their overall vision may be better than humans during dawn and dusk.

Q.36 Why don't trees freeze and burst in the winter like cold pipes?

Ans In many cases, trees do partially freeze in the cold of winter and burst like plumbing pipes in an unheated home. When liquid water freezes to ice, it expands in volume because of the way the water molecules spread out to form a solid crystalline lattice. If the water is contained in a closed vessel, it can press so hard as it freezes and expands that it bursts the container. This explosive effect is common in insufficiently heated houses, where the cold leads the plumbing pipes to burst. The fluid transport tissue in trees (xylem and phloem) can be seen as little pipes carrying water and nutrients throughout the tree. They too can freeze and burst, causing the tree to crack and/or explode. The crackling sound or gun-shot pop you hear in the forest in the winter is the sound of trees freezing and bursting. The bursting is usually not as violent or as deadly to the tree as you may first expect for a few reasons. A tree has hundreds to tens of thousands of these fluid channels. If one bursts, the tree has plenty of other ones to rely on. Furthermore, each channel is small, so that an individual channel bursting does not do occur.

Q.37 How do Painkillers work?

Ans. We sense pain due to the transmission of a specific signal to the brain via the spinal cord. Pain relief medications work by preventing this 'pain signal' from reaching the brain. There are two main types of painkillers that are commonly used: the 'aspirin medicines' and the 'narcotic medicines.'

Q.38 Why do we get Dizzy?

Ans Dizziness is caused when the brain receives conflicting signals from different sensors. The vestibular system is an intricate network of fluid-filled channels found in our inner ear and is responsible for our perception of gravity and motion. When we spin around, we set the fluid in the semicircular canal spinning. If we stop suddenly, our eyes and other sense organs immediately send a signal to the brain that the body has stopped moving. The fluid in our vestibular system, however, keeps spinning and so sends a signal to the brain that the head is moving. The sensation of 'dizziness' occurs due to the conflict between these two signals. The brain accepts both signals as true and so decides that the head is spinning, whilst the body is stationary.

Q.39 Why do our Stomach rumble?

Ans. The classic rumble associated with hunger is less to do with the stomach and more to do with our large intestine. A rumbling tummy is a combination of liquid and gas plus a small space. Food does not move down our digestive system by gravity - if that were the case, astronauts would not survive in space. Instead, muscle contractions in the gut wall called peristalsis both churn up the food and move it through the system. These muscle contractions occur right the way through the digestive system, from the oesophagus to the stomach to the intestines and out the other end.

When air gets trapped in the folds and bends of the small intestine, the liquid sloshing around can create a rumble - amplified by the small space of the small intestine. The reason we associate a rumbling tummy with hunger is that the rumbling is louder the less food is present in the intestine.

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Q.40 What is 'Brainfreeze'?

Ans. *Sphenopalatine ganglioneuralgia (or 'brain-freeze') is a painful condition similar to a migraine, which arises due to your body's natural reaction to cold temperatures.*

When you get cold, your body undergoes a series of changes designed to prevent heat loss. One of these adaptations is the constriction of blood vessels (vasoconstriction) close to the surface of the skin. With less blood flowing near to your skin, less heat is lost to the surroundings and you stay warmer for longer.

When something really cold hits the back of your mouth, the blood vessels in your palate rapidly constrict. When you swallow, the cold goes away and the same blood vessels rapidly dilate back to their original size. All of this is a perfectly normal physiological response to the cold.

Q.41 A block slides down a smooth inclined plane when released from the top while another falls freely from the same point at the same time. Which one of them will strike the ground earlier?

Ans. *Acceleration of the block sliding down the inclined plane is $g\sin\theta$ which is less than acceleration g of a freely falling body hence the block sliding down the inclined plane will reach the ground later.*

Q.42 A man with a load jumps from a high building. What will be the load experienced by him during the fall?

Ans. *Zero. While falling, both the man and the load are falling at the same acceleration that is acceleration due to gravity and hence reaction is equal to zero.*

Q.43 Why does a ball bounce upon falling?

Ans. *When a ball falls it is temporarily deformed. Because of elasticity, the ball tends to regain its original shape for which it presses the ground and gets a bounce due to reaction force offered by the ground.*

Q.44 Why glass breaks easily?

Ans. *Unlike other solid materials, like metals, glass is made up of amorphous loosely packed atoms arranged randomly. They can't absorb or dissipate energy. The atoms cannot rearrange themselves quickly to retain glass structure. So it collapses, shattering fragments everywhere.*

Q.45 Why small piece of camphor dance on the surface of water?

Ans. *When camphor is dissolved in water, the surface tension of water is reduced. Since camphor has irregular shape therefore it may dissolve more at one end than that at the other end. This produces unbalanced force due to which it appears to dance on the surface of water.*

Q.46 Why is it easier to skate on ice than on a smooth aluminium sheet?

Ans. *Ice below the feet of the person melts on account of increased pressure. Tiny drops of water are formed which behave like rollers. These rollers make easier to skate on ice. Such rollers are not formed on metallic sheet.*

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Q.47 Diamond is a good thermal conductor but is an excellent electrical insulator? Why?

Ans. *Diamond crystal has highly symmetric cubic structure in which carbon atoms are precisely aligned which makes diamond an ideal crystal. Atoms in crystal lattice vibrate without interaction with each other and this vibration makes it a good conductor of heat. Mobile electron facilitates electrical conduction. Diamond does not have free electron and hence it is an electrical insulator.*

Q.48 When a lighted match stick is placed before a light source, the shadow of the match stick is formed on screen but the shadow of flame is not formed, Why?

Ans. *A shadow is a dark region formed behind an opaque object in the direction opposite to the source of light, the match stick being opaque obstructs the light from the source and forms shadow. The flame of the match stick itself is a source of light and cannot prevent light from source to pass through it and hence shadow of flame is not formed.*

Q.49 Why hot soup tastes better than cold soup?

Ans. *Hot soup has comparatively less surface tension than cold soup. Hence, hot soup spreads over a larger surface area of tongue than cold soup and thus tastes better than cold soup.*

Q.50 What makes earth rotate continuously on its axis?

Ans. *The solar system and Galaxy are formed by condensation of rotating mass of gases. As friction and other forces are absent in space the object keeps on rotating due to conservation of angular momentum. Earth is also made by condensation of rotating gas and hence to keep its angular momentum conserved it keeps on rotating.*

Q.51 A drop of oil placed on the surface of waters spreads out, but a drop of water placed on oil contracts to spherical shape. Why?

Ans. *A drop of oil placed on the surface of water spreads because the force of adhesion between water molecules and oil molecules dominates the cohesion force of oil molecule. On the other hand the cohesive force of water molecule dominates the adhesive force between water and oil molecule.*

Q.52 What will be the expression for buoyant acting on an object immersed in a liquid if gravity force is neglected?

Ans. *There will be no buoyant force acting on the object, as buoyancy results from pressure difference caused due to gravity.*

Q. 53 Why the rising sun appears bigger?

Ans. *This happens due to atmospheric refraction. Light from the rising Sun reaches Earth obliquely through the atmosphere. Rays from different parts of Sun travel through different parts of earth atmosphere. Due to unequal refractions, the horizontal diameter appears bigger while the vertical diameter appears shorter, consequently, the rising Sun appears oval.*

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Q.54 Why rainbow cannot be observed from the surface of moon?

Ans. There are no water vapours on the Moon. Hence there is neither dispersion nor total internal reflection of Sun rays and rainbow can never be observed from moon.

Q.55 Why is cooking quicker in pressure cooker?

Ans. Boiling point of water increases in pressure cooker due to high pressure over the water surface. Food in the cooker gets higher temperature and hence gets soft easily.

Q.56 Why does rain comes in drops and not in continuous stream?

Ans When warm water vaporises it condenses to form clouds. A cloud is made of small drops of water or ice crystals depending on its height and how cold the surrounding air is. When the condensing droplets that form the cloud get large enough, they begin to fall. Actually to form rain, water vapour needs condensation which can be tiny particles of dust or pollen. Whatever may be the intensity of rains the size of drop never exceeds above 5mm. Larger drops do not survive due to frictional drag of air therefore the larger drops break into smaller drops.

