Q.1) Consider the following statements with regard to Aqua Regia.

1. It is a mixture of nitric acid and hydrochloric acid.
2. It is also known as royal water.
3. It is used to separate gold and silver.

Which of the above statements is/are correct?

a) 1 only
b) 2 only
c) 1, 2 and 3 only
d) 2 and 3 only

Q.1) Solution (c)

Aqua Regia ("royal water" or "king's water") is a mixture of **nitric acid and hydrochloric acid,** optimally in a molar ratio of 1:3. Aqua Regia is a yellow-orange fuming liquid, so named by alchemists because **it can dissolve the noble metals gold and platinum, though not all metals. It is used to separate gold and silver.**

Do you know?

- Pickles are always stored in glass jar because acid present in them reacts with the metal of metallic pot.

THINK!

- Oil of vitriol

Q.2) Which of the following are artificial sweeteners?

1. Saccharin
2. Aspartame
3. Alitame
4. Sucralose

Select the correct answer using the codes given below.

a) 1 and 2 only
b) 2 and 3 only
c) 2, 3 and 4 only
d) All the above

Q.2) Solution (d)

A sugar substitute is a food additive that provides a sweet taste like that of sugar while containing significantly less food energy. Some sugar substitutes are produced by nature, and others produced synthetically.

The world's most commonly used artificial sweetener, **sucralose is a chlorinated sugar** that is about 600 times as sweet as sugar. It is produced from sucrose when three chlorine atoms replace three hydroxyl groups.

Aspartame is an odorless, white crystalline powder that is derived from the two amino acids aspartic acid and phenylalanine. It is about 200 times as sweet as sugar and can be used as a tabletop sweetener or in frozen desserts, gelatins, beverages, and chewing gum.

Saccharin was the first artificial sweetener and was originally synthesized in 1879 by Remsen and Fehlberg. Its sweet taste was discovered by accident. It had been created in an experiment with toluene derivatives. A process for the creation of saccharin from phthalic anhydride was developed in 1950, and, currently, saccharin is created by this process as well as the original process by which it was discovered.

Alitame is an aspartic acid-containing dipeptide sweetener. It was developed by Pfizer in the early 1980s and currently marketed in some countries under the brand name Aclame. Most dipeptides are not sweet, but the unexpected discovery of aspartame in 1965 led to a search for similar compounds that shared its sweetness. Alitame is one such second-generation dipeptide sweetener. Neotame, developed by the owners of the NutraSweet brand, is another.

Do you know?

- An antioxidant is a molecule that inhibits the oxidation of other molecules. Oxidation is a chemical reaction that can produce free radicals, leading to chain reactions that may damage cells.

THINK!

- Sources of antioxidants

Q.3) Consider the following pairs.

Thermoplastic	Uses
1. Polythene	Bottles
2. Teflon	Containers and pipes that come in contact with reactive chemicals.
3. Polyvinyl chloride	coats, jackets and upholstery

Which of the above pairs is/are correctly matched?

a) 1 and 2 only
b) 2 and 3 only
c) 1, 2 and 3
d) 2 only

Q.3) Solution (c)

Polyethylene

Polyethylene (or polyethene, polythene, PE) is a family of materials categorized according to their density and molecular structure. For example, ultra-high molecular weight polyethylene (UHMWPE) is tough and resistant to chemicals, and it is used to manufacture moving machine parts, bearings, gears, artificial joints and some bulletproof vests. High-density polyethylene (HDPE) is used to make milk jugs, margarine tubs and water pipes. Medium-density polyethylene (MDPE) is used for packaging film, sacks and gas pipes and fittings. Low-density polyethylene (LDPE) is soft and flexible and is used in the manufacture of **squeeze bottles, sacks and sheets.**

Polyvinyl chloride (PVC) is a tough, lightweight material that is resistant to acids and bases. Much of it is used by the construction industry, such as for vinyl siding, drainpipes, gutters and roofing sheets**. It is also converted to flexible forms with the addition of plasticizers, thereby making it useful for items such as hoses, tubing, electrical insulation, coats, jackets and upholstery.** Flexible PVC is also used in inflatable products, such as water beds and pool toys.

Teflon is the brand name given by DuPont Corp. for a polymer called polytetrafluoroethylene (PTFE), which belongs to a class of thermoplastics known as fluoropolymers. It is famous as a coating for non-stick cookware**. Being chemically inert, it is used in making containers and pipes that come in contact with reactive chemicals**. It is also used as a lubricant to reduce wear from friction between sliding parts, such as gears, bearings and bushings.

Do you know?

- Polystyrene is manufactured in various forms that have differing applications. Extruded polystyrene (PS) is used in the manufacture **of disposable cutlery, CD and DVD cases, plastic models of cars and boats, and smoke detector housings.**

THINK!

- Bakelite
- Melamine

Q.4) Which of the following are synthetic fibers?

1. Rayon
2. Nylon
3. Polyester
4. Acrylic

Select the correct answer using the codes given below.

a) 1 and 2 only
b) 2 and 3 only
c) 2, 3 and 4 only
d) All the above

Q.4) Solution (d)

Types of Synthetic fibers-

- Rayon
- Nylon
- Polyester
- Acrylic are some synthetic fibers.

Rayon: Rayon is made from wood (artificial silk) pulp, a naturally- occurring, cellulose- based raw material. Rayon is moisture- absorbent and comfortable to wear.

