UNIT TEST-05

Subject : Physics
Class : XII

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

Q.1 (1)

$$\phi = \frac{12400}{5400Å} \cong 2.3\,eV$$

Q.2 (4)

Energy of one photon $= \frac{hc}{\lambda}$

Total energy $= 3{\cdot}2 \times 10^{-3}$ W

$\Rightarrow$ No. of photons $= \frac{\text{total energy}}{\text{energy of one photon}}$

$$= \frac{3{\cdot}2\times10^{-3}}{\left(\frac{hc}{\lambda}\right)} = \frac{3{\cdot}2\times10^{-3}\times6{\cdot}21}{1240\times1{\cdot}6\times10^{-19}}$$

$= 0{\cdot}01 \times 10^{16} = 10^{14}$ photons

Q.3 (2)

From Einstein photo electric equation

photon energy = work function + V_0(stopping potential)

$\Rightarrow$ 7.4eV = W + 4eV $\Rightarrow$ W = 3·4 eV

Q.4 (2)

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Q.5 (2)

Since, $\phi_0 = \frac{hc}{\lambda_0}$; so $\frac{\phi_{0_W}}{\phi_{0_{Na}}} = \frac{\lambda_{Na}}{\lambda_W}$

$$\lambda_W = \lambda_{Na} \times \frac{\phi_{0Na}}{\phi_{0W}} = \frac{5460\times2.3}{4.5} = 2791Å$$

Q.6 (4)

Work function, W = 2 eV,

$= 2 \times 1.6 \times 10^{19}$ J

$= 3.2 \times 10^{-19}$ J

$\nu = 1.5 \times 10^{15}$ Hz

$\therefore$ Maximum KE of photoelectrons

$(KE)_{max} = h\nu - W$

where, h = Planck's constant

$= 6.6 \times 10^{-34}$ J

$(KE)_{max} = 6.6 \times 10^{-34} \times 1.5 \times 10^{15} - 3.2 \times 10^{-19}$

$= 9.9 \times 10^{-19} - 3.2 \times 10^{-19}$

$= 6.7 \times 10^{-19}$ J

$$= \frac{6.7\times10^{-19}}{1.6\times10^{-19}}\,eV$$

$= 4.2$ eV

$= 4$ eV

Q.7 (3)

Q.8 (2)

$$\lambda \propto 1/\sqrt{T}$$

$$\frac{\lambda_1}{\lambda_2} = \sqrt{\frac{T_2}{T_1}} = \sqrt{\frac{127+273}{927+273}}$$

$$\frac{\lambda_1}{\lambda_2} = \sqrt{\frac{400}{1200}} \Rightarrow \boxed{\lambda\sqrt{3} = \lambda_2}$$

Q.9 (3)

$$\lambda = \frac{h}{mv} = \frac{h}{\sqrt{2mK}} = \frac{h}{\sqrt{2mq\Delta V}}$$

if mass of proton = m then mass of α-particle = 4m

charge on proton = e and charge on α-particle = 2e

As $\lambda_1 = \lambda_2 \Rightarrow p_1 = p_2$ and $p = \sqrt{2mq\Delta V}$

$$\Rightarrow \sqrt{2meV_1} = \sqrt{2(4m)(2e)V_2}$$

$$\Rightarrow me\,V_1 = 4m\,(2e)\,V_2 \quad \Rightarrow \frac{V_1}{V_2} = 8$$

Q.10 (1)

$\lambda = \frac{h}{\sqrt{2mE}}$ Here E is same so $\lambda \propto \frac{1}{\sqrt{m}}$

or $\frac{\lambda_P}{\lambda_\alpha} = \sqrt{\frac{m_\alpha}{m_P}} = \sqrt{\frac{4m_P}{m_P}} = \frac{2}{1}$

Q.11 (3)

Energy of photon = $mc^2 = E$

Momentum of photon = $mc = \frac{E}{c} = \frac{hc}{\lambda c} = \frac{h}{\lambda}$