Q.57 Why are winter nights and summer nights warmer during cloudy weather in comparison to when the sky is clear?

Ans. Clouds being bad conductor of heat do not permit radiation of heat from land to escape into the sky. Therefore this heat remains in the atmosphere making the cloudy night warmer.

Q.58 Why does grass gather more dew in night than metallic object or stone?

Ans. Grass is the good radiator which helps water vapour in the air to condense on it. Also grass gives out water continuously due to transpiration process, which appears in the form of dew because the air near the grasses is saturated with water vapour. Dew is formed on object which is good radiator and bad conductor.

Q.59 Why are curved rail tracks or curved roads banked or raised on one side?

Ans. Since a fast moving train or vehicle leans inward while taking turn the banked road provide centripetal force to take a round curve.

Q.60 Why heavy stable nucleuses contain more neutrons than protons?

Ans. Nuclear forces are attractive and columbic forces between protons are repulsive .The nuclear force must dominate over the columbic forces to make the nucleus stable. It is possible only when the number of neutron is more than proton.

Q.61 Why do we see tail of comet?

Ans. We see tail of comet due to tyndull effect exhibited by dust and ice particles present in colloidal dimension.

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Q .68 Why is it possible to drive a nail into a piece of wood with a hammer, but it is not possible to push a nail in by hand?

Ans. When you swing a hammer you increase its kinetic energy, so that by the time it strikes the nail it imparts a large force which drives the nail into the wood. The hammer is basically an energy reservoir to which you are adding energy during the course of the swing, and which is released all at once upon impact. This results in the impact force greatly exceeding the maximum force you can exert by just pushing on the nail.

Q 69 When a moving car encounters a patch of ice the brakes are applied. Why is it desirable to keep the wheels rolling on the ice without locking up?

Ans. Static friction is greater than kinetic friction. Static friction exists if the wheels keep rolling on the ice without locking up, resulting in maximum braking force. However, if the wheels lock up then kinetic friction takes over since there is relative slipping between wheel and ice. This reduces the braking force and the car takes longer to stop. Anti-lock braking systems (ABS) on a vehicle prevent the wheels from locking up when the brakes are applied, thus minimizing the amount of time it takes for the vehicle to reach a complete stop. Also, by preventing the wheels from locking up you have greater control of the vehicle.

Q.70 When a hanging carpet is beaten with a stick, the dust particles start coming out of it. Why?

Ans: This is due to the inertia of rest. i.e. the dust, or fruits, tend to be at rest when shaken.

Q.71 Imagine two spheres of equal size. One is made of aluminum, the other is made of lead. What is true about the buoyant force (call it FB) that each will experience when it is submerged in water?

Ans : They will experience the same buoyant force. It depends on the volume of the object and the density of water.

Q.72 Suppose you are travelling in a bus which is travelling at a speed of 20km/hr. Suppose a mosquito is also flying in the this bus. So please tell me whether the mosquito has to apply speed of more than or equal to 20km/hr to remain in the bus or this is not true. Give reasons for your answer.

Ans: The mosquito is flying in the air trapped in the bus. In relation to the bus the air is stationary so the mosquito can fly as fast or as slow as it likes.

Q.73 A stick is inserted in between the spokes of a wheel. If the wheel is rotated faster, how will the (a) frequency and (b)loudness of the sound produced change? Give reasons.

Ans: As the wheel is rotated faster: FREQUENCY of the sound - meaning the rate at which the sound (produced by the collision between the spikes and the stick inserted) occurs increases. However, please understand that the frequency of the sound wave does not vary. It remains unaffected as the same sound is produced each time (may be with a different intensity). LOUDNESS of the sound - If you assume that the stick obstructs the spikes and is held by a rigid support, the wheel won't be able to turn further unless the stick or the spike breaks. However if it is held by a loose support that would allow the spikes to move by hitting (and pushing away the stick temporarily), the loudness would be affected by (how strong or in general) of what physical properties the spike and the stick are. However, higher the area of contact, higher would be the loudness expected.

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Q.74 A transparent glass block is covered with sand. It becomes translucent. When the glass is smeared with water, it again becomes transparent. Explain.

Ans: *As it is obvious, the transparency or translucence of the glass block (in both the cases) is depending on the optical properties of the medium in which it is placed. As sand allows the penetration of light to some extent (because sand particles are separated by little air gaps that allow this penetration), they result in the translucence while water (which is itself transparent) results in transparency of the block as well.*

Q.75 A girl sitting in a railway carriage, moving at uniform velocity, throws a ball straight up in the air. Where will the ball fall?

Ans: *The ball will fall into her hand in the absence of any air-resistance. This can be explained from the inertia of motion of the ball. Before the projection the ball was moving in the horizontal direction along with the carriage. At the moment of projection the vertical velocity is added. The combined velocity takes the ball in a parabolic path. During its motion the vertical component is affected by the gravity but the horizontal motion (due to inertia) remains uniform. Thus the ball covers the same horizontal distance as the girl during the time of flight of the ball.*

Q.76 There is no force acting on a moving body. What will be state of motion for the body finally?

Ans: *The body continues to move with same uniform velocity (i.e. along a straight line). This follows from the 1st or 2nd law of Newton.*

Q.77 When a ball is thrown in the upward direction, first its momentum decreases and then it increases again during its fall. Does it violate the principle of conservation of momentum?

Ans: *The principle of conservation of momentum (of a body) is valid when there is no external force on the body. As the ball is acted on by the force of gravity of earth – its momentum cannot remain constant during its motion. If we consider the ball and the earth forming one single system then the force of gravity cannot be treated as an external force and the total momentum of this system remains conserved. That means the change of momentum of the ball becomes equal and opposite to the change of momentum of the earth at any time during the time the ball is in motion.*

Q.78 At night it is difficult to see through a closed glass-window from inside of an illuminated room. But this becomes relatively easy if the lights in the room are switched off. Why?

Ans: *This happens due to change in relative brightness of the outside objects with respect to other bodies. If the lights are on, the objects in the room are much brighter than the outside objects and the glass also reflects much light making it difficult to see the outside objects. When the room-lights are off the amount of light reflected by the glass or the other objects in the room decreases considerably making the outside body relatively brighter. This is similar to the case of stars not being visible in presence of the sun while they become visible in the night-time.*

Q.79 Why are cinema screens made rough and white?

Ans. *As the surface of the screen is rough, light incident on it undergoes diffused reflection making the image visible from all the portions of the audience. If it was very smooth, reflected light would reach only a small part of the audience. Then too the image wouldn't be visible due to its excessive*

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brightness. A white surface reflects all colors equally producing the image in its actual color. A colored screen would change the color of the image.

Q. 80 Why do we normally swing our arms while walking, and why not when we carry a load in our hands?

Ans. *The centre of gravity of a body depends on the distribution of mass in a body. As we walk the movement of the legs cause a shift in the centre of gravity. To compensate for this shift we swing our arms. When we are carrying load in the hands the effective centre of gravity is lower making it easier to maintain balance.*

Q.81 Although there are no electrons within the nucleus of an atom still beta-particles are emitted from radioactive atom. Explain.

Ans: *Nucleus contains only protons and neutrons and not electrons. Yet electrons (-article) are emitted from the radioactive atoms. Actually, during a beta-decay a neutron converts permanently into a proton producing one electron which is emitted as a beta-particle.*

Q.82 A droplet of water on lotus leaf or arum leaf appears shining – why?

Ans. *This happens due to total internal reflection of light. Water droplets cannot make the surface of the leaf wet as a thin layer of air forms beneath it. When a ray of light passes through water (of the droplet) and is incident on the air layer at an angle greater than the critical angle the light suffers total internal reflection giving it a shining appearance.*

Q.83 Two thermometers are identical in every respect except that one has a spherical bulb and the other cylindrical bulb of same volume. Which one is more sensitive?

Ans. *The thermometer with a cylindrical bulb is more sensitive. For a body of a fixed volume, the surface area is least when it is spherical. Therefore, the cylindrical bulb has a bigger surface area than the other one and hence absorbs more heat in a given time compared to the other. So, the thermometer with cylindrical bulb responds quickly.*

Q.84 How does a kingfisher catch fish?