Uses:

- Home furnishings such as bedspreads, bed sheets, blankets, curtains, tablecloth, carpets etc. are made from rayon fiber, as it has a silky lustre.
- It is strong fiber, it is used in automobile tyre cords.
- It is used to make apparel such are suits, jackets, slacks etc.

Nylon was the first synthetic fiber to be made entirely from chemicals. Basic raw materials for the production of nylon are coal, petroleum oil, water and air. Nylon fiber is very strong and elastic. It is light and wrinkle- resistant. It is easy to wash and absorbs very little water.

Uses:

- Garments such as saris are made from nylon. Since it is wear resistant, garments made from it last for a long time.
- Being very strong, nylon fiber is used to make ropes, tents, fishing nets and parachutes.
- It is also used to make toothbrushes, combs, zip fasteners and machine parts.

Polyester: Polyester is a polymer of many ester units. Polyester is manufactured from petroleum Polyester fibers are extremely strong, very durable, resistant to most chemicals and do not get wrinkled easily. Polyester does not absorb water, so it dries quickly. PET (Polyethylene terephthalate), the commonly used polyester, is made from two monomers by condensation polymerization.

Uses:

- Polyester is used to make pants, shirts, suits and bed sheets either by itself or as a blend.
- Its water- resistant property makes it ideal for garments & jackets that are to be used in wet or damp environments.

Acrylic: Acrylic is a light weight soft and warm synthetic fabric which has a wool like feel. It does not shrink is wrinkle- resistant and cheaper than wool. It can also be dyed very well in a variety of color.

Uses:

- Strong & warm, acrylic fiber is often used for making sweaters and tracksuits and as linings for boots and gloves as well as in furnishing fabrics and carpets.
- It is used in craft yarns, boat sails and vehicle covers.

Do you know?

- Glass wool is an insulating material made from fibres of glass arranged using a binder into a texture similar to wool.

THINK!

- Glass fiber.

Q.5) Consider the following pairs.

Drugs	Uses
1. Antipyretics	These drugs kill another organism and check the growth (spread) of virus and bacteria.
2. Antiseptics	This is specially used to prevent blood to be polluted and in cleaning wounds
3. Antibiotics	They are used as body pain reliever and in the form of

	medicine of fever etc

Which of the above pairs is/are correctly matched?

a) 1 and 2 only
b) 2 and 3 only
c) 1, 2 and 3
d) 2 only

Q.5) Solution (d)

Antiseptics: Antiseptic drugs are helpful in killing micro organism (virus and bacteria) and in preventing its spread. **This is specially used to prevent blood to be polluted and in cleaning wounds by suitable antiseptics.** There are three antiseptic substances which are today frequently used in making antiseptics as suggested by Semmelwies, Lister and Koch. Some antiseptic drugs which are commonly used are Iodine, Hypochlorous acid, Ethyl alcohol, phenols Hexachlorophene, Formaldehydes, Hydrogen peroxide, Acriflavine etc.

Antipyretics: Antipyretics are used as body pain reliever and in the form of medicine of fever etc. Some important antipyretic drugs are- Asprin, Crocin, Phenacitin, Pyromidin etc.

Antibiotics: Antibiotic drugs are prepared by microorganism; moulds, fungi etc and these **drugs kill another organism and check the growth (spread) of virus and bacteria**. The firstly Alexander Flemming invented the drug Penicillin (antibiotic) in 1929 which is used a destroyer of virus, bacteria and fungi. Some more important antibiotics which are used frequently are- Tetracycline, Cephalosporin, Streptomycin, Gentamycin, Rifamycin, Chloromycitin etc.

Do you know?

- **Sulpha Drugs:** These drugs are mainly composed from sulphur and nitrogen and such drugs are sharply effective against certain organisms. Some sulpha drugs are used specially for animals. The first sulpha drug was sulphanilamide invented and formed in 1908. Some important sulpha drugs are- Sulphanilamide, Sulphadigine, Sulpha pyridine, Sulphathiogol etc.

THINK!

- Anesthesia

Q.6) After white washing, within two or three days a shiny finish appears on walls. With reference to this, which of the following statements is correct?

a) The solution used for white washing reacts slowly with oxygen to give a shiny finish.
b) Formation of Calcium carbonate (CaCO3) gives a shiny finish to the walls.
c) Precipitation of Aluminum oxide on the surface of the walls.
d) None of the above

Q.6) Solution (b)

A solution of slaked lime (Ca(OH)2) is used for white washing walls. Calcium hydroxide reacts slowly with the carbon dioxide in air to form a thin layer of calcium carbonate on the walls. Calcium carbonate (CaCO3) is formed after two to three days of white washing and gives a shiny finish to the walls. The chemical formula for marble is also CaCO3.

Do you know?

- Calcium carbonate contains vitamin D which is essential for human body. Calcium carbonate is used as a dietary calcium supplement. Calcium carbonate makes bones and teeth strong and healthy. It can be used for disease like heart burn, high potassium osteoporosis, over active thyroid and so on.

THINK!

- Potash Alum

Q.7) The term 'Rancidity' refers to:

a) Decrease in pH of soil after acid rain.
b) Oxidation of unsaturated fat present in food products causing unpleasant odor or flavor.
c) Conversion of basic solution into acidic due to addition of hydrogen ions.
d) The process of formation of photochemical smog.

