RK VISION ACADEMY

PHYSICS

XII – DUAL NATURE OF RADIATION AND MATTER

SECTION A

1. The idea of matter waves was given by

(1) Davisson and Germer
(2) de-Broglie
(3) Einstein
(4) Planck

2. Wave is associated with matter

(1) When it is stationary
(2) When it is in motion with the velocity of light only
(3) When it is in motion with any velocity
(4) None of the above

3. The de-Broglie wavelength associated with the particle of mass *m* moving with velocity *v* is

(1) h/mv
(2) mv/h
(3) mh/v
(4) 4×10^4

4. A photon, an electron and a uranium nucleus all have the same wavelength. The one with the most energy

(1) Is the photon
(2) Is the electron
(3) Is the uranium nucleus
(4) Depends upon the wavelength and the properties of the particle.

5. A particle which has zero rest mass and non-zero energy and momentum must travel with a speed

(1) Equal to *c*, the speed of light in vacuum
(2) Greater than *c*
(3) Less than *c*
(4) Tending to infinity

6. When the kinetic energy of an electron is increased, the wavelength of the associated wave will

(1) Increase
(2) Decrease
(3) Wavelength does not depend on the kinetic energy
(4) None of the above

7. If the de-Broglie wavelengths for a proton and for a α −particle are equal, then the ratio of their velocities will be

(1) 4 : 1
(2) 2 : 1
(3) 1 : 2
(4) 1 : 4

8. The de-Broglie wavelength λassociated with an electron having kinetic energy *E* is given by the expression

(1) $\frac{h}{\sqrt{2mE}}$
(2) $\frac{2h}{mE}$
(3) $2mhE$
(4) $\frac{2\sqrt{2mE}}{h}$

9. Dual nature of radiation is shown by

(1) Diffraction and reflection
(2) Refraction and diffraction
(3) Photoelectric effect alone
(4) Photoelectric effect and diffraction

10. For the Bohr's first orbit of circumference $2\pi r$, the de-Broglie wavelength of revolving electron will be

(1) $2\pi r$
(2) πr
(3) $\frac{1}{2\pi r}$
(4) $\frac{1}{4\pi r}$

11. An electron of mass *m* when accelerated through a potential difference *V* has de-

Broglie wavelength λ. The de-Broglie wavelength associated with a proton of mass M accelerated through the same potential difference will be

(1) $\lambda \frac{m}{M}$

(2) $\lambda \sqrt{\frac{m}{M}}$

(3) $\lambda \frac{M}{m}$

(4) $\lambda \sqrt{\frac{M}{m}}$

12. What will be the ratio of de-Broglie wavelengths of proton and α −particle of same energy

(1) 2 : 1
(2) 1 : 2
(3) 4 : 1
(4) 1 : 4

13. What is the de-Broglie wavelength of the α −particle accelerated through a potential difference V

(1) $\frac{0.287}{\sqrt{V}}$Å

(2) $\frac{12.27}{\sqrt{V}}$Å

(3) $\frac{0.101}{\sqrt{V}}$Å

(4) $\frac{0.202}{\sqrt{V}}$Å

14. De-Broglie hypothesis treated electrons as

(1) Particles
(2) Waves
(3) Both '*a*' and '*b*'
(4) None of these

15. The energy that should be added to an electron, to reduce its de-Broglie wavelengths from $10^{-10}m$ to $0.5 \times 10^{-10}m$, will be

(1) Four times the initial energy
(2) Thrice the initial energy
(3) Equal to the initial energy
(4) Twice the initial energy

16. The de-Broglie wavelength of an electron having $80eV$ of energy is nearly

($1eV = 1.6 \times 10^{-19}$ J, Mass of electron = $9 \times 10^{-31} kg$ Plank's constant = 6.6×10^{-34} *J-sec*)

(1) 140 Å
(2) 0.14 Å
(3) 14 Å
(4) 1.4 Å

17. If particles are moving with same velocity, then maximum de-Broglie wavelength will be for

(1) Neutron
(2) Proton
(3) β-particle
(4) α -particle

18. If an electron and a photon propagate in the form of waves having the same wavelength, it implies that they have the same

(1) Energy
(2) Momentum
(3) Velocity
(4) Angular momentum

19. The de-Broglie wavelength is proportional to

(1) $\lambda \propto \frac{1}{v}$

(2) $\lambda \propto \frac{1}{m}$

(3) $\lambda \propto \frac{1}{p}$

(4) $\lambda \propto p$

20. Particle nature and wave nature of electromagnetic waves and electrons can be shown by

(1) Electron has small mass, deflected by the metal sheet
(2) X-ray is diffracted, reflected by thick metal sheet
(3) Light is refracted and defracted
(4) Photoelectricity and electron microscopy

