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THE OPEN UNIVERSITY OF SRI LANKA
08 DEC 2024
EXAMINATION DIVISION

The Open University of Sri Lanka
Department of physics
Bachelor of Science Degree Programme-2024/2025
Communication Skills - FNU 3201-Level 3
Final Examination

Date: 08. 12. 2024 **Time: 9.30 a.m.-11.30 a.m.**

Index No	.....

Instructions to Candidates

(1) This paper consists of five (5) questions and the candidates are asked to write answers to all the questions.

(2) Your hand writing must be legible.

(3) You Must write your index number in the box provided.

(4) Write answers in the paper itself.

Question No	Marks
(1)	20
(2)	20
(3)	20
(4)	20
(5)	20
Total	100

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1. Read the paragraph carefully and write answers to the questions in the space provided below.
(Please write complete sentences for the answers and no marks are awarded for extra-long and jumbled sentences)

The Evolution of Particle Physics

In the fifth century B.C., the Greek philosopher Democritus envisioned the existence of 'atoms' as the fundamental building blocks of everything. The teachings of Democritus and Leucippus, emphasizing mass conservation and the discontinuity of matter, began to support this revolutionary concept. To further endorse the existence of atoms, the Pythagorean School of philosophers proposed that light was composed of discrete corpuscles emitted from luminous bodies.

With the discovery of electricity, particle physics emerged as a true science. Around 1909, Marsden and Geiger conducted groundbreaking experiments on the scattering of alpha particles by metallic foils. These alpha particles, directed towards the foil by a lead collimator, mostly passed through without deviation. However, a significant percentage were deflected back towards the source. This experiment revealed that atoms were mostly empty space, but contain massive positively charged particles, making the whole atom electrically neutral. This led to the idea of the nucleus and the hypothesis of the proton, a positively charged particle within the nucleus. Contributions from many scientists helped to build a model of the atom, with a nucleus composed of protons and neutrons, and electrons orbiting around it. Max Planck introduced the quantum model of the atom.

Further experiments were conducted to determine if electrons, protons, and neutrons were divisible into smaller particles. Scientists realized that these particles could not be observed with the naked eye, even if divided, leading to the design of particle accelerators such as Linear Accelerators, Cyclotrons, Synchrotrons, Betatrons, Hadron Colliders, and Ion Implanters. These high-energy particles were then collided head on to break in to pieces, in various chambers like Cloud Chambers, Bubble Chambers, and Scintillation Chambers, allowing scientists to study their behavior.

In addition to Protons, Electrons, and Neutrons, numerous other particles were discovered in high-energy experiments or observed in nature following cosmic ray collisions. Unlike the stable protons and electrons, these sub atomic particles decayed rapidly, with half-lives ranging from 1023 s to 1026 s. Strong indirect evidence suggested that most of these particles, including Neutrons and Protons, are combinations of more elementary particles called Quarks. Quarks, Leptons such as the electron, and force-carrying particles such as the Photon are now considered the truly fundamental particles. Understanding the properties of elementary particles involves describe the forces of nature in which they participate. All particles in nature are subjected to four fundamental forces such as the Strong, Electromagnetic, Weak, and Gravitational forces. These force-carrying particles, known as gauge Bosons.

They responsible for the interactions between other particles. For example, the photon is the force-carrying particle for the electromagnetic force, allowing charged particles to interact with each other. The gluon is the force carrier for the strong force, which holds quarks together within protons and neutrons. The W and Z bosons mediate the weak force, responsible for processes like beta decay. Lastly, the hypothetical graviton is proposed to be the force carrier for gravity, although it has not yet been observed. Understanding these particles and their interactions is crucial for comprehending the fundamental workings of the universe.

1. Who envisioned the existence of 'atoms' as the fundamental building blocks of everything in the fifth century B.C.?

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2. What concept did the teachings of Democritus and Leucippus emphasize?

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3. Which school of philosophers proposed that light was composed of discrete corpuscles emitted from luminous bodies?

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4. What significant discovery marked the emergence of particle physics as a true science?

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5. Who conducted groundbreaking experiments on the scattering of alpha particles by metallic foils around 1909?

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6. Discuss the evidence and implications of the discovery that protons and neutrons are combinations of more elementary particles called quarks.

7. What did the alpha particle scattering experiment reveal about the composition of atoms?

8. Who introduced the quantum model of the atom?

9. What are the four fundamental forces that all particles in nature are subjected to?

10. How do the four fundamental forces (strong, electromagnetic, weak, and gravitational) interact with elementary particles, and what role do gauge bosons play in these interactions?

(2) Read the paragraph carefully and fill in the blanks using the most appropriate word given in the grid below.

