

## Science and Technology 2015

1. With reference to the use of nano-technology in health sector, which of the following statements is/are correct?

1. Targeted drug delivery is made possible by nanotechnology.
2. Nanotechnology can largely contribute to gene therapy.

Select the correct answer using the code given below:

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

**Ans: C**

**Exp:** *Nanotechnology has provided the possibility of delivering drugs to specific cells using nanoparticles.*

*The overall drug consumption and side-effects may be lowered significantly by depositing the active agent in the morbid region only and in no higher dose than needed. Targeted drug delivery is intended to reduce the side effects of drugs with concomitant decreases in consumption and treatment expenses. Drug delivery focuses on maximizing bioavailability both at specific places in the body and over a period of time. This can potentially be achieved by molecular targeting by nanoengineered devices.*

*Bionanotechnology is a specific application of nanotechnology. For example, DNA nanotechnology or cellular engineering would be classified as bionanotechnology because they involve working with biomolecules on the nanoscale. Conversely, many new medical technologies involving nanoparticles as delivery systems or as sensors would be examples of nanobiotechnology since they involve using nanotechnology to advance the goals of biology. However whether it can largely contribute to gene therapy or not is not clear.)*

2. In the context of modern scientific research, consider the following statements about 'IceCube', a particle detector located at South Pole, which was recently in the news:

1. It is the world's largest neutrino detector, encompassing a cubic kilometre of ice.
2. It is a powerful telescope to search for dark matter.
3. It is buried deep in the ice.

Which of the statements given above is/are correct?

- (a) Only 1                      (b) 2 and 3 only  
(c) 1 and 3 only            (d) 1, 2 and 3

**Ans: D**

**Exp:** *The IceCube Neutrino Observatory (or simply IceCube) is a neutrino telescope constructed at the Amundsen-Scott South Pole Station in Antarctica. Its thousands of sensors are distributed over a cubic kilometre of volume under the Antarctic ice. Similar to its predecessor, the Antarctic Muon And Neutrino Detector Array (AMANDA), IceCube consists of spherical optical sensors called Digital Optical Modules (DOMs), each with a photomultiplier tube (PMT) and a single board data acquisition computer which sends digital data to the counting house on the surface above the array. IceCube was completed on 18 December 2010.*

*However, a neutrino is an electrically neutral elementary particle with half-integer spin. The neutrino (meaning "little neutral one" in Italian) is denoted by the Greek letter  $\nu$  (nu). All evidence suggests that neutrinos have mass but that their masses are tiny, even compared to other subatomic particles. They are the only identified form of dark matter, specifically hot dark matter.*

3. With reference to 'Near Field Communication (NFC) Technology', which of the following statements is/are correct?
1. It is a contactless communication technology that uses electromagnetic radio fields.
  2. NFC is designed for use by devices which can be at a distance of even a metre from each other.
  3. NFC can use encryption when sending sensitive information.

Select the correct answer using the code given below:

- (a) 1 and 2 only      (b) Only 3  
(c) 1 and 3 only      (d) 1, 2 and 3

**Ans: C**

**Exp:** *Near field communication (NFC) is the set of protocols that enables smartphones and other devices to establish radio communication with each other by touching the devices together or bringing them into proximity to a distance of typically 10 cm (3.9 in) or less.*

4. The Genetic Engineering Appraisal Committee is constituted under the
- (a) Food Safety and Standards Act, 2006  
(b) Geographical Indications of Goods (Registration and Protection) Act, 1999  
(c) Environment (Protection) Act, 1986  
(d) Wildlife (Protection) Act, 1972

**Ans: C**

**Exp:** *The Genetic Engineering Appraisal Committee (GEAC) is the apex body constituted in the Ministry of Environment and Forests under 'Rules for Manufacture, Use, Import, Export and Storage of Hazardous Microorganisms/Genetically Engineered Organisms or Cells 1989', under the Environment Protection Act, 1986. (Source: website of Ministry of Environment, Forest and Climate Change)*

5. In which of the following activities are Indian Remote Sensing (IRS) satellites used?
1. Assessment of crop productivity
  2. Locating groundwater resources
  3. Mineral exploration
  4. Telecommunications
  5. Traffic studies