As speed of light is same for all photons

$\Rightarrow \frac{E_1}{E_2} = \frac{P_1}{P_2} = \frac{1}{2}$

Q.12 (4)

The radius of Bohr orbit, $r \propto n^2$

$\therefore \frac{r_1}{r_2} = \left(\frac{n_1}{n_2}\right)^2$

$\Rightarrow r_2 = r_1\left(\frac{n_2}{n_1}\right)^2$ ...(1)

Given : $r_1 = 0.5$ Å, $n_1 = 1$, $n_2 = 4$ putting given values in eq. (1)

$\therefore r_2 = 0.5\left(\frac{4}{1}\right)^2$

$\Rightarrow r_2 = 0.5 \times 16$

$\therefore r_2 = 8$ Å

Q.13 (1)

Q.14 (1)

Q.15 (4)

Q.16 (1)

As $mvr = \frac{nh}{2\pi}$ and $\lambda = \frac{h}{mv}$

$\Rightarrow r = \frac{n}{2\pi}\frac{h}{mv} \Rightarrow 2\pi r = n\lambda$

for n = 1 ; $\lambda = 2\pi r$

Q.17 (3)

H-spectrum

Q.18 (1)

Q.19 (2)

Nuclear density is independent of mass number.

Q.20 (3)

Radius of nucleus is given by $R=(1.3\times10^{-15})A^{1/3}$m, where A is mass number.

So, we can say that radius of nucleus is directly proportional to $A^{1/3}$.

i.e.,

$R \propto A^{\frac{1}{3}}$

$\therefore \frac{R_1}{R_2} = \left(\frac{A_1}{A_2}\right)^{\frac{1}{3}}$

$\Rightarrow \frac{R_1}{R_2} = \left(\frac{4}{3}\right)^{\frac{1}{3}}$

$\left(\frac{R_1}{R_2}\right)^3 = \left(\frac{4}{3}\right)$

$\Rightarrow \rho \propto A^o$

$\therefore \frac{\rho_1}{\rho_2} = \frac{1}{1}$

Q.21 (1)

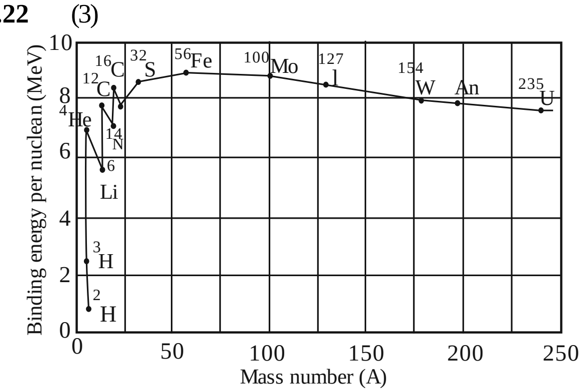
${}_ZX^A \rightarrow {}_{Z+1}y^A + {}_{-1}\beta^0 + \overline{\nu}$

Here , $n \rightarrow p + e^- + \overline{\nu}$

$\therefore$ no of neutrons decreases

& no.of protons increases

Q.22 (3)



From the above graph we notice the following main features of the plot:

The binding energy per nucleon (Ebn) is practically constant, i.e. practically independent of the atomic number for nuclei of middle mass number ($30 < A < 170$)

The curve has a maximum of about 8.75 MeV for A = 56 and has a value of 7.6 MeV for A = 238.

Ebn is lower for both light nuclei (A < 30) and heavy nuclei (A > 170).

Also from this, we can see that Fe or iron has the highest binding energy per nucleon, hence it is the most stable nucleus among all.

Q.23 (3)

Energy is released

$\therefore (B.E.)_{product} > (B.E.)_{Reactant}$

Q.24 (1)

Q.25 (2)

Q.26 (1)

$$E = \frac{dV}{dr} = \frac{0.5}{5\times10^{-7}} = 10^{6}\,V/m$$

Q.27 (2)
Due to the large concentration of electrons in N-side and holes in P-side, they diffuses from their own side to other side. Hence depletion region produces

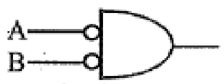
Q.28 (3)
Based on theory.

