1. What is virtual reality? What are its applications? In this light, examine the significance of Metaverse.

Approach-

Candidates need to write about the virtual reality and how it has several application. Also highlight and examine the virtual reality in the light of metaverse.

Introduction

Virtual Reality (VR) is a computer-generated environment with scenes and objects that appear to be real, making the user feel they are immersed in their surroundings. This environment is perceived through a device known as a Virtual Reality headset or helmet.

Body

Application of virtual reality:

- The first thing which comes to our mind when we think about VR is gaming, but applications of VR are not limited to just gaming.
- We are using this technology in the field of military, healthcare, education, fashion, business, sports, media, engineering, entertainment, scientific visualization, architecture, among others.
- For example in Education sector has adopted VR for teaching and learning situations. It has the potential to revolutionise learning, retention and content delivery exponentially.
- For example in military It is used to train soldiers in a simulated battlefield. This gives soldiers the opportunity to learn without the risk of being killed or injured.
- Also in engineering and architecture VR plays a major role in simulating 3-dimensional models or designs of infrastructures, which can provide a real-life experience of the physical designs of infrastructures beforehand. With the help of VR, cars, machines, aeroplanes etc. Can be virtually designed and pretested for factors.

Metaverse with VR:

- Metaverse is the next version of the Internet focused on social connection. It can be defined as a simulated digital environment that uses Virtual Reality (VR), along with concepts from social media, to create spaces for rich user interaction mimicking the real world.

- It can be imagined as a 3D virtual world, with ever-evolving aspects which are collectively shared by its inhabitants – a virtual world with real-time events and an online infrastructure.
- Virtual communities, activities, events, all seamlessly accessible without the need to sign into multiple apps.
- One can sign into his virtual office with metaverse as a virtual avatar of himself, meet a client, take a break or play a sport – virtually all in one place.

Conclusion

Technology of meta verse is still evolving it could also lead to new scrutiny of old issues like privacy and managing who does what to whom in a virtual world. The government's involvement in Metaverse is also a significant aspect as it may change the whole dynamic of the virtual spaces. Therefore requirement of preparatory infrastructure is needed for the transition to a digital economy and to the metaverse.

2. What is the meaning and significance of Ct Value in an RTPCR test? Explain.

Approach

Students are expected to write about the Ct value it's meaning and significance in the test of RT PCR.

Introduction

Among various scientific terms that the Covid-19 pandemic has made part of the public vocabulary, one is the 'Ct value' in RT-PCR tests for determining whether a patient is positive for Covid-19.

Body

Meaning:

- According to the ICMR advisory, the Ct value of an RT-PCR reaction is the number of cycles at which fluorescence of the PCR product is detectable over and above the background signal.
- Put simply, the Ct value refers to the number of cycles after which the virus can be detected.

Significance:

- According to the ICMR, a patient is considered Covid-positive if the Ct value is below 35. In other words, if the virus is detectable after 35 cycles or earlier, then the patient is considered positive.
- If the benchmark were to be lowered to 24 the value mentioned by state of Maharashtra it would mean that Ct values in the range 25-34 would not be considered positive.
- Ct value determines the detectable level of the virus in a given sample based on which it is decided if the person is COVID positive or negative.
- A benchmark of 35, therefore, means that more patients would be considered positive than we would get if the benchmark were 24.
- The ICMR has said lowering Ct threshold parameter may lead to missing several infectious persons.
- One can think of Ct value as a measure of transmission potential. So if there is more virus in my throat and nose, I will transmit it better.
- Although Ct value is inversely correlated with viral load, It does not have any bearing on the severity of the disease, experts have said.
- A patient can have a low Ct value, which means her viral load is high enough to be detected rapidly, but she may still be asymptomatic.
- The Ct value tells us about the viral load in the throat and not in the lungs.

Conclusion

While whether Ct value alone can determine the risks, severity and infection level in an individual still remains debatable, many clinicians, researchers consider it as one of the many parameters that hold potential in determining the dynamics of the infection and in efforts to control the transmission.

3. What is quantum key distribution technology? What can be its possible applications? Discuss.

Approach

Candidates need to write about the quantum key distribution technology and discuss about its possible applications.

Introduction

The concept of quantum key distribution (QKD) was first proposed in the 1970s. The idea was incredibly simple yet it still took until the 1990s, when the connection was made to entanglement, that physicists started to get really interested. Since then, the progress has been remarkable and it is now perhaps the most mature quantum technology, being commercially available for over 15 years now.

Quantum key distribution technology

Quantum Key Distribution (QKD), also known as Quantum Cryptography, is a mechanism for developing secure communication. It enables the distribution and sharing of secret keys, which are necessary for cryptographic protocols. The conventional cryptosystems used for data-encryption rely on the complexity of mathematical algorithms, whereas the security offered by quantum communication is based on the laws of Physics.

Applications of quantum key distribution technology

- The whole responsibility of QKD networks is to transfer keys between parties who wish to communicate securely.
- QKD is essential to address the threat that rapid advancement in Quantum Computing poses to the security of the data being transported by various critical sectors through the current communication networks.
- There will be applications where QKD is ideal – replacing trusted couriers, for example – and others where the benefits are not so clear – e.g., CNP and online banking, which need a huge quantum ATM infrastructure to allow it to work, but get added security as a result. Business decisions are never easy.
- It is especially good at creating long random keys from a short input – key extension functionality which could be invaluable for OTPs.
- The technology would be useful in enabling various start-ups and small and medium enterprises in the domain of quantum information.
- It will enable security agencies to plan a suitable quantum communication network with indigenous technology backbone.

Conclusion

The power of start-ups and Big Tech corporations involved in developing quantum technology and applications must be harnessed. The focus should be to develop an overarching strategy for the next 10-15 years. The strategy must ensure that there is no misallocation of resources and that the efforts put in are concentrated in key areas that provide both economic and strategic benefits.