Q.7) Solution (b)

Rancidity is a condition produced by aerial oxidation of unsaturated fat present in foods and other products marked by unpleasant odor or flavor.

When a fatty substance is exposed to air, its unsaturated components are converted into hydroperoxides, which break down into volatile aldehydes, esters, alcohols, ketones, and hydrocarbons, some of which have disagreeable odors.

Butter becomes rancid by the foregoing process and by hydrolysis, which liberates volatile and malodorous acids, particularly butyric acid.

To prevent it antioxidants are added to foods containing fats and oil. Keeping food in air tight containers help to slow down the process.

Do you know?

- Similar to rancidification, oxidative degradation also occurs in other hydrocarbons, such as lubricating oils, fuels, and mechanical cutting fluids.

THINK!

- Fermentation

Q.8) Which of the following statements are correct regarding Parker Solar Probe of NASA?

1. It is a robotic spacecraft to probe the outer corona of the sun.
2. It will stay at Lagrange Point 1 to study the sun's atmosphere.
3. It is the first ever mission to be named after a living person.

Select the code from following:

a) 1 only
b) 2 and 3
c) 1 and 2
d) 1 and 3

Q.8) Solution (d)

Parker Solar Probe

Parker Solar Probe (previously Solar Probe, Solar Probe Plus, or Solar Probe+) is a planned NASA robotic spacecraft to probe the outer corona of the Sun. It will approach to within 8.86 solar radii (6.2 million kilometers or 3.85 million miles) from the 'surface' (photosphere) of the Sun.

The project was announced in the fiscal 2009 budget year. Johns Hopkins University Applied Physics Laboratory designed and built the spacecraft, which was originally scheduled to launch in 2015.The launch date has since been rescheduled to the summer of 2018. This was the first time a NASA spacecraft was named after a living person, honoring physicist Eugene Parker.

Think

- Aditya L1

- Solar Flair

Q.9) Which of the following statements correctly explains 'DigiShala'?

a) It is a digital wallet developed by Ministry of Communication to promote digital payments in rural areas.
b) These are temporary schools developed in rural India to facilitate digital payments and create awareness regarding the same.
c) It is a free Doordarshan DTH channel, launched to educate and inform the people about the various modes of digital payments.
d) It is a program of Miety to create awareness about digital India in schools.

Q.9) Solution (c)

DigiShala

DigiShala, a free Doordarshan DTH channel is launched to educate and inform the people about the various modes of digital payments. DigiShala will be available through GSAT15 (DD Direct DTH), 93.5 degree East, Receive frequency: 11590 Mhz

The channel will help people understand the use of unified payments interface (UPI), USSD, aadhaar-enabled payments system, electronic wallets, debit and credit cards.

A website was also launched which will serve as a repository of knowledge regarding digital payments.

Both the channel and website were launched as a part of the '**Digi Dhan Abhiyan'**, a campaign conceptualized by the IT ministry to enable every citizen, small trader and merchant to adopt digital payments in their everyday financial transactions.

Significance: DigiShala will enable and empower every citizen of the country, especially farmers, students, Dalits and women in rural areas to learn the usefulness and benefits of digital payment in our everyday life to adopt the same on a mass scale

The provision of digital literacy to semi-urban and rural sector of the economy has become the major focus area for the government

Think

Swayam and Swayam Prabha

Q.10) Which of the following statements are correct regarding 'AmbuSens'?

1. It is a wireless technology developed to monitor condition of those patients who are ferried in Ambulances.
2. It is an app developed by researchers in IIT Kharagpur to locate the nearest ambulance in case of emergency.
3. The AmbuSens system includes both hardware and software.

Select the code from following:

a) 1 and 2
b) 2 and 3
c) 1 and 3
d) All of the above

Q.10) Solution (c)

AmbuSens

Indian Institute of Technology, Kharagpur has developed a wireless technology called 'AmbuSens' for remote monitoring of condition of those patients who are ferried in ambulances.

The AmbuSens system includes both hardware and software. The ambulance and the hospitals will have laptops or tablets with internet connection to continuously monitor the health condition of the patients in real-time.

The patients will be fitted with wireless body sensors. The technology will monitor the parameters like ECG, heart-rate, temperature and blood-pressure and can ensure remote monitoring of the patient's condition even before they reach the hospital.