Q.29 (4)

Q. 30 (1)

Q.31 (4)

$Y = \overline{A} + \overline{B} = \overline{A \cdot B}$ [NAND]



$Y = \overline{A} \cdot \overline{B} = \overline{A + B}$ [NOR]

Q.32 (3)

Q.33 (2)

Q.34 (2)

Q.35 (1)

Q.36 (1)
According to Einstein's quantum theory, light propagates in the form of bundles (packet or quanta) of energy, each bundle is called a photon. The photoelectric effect represents that light has a particle nature.

Q.37 (4)
Given $\phi_0 = 5\,eV = 5 \times 1.6 \times 10^{-19}\,J$

$$\therefore\ \upsilon_0 = \frac{\phi_0}{h} = \frac{5\times1.6\times10^{-19}\,J}{6.6\times10^{-34}\,J\ s} = 1.2\times10^{15}\,Hz$$

Q.38 (2)

$$\lambda = \frac{h}{\sqrt{2mE}}$$

$$\lambda \propto \frac{1}{\sqrt{m}}$$

$$\frac{\lambda}{\lambda_1} = \sqrt{\frac{M}{m}}$$

$$\lambda_1 = \lambda\sqrt{\frac{m}{M}}$$

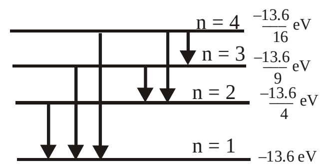
Q.39 (1)

$$\lambda = \frac{h}{p}\ ,\ \lambda_2 = \frac{3\lambda_1}{2} \Rightarrow p_2 = \frac{2p_1}{3}$$

$$\Delta p = p_1 - p_2 = p_o \Rightarrow p_1 - \frac{2p_1}{3} = p_o \Rightarrow \frac{p_1}{3} = p_o$$

$$\Rightarrow\ p_1 = 3p_o \Rightarrow \text{initial momentum} = 3p_o$$

Q.40 (3)



The maximum wavelength emitted here corresponds to the transition n = 4 → n = 3 (Paschen series 1st line)

Q.41 (2)

Q.42 (3)

$$A \xrightarrow{\alpha} A_1 \xrightarrow{\beta-} A_2 \xrightarrow{\alpha} A_3 \xrightarrow{\gamma} A_4$$

$$^{180}_{72}A \xrightarrow{\alpha} {}^{176}_{70}A_1$$

$$\xrightarrow{\beta-} {}^{176}_{71}A_2 \xrightarrow{\alpha} {}^{172}_{69}A_3 \xrightarrow{\gamma} {}^{172}_{69}A_4$$

Q.43 (2)

Nuclear density is independent of mass number.

Q.44 (1)
For A mass number = 34
Total binding energy = 1.2 × 34 = 40.8 MeV
For B mass number = 26
total binding energy = 1.8 × 26 = 46.8 MeV
Difference of BE = 6 MeV

Q.45 (4)
Mass of uranium changed into energy

$$= \frac{0.1}{100}\times1 = 10^{-3}\,kg$$

The energy released = mC^2
$= 10^{-3} \times (3 \times 10^{8})^{2}\ 7 = 9 \times 10^{13}$ J.

Q.46 (3)

Minumum energy required to produce e^- –hole pair

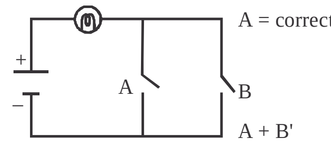
$$h\nu_{min} = \frac{h\nu}{\lambda_{max}} = \Delta Eg$$

$$\lambda_{max} = \frac{hc}{\Delta Eg} = \frac{12400}{0.72} = 17222 Å$$

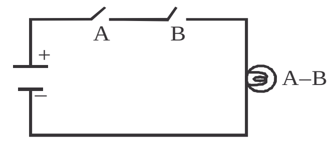
Q.47 (3)

Q.48 (4)

OR Gate



And Gate



Q.49 (4)

Q.50 (3)