Ans. *The king fisher flies vertically over the position of the fish , then plunges into the water at a 90 degree angle .The concept here is that the normally incident rays do not undergo refraction, hence the fish lies exactly where it appears to be. At any other angle, the apparent position of the fish would be different from its real position.*

Q.85 Sound emitted by an open organ pipe is more musical than that emitted by an organ pipe closed at one end. Why?

Ans *In an open organ pipe all harmonics (odd and even) of the fundamental frequency are present. But in case of a closed organ pipe only odd harmonics are produced. Presence of bigger number of harmonics makes the sound from an open organ pipe more musical.*

Q.86 A hollow spherical metal ball is filled with water and used as a pendulum. As it starts oscillating water starts to come out through a small hole at its lower end. Will it affect the period of oscillation? Explain.

Ans: *Yes, the time period (T) of oscillation will change with time.*

We know, for a pendulum $T=2\pi\sqrt{L/g}$ where L is the effective length of the pendulum. At first the centre of gravity of the ball remains at the centre of the sphere. After a while some amount of water leaves the sphere and the centre of gravity moves to a lower position which increases L resulting in an increase in time period T. This continues up to a certain time and after that the

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amount of water becomes very small and the centre of gravity starts to go back toward its original position and completely returns there when it is empty. So, we observe an increase and then a decrease in the value of T to its original value

Q.87 What is the source of energy released in nuclear fission?

Ans. *Mass lost in a nuclear fission reaction is the source of energy released. According to Einstein's theory of relativity mass and energy are equivalent. – They can be converted from one form to the other. In a nuclear (fission) reaction the total mass of the products after the reaction is less than the total mass of the reactants before the reaction. The lost mass accounts for the produced energy.*

Q.88 A piece of green glass is placed in a furnace and then taken out when it is heated. It is seen to be glowing with red light. Why?

Ans: *Green and red are the complementary colors. Therefore when the red light is absorbed by a body, illuminated with white light (containing all the colors) it appears green to us. The consequence of Kirchhoff's law (or radiation) is that good absorber of radiation are also good radiator and vice versa. Therefore, when this piece of glass it is taken out of the furnace it radiates out its heat through the wavelength of red light.*

Q.89 Two persons ordered for tea in a cafe while waiting for a third friend. One of them immediately poured tea in his cup and mixed cold milk with it. The other person poured tea immediately but mixed cold milk after the friend arrived. Who drinks warmer tea? Explain.

Ans: *The person who mixes tea with cold milk before the arrival of their friend drinks warmer tea. This can be explained from the Newton's law of cooling. According to this law the rate of heat loss from a hot body is higher if its temperature difference with the surrounding is higher. Mixing of cold milk lowers the temperature of tea at the beginning of their wait. Therefore the temperature difference between this mixture and the surrounding is less compared to the tea in other cup and hence this tea loses less heat in the same time. As a result this tea remains warmer.*

Q.90 A beaker is filled with water at 4°C . What will happen to the water level when it is heated? What will happen if the temperature is lowered?

Ans. *Both for the rise or fall in temperature the water in the beaker will overflow. Water at 4°C has maximum density and hence its volume is minimum. Therefore at this temperature if the water is heated it expands in volume and overflows.*

Q. 91 A hollow iron-ball floats in water at 20°C in fully submerged condition. What will happen if the temperature of water raise to 50°C ?

Ans: *The iron-ball will sink in water at 50°C . At 10°C the weight of the ball is just equal to the weight of the displaced water. With the rise in temperature both the ball and water expand but the expansion of liquid is relatively larger than that of the metal (here, iron). So, effectively we should consider the expansion of water as a net result. Due to the expansion of water, its density will decrease and the buoyant force cannot balance the weight of the ball. Therefore the iron-ball sinks at a higher temperature like 50°C .*

Q.92 Can a convex lens behave as a diverging lens?

Ans. *In general the lenses are made up of glass and the surrounding medium is air. Under such conditions a convex lens behaves as a converging lens. In this situation the refractive index of the*

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lens medium is larger than the refractive index of its surrounding. But if the lens is immersed in a fluid such that the refractive index of the fluid is larger than that of the lens then the nature of refraction is opposite and it becomes a diverging lens.

LATEST DEVELOPMENTS IN SCIENCE

Q.1 What is precision medicine?

Ans *Medical care designed to optimize efficiency or therapeutic benefit for particular groups of patients, especially by using genetic or molecular profiling.*

Q.2 What is bunionplasty?

Ans *The Bunionplasty technique allows for the incisions to be hidden – avoiding unsightly visible scars on the top of the foot to allow for a more aesthetic outcome. Special plastic surgery techniques are performed to minimize scarring. In addition to the skin aspect of bunion correction, the underlying bone work is performed in such a manner to properly realign the foot bones.*

Q.3 What is arthroscopy?

Ans *Arthroscopy (also called arthroscopic surgery) is a minimally invasive surgical procedure on a joint in which an examination and sometimes treatment of damage is performed using an arthroscope, an endoscope that is inserted into the joint through a small incision.*

Q.4 What is hypnosurgery?

Ans *Hypnosurgery is the term given to an operation where the patient is sedated using hypnotherapy rather than traditional anaesthetics.*

Q.5. What is surgical drain?

Ans *Surgical drain is a tube used to remove pus, blood or other fluids from a wound. They are commonly placed by surgeons or interventional radiologists.*

Q.6 What is MICS?

Ans *Recent advances in surgical technique and equipment allow the surgeon to perform coronary artery bypass surgery in a less traumatic way. These types of procedures are called "minimally invasive". Minimally invasive cardiac surgery (MICS) may include a smaller incision, avoidance of the heart-lung machine, or both.*

Q.7 What is FISH?

Ans *Fluorescent in situ Hybridization (FISH) DNA array Hybridization.*

Q.8 What is BACTEC?

Ans *The BACTEC blood culture system was found to improve the yield of clinically significant isolates from normally sterile body fluids with reduced time to detection; it may be advantageous for isolation of fastidious microorganisms, such as Brucella and S pneumoniae, especially from cerebrospinal and synovial fluid specimens.*

Q.9 What is CFT?

Ans *Complement fixation test (CFT) is one of the oldest methods in the history of clinical virology (Casals and Palacios, 1941). The complement reacts only with antigen–antibody complex in a non-*

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specific manner. Thus, in the presence of the complex, the complement is not free to interact with sensitized sheep red blood cells (RBCs) used as an indicator, and which remain unlysed. The test is said to be 'positive'.

Q.10 What are radio sensitizers?

Ans Aradiosensitizer is a drug that makes tumor cells more sensitive to radiation therapy. It is sometimes also known as a radiation sensitizer or radio-enhancer.

Q.11 What is antimatter?

Ans In the centre of an atom called the nucleus, there are protons (which have a positive electrical charge) and neutrons (which have a neutral charge). Electrons, which have a negative charge, occupy orbits around the nucleus. The orbits can change depending on how "excited" the electrons are (meaning how much energy they have.)

In the case of antimatter, the electrical charge is reversed relative to matter. Anti-electrons (called positrons) behave like electrons but have a positive charge. Antiprotons, as the name implies, are protons with a negative charge.

EXTRA BYTE:

These antimatter particles (which are called "antiparticles") have been generated and studied at huge particle accelerators such as the Large Hadron Collider operated by CERN (the European Organization for Nuclear Research),

Antimatter was first predicted in 1928 by English physicist Paul Dirac.

Dirac put together Einstein's special relativity equation (which says light is the fastest-moving thing in the universe) and quantum mechanics (which describes what happens in an atom), He discovered the equation worked for electrons with negative charge or with positive charges.

Dirac said that every particle in the universe would have a mirror image. American physicist Carl D. Anderson discovered positrons in 1932 which is antiparticle of electron. Dirac received a Nobel Prize in Physics in 1933, and Anderson got the prize in 1936.

Q.12 What are PSLV and GSLV?