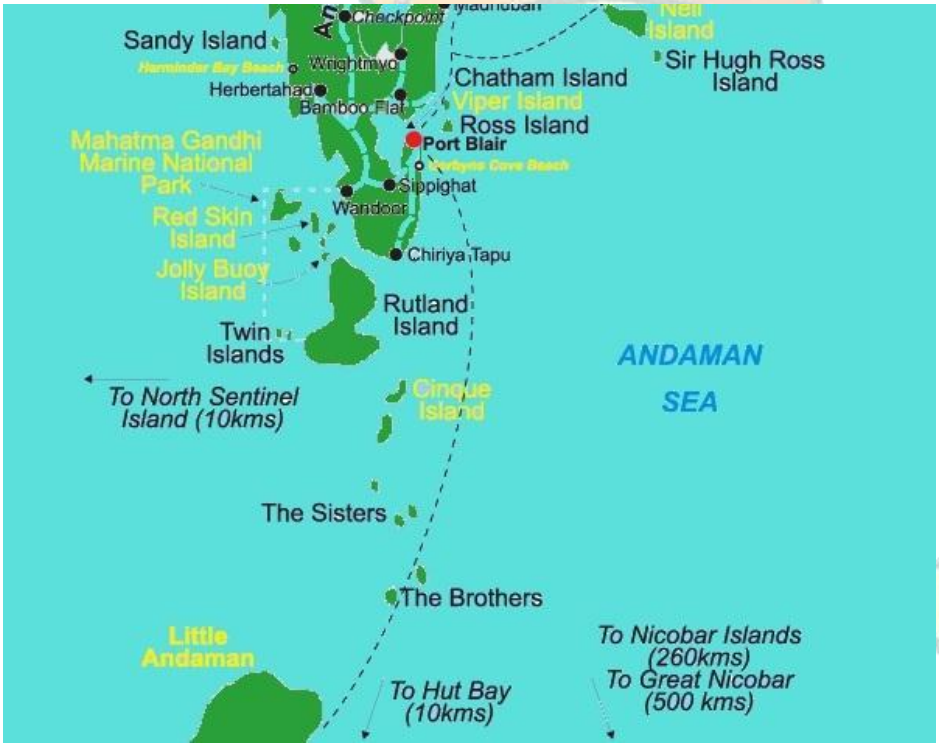
Q.11) The National Board of Wildlife has approved Rutland Island to be the site for the country's long-range missile test facility. Where is Rutland Island Located?

a) Andaman and Nicobar Islands
b) Odisha Coast
c) Goa Coast
d) Lakshadweep

Q.11) Solution (a)

The National Board of Wildlife has approved Rutland Island in South Andaman to be the site for the country's long-range missile test facility. DRDO has been seeking the approval for the test facility since 2012. Taking into account the strategic importance of the project for country's defence, the Standing Committee of the National Board of Wildlife has approved the project.

The island is located at an ideal distance from the mainland where tests are typically launched from. The test facility is vital for DRDO's plans to have a comprehensive testing facility in order to identify and track long-range missile tests. DRDO also requires a land-based test area to accurately track its long range missiles. The Rutland Island is ideally located due to its distance from mainland.



Think

- Chandipur
- Wheeler Island

Q.12) The World's first hybrid 'Aeroboat' has been developed by a joint venture of India and Russia. Which of the following statements regarding aeroboat are correct?

1. The aeroboat is capable of travelling on land, water, snow and sand.
2. Aeroboats are much faster and robust when compared to hovercrafts.
3. It is capable of take off without runway and can fly in all weather conditions.

Select the code from following:

a) 1 and 2
b) 2 and 3
c) 1 and 3
d) All of the above

Q.12) Solution (a)

Aeroboat

The world's first hybrid "aeroboat" capable of travelling on land, water, snow and sand has been built by an Indo-Russian joint venture. The aeroboat was unveiled in Moscow on Tuesday at a start-ups event organised by Russia's state-run Skolkovo Foundation.

All about the world's first hybrid aeroboat:

- The aeroboat is capable of travelling on land, water, snow and sand. It has been designed to access difficult terrain, such as flooded or marshy areas in which the regular boats cannot handle because of shallow water, patches of dry land or by marine vegetation
- The aeroboat can handle steep slopes and embankments without the requirement of marine infrastructure, such as jetties
- It will have room for 10 passengers and one crew member
- Aeroboats are much faster and robust when compared to hovercrafts. They are capable of moving at the speed of around 150 kmph or more on water, while hovercrafts can move at around 45-50 kmph or more
- Unlike hovercrafts, aeroboats are cheaper to maintain and fuel. The aeroboat "hybrid" engine is capable of running on either petrol or electricity, thus helping in reducing the carbon emissions and improve energy efficiency
- While hovercrafts work on static air cushion, aeroboats function on dynamic air-cushion. The dynamic air-cushion feature provides a lot of advantage to aeroboats in terms of speed and manoeuvrability

- The amphibious aeroboats can provide high-speed year-round navigation even in frozen surfaces

- In India, these aeroboats will be very helpful for disaster management authorities, especially during the monsoon season.

Q.13) Which of the following statements correctly explains the 'Internet of Birds'?

a) Internet connectivity is provided to users using a collar for common urban birds which will emit radio waves.
b) It is a mechanism to trace the movement of endangered birds using a electromagnetic collar.
c) It is the name given to a network created by mobile internet devices.
d) It is a platform to identify birds from Indian Sub continent with the help of Artificial Intelligence.

Q.13) Solution (d)

Internet of Birds

Accenture Labs in Bengaluru and the Bombay Natural History Society (BNHS) in Mumbai have developed an Internet of Things-based platform that identifies birds.

The cloud-based software uses Artificial Intelligence (machine learning and computer vision) to recognise species from digital photographs.

Q.14) Ministry of Science and Technology has launched 'VAJRA' scheme to connect the Indian academic and research and development (R&D) systems to the best of global science and scientists for a sustained international collaborative research. Which of the following statements are correct regarding VAJRA scheme?

1. Under this scheme, foreign researchers abroad of Indian origin or otherwise can collaborate with faculties in public funded Indian institutions.
2. The VAJRA faculty can reside in India for a minimum of 1 month and a maximum of 3 months a year.
3. VAJRA Faculty is provided US Dollars 15000 in the first month of residence and US Dollars 10000 in each of the subsequent month.

