TEST SERIES 2019-20 **TEST NO. 8**

CH 11,12 AND 13 **CONDUCTED ON 2ND FEBRUARY 2020**

Maximum Marks: 45 **Time Allowed: 2 hours**

SECTION A

1. **Radiations of frequency f are incident on a photosensitive material. The maximum kinetic energy of photoelectrons is E. when the frequency of the incident radiation is doubled, what is the maximum kinetic energy of the photoelectrons?**
   - **(a) 2E**
   - **(b) 4E**
   - **(c) E+hf**
   - **(d) E-hf**
2. **The energy of a photon of wavelength 660 nm is**
   - **(a) 3×10^{-17} J**
   - **(b) $3x\ 10^{-16}$ J**
   - **(c) $3\ X10^{-19}$J**
   - **(d) $3\ X\ 10^{-18}$J**
3. **A proton and an alpha particle are accelerated through same potential. The ratio of their de Broglie wavelengths $\lambda_p / \lambda_\alpha$ is**
   - **(a) 1**
   - **(b) 2**
   - **(c) $\sqrt{8}$**
   - **(d) $1/\sqrt{8}$**
4. **In photoelectric effect, the number of photoelectrons is proportional to**
   - **(a) Intensity of incident beam**
   - **(b) Frequency of incident beam**
   - **(c) Velocity of incident beam**
   - **(d) Work function of photosensitive metal**
5. **For a given kinetic energy which of the following has smallest de Broglie wavelength?**
   - **(a) Photoelectric effect**
   - **(b) Refraction**
   - **(c) Interference**
   - **(d) Polarization**
6. **Energy of an electron in the second orbit of hydrogen atom is E and the energy of electron in 3rd orbit of He will be**

(a) 16E/9
(b) 16E/3
(c) 4E/9
(d) 4E/3

7. The ratio between Bohr radii is
   (a) 1:2:3
   (b) 2:4:6
   (c) 1:4:9
   (d) 1:3:5
8. The transition of electrons from n=4,5,6,……to n=3 corresponds to
   (a) Lyman series
   (b) Balmer series
   (c) Paschen series
   (d) Brackett series
9. On moving up in the energy states of a H-like atom, the energy difference between two consecutive energy states
   (a) Decreases
   (b) Increases
   (c) First decreases then increase
   (d) First increases then decrease
10. For ionizing an excited state hydrogen atom, the energy required(in eV) will be
   (a) A little less than 13.6 eV
   (b) 13.6eV
   (c) More than 13.6 eV
   (d) 3.4eV or less
11. When a beta particle is emitted from a nucleus then its neutron-proton ratio
   (a) Increases
   (b) Decreases
   (c) Remains unchanged
   (d) May increase or decrease depending upon the nucleus.
12. Average binding energy is maximum for
   (a) C^{12}
   (b) Fe^{56}
   (c) U^{235}
   (d) Po^{210}
13. The quantity which is not conserved in a nuclear reaction is
   (a) Momentum
   (b) Mass

(c) Charge

(d) None of these

14. A nucleus undergoes gamma decay due to

(a) Excess of protons

(b) Excess of neutron

(c) Large mass

(d) Its excited state

15. A radioactive element has half life period 1600 years. After 6400 years what amount will remain?

(a) ½

(b) 1/16

(c) 1/8

(d) ¼

16. Two nuclei have mass numbers in the ratio 27:125. Then the ratio of their nuclear radii is…….

17. Isotones have same number of……

18. Number of possible spectral lines emitted on dexcitation of electrons from energy level n to ground state is equal to……..

19. ……is the perpendicular distance of the velocity vector of the alpha particle from the centre of nucleus.

20. …….. experiment has verified and confirmed the wave nature of electrons.

SECTION B

21. Monochromatic light of frequency 6.0×10^{14} Hz is produced by a laser. The power emitted is 2.0×10^{-3} W. How many photons per second, on an average, are emitted by the source?

22. Obtain the binding energy per nucleon (in MeV) of a nitrogen nucleus $^{14}_{7}N$, given m ($^{14}_{7}N$) =14.00307 u, m_H = 1.007825 u, m_n=1.008665 u, 1 u = 931 MeV/c^2

23. Calculate the frequency of the photon radiated by a hydrogen atom when it de-excites from the first excited state to the ground state?

24. A 12.9 eV beam of electrons is used to bombard gaseous hydrogen at room temperature. Up to which energy level the hydrogen atoms would be excited? Which spectral line will be emitted if an electron from this level moves to ground level?

25. A heavy nucleus X of mass number A=240 and binding energy per nucleon 7.6MeV is split into two nearly equal fragments Y and Z of mass number A_1=110 and A_2=130.The binding energy of each one of these nuclei is 8.5 Me V per nucleon. Calculate the energy released in MeV.

SECTION C

26. What is β-decay? How can radioactive nuclei emit β-particles even though nuclei do not contain these particles? Hence explain why the mass number of a radioactive nucleus does not change during β-decay.

27. Use the basic law of radioactive decay, to show that radioactive nuclei follow an exponential decay law. Hence obtain a formula, for the half-life of a radioactive nuclide, in terms of its disintegration constant.

28. Using Bohr's postulates, obtain the expression for the total energy of the electron in the stationary states of the hydrogen atom.

29. Why photoelectric effect cannot be explained on the basis of wave nature of light? Explain. Write the basic features of photon picture of electromagnetic radiation on which Einstein's photoelectric equation is based

30. Draw a graph showing the variation of binding energy per nucleon with mass number for different nuclei. Write two important conclusions which you can draw from this plot.

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