Ans Both PSLV and GSLV are the satellite-launch vehicles (rockets) developed by Indian Space Research Organisation (ISRO). PSLV is used for delivering various satellites to Low Earth Orbits. It is designed mainly to deliver the "earth-observation" or "remote-sensing" satellites with lift-off mass of up to about 1750 Kg to Sun-Synchronous circular polar orbits of 600-900 Km altitude. Apart from launching the remote sensing satellites to Sun-synchronous polar orbits, the PSLV is also used to launch the satellites of lower lift-off mass of up to about 1400 Kg to the elliptical Geosynchronous Transfer Orbit (GTO). GSLV's primary payloads are communication satellites of INSAT class (about 2,500 kg mass) that operate from Geostationary orbits (about 36000 km) and hence are placed in Geosynchronous Transfer Orbits by GSLV. The GSLV is designed mainly to deliver the communication-satellites to the highly elliptical Geosynchronous Transfer Orbit (GTO).

Q.13 What is QUARK?

Ans. Quarks are one type of matter particle. Most of the matter we see around us is made from protons and neutrons, which are composed of quarks.

There are six quarks, but physicists usually talk about them in terms of three pairs: up/down, charm/strange, and top/bottom.

(Also, for each of these quarks, there is a corresponding antiquark.)

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Quarks have the unusual characteristic of having a fractional electric charge, unlike the proton and electron, which have integer charges of +1 and -1 respectively.

Quarks

charge	generation		
	I	II	III
$+\frac{2}{3}e$	u up	c charm	t top
$-\frac{1}{3}e$	d down	s strange	b bottom

Anti-quarks

charge	generation		
	I	II	III
$-\frac{2}{3}e$	\bar{u} up	\bar{c} charm	\bar{t} top
$+\frac{1}{3}e$	\bar{d} down	\bar{s} strange	\bar{b} bottom

(anti-particles are conventionally expressed by adding a bar on top of the character)

Q.14 What is TOKAMOK?

Ans. *The Tokamak is the most developed magnetic confinement system and is the basis for the design of future fusion reactors using this method. It was invented in the Soviet Union during the 1960s and soon adopted by researchers around the world. The Joint European Torus (JET – pictured), located at Culham Centre for Fusion Energy, is the largest and most powerful tokamak currently operating.*



The main Tokamak components and functions are as follows:

The plasma is contained in a vacuum vessel. The vacuum is maintained by external pumps. The plasma is created by letting in a small puff of gas, which is then heated by driving a current through it.

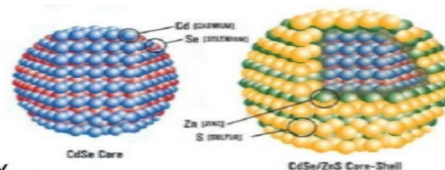
The hot plasma is contained by a magnetic field which keeps it away from the machine walls. The combination of two sets of magnetic coils – known as toroidal and poloidal field coils – creates a field in both vertical and horizontal directions, acting as a magnetic ‘cage’ to hold and shape the plasma.

Q.15 What are quantum dots?

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What is Quantumdots?

- Quantum dots are semiconductor nanocrystals.
- They are made of many of the same materials as ordinary semiconductors (mainly combinations of transition metals and/or metalloids).
- Unlike ordinary bulk semiconductors, which are generally macroscopic objects, quantum dots are extremely small, on the order of a few nanometers. They are very nearly zero-dimensional.



Ans *Each quantum dot is actually a tiny semiconductor -- which means it can convert incoming energy. The electronic characteristics of quantum dots are determined by their size and shape. This means we can control the color of light given off by a quantum dot just by changing its size. Bigger dots emit longer wavelengths like red, while smaller dots emit shorter wavelengths like green. Think of a guitar string. When a guitar string is shortened, it produces a higher pitch and when it is lengthened, it creates a lower pitch. The tune of a quantum dot – the wavelength of the light it emits – behaves in a similar way. For LCD screens, the benefits are numerous. Higher peak brightness – One of the reasons TV manufacturers like quantum dots is that they allow them to produce TVs with much higher peak brightness.*

Q.16 What is quantum entanglement?

Ans *Current science is looking into the very real possibility of transmitting data faster than the speed of light, through quantum entanglement. The theory is that two quantum entangled particles change states at the same point in time, regardless of distance, which should not be possible under conventional physics, as a signal between them should not travel faster than the speed of light. This means that there is either a form of energy that travels faster than light, or entangled particles have a connection that is not exchanging energy, but communicating in another manner. In other words, the particles don't change location, they just change states. Quantum entanglement is a quantum mechanical phenomenon in which the quantum states of two or more objects have to be described with reference to each other, even though the individual objects may be spatially separated. But quantum entanglement does not enable the transmission of classical information faster than the speed of light. Quantum entanglement has applications in the emerging technologies of quantum computing and quantum cryptography, and has been used to realize quantum teleportation experimentally.*

Q.17 What is spintronics?

Ans *Conventional electronic devices rely on the transport of electrical charge carriers - electrons - in a semiconductor such as silicon. Now, however, physicists are trying to exploit the 'spin' of the electron rather than its charge to create a remarkable new generation of 'spintronic' devices which will be smaller, more versatile and more robust than those currently making up silicon chips and circuit elements. All spintronic devices act according to the simple scheme: (1) information is stored (written) into spins as a particular spin orientation (up or down), (2) the spins, being attached to mobile*

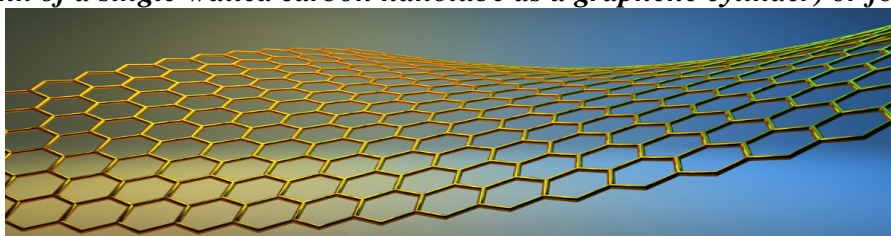
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electrons, carry the information along a wire, and (3) the information is read at a terminal. Spin orientation of conduction electrons survives for a relatively long time (nanoseconds, compared to tens of femtoseconds during which electron momentum decays).

Q.18 What is graphene?

Ans *Carbon comes in many different forms, from the graphite found in pencils to the world's most expensive diamonds. In 1980, we knew of only three basic forms of carbon, namely diamond, graphite, and amorphous carbon. Then, fullerenes and carbon nanotubes were discovered and, in 2004, graphene joined the club. Graphene is an atomic-scale honeycomb lattice made of carbon atoms.*

Existing forms of carbon basically consist of sheets of graphene, either bonded on top of each other to form a solid material like the graphite in your pencil, or rolled up into carbon nanotubes (think of a single-walled carbon nanotube as a graphene cylinder) or folded into fullerenes.



The reason nanotechnology researchers are so excited is that the properties of graphene and other two-dimensional crystals (it's called 2D because it extends in only two dimensions: length and width; as the material is only one atom thick, the third dimension, height, is considered to be zero) open up a whole new class of materials with novel electronic, optical and mechanical properties. Early experiments with graphene have revealed some fascinating phenomena that excite researchers working towards molecular electronics.

For instance, it was found that graphene remains capable of conducting electricity even at the limit of nominally zero carrier concentration because the electrons don't seem to slow down or localize. The electrons moving around carbon atoms interact with the periodic potential of graphene's honeycomb lattice, which gives rise to new quasiparticles that have lost their mass, or 'rest mass'. That means that graphene never stops conducting. It was also found that they travel far faster than electrons in other semiconductors.

Q.19 What is “CHANDRA X- RAY OBSERVATORY ” ?