21. The de-Broglie wavelength of a particle moving with a velocity 2.25×10^8 *m/s* is equal to the wavelength of photon. The ratio of kinetic energy of the particle to the energy of the photon is (velocity of light is 3×10^8 *m/s*)
(1) 1/8
(2) 3/8
(3) 5/8
(4) 7/8

22. According to de-Broglie, the de-Broglie wavelength for electron in an orbit of hydrogen atom is 10^{-9} *m*. The principle quantum number for this electron is
(1) 1
(2) 2
(3) 3
(4) 4

23. The speed of an electron having a wavelength of $10^{-10} m$ is
(1) $7.25 \times 10^6 m/s$
(2) $6.26 \times 10^6 m/s$
(3) $5.25 \times 10^6 m/s$
(4) $4.24 \times 10^6 m/s$

24. The kinetic energy of electron and proton is $10^{-32} J$. Then the relation between their de-Broglie wavelengths is
(1) $\lambda_p < \lambda_e$
(2) $\lambda_p > \lambda_e$
(3) $\lambda_p = \lambda_e$
(4) $\lambda_p = 2\lambda_e$

25. The de-Broglie wavelength of a particle accelerated with 150 *volt* potential is $10^{-10} m$. If it is accelerated by 600 *volts* p.d., its wavelength will be
(1) 0.25 Å
(2) 0.5 Å
(3) 1.5 Å
(4) 2 Å

26. The de-Broglie wavelength associated with a hydrogen molecule moving with a thermal velocity of 3 *km/s* will be
(1) 1 Å
(2) 0.66 Å
(3) 6.6 Å
(4) 66 Å

27. When the momentum of a proton is changed by an amount P_0, the corresponding change in the de-Broglie wavelength is found to be 0.25%. Then, the original momentum of the proton was
(1) p_0
(2) 100 p_0
(3) 400 p_0
(4) 4 p_0

28. The de-Broglie wavelength of a neutron at 27°*C* is λ. What will be its wavelength at 927°*C*
(1) $\lambda / 2$
(2) $\lambda / 3$
(3) $\lambda / 4$
(4) $\lambda / 9$

29. An electron and proton have the same de-Broglie wavelength. Then the kinetic energy of the electron is
(1) Zero
(2) Infinity
(3) Equal to the kinetic energy of the proton
(4) Greater than the kinetic energy of the proton

30. For moving ball of cricket, the correct statement about de-Broglie wavelength is

(1) It is not applicable for such big particle

(2) $\frac{h}{\sqrt{2mE}}$

(3) $\sqrt{\frac{h}{2mE}}$

(4) $\frac{h}{2mE}$

31. Photon and electron are given same energy ($10^{-20}J$). Wavelength associated with photon and electron are λ_{Ph} and λ_{el} then correct statement will be

(1) $\lambda_{Ph} > \lambda_{el}$

(2) $\lambda_{Ph} < \lambda_{el}$

(3) $\lambda_{Ph} = \lambda_{el}$

(4) $\frac{\lambda_{el}}{\lambda_{Ph}} = C$

32. The kinetic energy of an electron with de-Broglie wavelength of 0.3 nanometer is

(1) 0.168 *eV*

(2) 16.8 *eV*

(3) 1.68 *eV*

(4) 2.5 *eV*

33. A proton and an α-particle are accelerated through a potential difference of 100 *V*. The ratio of the wavelength associated with the proton to that associated with an α-particle is

(1) $\sqrt{2}:1$

(2) $2:1$

3) $2\sqrt{2}:1$

(4) $\frac{1}{2\sqrt{2}}:1$

34. The wavelength of de-Broglie wave is 2μm, then its momentum is ($h = 6.63 \times 10^{-34}$ *J-s*)

(1) 3.315×10^{-28} *kg-m/s*

(2) 1.66×10^{-28} *kg-m/s*

(3) 4.97×10^{-28} *kg-m/s*

(4) 9.9×10^{-28} *kg-m/s*

35. De-Broglie wavelength of a body of mass 1 *kg* moving with velocity of 2000 *m/s* is

(1) 3.32×10^{-27} Å

(2) 1.5×10^{7} Å

(3) 0.55×10^{-22} Å

(4) None of these

SECTION B

36. The kinetic energy of an electron is 5 *eV*. Calculate the de-Broglie wavelength associated with it ($h = 6.6 \times 10^{-34}$ *Js*, $m_e = 9.1 \times 10^{-31}$ *kg*)

