

PYQ's and Important Questions

2022
 ① How many electrons are there in a body if its total charge is $1.6 \times 10^{-18} \text{ C}$? (2022)

Solⁿ
 $Q = ne$
 $\Rightarrow n = \frac{Q}{e}$
 $\Rightarrow n = \frac{1.6 \times 10^{-18}}{1.6 \times 10^{-19}}$
 $= 10^{-18+19}$

2022
 ② Which of the following options expresses wheatstone bridge principle as given in your text book.

- (i) $\frac{R_1}{R_2} = \frac{R_3}{R_4}$, when $I_g = 0$ (ii) $\frac{R_1}{R_2} = \frac{R_3}{R_4}$, when $I_g \neq 0$
 (iii) Both of the above (iv) None of the above

2022
 ③ Which of Gauss and Tesla is a bigger unit? Write the ratio of 1 Gauss to 1 Tesla.

PATTERN CLASSES

Solⁿ
 $1 \text{ T} = 10^4 \text{ Gauss}$
 \therefore Tesla is a bigger unit.
 Now
 $10^4 \text{ Gauss} = 1 \text{ Tesla}$
 $\Rightarrow 1 \text{ Gauss} = \frac{1}{10^4} \text{ T}$
 $\Rightarrow \frac{1 \text{ Gauss}}{1 \text{ Tesla}} = \frac{1}{10^4} = 10^{-4}$
 $\Rightarrow 1 \text{ G} : 1 \text{ T} = 1 : 10^{-4}$

2022
 ④ Fill up the blank, $\text{Wb} = \underline{\hspace{2cm}} \text{ m}^2$

Solⁿ
 Wb is the SI unit of magnetic flux
 $1 \text{ Wb} = \text{Tesla} \times \text{m}^2$
 $\therefore \text{Wb} = \underline{\text{Tesla}} \text{ m}^2$

①

2022

6) which of the following options is correct -

(i) $c^2 = \frac{1}{\mu_0 \epsilon_0} = \frac{E_0^2}{B_0^2}$ (ii) $c^2 = \frac{1}{\mu_0 \epsilon_0} = \frac{B_0^2}{E_0^2}$

(iii) Both of the above

(iv) None of the above

2022

6) In a prism except the position of minimum deviation, there are _____ values of angles of incident producing same angle of deviation.

Solⁿ: Two.

PATTERN CLASSES

2022

7) de-Broglie in 1924 reasoned that nature was symmetrical and that the two basic physical entities _____ and _____ must have symmetrical character.

Solⁿ: Matter and energy.

2022

8) According to Bohr's 2nd postulate of quantisation, the angular momentum of electron in the 1st possible orbit is -

(i) $\frac{2h}{\pi}$ (ii) $\frac{h}{2\pi}$ (iii) $\frac{2\pi}{h}$ (iv) $\frac{h}{2\pi}$

Solⁿ $L = \frac{n h}{2\pi}$, for the 1st orbit $n=1$

$\therefore L = \frac{1 \times h}{2\pi} = \frac{h}{2\pi}$ (option (ii))

9) Which of the following is correct unit of diode's reverse current?

(i) A (ii) mA (iii) μA (iv) None of the above

Solⁿ Option (iii)

μA (micro Ampere)

(2)

2021
(10) H_2O is a polar / nonpolar molecule ?

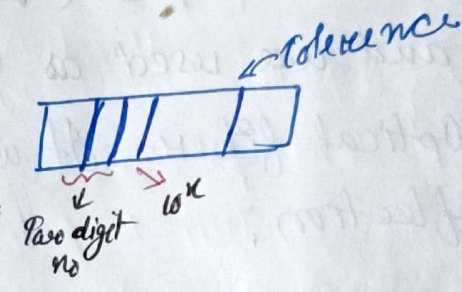
Solⁿ: H_2O is a polar molecule.

2020
(11) Mention one difference between mass and charge.

Solⁿ: Electric charge is quantised but mass is not quantised. Also charge may be +ve or -ve but mass of a body is always positive.

2020
(12) The colours on a carbon resistor are yellow, violet, brown and golden from left to right. Find the value of the resistance (C = 4, 7, 1 and 5)

Solⁿ: $R = 47 \times 10^1 \pm 5\%$
 $= 470 \pm 5\% \Omega$



2020
(13) What is eddy current ?

Solⁿ: Out of syllabus.