Ans *The Chandra X-ray Observatory (CXO), previously known as the Advanced X-ray Astrophysics Facility (AXAF), is a Flagship-class space observatory launched on STS-93 by NASA . Chandra is sensitive to X-ray sources 100 times fainter than any previous X-ray telescope, enabled by the high angular resolution of its mirrors.*

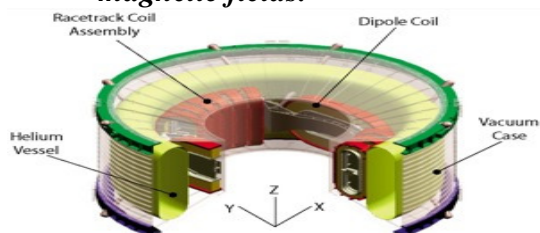
Since the Earth's atmosphere absorbs the vast majority of X-rays, they are not detectable from Earth-based telescopes; therefore space-based telescopes are required to make these observations. Chandra is an Earth satellite in a 64-hour orbit, and its mission is ongoing as of 2017.

Chandra is one of the Great Observatories, along with the Hubble Space Telescope, Compton Gamma Ray Observatory (1991–2000), and the Spitzer Space Telescope. The telescope is named after astrophysicist Subrahmanyan Chandrasekhar. A superconducting magnet is an electromagnet made from coils of superconducting wire. They must be cooled

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to cryogenic temperatures during operation. In its superconducting state the wire can conduct much larger electric currents than ordinary wire, creating intense magnetic fields. Superconducting magnets can produce greater magnetic fields than all but the strongest electromagnets and can be cheaper to operate because no energy is dissipated as heat in the windings.

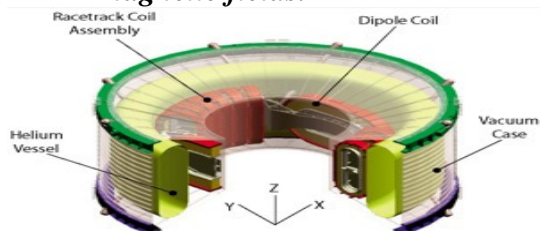
They are used in MRI machines in hospitals, and in scientific equipment such as NMR spectrometers, mass spectrometers and particle accelerators. Although the idea of making electromagnets with superconducting wire was proposed by Heike Kamerlingh Onnes shortly after he discovered superconductivity in 1911, a practical superconducting electromagnet had to await the discovery of superconducting materials that could support large critical supercurrent in high magnetic fields.



Q.20 What are superconducting magnets?

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Q.21 What is ambient back scatter?

Ans: *Ambient backscatter transforms existing wireless signals into both a source of power and a communication medium. It enables two battery free devices to communicate*

Q.22 What is life straw?

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Ans: *Life Straw is a water filter designed to be used by one person to filter water for drinking. It filters a maximum of 1000 litres of water, enough for one person for one year. It removes almost all of water-borne bacteria and parasites.*

Q.23 What is LUV water purifier?

Ans: *LUV Water is a self- powered water purification unit that works with UV-LED lights, making potable water accessible to everyone. The concept is to use the gravitational weight of water to rotate a motor that powers the UV-LED lights. These UV-LED lights disrupt the microbes and coupled with a particle filter, have the ability to provide clean drinking water.*

Q.24 What is wireless electricity?

Ans: *Wireless power transfer (WPT) or wireless energy transmission is the transmission of electrical energy from a power source to an electrical load, such as an electrical power grid or a consuming device, without the use of discrete man-made conductors. An alternating current in the transmitter coil generates a magnetic field which induces a voltage in the receiver coil. This voltage can be used to power a mobile device or charge a battery. The phenomenon of mutual induction is applied for wireless power transfer.*

Q.25 What is GPS?

Ans: *A GPS tracking system uses the Global Navigation Satellite System (GNSS) network. This network incorporates a range of satellites that use microwave signals that are transmitted to GPS devices to give information on location, vehicle speed, time and direction. So, a GPS tracking system can potentially give both real-time and historic navigation data on any kind of journey. The control of the Positioning System consists of different tracking stations that are located across the globe. These monitoring stations help in tracking signals from the GPS satellites that are continuously orbiting the earth. Space vehicles transmit microwave carrier signals. The users of Global Positioning Systems have GPS receivers that convert these satellite signals so that one can estimate the actual position, velocity and time.*

Q.26 What is the basic idea of building superfast computer?

Ans: *Detecting photons and using them as message signals. David Wineland and Serge Haroche were awarded Physics Nobel 2012 for detecting photons. Particles in a traditional Bose Einstein condensate and are cooled down close to absolute zero, until they gloom onto each other and become indistinguishable acting as one giant particle. This giant particle can be used as message carrier.*

Q.27 How quantum computer works?

Ans: *Quantum computers work on superposition of states also known as qubits. Quantum computing is based on the fact that, in the microscopic world, things don't have to be as clear-cut as we'd expect from our macroscopic experience. Tiny particles, such as electrons or photons, can simultaneously take on states that we would normally deem mutually exclusive. They can be in several places at once, for example, and in the case of photons simultaneously exhibit two kinds of polarisation. We never see this superposition of different states in ordinary life because it somehow disappears once a system is observed: when you measure the location of an*

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electron or the polarisation of a photon, all but one of the possible alternatives are eliminated and you will see just one. Nobody knows how that happens, but it does.

(Superposition frees us of from binary constraints. A quantum computer works with particles that can be in superposition. Rather than representing bits — such particles would represent qubits, which can take on the value 0, or 1, or both simultaneously. "If you do something to [such a quantum system], it's as though you are doing it simultaneously to 0 and to 1," explains Richard Jozsa, a pioneer of quantum computing at the University of Cambridge.

Q.28 Name the theory that talks about the origin of mass.

Ans: The universe is filled with Higgs bosons. As atoms and parts of atoms zoom around, they interact with and attract Higgs bosons, which cluster around them in varying numbers. Certain particles will attract larger clusters of Higgs bosons, and the more of them a particle attracts, the greater its mass will be. The explanation helped complete scientists' understanding of the nature of all matter

Q.29 What is CERN's LHC?

Ans: The Large Hadron Collider (LHC) is the world's largest and most powerful particle accelerator. It first started up on 10 September 2008, and remains the latest addition to CERN's accelerator complex. The LHC consists of a 27-kilometre ring of superconducting magnets with a number of accelerating structures to boost the energy of the particles along the way. Inside the accelerator, two high-energy particle beams travel at close to the speed of light before they are made to collide. The beams travel in opposite directions in separate beam pipes – two tubes kept at ultrahigh vacuum. They are guided around the accelerator ring by a strong magnetic field maintained by superconducting electromagnets. The electromagnets are built from coils of special electric cable that operates in a superconducting state, efficiently conducting electricity without resistance or loss of energy. This requires chilling the magnets to -271.3°C – a temperature colder than outer space. For this reason, much of the accelerator is connected to a distribution system of liquid helium, which cools the magnets, as well as to other supply services.

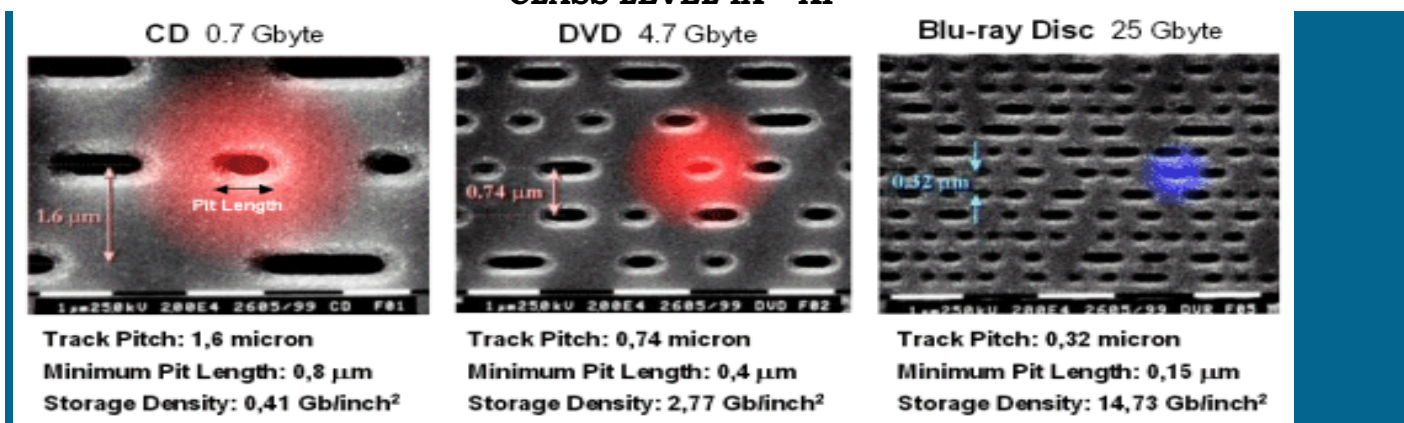
Q.30 What is the importance of blue LED?

