

## UPSC 2021 Prelims

### SCIENCE AND TECHNOLOGY Answer Key with Explanation

#### 1. In the context of hereditary diseases, consider the following statements:

1. Passing on mitochondrial diseases from parents to child can be prevented by mitochondrial replacement therapy either before or after in vitro fertilization of the egg.
2. A child inherits mitochondrial diseases entirely from mother and not from father.

Which of the statements given above is/ are correct?

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

**Answer: D**

#### Explanation

- Both the statements are incorrect. MRT can be done only before the egg is fertilised through in-vitro method..  
<https://www.winfertility.com/blog/mitochondrial-replacement-therapy-explained/>
- Comes from both parents  
<https://www.pbs.org/wgbh/nova/article/dads-mitochondrial-dna/>

#### 2. Bollgard I and II technologies are mentioned in the context of

- (a) clonal propagation of crop plants
- (b) Developing genetically modified crop plants
- (c) Production of plant growth substances
- (d) Production of biofertilizers

**Answer B**

#### Explanation

- Bollgard® Bt cotton (single-gene technology) is India's first biotech crop technology approved for commercialization in India in 2002, followed by Bollgard® II – double-gene technology in mid-2006, by the Genetic Engineering Approval Committee (GEAC), the Indian regulatory body for biotech crops.  
<https://www.cropscience.bayer.in/en/Products-H/Brands/Seeds-and-Traits/Traits-Bollgard.aspx>

**3. In a pressure cooker the temperature at which the food is cooked depends mainly upon which of the following?**

1. Area of the hole in the lid
2. Temperature of the flame
3. Weight of the lid

Select the correct answer using the code given below

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

**Answer: D**

**Explanation**

**4. Consider the following:**

1. Bacteria
2. Fungi
3. Virus

Which of the above can be cultured in artificial / synthetic medium?

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

**Answer: A**

**Explanation**

- Viruses are infectious agents with both living and nonliving characteristics.
- Living characteristics of viruses include the ability to reproduce – but only in living host cells – and the ability to mutate.
- Nonliving characteristics include the fact that they are not cells, have no cytoplasm or cellular organelles, and carry out no metabolism on their own and therefore must replicate using the host cell's metabolic machinery.
- Viruses can infect animals, plants, and even other microorganisms.

- Since viruses lack metabolic machinery of their own and are totally dependent on their host cell for replication, they cannot be grown in synthetic culture media.

[https://bio.libretexts.org/Bookshelves/Microbiology/Book%3A\\_Microbiology\\_\(Kaiser\)/Unit\\_4%3A\\_Eukaryotic\\_Microorganisms\\_and\\_Viruses/10%3A\\_Viruses/10.01%3A\\_General\\_Characteristics\\_of\\_Viruses](https://bio.libretexts.org/Bookshelves/Microbiology/Book%3A_Microbiology_(Kaiser)/Unit_4%3A_Eukaryotic_Microorganisms_and_Viruses/10%3A_Viruses/10.01%3A_General_Characteristics_of_Viruses)

### 5. Water can dissolve more substances than any other liquid because.

- (a) it is dipolar in nature
- (b) it is a good conductor of heat
- (c) it has high value of specific heat
- (d) it is an oxide of hydrogen

**Answer: A**

#### **Explanation**

- Water is called the "universal solvent" because it is capable of dissolving more substances than any other liquid.
- It is water's chemical composition and physical attributes that make it such an excellent solvent. Water molecules have a **polar arrangement of oxygen and hydrogen atoms**—one side (hydrogen) has a positive electrical charge and the other side (oxygen) had a negative charge. This allows the water molecule to become attracted to many other different types of molecules.
- Water can become so heavily attracted to a different compound, like salt (NaCl), that it can disrupt the attractive forces that hold the sodium and chloride in the salt compound together and, thus, dissolve it.

[https://www.usgs.gov/special-topic/water-science-school/science/water-qa-why-water-universal-solvent?qt-science\\_center\\_objects=0#qt-science\\_center\\_objects](https://www.usgs.gov/special-topic/water-science-school/science/water-qa-why-water-universal-solvent?qt-science_center_objects=0#qt-science_center_objects)

### 6. With reference to street lighting, how do sodium lamps differ from LED lamps?

1. Sodium lamps produce light in 360 degrees but it is not so in the case of LED lamps.
2. As street – light, sodium lamps have a longer lifespan than LED lamps.
3. The spectrum of visible light from sodium of visible light from sodium lamps is almost monochromatic while LED lamps offer significant colour advantages in street- lighting .

Select the Correct answer using the code given below.

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

**Answer: C**

**Explanation**

Sodium lamps	LED lamps
Lifespan: High Pressure Sodium lights tend to have a lifespan averaging 24,000 hours.	Lifespan: Range of 25,000 to 200,000 hours.
Efficacy: High efficacy that is easily comparable to LED lights.	Efficacy: The most efficiency lights on the market with high efficacy averaging about 50
Bulb Angle: 360-degree bulb angle	Bulb Angle: 180-degree bulb angle to preserve light efficiency and allow for target lighting over areas.
The spectrum of visible light from sodium of visible light from sodium lamps is almost monochromatic .	D lamps offer significant colour advantages in street- lighting .

**7. Bisphenol A (BPA), a cause of concern, is a structural /key component in the manufacture of which of the following kinds of plastics?**

- (a) Low- density polyethylene
- (b) Polycarbonate
- (c) Polyethylene terephthalate
- (d) Polyvinyl chloride

**Answer: B**

**Explanation**

- Bisphenol A (BPA) is a chemical produced in large quantities for use primarily in the production of polycarbonate plastics and epoxy resins.

<https://www.niehs.nih.gov/health/topics/agents/sya-bpa/index.cfm>

**8. “Triclosan’, considered harmful when exposed to high levels for a long time, is most likely present in which of the following?**

- (a) Food preservatives
- (b) Fruit – ripening substances
- (c) Reused plastic containers
- (d) Toiletries

**Answer: D**

**Explanation**

- Triclosan is an ingredient added to many consumer products intended to reduce or prevent bacterial contamination. It is added to some antibacterial soaps and body washes, toothpastes, and some cosmetics—products regulated by the U.S. Food and Drug Administration.

<https://www.fda.gov/consumers/consumer-updates/5-things-know-about-triclosan>

**9. Which one of the following is a reason why astronomical distances are measured in light-years?**

- (a) Distances among stellar bodies do not change.
- (b) Gravity of stellar bodies does not change.
- (c) Light always travels in a straight line.
- (d) Speed of light is always the same.

**Answer: D**

**Explanation**

- A light-year is the distance a beam of light travels in a single Earth year, or 6 trillion miles (9.7 trillion kilometers). It is used to measure astronomical distance because the speed of light is constant throughout the universe and is known to high precision.