JEE MAIN : CHAPTER WISE TEST-9

SUBJECT :- PHYSICS **DATE.....**

CLASS :- 12th **NAME.....**

CHAPTER :- MODERN PHYSICS **SECTION.....**

(SECTION A)

1. Hydrogen atom emits blue light when it changes from n = 4 to n = 2 level. Which colour of light would the atom emit when it changes n = 5 to n = 2

(A) Red (B) Yellow

(C) Green (D) Violet

2. The shortest wavelength of the Brackett series of a hydrogen like atom (atomic number = Z) is the same as the shortest wavelength of the Belmar series of hydrogen atom. The value of Z is –

(A) 2 (B) 3 (C) 4 (D) 6

3. When 24.8 KeV x-rays strike a material, the photoelectrons emitted from K shell are observed to move in a circle of radius 23 mm in a magnetic field of 2×10^{-2} T. The binding energy of K-shell electrons is-

(A) 6.2 KeV (B) 5.4 KeV

(C) 7.4 KeV (D) 8.6 KeV

4. Assuming that about 200 MeV of energy is released per fission of $_{92}U^{235}$ nuclei, then the mass of U^{235} consumed per day in fission reactor of power 1 megawatt will be approximately:

(A) 10^{-2}g (B) 1 g

(C) 100 g (D) 10,000 g

5. When photons of energy $h\nu$ are incident on the surface of photosensitive material of work function $h\nu_0$, then -

(A) the kinetic energy of all emitted electrons is $h\nu_0$

(B) the kinetic energy of all emitted electrons is $h(\nu - \nu_0)$

(C) the kinetic energy of all fastest electrons is $h(\nu - \nu_0)$

(D) the kinetic energy of all emitted electrons is $h\nu$

6. When radiation of the wavelength λ is incident on a metallic surface, the stopping potential is 4.8 volt. If the same surface is illuminated with radiation of double the wavelength, then the stopping potential becomes 1.6 volt. Then the threshold wavelength for the surface is.

(A) 2λ (B) 4λ (C) 6λ (D) 8λ

7. Light of frequency υ falls on material of threshold frequency υ_0. maximum kinetic energy of emitted electron is proportional to.

(A) $\upsilon - \upsilon_0$ (B) υ

(C) $\sqrt{\upsilon - \upsilon_0}$ (D) υ

8. When a certain metal surface is illuminated with light of frequency υ. the stopping potential for photoelectric current is V_0. When the same surface is illuminated by light of frequency $\frac{\upsilon}{2}$ the stopping potential is $\frac{V_0}{4}$. The threshold frequency for photoelectric emission is.

(A) $\frac{\upsilon}{6}$ (B) $\frac{\upsilon}{3}$

(C) $\frac{2\upsilon}{3}$ (D) $\frac{4\upsilon}{3}$

9. Photon of frequency u has a momentum associated with it. If c the velocity of light, the momentum is.

(A) $\frac{h\upsilon}{c}$ (B) $\frac{\upsilon}{c}$

(C) $h\upsilon c$ (D) $\frac{h\upsilon}{c^2}$

10. During nuclear fusion reaction

(A) A heavy nucleus breaks into two fragments by itself

(B) A light nucleus bombarded by thermal neutrons breaks up

(C) A heavy nucleus bombarded by thermal neutrons breaks up

(D) Two light nuclei combine to give a heavier nucleus and possibly other products

11. The rest mass of photon is.

(A) $\frac{h\upsilon}{c}$ (B) $\frac{h\upsilon}{c^2}$

(C) $\frac{h\upsilon}{\lambda}$ (D) zero

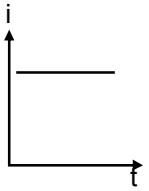
12. Calculate the linear momentum of a 3 Me V photon.
(A) 0.01 eV s/m (B) 0.02 eV s/m
(C) 0.03 eV s/m (D) 0.04 eV s/m

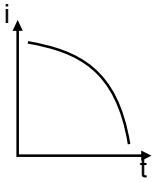
13. The speed of an electron having a wavelength of 10^{-10} m is.
(A) 7.25×10^6 m/s (B) 6.25×10^6 m/s
(C) 5.25×10^6 m/s (D) 4.24×10^6 m/s