Ans: The nobel prize 2014 in physics was awarded to Isamu Akasaki, Hiroshi Amano, Shuji Nakamura for the invention of efficient blue light emitting diode and energy saving white light sources. They used gallium nitride on aluminum sapphire substrate with indium. The lamp is constructed and the missing blue light is added with red and green to produce white light.

Q.31 Why blue ray disc is better than the infra memory storage devices?

Ans: Just as DVD meant a five to ten time increase in storage capacity compared to CD, Blue -ray Disc will increase DVD capacity by five to ten times. This is due, among other reasons, to the usage of a blue instead of a red laser and improved lens specifications, allowing for a much smaller focus laser beam which enables the recording of much smaller and higher density pits on the disc.

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Due to the fact that the data layer on a Blu-ray Disc is placed much "closer" to the laser lens than in DVD (or even the HD-DVD proposal), there is less distortion resulting in significantly improved tolerances. Hence, more precision and ultra high storage densities are made possible. As a result of Blu-ray Disc being manufactured as a single substrate disc comparable to CD, but unlike DVD (and the HD-DVD proposal), the manufacturing process does not involve the bonding of two substrates, resulting in less production material, a shorter production time and hence lower production costs per disc.

Q.32 How has neutrino has saved the earth from an icy death?

Ans: Nobel laureate Mcdonald and Kajita investigated the oscillation of neutrino that revealed a fact that it has mass. A neutrino when interacts with matter can change into either of three states i.e tau, electron and muon. Physicists found that there is continuous decrease in the number of neutrinos coming directly from the sun. It created the mystery amongst all the researchers that sun will die eventually. Neutrino's oscillation among them proves that it has mass. It also proves that sun will continue to radiate energy forever and earth will not die in an icy death.

Q.33 What is a printable organ and where does it find its use?

Ans: A printable organ is an artificially constructed device designed for organ replacement, produced using 3D printing techniques. The primary purpose of printable organs is in transplantation. Research is currently being conducted on artificial heart, kidney, and liver structures, as well as other major organs. For more complicated organs, such as the heart, smaller constructs such as heart valves have also been the subject of research. Some printed organs have already reached clinical implementation, and primarily include hollow structures such as the bladder, as well as vascular structures such as urine tubes.

Q.34 Name and describe the Antibiotic that is discovered in 2016.

Ans: Teixobactin

Teixobactin is a small molecule antibiotic that is active against gram-positive bacteria. It appears to belong to a new class of antibiotics, and harms bacteria by binding to lipid II and lipid III, important precursor molecules for forming the cell wall. Its discovery was announced in early 2015 in the journal Nature.

Teixobactin was discovered using a new method of culturing bacteria in soil, which allowed researchers to grow a previously unculturable bacteria now named Eleftheria terrae, which

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produces the antibiotic. In the Nature study, teixobactin was shown to kill Staphylococcus aureus or Mycobacterium tuberculosis without the bacteria developing a resistance to the antibiotic.

Q.35 Which is the newest member of the human family?

Ans: *Homo naledi*

Homo naledi is a previously-unknown species of extinct hominin discovered within the Dinaledi Chamber of the Rising Star cave system, Cradle of Humankind, South Africa. This species is characterized by body mass and stature similar to small-bodied human populations but a small endocranial volume similar to australopiths. Cranial morphology of H. naledi is unique, but most similar to early Homo species including Homo erectus, Homo habilis or Homo rudolfensis. While primitive, the dentition is generally small and simple in occlusal morphology. H. naledi has humanlike manipulatory adaptations of the hand and wrist. It also exhibits a humanlike foot and lower limb. These humanlike aspects are contrasted in the postcrania with a more primitive or australopith-like trunk, shoulder, pelvis and proximal femur. Representing at least 15 individuals with most skeletal elements repeated multiple times, this is the largest assemblage of a single species of hominins yet discovered in Africa.

Q.36 Which hormone is associated with hunger?

Ans: *Ghrelin*

Ghrelin (pronounced GREL-in), the "hunger hormone", also known as lenomorelin (INN), is a peptide hormone produced by ghrelinergic cells in the gastrointestinal tract which functions as a neuropeptide in the central nervous system. Besides regulating appetite, ghrelin also plays a significant role in regulating the distribution and rate of use of energy.

When the stomach is empty, ghrelin is secreted. When the stomach is stretched, secretion stops. It acts on hypothalamic brain cells both to increase hunger, and to increase gastric acid secretion and gastrointestinal motility to prepare the body for food intake.

Q.37 Name the hormone that is known as “beauty hormone”.

Ans: *Vitamin E*

Vitamin E is a fat-soluble antioxidant that stops the production of ROS formed when fat undergoes oxidation. Scientists are investigating whether, by limiting free-radical production and possibly through other mechanisms, vitamin E might help prevent or delay the chronic diseases associated with free radicals. Antioxidants protect cells from the damaging effects of free radicals, which are molecules that contain an unshared electron. Free radicals damage cells and might contribute to the development of cardiovascular disease and cancer. Unshared electrons are highly energetic and react rapidly with oxygen to form reactive oxygen species (ROS). The body forms ROS endogenously when it converts food to energy, and antioxidants might protect cells from the damaging effects of ROS. The body is also exposed to free radicals from environmental exposures, such as cigarette smoke, air pollution, and ultraviolet radiation from the sun. ROS are part of signaling mechanisms among cells.

Q.38 How does the Zika Virus affect people?

Ans: *Brain of fetus*

Zika virus disease is caused by a virus transmitted primarily by Aedes mosquitoes. People with Zika virus disease can have symptoms that can include mild fever, skin rash, conjunctivitis, muscle and joint pain, malaise or headache.

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Q.39 What are C3 plants and why C3 plants are called the plants of future?

Ans: *Almost all plant life on Earth can be broken into two categories based on the way they assimilate carbon dioxide into their systems. C3 plants include more than 95 percent of the plant species on earth. (Trees, for example, are C3 plants.) C4 plants include such crop plants as sugar cane and corn. They are the second most prevalent photosynthetic type. During the first steps in CO₂ assimilation, C3 plants form a pair of three carbon-atom molecules. C4 plants, on the other hand, initially form four carbon-atom molecules. It turns out that the important difference between C3 and C4 species for rising CO₂ levels is that C3 species continue to increase photosynthesis with rising CO₂, while C4 species do not. So, C3 plants that can respond readily to higher CO₂ levels, and C4 plants can make only limited responses. Thus increased CO₂ likely will mean that some plant species will be stronger, more prolific, and may overwhelm those less able to benefit. The nature of plant populations in various areas probably will change; more sedges in place of grasses in marshlands, for example, consequences we don't yet know. At our research sites, we are looking at how these different classes of plants respond to increased CO₂ levels, and the broader implications for the ecosystems in which they live. C3 plants are called the plants of future as They are better adapted for high conc. of CO₂.*

Q.40 Where does the term “Microbiota” used?

Ans: *Useful microorganism resides in the body*

A microbiota is "the ecological community of commensal, symbiotic and pathogenic microorganisms that literally share our body space". Joshua Lederberg coined the term, emphasizing the importance of microorganisms inhabiting the human body in health and disease.

Q.41 Which nutrient is responsible for regulating body clock?

Ans: *Magnesium*

An essential mineral in our diets has an unexpected role in helping living things remain adapted to the rhythms of night and day, scientists have found. Magnesium – a nutrient found in many foods – helps control how cells keep their own form of time to cope with the natural environmental cycle of day and night. Scientists found that this oscillation was critical to sustain the 24-hour clock in cells. They were surprised to discover that it also had an enormous impact on metabolism in cells – how fast cells can convert nutrients into energy – throughout the course of a day. magnesium levels were linked to the cells' ability to burn energy (adenosine triphosphate, ATP). It was already known that magnesium is essential to help living things convert food into fuel, but scientists were surprised to discover that it also controls when this biological function takes place, and how efficiently.