Select the code from following:

a) 1 only
b) 2 and 3
c) 1 and 3
d) All of the above

Q.14) Solution (d)

'Visiting Advanced Joint Research (VAJRA) Faculty Scheme'

The Science and Engineering Research Board (SERB), a Statutory body of the Department of Science and Technology (DST) has recently launched a 'Visiting Advanced Joint Research (VAJRA) Faculty Scheme' to connect the Indian academic and research and development (R&D) systems to the best of global science and scientists for a sustained international collaborative research.

The scheme offers adjunct / visiting faculty assignments to overseas scientists, faculty members and R&D professionals including Non-resident Indians (NRI) and Overseas Citizen of India (OCI) to undertake high quality collaborative research in cutting edge areas of science and technology including interdisciplinary areas of priority such as energy, water, health, security, nutrition, materials and manufacturing, etc. with one or more Indian collaborators of public funded academic and research institutions of India.

The VAJRA Faculty should be an active researcher working in an overseas leading academic / research / industrial organization with significant accomplishments in R&D.

The initial Faculty assignment is given for a period of one year extendable to subsequent years based on the collaborative outcome and interest.

The residency period of VAJRA Faculty in the host institution would be for a minimum of 1 month and a maximum of 3 months every year. VAJRA Faculty is provided US Dollars 15000 in the first month of residence and US Dollars 10000 in each of the subsequent month. Presently, call for applications is made open for prospective researchers.

Q.15) With the boom of the bitcoin – a variety of cryptocurrency – the blockchain technology has come into prominence. What does this technology promise to do, even though it is still in its infancy?

a) Help facilitate secure, online transactions in a decentralized way
b) Keep out malware
c) Connect servers with common reasons for existence, remotely
d) Helps to remove inequality and promote inclusive development

Q.15) Solution (a)

What is blockchain?

Blockchain is the backbone technology on which bitcoins run. Simply put, it is a digital public ledger that records every transaction. Once a transaction is entered in the blockchain, it cannot be erased or modified.

Blockchain removes the need for using a trusted third party such as a bank to make a transaction by directly connecting the customers and suppliers. Each transaction is recorded to the ledger after verification by the network participants, mainly a chain of computers, called nodes.

Blockchain today may be compared to what the Internet was in the early 1990s. While we have witnessed how the 'Internet of Information' has changed our society over the past two decades, we are now entering a phase where blockchain may do the same by ushering in a new paradigm comprising 'Internet of Trust' and 'Internet of Value', as per a Deloitte and Assocham study.

Do you know?

Bitcoin is just one of the applications for the technology, whose use is being tested across industries. It is witnessing a lot of traction within India, in sectors such as banking and insurance. In most of these industries, players are coming together to form a consortium to realise the benefits of blockchain at an industry level.

For example, in India, there is a consortium 'BankChain' which has about 27 banks from India (including State Bank of India or SBI and ICICI) and the Middle East as its members. The consortium is exploring using usage of Blockchain technology to make business safer, faster and cheaper.

The Institute for Development and Research in Banking Technology (IDRBT), an arm of the Reserve Bank of India (RBI), is developing a model platform for blockchain technology.

What are the benefits?

The benefits of using blockchain will vary from case to case.

The major uses of blockchain technology are focused on the decentralized data storage, data immutability, and distributed ownership features.

Blockchain is expected to improve the efficiency of a transaction by eliminating the middlemen, while also reducing the cost of all transactions. It is also likely to increase

transparency. and bring down fraud as every transaction would be recorded and distributed on a public ledger.

What is happening in India?

A high-level committee, which consists of officials from the Ministries of Finance, Home Affairs and IT as well as SEBI, the RBI, SBI, and NITI Aayog, is currently deliberating on whether or not cryptocurrencies should be banned in India. However, the discussions till now are learnt to be in support of encouraging the use of blockchain technology.

Q.16) Water deep inside oceans doesn't freeze even when the temperature in the deep is extremely low. Why?

a) Difference in salinity
b) Warm ocean currents prevent freezing
c) Water deep inside the oceans is under very high pressure
d) Water deep inside the oceans is under low pressure

Q.16) Solution (c)

A liquid freezes when its body temperature falls below its freezing point and a solid melts when its body temperature rises above its melting point. Though the term, 'melting point,' means the temperature where the solid commences to melt and the term, 'freezing point,' means the temperature where the liquid commences to freeze, these two terms are numerically the same, for a given pure material. However, this value depends on the pressure whereat the change of state (phase) from liquid to solid or vice versa takes place. Handbooks tabulate data of melting points of various substances for a pressure of 1 atm.

There is a famous equation known in Thermodynamics as 'Clausius-Clapeyron Equation' after the nineteenth century European physicists, Rudolf Clausius and Paul Clapeyron that relates the temperatures of phase transformations (melting point is one among them) to the pressure, change of density (during the phase transformation) and the heat of such phase transformation (quantity of heat released or absorbed during the phase change).