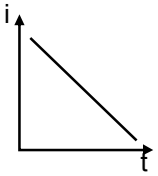
14. The de Broglie wavelength of a particle moving with a velocity 2.25×10^8 m/s is equal to the wavelength of a photon. The ratio of kinetic energy of the particle of the energy of the photon is (Velocity of light is 3×10^8 m/s)
(A) $\frac{1}{8}$ (B) $\frac{3}{8}$ (C) $\frac{5}{8}$ (D) $\frac{7}{8}$

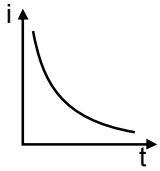
15. **Statement I:** Two photons having equal linear moments have equal wavelengths.
Statement II: If the wavelength of photon is decreased, then the momentum and energy of a photon will also decrease.
In the light of the above statements, choose the correct answer from the options given below.
(A) Both Statement I and Statement II are true
(B) Statement I is false but Statement II is true
(C) Both Statement I and Statement II are false
(D) Statement I is true but Statement II is false

16. A point source causes photoelectric effect from a small metal plate. Which of the following curves may represent the saturation photocurrent as a function of the distance between the source and the metal?

(A) 

(B) 

(C) 

(D) 

17. Two different photons of energies, 1 eV and 2.5 eV, fall on two identical metal plates having work function 0.5 eV, Then the ratio of maximum KE of the electrons emitted from the two surface is–
(A) 1 : 2 (B) 1 : 4
(C) 2 : 1 (D) 4 : 1

18. When x-rays of wavelength 0.5 Å would transmitted by an aluminum tube of thickness 7 mm, its intensity remains one-fourth. The attenuation coefficient of aluminum for these X-rays -
(A) 0.188 mm^{-1} (B) 0.189 mm^{-1}
(C) 0.198 mm^{-1} (D) None

19. Assuming the nitrogen molecule is moving with r.m.s. velocity at 400 K, the de-Broglie wavelength of nitrogen molecule is close to (Given : nitrogen molecule weight: 4.64×10^{-26} kg, Boltzmann constant constant : 1.38×10^{-23} J/K, Planck constant: 6.63×10^{-34} J.s)
(A) 0.24 Å (B) 0.20 Å
(C) 0.34 Å (D) 0.44 Å

20. The wavelength of first spectral line of sodium is 5896 Å. The first excitation potential (ev) of sodium atom will be (h = 6.63×10^{-34} J s)
(A) 4.2 V (B) 3.5 V
(C) 2.1 V (D) None of these

(SECTION B)

21. For a radioactive sample, the initial activity of the material was 8 counts and after 3 h it becomes 1 count. The half– life of the sample is (in h)

22. Excitation energy of a hydrogen like ion in its first excitation state is 40.8 eV. Energy (in eV) needed the electron from the ion in ground state is.

23. In a radioactive decay chain reaction $\frac{4}{2}=2$ The nucleus decays into 84^{214} Po nucleus The ratio of the number of α to number of β^- particles emitted in this process is_____.

24. If in Rutherford's experiment, the number of particles scatterd at 90° angle are 28 per min, then number of scattered particles scattered per min at an angle 60° will be–

25. Two lighter nuclei combine to from a comparatively heavier nucleus by the realtion given below.

$${}_1^2X + {}_1^2X = \frac{2}{4}Y$$

The binding energies per nucleon ${}_1^2X$ and ${}_2^4Y$ are 1.1 MeV and 7.6 MeV respectively. The energy released in this process is _____MeV.

26. Two deuterons are moving towards each other with equal speeds. What should be their initial kinetic energies (in MeV) so that the distance of closest approach between them is 2 fm?

27. A nuclear disintegrates into two nuclear parts, in such a way that ratio of their nuclear sizes is $1:2^{\frac{1}{3}}$, Their respective speed have a ratio of n : 1, The value of n is_____.

28. The first excitation potential of He^+ ion is 'n' and the ionization potential of Li^{++}ion is 'm' then find out value of $\frac{m}{n}$.

29. In a photoelectric effect experiment, stopping potential changes by 30 Volt if we change frequency of the radiation. The magnitude of change in the frequency is K $\times$ 10^{15}–1. Find the value of k. (h=6 $\times 10^{34}$J–s).

30. An electron is accelerated by a potential difference of 50 volt. Find the de-Broglie wavelength (A°) associated with it.