Q.42 What is the Base of parental law suit used now a days in forensic technique?

Ans: *DNA fingerprinting*

DNA profiling (also called DNA fingerprinting, DNA testing, or DNA typing) is a forensic technique used to identify individuals by characteristics of their DNA. A DNA profile is a small set of DNA variations that is very likely to be different in all unrelated individuals, thereby being as unique to individuals as are fingerprints (hence the alternate name for the technique). DNA profiling should not be confused with full genome sequencing.[1] First developed and used in 1985,[2] DNA profiling is used in, for example, parentage testing and criminal investigation, to identify a person or to place a person at a crime scene, techniques which are now employed

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globally in forensic science to facilitate police detective work and help clarify paternity and immigration disputes.

Although 99.9% of human DNA sequences are the same in every person, enough of the DNA is different that it is possible to distinguish one individual from another, unless they are monozygotic ("identical") twins.[4] DNA profiling uses repetitive ("repeat") sequences that are highly variable,[4] called variable number tandem repeats (VNTRs), in particular short tandem repeats (STRs). VNTR loci are very similar between closely related humans, but are so variable that unrelated individuals are extremely unlikely to have the same VNTRs. The modern process of DNA profiling was developed in 1988.

Q.43 Which technology is used while taking Insulin through injection ?

Ans: rDNA technology

Recombinant DNA (rDNA) molecules are DNA molecules formed by laboratory methods of genetic recombination (such as molecular cloning) to bring together genetic material from multiple sources, creating sequences that would not otherwise be found in the genome. Recombinant DNA is possible because DNA molecules from all organisms share the same chemical structure. They differ only in the nucleotide sequence within that identical overall structure.

Q.44 What is the essential requirement during Organ transplantation?

Ans: MHC compatibility

The major histocompatibility complex (MHC) is a set of cell surface proteins essential for the acquired immune system to recognize foreign molecules in vertebrates, which in turn determines histocompatibility. The main function of MHC molecules is to bind to peptide fragments derived from pathogens and display them on the cell surface for recognition by the appropriate T-cells.[1] MHC molecules mediate interactions of leukocytes, also called white blood cells (WBCs), which are immune cells, with other leukocytes or with body cells. The MHC determines compatibility of donors for organ transplant, as well as one's susceptibility to an autoimmune disease via cross reacting immunization. In humans, the MHC is also called the human leukocyte antigen (HLA).

Q.45 Name the medicine that is given at the time of Organ transplantation.

Ans: Immunosuppressants are drugs or medicines that lower the body's ability to reject a transplanted organ. Another term for these drugs is anti-rejection drugs. There are 2 types of immunosuppressants: Induction drugs: Powerful antirejection medicine used at the time of transplant.

Q.46 According to Human Genome project how many genes are present in humans?

Ans: 20,500

The Human Genome Project (HGP) is an international scientific research project with the goal of determining the sequence of chemical base pairs which make up human DNA, and of identifying and mapping all of the genes of the human genome from both a physical and functional standpoint.

Q.47 Which element now a days is used in Pace maker?

Ans : Lithium battery

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Introduction of a lithium iodine battery in 1975 greatly extended the pacemaker battery life (more than 10 years for some models) and replaced the mercury-zinc battery. Lithium Primary batteries are used in pacemakers since they meet the requirements of long life, low drain current and voltage characteristics. The shelf life of primary lithium cells is typically equivalent to a 10% loss of capacity over five years. This compares with a similar loss for alkaline cells over only one year. The long shelf life of lithium batteries arises from the lithium metal surface becoming passivated by reaction with the electrolyte. All lithium systems are said to be thermodynamically unstable but kinetically stable. They produce no gas and hence they can be hermetically sealed.

Q.48 What is the alternative name of H1N1 virus?

Ans: *Swine influenza A (H1N1)*

Influenza A (H1N1) virus is the subtype of influenza A virus that was the most common cause of human influenza (flu) in 2009, and is associated with the 1918 outbreak known as the Spanish Flu.

It is an orthomyxovirus that contains the glycoproteins haemagglutinin and neuraminidase. For this reason, they are described as H1N1, H1N2 etc. depending on the type of H or N antigens they express with metabolic synergy. Haemagglutinin causes red blood cells to clump together and binds the virus to the infected cell. Neuraminidase are a type of glycoside hydrolase enzyme which help to move the virus particles through the infected cell and assist in budding from the host cells.

Some strains of H1N1 are endemic in humans and cause a small fraction of all influenza-like illness and a small fraction of all seasonal influenza. H1N1 strains caused a small percentage of all human flu infections in 2004–2005. Other strains of H1N1 are endemic in pigs (swine influenza) and in birds (avian influenza).

In June 2009, the World Health Organization (WHO) declared the new strain of swine-origin H1N1 as a pandemic. This strain is often called swine flu by the public media. This novel virus spread worldwide and had caused about 17,000 deaths by the start of 2010. On August 10, 2010, the World Health Organization declared the H1N1 influenza pandemic over, saying worldwide flu activity had returned to typical seasonal patterns.

Q.49 Which organism is used in biofuels?

Ans: *Jatropha*

Jatropha curcas is a species of flowering plant in the spurge family, Euphorbiaceae, that is native to the American tropics, most likely Mexico and Central America. It is cultivated in tropical and subtropical regions around the world, becoming naturalized in some areas. The specific epithet, "curcas", was first used by Portuguese doctor Garcia de Orta more than 400 years ago and is of uncertain origin. Common names include Barbados nut, purging nut, physic nut, or JCL (abbreviation of Jatropha curcas Linnaeus).

J. curcas is a poisonous, semi-evergreen shrub or small tree, reaching a height of 6 m (20 ft). It is resistant to a high degree of aridity, allowing it to be grown in deserts.

The seeds contain 27-40% oil (average: 34.4%) that can be processed to produce a high-quality biodiesel fuel, usable in a standard diesel engine. The seeds are also a source of the highly poisonous toxalbumin curcin or jatrophin.

Q.50 What structure and function that Venkatraman Ramakrishnan studied which enabled him to win the noble prize in medicine in 2009?

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Ans: *For how ribosome looks like and how it functions at the atomic level. All three have used a method called X-ray crystallography to map the position for each and every one of the hundreds of thousands of atoms that make up the ribosome. Inside every cell in all organisms, there are DNA molecules. They contain the blueprints for how a human being, a plant or a bacterium, looks and functions. But the DNA molecule is passive. If there was nothing else, there would be no life. The blueprints become transformed into living matter through the work of ribosomes. Based upon the information in DNA, ribosomes make proteins: oxygen-transporting hemoglobin, antibodies of the immune system, hormones such as insulin, the collagen of the skin, or enzymes that break down sugar. There are tens of thousands of proteins in the body and they all have different forms and functions. They build and control life at the chemical level.*

Q.51 Why RNA is considered as 1st molecule that is evolved in central dogma?

Ans: *Because it gives rise to protein as well as DNA. According to this hypothesis, RNA stored both genetic information and catalyzed the chemical reactions in primitive cells. Only later in evolutionary time did DNA take over as the genetic material and proteins become the major catalyst and structural component of cells. If this idea is correct, then the transition out of the RNA world was never complete; as we have seen in this chapter, RNA still catalyzes several fundamental reactions in modern-day cells, which can be viewed as molecular fossils of an earlier world.*

Q.52 Which new chemical method has been discovered to immobilize uranium in contaminated groundwater, which could lead to more precise and successful water remediation efforts at former nuclear sites.?

Ans. *Calcium and phosphate work together chemically to immobilize uranium, which is shown to lead to increased cancer risk and liver damage in humans when ingested. PROCESS: In three different types of experiments conducted in Giammar's lab, the researchers first determined the exact level of calcium in the water. They were then able to add specific amounts of phosphate that formed calcium phosphate, chemically neutralizing and structurally incorporating the uranium. The exact combination of calcium and added phosphate rendered the uranium inert and trapped it in the groundwater.*

Q.53 Which type of device has been developed for cost-effective gas sensors.?