Select the correct answer using the code given below:

- (a) 1, 2 and 3 only      (b) 4 and 5 only  
(c) 1 and 2 only      (d) 1, 2, 3, 4 and 5

**Ans: A**

**Exp:** *Data from Indian Remote Sensing satellites are used for various applications of resources survey and management under the National Natural Resources Management System (NNRMS). Following is the list of those applications:*

- *Space Based Inputs for Decentralized Planning (SIS-DP)*
- *National Urban Information System (NUIS)*
- *ISRO Disaster Management Support Programme (ISRO-DMSP)*
- *Biodiversity Characterizations at landscape level*
- *Preharvest crop area and production estimation of major crops.*
- *Drought monitoring and assessment based on vegetation condition.*

- *Flood risk zone mapping and flood damage assessment.*
- *Hydro-geomorphological maps for locating underground water resources for drilling well.*
- *Irrigation command area status monitoring*
- *Snow-melt run-off estimates for planning water use in down stream projects*
- *Land use and land cover mapping*
- *Urban planning*
- *Forest survey*
- *Wetland mapping*
- *Environmental impact analysis*
- *Mineral Prospecting*
- *Coastal studies*
- *Integrated Mission for Sustainable Development (initiated in 1992) for generating locale-specific prescriptions for integrated land and water resources development in 174 districts.*

6. The term 'IndARC', sometimes seen in the news, is the name of
- (a) an indigenously developed radar system inducted into Indian Defence
  - (b) India's satellite to provide services to the countries of Indian Ocean Rim
  - (c) a scientific establishment set up by India in Antarctic region
  - (d) India's underwater observatory to scientifically study the Arctic region

**Ans: D**

**Exp:** *A major milestone in India's scientific endeavors in the Arctic region has been achieved on the 23rd July, 2014 when a team of scientists from the ESSO-National Centre for Antarctic and Ocean Research (NCAOR) and the ESSO-National Institute of Ocean Technology (NIOT) successfully deployed IndARC, the country's first multi-sensor moored observatory in the Kongsfjorden fjord of the Arctic, roughly half way between Norway and the North Pole. This moored observatory, designed and developed by ESSO-NIOT and ESSO-NCAOR with ESSO-Indian National Centre for Ocean Information Services (INCOIS) was deployed from the Norwegian Polar Institute's research vessel R.V. Lance during its annual MOSJ-ICE cruise to the Kongsfjorden area. The observatory is presently anchored (78°57' N 12°01' E), about 1100 km away from the North Pole at a depth of 192 m and has an array of ten state-of-the-art oceanographic sensors strategically positioned at discrete depths in the water column. These sensors are programmed to collect real-time data on seawater temperature, salinity, current and other vital parameters of the ford. (Source: PIB)*

7. HINI virus is sometimes mentioned in the news with reference to which one of the following diseases?
- (a) AIDS (b) Bird flu  
(c) Dengue (d) Swine flu

**Ans: D**

**Exp:** *Influenza A (HINI) virus is the most common cause of human influenza (flu). In June 2009, the World Health Organization (WHO) declared the new strain of swine-origin HINI as a pandemic. This strain is often called swine flu by the public media.*

8. With reference to bio-toilets used by the Indian Railways, consider the following statements:
1. The decomposition of human waste in the bio-toilets is initiated by a fungal inoculum.
  2. Ammonia and water vapour are the only end products in this decomposition which are released into the atmosphere.

Which of the statements given above is/are correct?

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

**Ans: D**

**Exp:** *The bio-toilets introduced by the Indian Railway with assistance from DRDO uses bacteria. The anaerobic bacteria named 'inoculum' are used in the bio-toilets have been collected and analysed by DRDO from Antarctica and the efficiency of this system has been tested in extreme climates and conditions. it will be kept in a container under the lavatories that convert human waste into water and small amounts of gases. Gases will be released into the atmosphere and the water will be discharged after chlorination onto the tracks.*

9. With reference to 'fuel cells' in which hydrogen-rich fuel and oxygen are used to generate electricity, consider the following statements:
1. If pure hydrogen is used as a fuel, the fuel cell emits heat and water as by products.
  2. Fuel cells can be used for powering buildings and not for small devices like laptop computers.
  3. Fuel cells produce electricity in the form of Alternating Current (AC).