According to this proven equation, the melting point of a solid increases when pressure is increased where the density of the solid is higher than that of its liquid. This is usually the case with many of the substances we see around. But the case of water is unusual; water has lower density in its solid state (ice form) than in its liquid state. That is why ice floats on water. For such anomalous substances, the 'Clasius-Clapeyron Equation' states that the melting point decreases with increased pressure. In other words, water can remain as liquid

water without freezing (or ice can readily melt) even when the temperature is below 0 C if it is under higher pressure (than 1 atm).

The water deep inside the oceans is under the heavy weight of the water held above it and is, effectively, experiencing very high pressure. So the 'ice' that should have been as 'frozen ice' has its melting point reduced so much extremely low that it is 'already molten' as liquid water; or that water is 'yet to freeze.' This is also a reason why in certain glaciers, water is still in liquid form below the sheets of ice.

Put your palm on an ice block and press it. You will see ice melting under your palm though the temperature there is considerably lower than 0 C.

Q.17) Water has the property of gradual freezing and melting due to

a) High specific heat capacity
b) High latent heat of fusion
c) High latent heat of vaporisation
d) Low specific gravity

Q.17) Solution (b)

High latent heat of fusion

Latent heat is the heat per mass unit required for a phase change to occur.

The heat of fusion, also known as the latent heat of fusion, is a category of latent heat describing the energy for the phase change between a liquid and a solid to occur without a change in temperature.

Q.18) Communication satellites need to be placed in geosynchronous orbits to be tracked by an Earth station from a fixed place. How high should the geosynchronous orbit be?

a) About 360 km
b) About 3,600 km
c) About 36,000 km
d) Anywhere between 360 km to 3,600 km

Q.18) Solution (c)

A geostationary orbit, geostationary Earth orbit (often referred to as geosynchronous equatorial orbit) (GEO) is a circular geosynchronous orbit 35,786 km (22,236 mi) above Earth's equator and following the direction of Earth's rotation. An object in such an orbit appears motionless, at a fixed position in the sky, to ground observers.

Do you know?

Communications satellites and weather satellites are often placed in geostationary orbits, so that the satellite antennae (located on Earth) that communicate with them do not have to rotate to track them, but can be pointed permanently at the position in the sky where the satellites are located.

Using this characteristic, ocean color satellites with visible and near-infrared light sensors (e.g. GOCI) can also be operated in geostationary orbit in order to monitor sensitive changes of ocean environments.

Q.19) Bionics is an interdisciplinary branch of science which has found use in many applications. Consider the following statements regarding Bionics:

1. It refers to the application of principles of Biology to engineering.
2. Bioengineering is a sub branch of Bionics.
3. Biomedical Engineers have designed artificial ears and artificial retinas that can restore hearing and sight to the people using Bionics.

Which of the above statements are correct?

a) 1 only
b) 1 and 3
c) 2 and 3
d) All of the above

Q.19) Solution (b)

Bionics is not a specialized science. It refers to the use of principles of biology to engineering. Now it is used more to describe a method to engineer organs that can replace diseased or non- functional organs in human body.

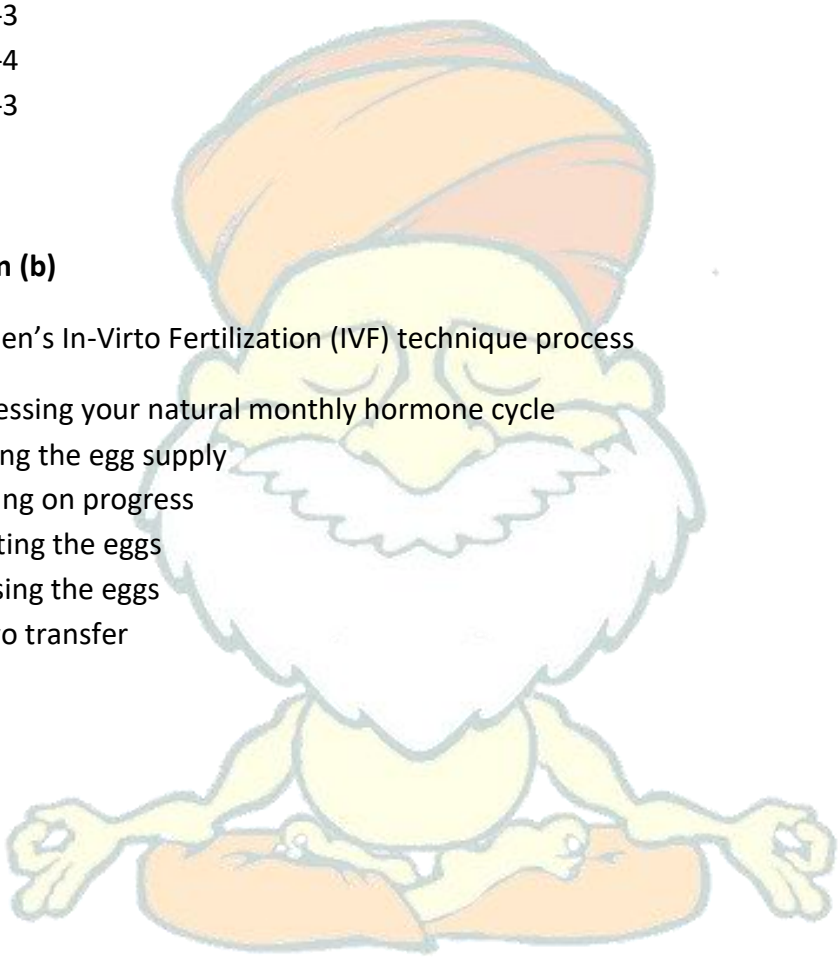
Bionics is different from bioengineering (or Biotechnology), which is the use of living things to perform industrial tasks like use of microbes to remove waste etc.

