

1. If the energy of  $\text{He}^+$  in the ground state is -54.4 eV, then its energy in the first excited state is
  - a) 13.6 eV
  - b) + 13.6 eV
  - c) - 27.2 eV
  - d) + 27.2 eV
2. The additional energy that should be given to an electron to reduce its de-Broglie wavelength from 1nm to 0.5nm is
  - a) 2 times the initial K.E.
  - b) 5 times the initial K.E.
  - c) 0.5 times the initial K.E.
  - d) 4 times the initial K.E.
3. The speed of electron in the first Bohr orbit  $\frac{c}{137}$ , where C is speed of light in free space. The speed of electron in the 2<sup>nd</sup> Bohr orbit will be :
  - a)  $\frac{1}{2} \left( \frac{c}{137} \right)$
  - b)  $2 \times \left( \frac{c}{137} \right)$
  - c)  $\frac{1}{4} \left( \frac{c}{137} \right)$
  - d)  $4 \left( \frac{c}{137} \right)$
4.  ${}_{92}\text{U}^{238}$  decays to a stable nucleus of  ${}_{82}\text{Pb}^{206}$ . In this process
  - a) 8  $\alpha$  - particles and 6  $\beta$  - particles are emitted
  - b) 6  $\alpha$  - particles and 8  $\beta$  - particles are emitted
  - c) 7  $\alpha$  - particles and 7  $\beta$  - particles are emitted
  - d) 8  $\alpha$  - particles and 4  $\beta$  - particles are emitted
5. An electron in  $\text{H}_2$  atom makes a transition from  $n_1 \rightarrow n_2$ . The time period of electron in the initial state is eight times that in the final state. Then ratio of  $n_1$  to  $n_2$ :
  - a) 1 : 2
  - b) 2 : 1
  - c) 4 : 1
  - d) 8 : 1
6. A hydrogen atom emits a photon of energy 12.1 eV. Its orbital angular momentum changes by  $\Delta L$ . Then  $\Delta L$  equals :
  - a)  $1.5 \times 10^{-34} \text{Js}$
  - b)  $2.11 \times 10^{-34} \text{Js}$
  - c)  $3.16 \times 10^{-34} \text{Js}$
  - d)  $4.22 \times 10^{-34} \text{Js}$

7. A hydrogen atom in the ground state absorbs  $12.09 \text{ eV}$  of energy. The change in the orbital angular momentum of the electron is :
- $+ 1.05 \times 10^{-34} \text{ Js}$
  - $+ 2.11 \times 10^{-34} \text{ Js}$
  - $- 2.11 \times 10^{-34} \text{ Js}$
  - $4.22 \times 10^{-34} \text{ Js}$
8. The radioactivity of a sample is  $R_1$  at a time  $t_1$  and  $R_2$  at time  $t_2$ . If half life of sample is  $T$ , then no. of atoms that have disintegrated in time  $(t_2 - t_1)$  is proportional to :
- $R_1 t_1 - R_2 t_2$
  - $(R_1 - R_2)^{-1}$
  - $\frac{R_1 - R_2}{T}$
  - $(R_1 - R_2) T$ .
9. Which of the following spectral series of hydrogen atom is lying in visible region electromagnetic wave?
- Paschen series
  - Pfund series
  - Lyman series
  - Balmer series.
10. What is the energy of the electron revolving in third orbit expressed eV?
- $1.51 \text{ eV}$
  - $3.4 \text{ eV}$
  - $4.53 \text{ eV}$
  - $4 \text{ eV}$
11. The relation between half-life ( $T$ ) and decay constant ( $\lambda$ ) is :
- $\lambda T = 1$
  - $\lambda T = \frac{1}{2}$
  - $\lambda T = \log_e 2T$
  - $\lambda = \log 2T$
12. A force between two protons is same as the force between proton and neutron. The nature of the force is :
- Weak nuclear force
  - Strong nuclear force
  - Electrical force
  - Gravitational force
13. An  $\alpha$  - particle of energy  $5 \text{ MeV}$  is scattered through  $180^\circ$  by gold nucleus. The distance of closest approach is of the order of :
- $10^{-12} \text{ cm}$
  - $10^{-16} \text{ cm}$
  - $10^{-10} \text{ cm}$
  - $10^{-14} \text{ cm}$
14. A radioactive decay can form an isotope of the original nucleus with the emission of the particles :
- One  $\alpha$  and two  $\beta$
  - four  $\alpha$  and once  $\beta$

- c) One  $\alpha$  and four  $\beta$
- d) One  $\alpha$  and one  $\beta$
15. The half life of radioactive substance is 20 minutes. The time taken between 50% decay and 87.5% decay of the substance will :
- a) 40 minutes
- b) 10 minutes
- c) 30 minutes
- d) 25 minutes
16. A nucleus at rest splits into two nuclear parts having radii in the ration 1:2. Their velocities are in the ratio :
- a) 6 : 1
- b) 2 : 1
- c) 8 : 1
- d) 4 : 1
17. What is the wavelength of light for the least energetic spectrum. (take  $hc = 1240 \text{ eV nm}$ ):
- a) 102nm
- b) 150 nm
- c) 82 nm
- d) 122 nm
18. If an electron in hydrogen atom jumps from an orbit of level  $n = 3$  to an orbit of level  $n = 2$ , the emitted radiation has a frequency (R = Rydberg constant,  $c$  = velocity of light)
- a)  $\frac{Rc}{25}$
- b)  $\frac{5Rc}{36}$
- c)  $\frac{3Rc}{27}$
- d)  $\frac{8Rc}{9}$