Which of the statements given above is/are correct?

- (a) Only 1 (b) 2 and 3 only  
(c) 1 and 3 only (d) 1, 2 and 3

**Ans: A**

**Exp:** *It can be used in small devices also and Fuel cells produce electricity in the form of Direct Current(DC).*

10. The term 'Goldilocks Zone' is often seen in the news in the context of
- (a) the limits of habitable zone above the surface of the Earth
  - (b) region inside the Earth where shale gas is available
  - (c) search for the Earth-like planets in outer space
  - (d) search for meteorites containing precious metals

**Ans: C**

**Exp:** *In astronomy and astrobiology, the circumstellar habitable zone (CHZ), or simply the habitable zone, is the region around a star within which planetary-mass objects with sufficient atmospheric pressure can support liquid water at their surfaces. The bounds of the CHZ are calculated using the known requirements of Earth's biosphere, its position in the Solar System and the amount of radiant energy it receives from the Sun. Due to the importance of liquid water to life as it exists on Earth, the nature of the CHZ and the objects within is believed to be instrumental in determining the scope and distribution of Earth-like extraterrestrial life and intelligence.*

*The habitable zone is also called the Goldilocks zone, a metaphor of the children's fairy tale of Goldilocks and the Three Bears, in which a little girl chooses from sets of three items, ignoring the ones that are too extreme (large or small, hot or cold, etc.), and settling on the one in the middle, which is "just right".*

## Science and Technology 2014

1. With reference to technologies for solar power production, consider the following statements:
  1. 'Photovoltaics' is a technology that generates electricity by direct conversion of light into electricity, while 'Solar Thermal' is a technology that utilizes the Sun's rays to generate heat which is further used in electricity generation process.
  2. Photovoltaics generates Alternating Current (AC), while Solar Thermal generates Direct Current (DC).
  3. India has manufacturing base for Solar Thermal technology, but not for Photovoltaics.

Which of the statements given above is/are correct?

- (a) Only 1 (b) 2 and 3 only  
(c) 1, 2 and 3 (d) None

**Ans. A**

2. With reference to two non-conventional energy sources called 'coalbed methane' and 'shale gas', consider the following 'statements':

- Coalbed methane is the pure methane gas extracted from coal seams, while shale gas is a mixture of propane and butane only that can be extracted from fine-grained sedimentary rocks.
- In India abundant coalbed methane sources exist, but so far no shale gas sources have been found.

Which of the statements given above is/are correct?

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

**Ans: D**

3. Which of the following pair is/are correctly matched?

<b>Spacecraft</b>	<b>Purpose</b>
1. Cassini-Huygens	: Orbiting the Venus and transmitting data to the Earth
2. Messenger	: Mapping and investigating the Mercury
3. Voyager 1 and 2	: Exploring the outer solar system

Select the correct answer using the code given below:

- (a) Only 1  
(b) 2 and 3 only  
(c) 1 and 3 only  
(d) 1, 2 and 3

**Ans: B**

4. There is some concern regarding the nanoparticles of some chemical elements that are used by the industry in the manufacture of various products. Why?

- They can accumulate in the environment, and contaminate water and soil.
- They can enter the food chains.
- They can trigger the production of free radicals.

Select the correct answer using the code given below:

- (a) 1 and 2 only  
(b) Only 3  
(c) 1 and 3 only  
(d) 1, 2 and 3

**Ans: D**

1. Due to improper / indiscriminate disposal of old and used computers or their parts, which of the following are released into the environment as e-waste?