Ans. *A pioneering team has created a new type of device that emits light in the infrared part of the spectrum. Many important gases strongly absorb infrared light and this characteristic absorption can be used as a way of sensing them. The new sensors could be used for a diverse range of applications including the sensing of atmospheric pollutants such as nitrogen dioxide, which is emitted from car exhausts and which can have a significant effect on public health.*

Q.54 Which new fuel cell has been developed to generate electricity from urine?

Ans. *A microbial fuel cell is a device that uses natural biological processes of 'electric' bacteria to turn organic matter, such as urine, into electricity. These fuel cells are efficient and relatively cheap to run, and produce nearly zero waste compared to other methods of electricity generation.*

Q.55 Researchers involved in an international study, in which the UPV/EHU-University of the Basque Country has participated, and have stabilised chains of more than _____ carbon atoms using double-walled nanotubes.

A) 5000 B) 6400 C) 7000 D) 100

Ans. *B) 6400*

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REASON. *To do this, they used the confined space inside a double-walled carbon nanotube as a nano-reactor to make the ultra-long carbon chains grow and also to provide the chains with great stability. This stability is tremendously important for future applications.*

Q.56 Which catalyst has been developed that can efficiently and selectively convert carbon dioxide to ethylene?

Ans. *Nitrogen-rich graphene dotted with copper nanoparticles*

Q.57 Which device has been created that can identify tiny amounts of explosive particles invisible to the naked eye?

Ans *ExDtectcrated by the brainchild of Loughborough professor John Tyre*

Q.58 Which new type of hybrid ink has been customized that allows electronic circuits to be applied to paper directly from a pen ?

Ans. *Research scientists at INM have combined the benefits of organic and inorganic electronic materials in a new type of hybrid inks. This requires printable electronic materials that can be printed and retain a high level of conductivity during usage in spite of their curved surfaces.*

Q.59 What kind of new biological-solar (bio-solar) cells have been developed?

Ans. *For the first time ever, researchers connected nine biological-solar (bio-solar) cells into a bio-solar panel. Then they continuously produced electricity from the panel and generated the most wattage of any existing small-scale bio-solar cells -- 5.59 microwatts.*

Q.60 How does sleeping sickness parasite streamlines it's own way?

Ans: *Researchers from Umeå University in Sweden have discovered that the single-celled parasite causing African sleeping sickness has a defence mechanism against potential pharmaceuticals under development against the disease. The deadly parasite has an enzyme that can cleave and hence disarm adenosine analogue pharmaceuticals. "Up until now, researchers have been unaware of why some pharmaceuticals based on adenosine analogues work against sleeping sickness whereas others don't," says Anders Hofer, researcher at the Department of Medical Biochemistry and Biophysics and last author of the article in the Journal of Biological Chemistry. "We are now able to show that the parasite has an enzyme able to cleave some of the adenosine analogues and this gives us an idea of why some drugs don't work."*

Q.61 How nanostructure grown on fabric used to mop up oil slips?

Ans: *We used nylon, but in principle any fabric could work. We took commercially available nylon that already had a seed layer of silver woven into it which makes it easier to carry out the next part of the process – addition of the copper.*

"We then dipped this fabric into a vat where a copper layer was electrochemically deposited onto it. "Now with a copper coating, we converted the fabric into a semiconducting material with the addition of another solution that causes nanostructures to grow on the fabric's surface - the key to its enhanced properties.

"The nanostructures are like tiny rods that cover the surface of the fabric. Water just runs straight off it but the rods attract and hold oil.

"Also, when the fabric is saturated it allows the oil to permeate where it then acts like a sieve to separate oil and water."

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Q.62 What is “Molecular Robot”?

Ans: *Scientists from university of Manchester have created world’s first molecular robot – millionth of a millimeter in size. It is made up of just 150 carbon, hydrogen, oxygen and nitrogen atoms, which are basic building blocks required to form molecules.*

The molecular robot operates by carrying out chemical reactions in special solutions which can then be controlled and programmed by scientist to perform the basic tasks. It is so small, that it massively reduces demand for materials, reduce power requirements and can accelerate and improve drug discovery and rapidly increase the miniaturization of other products. It can be used for medical purposes, advanced manufacturing process and even building molecular factories and assembly lines.

Q.63 How do bats and other small mammals act as disease reservoirs?

Ans *Many high-profile epidemics caused by viruses have been traced to bats and several species of small mammals. These animals seem especially adept at harbouring and spreading diseases. Scientists are also discovering new bat-borne viruses all the time. There is also sufficient evidence about their role in the natural cycle of Kyasanur forest disease (KFD), dengue and Ebola. Bats are suspected to be involved in Zika too. Bats can, therefore, be called zoonotic reservoirs.*

Q.64 Explain the way of reducing the transportation cost of heavy oil?

Ans: *The project consists of mixing the oil with water with the aid of biosurfactants (substances that allow an emulsion to form), which are derived from plant biomass, trees, grass, as well as corn and wheat residue, and contain particular molecules. By making the emulsion, oil viscosity is substantially reduced. "We are talking about a virtually solid oil, and when we emulsify it in water, the resulting viscosity is equivalent to that of a liquid flowing without any problems. Furthermore, the process does not change the composition and properties of the hydrocarbon," Dr. Anell said.*

Q.65 What is the percentage composition by mass of dark matter in universe?

Ans: *FOR every gram of visible matter in the universe that emits and absorbs light—matter that makes up all the stars and galaxies in the cosmos—there is more than 5 grams of matter out there that is completely invisible or “dark”, stuff that does not interact with any form of electromagnetic radiation at all but interacts only via gravity. That is, unlike electrons and other fundamental particles of nature that interact both through gravity and electric charge, dark matter does not seem to have any other interaction except gravitation.*

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Branches of Science

Mainly science is divided into following four branches:

- 1) Natural sciences : *Study of fundamental forces and biological science*
- 2) Formal science : *Study of mathematics and logic*
- 3) Social sciences : *Human behavior and societies*
- 4) Applied science : *Engineering and Medicine*

Various branches of Physics

- 1) Astronomy : *Study of space and universe.*
- 2) Thermodynamics : *Study of matter at different temperature*
- 3) Oceanography : *Exploration of ocean*
- 4) Meteorology : *Study of atmosphere ,weather and climate*
- 5) Epistemology : *Philosophy and History of Science*
- 6) Photonics : *Study of photons*
- 7) Mechanics : *Study of simple machines*
- 8) Optics : *Study of light*
- 9) Acoustics : *Study of sound*
- 10) Nuclear Physics : *Study of behavior of nucleons or sub atomic particles*

Various branches of Chemistry

- 1) Physical chemistry : *Study of physical and fundamental basis of chemical system and process*
- 2) Organic chemistry : *Study of compounds of carbon and hydrogen , the structure , properties, composition mechanism and reactions of organic compounds*
- 3) Inorganic chemistry : *Study of properties and reactions of inorganic compounds*

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- 4) Bio-Chemistry : *Study of chemistry inside living organism*
- 5) Pharmacology : *Branch of medicine and biology concerned with the study of drug action along with the chemical effect*
- 6) Analytical Chemistry : *Analysis of material sample to gain an understanding of their chemical Composition and structure*
- 7) Femto-Chemistry : *Area of physical chemistry that studies chemical reaction on extremely short time scale*

Various branches of Biology

- 1) Anatomy : *Study of inner structure of organism*
- 2) Bacteriology : *Study of bacteria*
- 3) Biotechnology : *Study of combination of biology and technology to convert natural resource to useful form*
- 4) Botany : *Study of plants and their uniqueness*
- 5) Ecology : *Study of interrelation between organism and environment*
- 6) Embryology : *Study of growth of embryo from zygote to grown up*
- 7) Endocrinology : *Study of hormone present in body*
- 8) Entomology : *Study of all aspects of insect life*
- 9) Evolution : : *Study of the change occurring in organism slowly and in a long time until a new species is formed*
- 10) Physiology : *Study of internal working of organism*
- 11) Genetics : : *Study process of inheriting qualities in organism*
- 12) Histology : *Study of structure and tissues of organism*