

COVENANT UNIVERSITY
NIGERIA

TUTORIAL KIT
OMEGA SEMESTER

PROGRAMME: PHYSICS

COURSE: PHY 122

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PHY 122: Atomic and Nuclear Physics

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$k=8.99 \times 10^9 \text{Nm}^2$, $h = 6.63 \times 10^{-34} \text{Js}$, $c = 3 \times 10^8 \text{m/s}$, $1\text{eV} = 1.6 \times 10^{-19} \text{J}$, Rydberg constant = $10.97 \times 10^6 \text{m}^{-1}$, $e/m = 1.756 \times 10^{11} \text{C/kg}$, $h = 6.63 \times 10^{-34} \text{Js}$, $e = 1.62 \times 10^{-19} \text{C}$, mass of electron $m_e = 9.11 \times 10^{-31} \text{Kg}$, The energy equivalence of the atomic mass unit is 931.5MeV,

1. How is Lewis notation useful?.....

Model answer It can be generated by trial and error

2. How many particles are there in a sample of matter that contains five moles of particles?.....

3. What was the "basic idea" about matter that Leucippus and Democritus proposed?.....

Model answer Atoms are objects that could not be divided further

4. What observation led Chadwick (and Rutherford) to conclude there must be something besides just the proton in the nucleus of atoms?

.....

5. List two reasons why Democritus' idea were not useful in scientific sense.....

..... and.....

Model answer He could not explain chemical behaviour of atoms and not supported experimentally

6. A hydrogen atom is in its first excited state ($n=2$). Using the Bohr's theory of atoms, calculate the linear momentum of the electron.....

7. The size of the atoms in Rutherford model is about $1.0 \times 10^{-10} \text{m}$. Determine (in eV) the electrical potential energy of the atom

Model answer = -14eV

8. What observation led Chadwick (and Rutherford) to conclude there must be something besides just the proton in the nucleus of atoms?

.....

9. Compute the energy of a photon of red light of wavelength 450 nm.

Model answer = $4.42 \times 10^{-22} \text{J}$ or $0.0442 \times 10^{-20} \text{J}$

10. Calculate the wavelength of the third member of Lyman series of hydrogen atom if the Rydberg constant is as stated above.....

11 The unit of magnetic flux is Weber per metre square (wb/m^2) or

Model answer Tesla

12. A photon of orange light has a wavelength of 1000nm. The photon frequency is

13. The work function of a metal is expressed as

Model answer $W_0 = hf_0$ or $\frac{hv}{\lambda_0}$ or $\frac{hc}{\lambda_0}$

14. The binding energy of an isotope of chlorine is 298MeV. is the mass defect of this chlorine in atomic mass units.

15. If a voltage of 85kV is applied to an X-ray tube. What is the minimum wavelength of the X-rays.....

Model answer = $1.44 \times 10^{-11} m$ or $1.45 \times 10^{-11} m$

16. An electron beam passes through a magnetic field of $2 \times 10^{-3} W/m^2$ and an electric field of $3.4 \times 10^4 V/m$ acting simultaneously. If the path of the electron remains undeviated, calculate the speed of the electron.....

17. Complete this sentence: in a β^+ decay process, the emitted particle is

Model answer A positron

18. and are the missing product(s) in the nuclear decay process



19. The half-life of ^{226}Ra is 2.2×10^3 s. What is the mass of a sample of ^{226}Ra that has the activity of $1.42 \times 10^{12} \text{Bq}$?

Model answer = $1.9610^{-6} g$

20. energy is required to split a ^{238}U of mass 51.940509u into two identical ^{119}Zn atoms? The mass of this isotope of magnesium is 25.98259u.