The James Webb Space Telescope

The James Webb Space Telescope is a groundbreaking observatory that has (1) ..... our understanding of the (2) ..... Launched on December 25, 2021, JWST (3) ..... the Sun at the second Lagrange point (L2), (4) ..... 1.5 million kilometers from Earth. This strategic (5) ..... allows it to maintain a stable position relative to the Earth and Sun, providing an unobstructed view of the (6) .....

JWST is (7) ..... with a 6.5-meter primary mirror, (8) ..... larger than the Hubble Space Telescope's 2.4-meter mirror. This larger mirror enables JWST to (9) ..... more light, (10) ..... it to observe faint and (11) ..... objects with (12) ..... clarity. Additionally, JWST operates (13) ..... in the infrared spectrum, which is crucial for studying the early universe, star formation, and the (14) ..... of exoplanets. (15) ..... observations can penetrate cosmic dust clouds that often obscure visible light, revealing hidden structures and phenomena.

One of the key scientific goals of JWST is to study the formation and evolution of galaxies. By observing galaxies at various stages of their development, JWST aims to provide insights into how galaxies form, grow, and (16) ..... over time. Another major objective is to investigate the birth of stars and planetary systems. JWST's infrared capabilities allow it to peer into the dense molecular clouds where stars and planets are born, offering a detailed view of these processes.

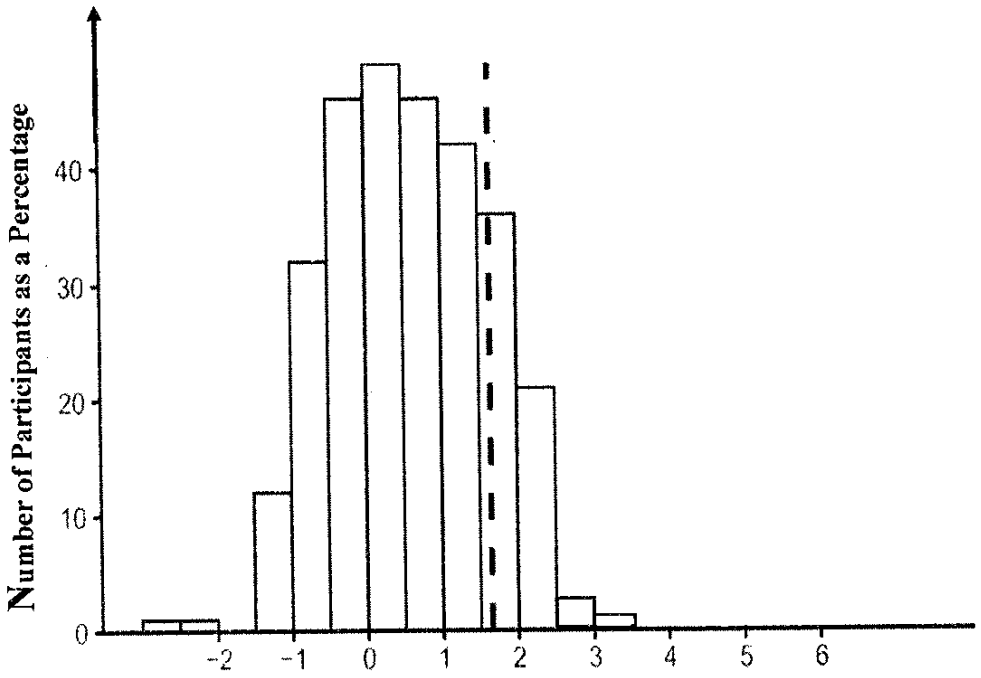
JWST is also set to explore the atmospheres of exoplanets, searching for signs of (17) ..... and potential biosignatures. By analyzing the light passing through an exoplanet's atmosphere, JWST can detect the presence of molecules such as water, carbon dioxide, and methane, which are essential for life as we know it.

The telescope's innovative design includes a five-layer sunshield to protect its instruments from the Sun's heat, ensuring precise and sensitive measurements. This sunshield is about the size of a tennis court and is crucial for maintaining the telescope's operating temperature at around -233 degrees Celsius. The JWST represents a significant leap forward in our quest to unravel the mysteries of the universe, promising to deliver groundbreaking (18) ..... and expand our knowledge of the cosmos.