- |              |               |
|--------------|---------------|
| 1. Beryllium | 2. Cadmium    |
| 3. Chromium  | 4. Heptachlor |
| 5. Mercury   | 6. Lead       |
| 7. Plutonium |               |

Select the correct answer using the codes given below:

- (a) 1, 3, 4, 6 and 7 only  
(b) 1, 2, 3, 5 and 6 only  
(c) 2, 4, 5 and 7 only  
(d) 1, 2, 3, 4, 5, 6 and 7

**Ans: B**

2. Which of the following diseases can be transmitted from one person to another through tattooing?

- |                |                |
|----------------|----------------|
| 1. Chikungunya | 2. Hepatitis B |
| 3. HIV-AIDS    |                |

Select the correct answer using the codes given below:

- (a) Only 1                      (b) 2 and 3 only  
(c) 1 and 3 only              (d) 1, 2 and 3

**Ans: B**

3. Recombinant DNA technology (Genetic Engineering) allows genes to be transferred

- across different species of plants
- from animals to plants
- from microorganisms to higher organisms

Select the correct answer using the codes given below:

- (a) Only 1                      (b) 2 and 3 only  
(c) 1 and 3 only              (d) 1, 2 and 3

**Ans: D**

4. Fruits stored in a cold chamber exhibit longer storage life because

- exposure to sunlight is prevented
- concentration dioxide in the is increased of carbon environment
- rate of respiration is decreased
- there is an increase in humidity

**Ans: C**

5. Ball bearings are used in bicycles, cars, etc., because

- The actual area of contact between the wheel and axle is increased
- The effective area of contact between the wheel and axle is increased
- The effective area of contact between the wheel and axle is reduced
- None of the statements is correct

**Ans: D**

6. Consider the following phenomena:
1. Size of the sun at dusk
  2. Colour of the sun at dawn
  3. Moon being visible at dawn
  4. Twinkle of stars in the sky
  5. Polestar being visible in the sky

Which of the above are optical illusions?

- (a) 1, 2 and 3
- (b) 3, 4 and 5
- (c) 1, 2 and 4
- (d) 2, 3 and 5

**Ans: C**

7. Many transplanted seedlings do not grow because
- (a) the new soil does not contain favorable minerals
  - (b) most of the root hairs grip the new soil too hard
  - (c) most of the root hairs are lost during transplantation
  - (d) leaves get damaged during transplantation

**Ans: C**

8. The known forces of nature can be divided into four classes, viz, gravity, electromagnetism, weak nuclear force and strong nuclear force. with reference to them, which one of the following statements is not correct?
- (a) Gravity is the strongest of the four
  - (b) Electromagnetism act only on particles with an electric charge
  - (c) Weak nuclear force causes radioactivity
  - (d) Strong nuclear force holds protons and neutrons inside the nucleus of an atom.

**Ans: A**

9. The efforts to detect the existence of Higgs boson particle have become frequent news in the recent past. What is /are the importance/importance of discovering this particle?
1. It will enable us to understand as to why elementary particles have mass.
  2. It will enable us in the near future to develop the technology to transferring matter from one point to another without traversing the physical space between them.
  3. It will enable us to create better fuels for nuclear fission.

Select the correct answer using the codes given below:

- (a) Only 1
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1, 2 and 3

**Ans: A**

10. Mycorrhizal biotechnology has been used in rehabilitating degraded sites because mycorrhiza enables the plants to
1. resist drought and increase absorptive area
  2. tolerate extremes of PH
  3. Resist disease infestation

Select the correct answer using the codes given below:

- (a) Only 1
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1, 2 and 3

**Ans: D**

## Science and Technology 2011

1. What is the difference between a CFL and an LED lamp?
1. To produce light, a CFL uses mercury vapour and phosphor while an LED lamp uses semiconductor material.
  2. The average life span of a CFL is much longer than that of an LED lamp.
  3. A CFL is less energy-efficient as compared to an LED lamp.

Which of the statements given above is/are correct?

- (a) Only 1
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1, 2 and 3

**Ans: C**

2. Recently, "oil zapper" was in the news. What is it?
- (a) It is an eco-friendly technology for the remediation of oily sludge and oil spills.
  - (b) It is the latest technology developed for under-sea oil exploration.
  - (c) It is a genetically engineered high biofuel-yielding maize variety.
  - (d) It is the latest technology to control the accidentally caused flames from oil wells.

**Ans: A**

3. A new optical disc format known as the blu-ray disc (BD) is becoming popular. In what way is it different from the traditional DVD?
1. DVD supports standard definition video while BD supports high definition video.
  2. Compared to a DVD, the BD format has several times more storage capacity.
  3. Thickness of BD is 2.4 mm while that of DVD is 1.2 mm.

