

T4 ch20,21 27/04/2020

Wasim Tahir physics center

**Q1) Choose the most appropriate option. Cutting / overwriting is not allowed:**

17 Marks

- i) When  $\alpha$ -particle is emitted from any nucleus, its mass number \_\_\_\_\_ and its charge number \_\_\_\_\_.  
 A) Increases by 2, increases by 2    B) Decreases by 4, increases by 2    C) Decreases by 4, decreases by 2    D) Increases by 4, decreases by 2
- ii) Which of the following series lies in the ultraviolet region?  
 A) Lyman series    B) Balmer series    C) Pfund series    D) Bracket series
- iii) Mass of meson is \_\_\_\_\_.  
 A) Greater than proton    B) Less than proton    C) Equal to proton    D) Equal to neutron
- iv) The charge on  $\beta$ -particle is \_\_\_\_\_.  
 A) +e    B) -e    C) +2e    D) -2e
- v) For holography, we use a beam of \_\_\_\_\_.  
 A)  $\gamma$  rays    B) X-rays    C)  $\beta$  rays    D) LASER
- vi) Radiations emitted by human body at normal temperature ( $37^\circ\text{C}$ ) lies in \_\_\_\_\_ region.  
 A) X-rays    B) Visible    C) Infrared    D) Ultraviolet
- vii) Energy of the 4<sup>th</sup> orbit in hydrogen atom is \_\_\_\_\_.  
 A) -2.51eV    B) -3.50eV    C) -13.6eV    D) -0.85eV
- viii) The activity of radioactive sample  
 A) is constant    B) increases with time    C) Decreases linearly with time    D) Decreases exponentially with time
- ix) Which is true for both  $\alpha$ -particles and  $\gamma$ -rays?  
 A) They cause ionization in air    B) They can be deflected by electric field    C) They can be deflected by magnetic field    D) They can penetrate a few millimeter of aluminum
- x) Which is not true for X-rays?  
 A) X-rays are not deflected by electric field    B) X-rays are polarized    C) X-rays consist of electromagnetic waves    D) X-rays can be diffracted by grating
- xi) The number of isotopes of cesium are \_\_\_\_\_.  
 A) 4    B) 32    C) 36    D) 22
- xii) In nuclear fission reaction, when the products are  $^{140}\text{Xe}$  and  $^{94}\text{Sr}$ , the number of neutrons emitted is \_\_\_\_\_.  
 A) 3    B) 4    C) 2    D) 1
- xiii) The value of Rydberg constant is \_\_\_\_\_.  
 A)  $1.0974 \times 10^7 \text{ m}^{-1}$     B)  $1.0794 \times 10^7 \text{ m}^{-1}$     C)  $1.0974 \times 10^9 \text{ m}^{-1}$     D)  $1.974 \times 10^9 \text{ m}^{-1}$
- xiv) Energy given out per nucleon in p-p reaction is \_\_\_\_\_ MeV.  
 A) 5.2    B) 6    C) 6.4    D) 7.7
- xv)  $K_{\alpha}$  - X rays are produced due to transition of electrons from.  
 A) K to L shell    B) L to K shell    C) M to K shell    D) M to L shell
- xvi) Which of the following is elementary particle?  
 A) Proton    B) Neutron    C) Photon    D) Meson
- xvii) Two down and one up quarks make \_\_\_\_\_.  
 A) Proton    B) Neutron    C) Photon    D) Positron

**Q2) Write short answers of the following:**

44 Marks

- i) Can electron in the ground state of hydrogen absorb a photon of energy 13.6eV and greater than 13.6eV?

- ii) Why population inversion and lasing action are necessary for Laser production?
- iii) How can the spectrum of hydrogen contain so many lines, when hydrogen contains one electron?
- iv) What is meant by a line spectrum? Explain how line spectrum can be used for the identification of elements.
- v) Is energy conserved when an atom emits a photon of light?
- vi) What advantages an electron microscope has over optical microscope?
- vii) What are biological effects of X-rays?
- viii) What are advantages of laser over ordinary light?
- ix) How can radioactivity help in the treatment of cancer?
- x) Briefly give the uses of (i) Wilson cloud chamber (ii) G.M. counter.
- xi) What is radioactive tracer? Give its one application in industry and medicine.
- xii) State advantages and disadvantages of fusion power from the point of view of safety, pollution and resources?
- xiii) What is meant by fluorescence?
- xiv) Which radiation would deposit more energy to the body (i) 10mGy to the hand or (ii) 1mGy dose to entire body? Explain why?
- xv) What do you mean by the term critical mass?
- xvi) Define background radiations. What are their sources?
- xvii) Describe a brief account of interaction of various types of radiations with matter.
- xviii) Why are heavy nuclei unstable?
- xix) Differentiate between Baryons and Mesons.
- xx) State the advantages and disadvantages of nuclear power. (xxi) what is gray? (xxii) what is rem?

**Give explanatory answer of the following:**

24 Marks

- 3A) Write Bohr's second postulate and find out formula for Bohr's quantized radii.
- 3B) Define spectroscopy. Derive expression for radii of quantized orbit.
- 4A) Explain mass defect and binding energy.
- 4B) How isotopes are detected with a mass spectrograph?
- 5A) Define isotopes and describe mass spectrograph to separate different isotopes of an element
- 5B) A 75kg person receives a whole body radiation dose of 24m-rad, delivered by  $\alpha$ -particles for which RBE factor is 12. Calculate the absorbed energy in joules.