In addition to its scientific (19) ....., JWST is a testament to international collaboration. The project is a joint effort between NASA, the European Space Agency (ESA), and the Canadian Space Agency (CSA). This (20) ..... has brought together the best minds and resources from around the world to create a telescope that will push the boundaries of our understanding of the universe. The James Webb Space Telescope is not just a successor to Hubble; it is a transformative tool that will enable us to see the universe in ways we never thought possible. Its discoveries will undoubtedly shape the future of astronomy and our understanding of the cosmos for decades to come.

universe primarily approximately capture significantly distant revolutionized unprecedented location orbits equipped atmospheres Infrared evolve habitability discoveries capabilities cosmos allowing collaboration

(3) Go through the bar graph carefully which illustrates the Percentage number of Participants vs Z score marks of G.C.E. Advanced level Examination in the year 2023 in Science Stream. Describe the graph and decided how successful the candidates were at the exam. (100 words)



Z SCORE Marks of students who Sat for G.G.E. Advanced Level Examination in the year 2023

(4) Read the paragraph carefully and write a summary providing a suitable heading. (75 words)

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The origins of the word dengue are not clear, but one theory is that it is derived from the Swahili phrase "Ka-dinga pepo", meaning "cramp-like seizure caused by an evil spirit". The Swahili word "dinga" may possibly have its origin in the Spanish word "dengue" meaning fastidious or careful, which would describe the gait of a person suffering the bone pain of dengue fever. Alternatively, the use of the Spanish word may derive from the similar-sounding Swahili. Slaves in the West Indies who contracted dengue were said to have the posture and gait of a dandy, and the disease was known as "Dandy Fever".

The first record of a case of probable dengue fever is in a Chinese medical encyclopedia from the Jin Dynasty (265–420 AD) which referred to a "water poison" associated with flying insects. The first recognized Dengue epidemics occurred almost simultaneously in Asia, Africa, and North America in the 1780s, shortly after the identification and naming of the disease in 1779. The first confirmed case report dates from 1789 and is by Benjamin Rush, who coined the term "break bone fever" because of the symptoms of myalgia and arthralgia.

The viral etiology and the transmission by mosquitoes were only deciphered in the 20th century. The socioeconomic impact of World War II resulted in increased spread globally. Nowadays, about 2.5 billion people, or 40% of the world's population, live in areas where there is a risk of dengue transmission. Dengue spread to more than 100 countries in Asia, the Pacific, the Americas, Africa, and the Caribbean.

Possible factors for dengue fever spread include: Unplanned urban overpopulation of areas leading to inadequate housing and public health systems (water, sewerage and waste management) Poor vector control, e.g., stagnant pools of water, climatic changes and viral evolution (increased virus transmission has been linked to El Nino conditions) increased international travel (recreational, business, military) to endemic areas. All of these factors must be addressed to control the spread of dengue. Unplanned urbanization is believed to have had the largest impact on disease amplification in individual countries, whereas travel is believed to have had the largest impact on global spread.

Dengue is spread by several species of mosquito of the Aedes type, principally A. aegypti. The virus has five different types; infection with one type usually gives lifelong immunity to that type, but only short-term immunity to the others. Subsequent infection with a different type increases the risk of severe complications. A number of tests are available to confirm the diagnosis including detecting antibodies to the virus or it's RNA. An antibody (Ab), also known as an immunoglobulin (Ig), is a large, Y-shaped protein

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produced mainly by plasma cells that is used by the immune system to neutralize pathogens such as bacteria and viruses.

(5) Write a topic and a topic sentence to the following Paragraphs.

(a) Astrobiology is the study of the origin, evolution, and distribution of life in the Universe, and searching for life on Mars is a major goal of the Mars 2020 mission. While humans have long wondered whether there are others like us, it's only been a few decades since we've developed the technologies to search for life beyond Earth in earnest.

Topic

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Topic Sentences

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(b) Early space flight research was conducted simply to evaluate the viability of living systems in the microgravity environment. Later, researchers began to examine the changes that occur in such systems in response to microgravity.

Topic

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Topic Sentences

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(c) A normal star like our Sun is supported against contracting under its own gravity by pressure generated by nuclear reactions in its core. However, eventually the star will use up its nuclear "fuel". If the gravitational self-attraction is to be balanced then some new source of pressure is required.

Topic

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Topic Sentences

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(d) Earth is the only planet known to modern science on which life exists thanks to the atmosphere. It ensures our existence. Atmosphere is, first of all, air, which must be breathable for people and animals and must not contain harmful impurities and substances. How to protect air from pollution? This is a very important issue that needs to be addressed in the foreseeable future.

Topic

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Topic Sentences

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(e) Sports and games are essential for both physical and mental of the students. Moreover, it increases the immunity of the person. As it increases the blood flow in the body and makes it adaptable for exertion. The main difference between a sport and a game is, we can play games both indoors and outdoors. But we can only play sports outdoors.

Topic

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Topic Sentences

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