Which of the statements given above is/are correct?

- (a) Only 1
- (b) 1 and 2 only
- (c) 2 and 3 only
- (d) 1, 2 and 3

**Ans: B**

4. Satellites used for telecommunication relay are kept in a geostationary orbit. A satellite is said to be in such as orbit when:
1. The orbit is geosynchronous.
  2. The orbit is circular.
  3. The orbit lies in the plane of the earth's equator.
  4. The orbit is at an altitude of 22,236.

Which the correct answer using the codes given below:

- (a) 1, 2 and 3 only      (b) 1, 3 and 4 only  
(c) 2 and 4 only      (d) 1, 2, 3 and 4

**Ans: A**

5. At present, scientists can determine the arrangement or relative positions of genes or DNA sequences on a chromosome. How does this knowledge benefit us?
1. It is possible to know the pedigree of livestock.
  2. It is possible to understand the causes of all human diseases.
  3. It is possible to develop disease-resistant animal breeds.

Which of the statements give above is/are correct?

- (a) 1 and 2 only      (b) Only 2  
(c) 1 and 3 only      (d) 1, 2 and 3

**Ans: D**

6. Microbial fuel cells are considered a source of sustainable energy. Why?
1. They use living organisms as catalysts to generate electricity from certain substrates.
  2. They use a variety of inorganic materials as substrates.
  3. They can be installed in waste water treatment plants to cleanse water and produce electricity.

Which of the following statements given above is/are correct?

- (a) Only 1      (b) 2 and 3 only  
(c) 1 and 3 only      (d) 1, 2 and 3

**Ans: D**

7. What is the difference between blue-tooth and Wi-Fi devices?
- (a) Bluetooth uses 2.4 GHz radio frequency band, whereas Wi-Fi can use 2.4 GHz or 5 GHz frequency band.
  - (b) Bluetooth is used for wireless local area networks (WLAN) only, whereas Wi-Fi is used for wireless wide area networks (WWAN) only.
  - (c) When information is transmitted between two devices using blue-tooth technology, the devices have to be in the line of sight of each other, but when Wi-Fi technology is used the devices need not be in the line of sight of each other.
  - (d) The statements (a) and (b) given above are correct in this context.

**Ans: A**

8. An artificial satellite orbiting around the earth does not fall down. This is so because the attraction of earth?
- (a) Does not exist at such distance.
  - (b) Is neutralized by the attraction of the moon.
  - (c) Provides the necessary speed for its steady motion.
  - (d) Provides the necessary acceleration for its motion.

**Ans: D**

9. A genetically engineered form of brinjal, known as the Bt-brinjal, has been developed. The objective of this is?
- (a) To make it pest-resistant.
  - (b) To improve its taste and nutritive qualities.
  - (c) To make it drought-resistant.
  - (d) To make its shelf-life longer.

**Ans: A**

10. What is "virtual private network"?
- (a) It is a private computer network of an organization where the remote users can transmit encrypted information through the server of the organization.
  - (b) It is a computer network across a public internet the provides users access to their organizations network while maintaining the security of the information transmitted.
  - (c) It is a computer network in which users can access a shared pool of computing resources through a service provider.
  - (d) None of the statements (a), (b) and (c) given above is correct description of virtual private network.

**Ans: B**

11. The function of heavy water in a nuclear reactor is to
- (a) Slow down the speed of neutrons.
  - (b) Increase the speed of neutrons.
  - (c) Cool down the reactor.
  - (d) Stop the nuclear reaction.

**Ans: A**

## Science and Technology 2010

1. Consider the following statements:
- The satellite Oceansat-2 launched by India helps in
1. estimating the water vapor content in the atmosphere
  2. predicting the onset of monsoons
  3. monitoring the pollution of coastal waters
- Which of the statements given above is/are correct?
- (a) 1 and 2      (b) Only 2
  - (c) 1 and 3      (d) 1, 2 and 3

**Ans: D**

2. In the context of space technology, what is “Bhuvan”, recently in the news?
- A mini satellite launched by ISRO for promoting the distance education in India
  - The name given to the next Moon Impact Probe, for Chandrayan-II
  - A geoportal of ISRO with 3 D imaging capabilities of India
  - A space telescope developed by India