Q.20) In-Virto Fertilization (IVF) technique is gaining popularity. Consider the following steps in Women's IVF process and arrange it in its correct order of occurrence

1. Collecting the eggs
2. Boosting the egg supply
3. Embryo transfer
4. Fertilizing the eggs

Select the correct code

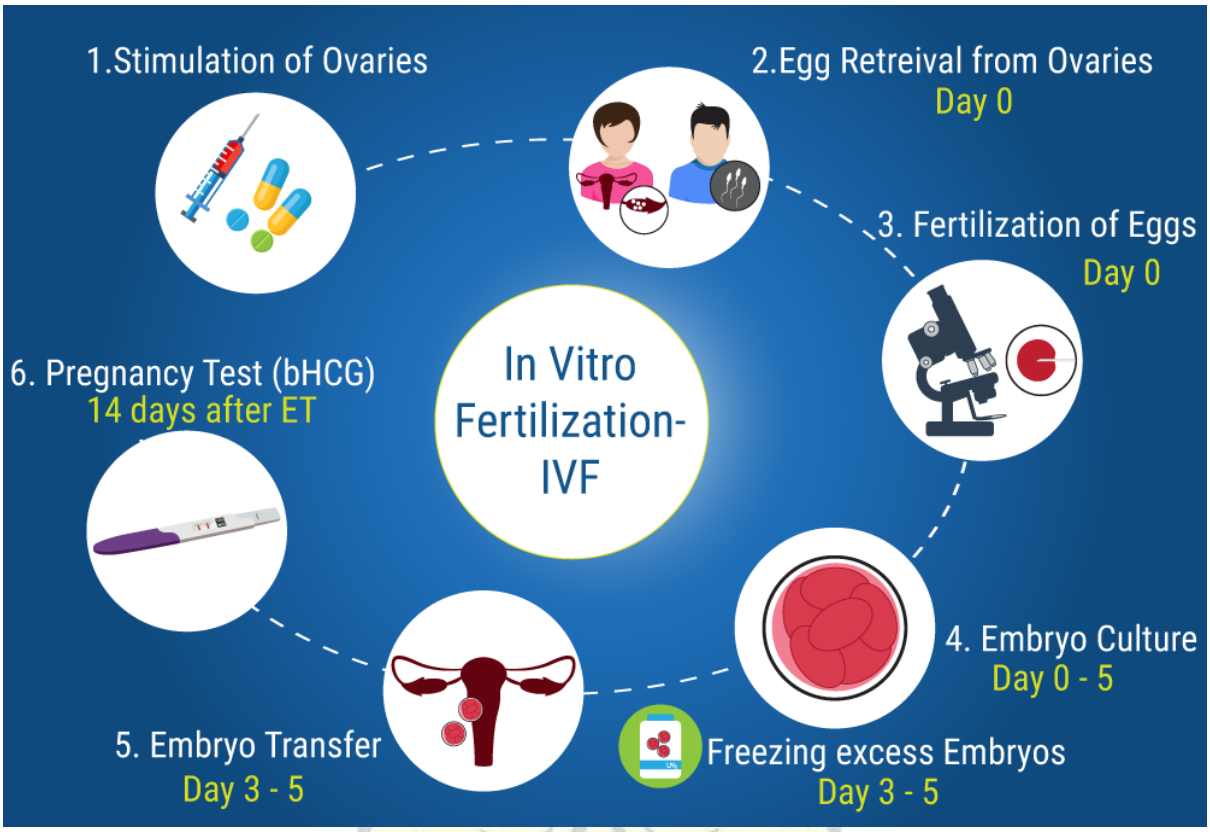
a) 1-2- 3-4
b) 2-1- 4-3
c) 2-1- 3-4
d) 1-2- 4-3



Q.20) Solution (b)

Steps in Women's In-Virto Fertilization (IVF) technique process

1. Suppressing your natural monthly hormone cycle
2. Boosting the egg supply
3. Checking on progress
4. Collecting the eggs
5. Fertilising the eggs
6. Embryo transfer



Pic link: http://www.indoreinfertilityclinic.com/wp-content/uploads/2013/08/IVF-Steps.png

Q.21) Which of the following is/are the differences between Laser light and Ordinary light?

1. The Laser light is collimated and coherent, that is, it travels in a single direction whereas ordinary light is scattered in every direction.
2. The Laser light is monochromatic, that is, it contains only one colour or a narrow range of colours of same frequency whereas ordinary light have a wide variety of colours of varying wavelengths.

Select the correct option from the codes given below:

a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 nor 2

Q.21) Solution (c)

Both ordinary light and laser light are electromagnetic waves. Therefore, both travel with the velocity of light in vacuum. However, laser light has very important and unique properties that cannot be seen in nature. Ordinary light is divergent and incoherent whereas laser light is highly directional and coherent. Ordinary light is a mixture of electromagnetic waves having different wavelengths. Laser light, on the hand, is monochromatic. This is the main difference between ordinary light and laser light. This article focuses on the differences between ordinary light and laser light.