(1) 5.47 Å

(2) 10.9 Å

(3) 2.7 Å

(4) None of these

37. The wavelength associated with an electron accelerated through a potential difference of 100 *V* is nearly

(1) 100 Å

(2) 123 Å

(3) 1.23 Å

(4) 0.123 Å

38. The de-Broglie wavelength λ

(1) is proportional to mass

(2) is proportional to impulse

(3) Inversely proportional to impulse

(4) does not depend on impulse

39. Davission and Germer experiment proved

(1) Wave nature of light

(2) Particle nature of light

(3) Both (1) and (2)

(4) Neither (1) nor (2)

40. If the kinetic energy of a free electron doubles, its de-Broglie wavelength changes by the factor

(1) $\frac{1}{\sqrt{2}}$

(2) $\sqrt{2}$

(3) $\frac{1}{2}$

(4) 2

41. The energy that should be added to an electron to reduce its de Broglie wavelength from one *nm* to 0.5 *nm* is

(1) Four times the initial energy
(2) Equal to the initial energy
(3) Twice the initial energy
(4) Thrice the initial energy

42. The work function of a metal is 4.2 eV, its threshold wavelength will be
(1) 4000 $Å$
(2) 3500 $Å$
(3) 2955 $Å$
(4) 2500 $Å$

43. The number of photo-electrons emitted per second from a metal surface increases when
(1) The energy of incident photons increases
(2) The frequency of incident light increases
(3) The wavelength of the incident light increases
(4) The intensity of the incident light increases

44. The work function of metal is 1 eV. Light of wavelength 3000 $Å$ is incident on this metal surface. The velocity of emitted photoelectrons will be
(1) 10 *m/sec*
(2) 1×10^3 *m/sec*
(3) $1 \times 10^4\ m/sec$*m/sec*
(4) $1 \times 10^6\ m/sec$*m/sec*

45. The retarding potential for having zero photo-electron current
(1) Is proportional to the wavelength of incident light
(2) Increases uniformly with the increase in the wavelength of incident light
(3) Is proportional to the frequency of incident light
(4) Increases uniformly with the increase in the frequency of incident light wave

46. In a dark room of photography, generally red light is used. The reason is
(1) Most of the photographic films are not sensitive to red light
(2) The frequency for red light is low and hence the energy $h\nu$ of photons is less
(3) (1) and (2) both
(4) None of the above

47. The work function of a metal is $1.6 \times 10^{-19} J$. When the metal surface is illuminated by the light of wavelength 6400 Å, then the maximum kinetic energy of emitted photo-electrons will be (Planck's constant $h = 6.4 \times 10^{-34} Js$)
(1) $14 \times 10^{-19}\ J$
(2) $2.8 \times 10^{-19}\ J$
(3) $1.4 \times 10^{-19} J$
(4) $1.4 \times 10^{-19} eV$

48. Ultraviolet radiations of $6.2 eV$ falls on an aluminium surface (work function $4.2\ eV$). The kinetic energy in joules of the fastest electron emitted is approximately
(1) 3.2×10^{-21}
(2) 3.2×10^{-19}
(3) 3.2×10^{-17}
(4) 3.2×10^{-15}

49. The work function for tungsten and sodium are 4.5 eV and 2.3 eV respectively. If the threshold wavelength λ for sodium is 5460Å, the value of λ for tungsten is
(1) 5893 $Å$
(2) 10683 $Å$
(3) 2791 $Å$
(4) 528 $Å$

50. A photon of energy 3.4 eV is incident on a metal having work function 2 eV. The

maximum K.E. of photo-electrons is equal to

(1) 1.4 eV

(2) 1.7 eV

(3) 5.4 eV

(4) 6.8 eV

RK VISION ACADEMY

PHYSICS

XII – DUAL NATURE OF RADIATION AND MATTER

SECTION A

1.	2
2.	3
3.	1
4.	1
5.	1
6.	2
7.	1
8.	1
9.	4
10.	1
11.	2
12.	1
13.	3
14.	2
15.	2
16.	4
17.	3
18.	2
19.	3
20.	4
21.	2
22.	3
23.	1
24.	1
25.	2
26.	2
27.	3
28.	1
29.	4
30.	2
31.	1
32.	2
33.	3
34.	1
35.	1
SECTION B	
36.	1
37.	3
38.	3
39.	4
40.	1
41.	4
42.	3
43.	4
44.	4
45.	4
46.	3
47.	3
48.	2
49.	3
50.	1