**Ans: C**

3. Recently, LASIK (Lasser Assisted In Situ Keratomileusis) procedure is being made popular for vision correction. Which one of the following statements in this context is not correct?
- LASIK procedure is used to correct refractive errors of the eye
  - It is a procedure that permanently changes the shapes of the cornea
  - It reduces a person’s dependence on glasses or contact lenses
  - It is a procedure that can be done on the person of any age

**Ans: D**

4. With reference to the treatment of cancerous tumours, a tool called cyber knife has been making the news. In this context, which one of the following statements is not correct?
- It is a robotic image guided system
  - It delivers an extremely precise dose of radiation
  - It has the capability of achieving sub-millimetre accuracy
  - It can map the spread of tumour in the body

**Ans: D**

5. Mon 863 is a variety of maize. It was in the news for the following reason
- It is a genetically modified dwarf variety which is resistant to drought
  - It is a genetically modified variety which is pest resistant
  - It is a genetically modified variety with ten times higher protein content than regular maize crop
  - It is a genetically modified variety used exclusively for bio-fuel production

**Ans: B**

6. Which bacterial strain, developed from natural isolates by genetic manipulations, can be used for treating oil spills?
- Agrobacterium
  - Clostridium
  - Nitrosomonas
  - Pseudomonas

**Ans: D**

7. Genetically modified “golden rice” has been engineered to meet human nutritional requirement. Which one of the following statements best qualifies golden rice?
- The grains have been fortified with genes to provide three times higher grain yield per acre than other high yielding varieties
  - Its grains contain pro-vitamin A which upon ingestion is converted to vitamin A in the human body
  - Its modified genes cause the synthesis of all the nine essential amino acids
  - Its modified genes cause the fortification of its grains with vitamin D

**Ans: B**

8. Which feature of some species of blue-green algae helps promote them as bio-fertilizers?
- They convert atmospheric methane into ammonia which the crop plants can absorb readily
  - They induce the crop plants to produce the enzymes which help convert atmospheric nitrogen to nitrates
  - They have the mechanism to convert atmospheric nitrogen into a form that the crop plants can absorb readily
  - They induce the roots of the crop plants to absorb the soil nitrates in larger quantities

**Ans: C**

9. Other than *Jatropha curcas*, why is *Pongamia pinnata* also considered a good option for the production of bio-diesel in India?
- Pongamia pinnata* grows naturally in most of the arid regions of India
  - The seeds of *Pongamia pinnata* are rich in lipid content of which nearly half is oleic acid

Which of the statements given above is/are correct?

- Only 1
- Only 2
- Both 1 and 2
- Neither 1 nor 2

**Ans: C**

10. Due to their extensive rice cultivation, some regions may be contributing to global warming. To what possible reason/reasons is this attributable?
- The anaerobic conditions associated with rice cultivation cause the emission of methane
  - When nitrogen based fertilizers are used, nitrous oxide is emitted from the cultivated soil

Which of the statements given above is/are correct?

- Only 1
- Only 2
- Both 1 and 2
- Neither 1 nor 2

**Ans: C**

11. Given below are the names of four energy crops. Which one of them can be cultivated for ethanol?

- (a) Jatropha                      (b) Maize  
(c) Pongamia                      (d) Sunflower

**Ans: B**

12. Which among the following do/does not belong/belongs to the GSM family of wireless technologies?

- (a) EDGE  
(b) LTE  
(c) DSL  
(d) Both EDGE and LTE

**Ans: C**

13. Consider the following:

1. Bluetooth device    2. Cordless phone  
3. Microwave oven    4. Wi-Fi device

Which of the above can operate between 2.4 and 2.5 GHz range of radio frequency band?

- (a) 1 and 2                      (b) 3 and 4  
(c) 1, 2 and 4                      (d) 1, 2, 3 and 4

**Ans: D**

14. Hydrogen fuel cell vehicles produce one of the following as "exhaust"

- (a)  $\text{NH}_3$                       (b)  $\text{CH}_4$   
(c)  $\text{H}_2\text{O}$                       (d)  $\text{H}_2\text{O}_2$

**Ans: C**