Further reading: http://pediaa.com/difference-between-ordinary-light-and-laser-light/

Q.22) Consider the following statements about 'Luminescence Dating'

1. It measures the amount of light emitted from energy stored in certain rock types and derived soils to obtain an absolute date for a specific event that occurred in the past
2. It does not require a contemporary organic component of the sediment to be dated

Select the correct statements

a) 1 Only
b) 2 Only
c) Both 1 and 2
d) Neither 1 nor 2

Q.22) Solution (c)

About

- Luminescence dating (including thermoluminescence and optically stimulated luminescence) is a type of dating methodology that measures the amount of light emitted from energy stored in certain rock types and derived soils to obtain an absolute date for a specific event that occurred in the past.
- The method is a direct dating technique, meaning that the amount of energy emitted is a direct result of the event being measured.
- It is much more useful than carbon dating
- Unlike carbon-14 dating, luminescence dating methods do not require a contemporary organic component of the sediment to be dated.

Two forms of luminescence dating are used by archaeologists to date events in the past:

- Thermoluminescence (TL) or thermally stimulated luminescence (TSL), which measures energy emitted after an object has been exposed to temperatures between 400 and 500°C;

- Optically stimulated luminescence (OSL), which measures energy emitted after an object has been exposed to daylight.

Luminescence

- The term luminescence refers to the energy emitted as light from minerals such as quartz and feldspar after they've been exposed to an ionizing radiation of some sort.
- Minerals are exposed to cosmic radiation: luminescence dating takes advantage of the fact that certain minerals both collect and release energy from that radiation under specific conditions.

OSL

- It is a method widely used by geologists for dating the sediment layers in which tools are found

Source: https://www.hindustantimes.com/science/115-000-year-old-bone-tools-in-china-show-how-sophisticated-prehistoric-techniques-were/story-sMszgnCuLM795ly54o2CVN.html

Q.23) Which of the following are channels of monetary policy transmission?

1. Interest rate
2. Credit
3. Exchange rate
4. Asset price

Select the correct code:

a) 1, 2 and 3
b) 2, 3 and 4
c) 1 and 3 Only
d) All of the above

Q.23) Solution (d)

Monetary Policy Transmission

News: Monetary policy transmission improves if friction in the financial system diminishes: Development Research Group (DRG) of the Reserve Bank of India (RBI)

It said

- It is possible with greater financial inclusion in terms of depositors' base and easing of the collateral constraints of the households
- Easier norms for collateral are likely to enable households to increase their borrowings which, in turn, may improve the transmission

About

- It refers to the process by which a central bank's monetary policy decisions are passed on, through financial markets, to businesses and households.
- Interest rate is the main channel of monetary policy transmission. Similarly, there is credit channel, asset price channel, confidence channel, exchange rate channel etc.
- In the Indian scenario, the momentary policy transmission is heavily depending upon the repo rate.

Q.24) Consider the following statements about 'Baobab Tree'

a) They are generally found in Tropical Evergreen Forests
b) It is native to India
c) Both (a) and (b)
d) Neither (a) nor (b)

Q.24) Solution (d)

Adansonia is a genus of deciduous trees known as baobabs. They are found in arid regions of Madagascar, mainland Africa, Arabia, and Australia.

Baobabs store water in the trunk (up to 120,000 litres) to endure harsh drought conditions. All occur in seasonally arid areas, and are deciduous, shedding their leaves during the dry season.

Q.25) Consider the following statements about Green Growth Equity Fund (GGEF)

1. It is an alternative investment fund registered with SEBI
2. National Investment and Infrastructure Fund of India (NIIF) and the UK government have committed £120 million each for the fund

Select the correct statements

a) 1 Only
b) 2 Only

c) Both 1 and 2
d) Neither 1 nor 2

Q.25) Solution (c)

National Investment and Infrastructure Fund of India (NIIF) announced a partnership with the UK government to launch Green Growth Equity Fund (GGEF), an alternative investment fund registered with the Securities and Exchange Board of India (Sebi).

NIIF and the UK government have committed £120 million each for the fund which will be managed by EverSource Capital, a joint venture of home-grown private equity firm Everstone Group and Lightsource BP.

Q.26) Which of the following capital account transactions by an individual are permitted under the Liberalised Remittance Scheme (LRS)?

1. Trading on the foreign exchange markets
2. Opening of foreign currency account abroad with a bank
3. Purchase of property abroad

Select the correct code:

a) 1 and 2
b) 2 and 3
c) 1 and 3
d) None of the above

Q.26) Solution (b)

Liberalised Remittance Scheme (LRS)

- It was introduced as a liberalization measure to facilitate resident individuals to remit funds abroad for permitted current or capital account transactions or combination of both.
- These Regulations are amended from time to time to incorporate the changes in the regulatory framework and published through amendment notifications.
- Remittances are permitted for overseas education, travel, medical treatment and purchase of shares and property, apart from maintenance of relatives living abroad, gifting and donations.

- Individuals can also open, maintain and hold foreign currency accounts with overseas banks for carrying out transactions.
- The rules do not allow remittances for trading on the foreign exchange markets, margin or margin calls to overseas exchanges and counterparties and the purchase of Foreign Currency Convertible Bonds issued by Indian companies abroad.
- Under LRS, people can't send money to countries identified as 'non cooperative' by the Financial Action Task Force.