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2020
(14) Name the beautiful natural phenomenon that occurs in the sky of polar regions of earth due to the helical motion of charged particle.

Solⁿ: Aurora. (occurs in the ionosphere due to the collision of solar wind with the atoms of oxygen and nitrogen present in the earth's atmosphere).

2020
(15) Name the portion of the electromagnetic spectrum in betⁿ ultraviolet and infrared regions.

(13)

Solⁿ: Visible light.

em spectrum :

Radio wave \rightarrow Microwave \rightarrow Infrared wave \rightarrow Visible light \rightarrow UV ray \rightarrow X-ray \rightarrow Gamma rays

increasing wavelength.

2020

Q16) What is the radiation pressure on earth's surface?

Solⁿ Radiation pressure on earth's surface is $= 7 \times 10^{-6} \text{ N/m}^2$

2020

Q17) Name the equipment which can transmit optical signal through it and are used as light pipe?

Solⁿ Optical fiber. It works on the principle of Total internal reflection.

Q18) Graph the shape of the curve which shows the variation of V_0 with ν in case of photo electric emission shown by the given relation -

$$V_0 = \left(\frac{h}{e}\right) \nu - \frac{\phi_0}{e}$$

PATTERN CLASSES

Solⁿ

$$V_0 = \left(\frac{h}{e}\right) \nu - \frac{\phi_0}{e}$$

$V_0 \rightarrow$ stopping potential

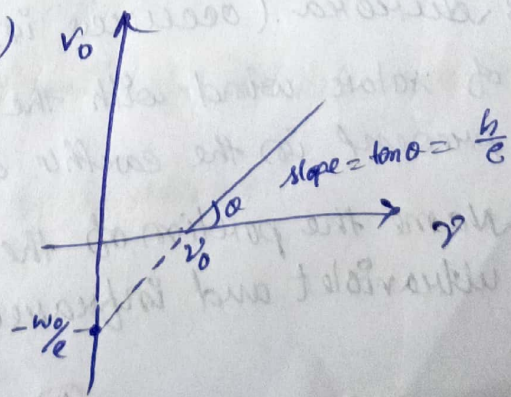
$\nu \rightarrow$ frequency of incident radiation

$\phi_0 \rightarrow$ work function

$h \rightarrow$ Planck's constⁿ

$e \rightarrow$ charge of electron

The given relation is an equation of a straight line with slope $(\frac{h}{e})$ and intercept $(-\frac{\phi_0}{e})$



(4)

2020

(19) The de-Broglie wave length of a heavier particle is Small.

Solⁿ $\lambda = \frac{h}{mv}$ for heavier mass λ is smaller
 $\lambda \propto \frac{1}{m}$ and for light mass λ is larger.

2019

(20) What is Meissner actually observed which is known as Meissner effect.

Solⁿ: when a conductor is cooled to very low temperature it becomes a superconductor and shows perfect diamagnetism which is called Meissner effect.

2019

(21) Mention one similarity between Coulomb force and gravitational force.

Solⁿ: Similarity: Both obeys inverse square law.

Difference: Gravitational force is independent of the medium between the two masses. While Coulomb's force depends of the medium betⁿ the charges.

(22) Define mutual Inductance of 1 Henry?


Solⁿ As we have $|E_{ind}| = L \frac{dI}{dt}$
 $\Rightarrow L = \frac{|E_{ind}|}{dI/dt}$

PATTERN CLASSES


Self Inductance

If the rate of change of current in a coil is 1 A/s and due to this induced emf in the coil is 1 volt, then the self inductance of the coil is 1 Henry.

(5)

 Mutual Inductance: If the rate of change of current in the primary coil is 1 A/s and due to this induced emf in the secondary coil is 1 volt , then the mutual inductance of the combination will be 1 Henry .

2010

 If the radius of the 1st orbit of H-atom is $5.3 \times 10^{-11} \text{ m}$. What is the radius of the 3rd orbit.

Solⁿ: Radius of the n^{th} orbit of H-atom is given by -

$$r_n = n^2 \cdot r_0 \quad \left| \begin{array}{l} r_0 = \text{radius of the 1st orbit} \\ = 5.3 \times 10^{-11} \text{ m (Given)} \end{array} \right.$$


For the 3rd orbit

$$\begin{aligned}
 r_3 &= 3^2 \times r_0 \\
 &= 9 \times 5.3 \times 10^{-11} \text{ m} \\
 &= \cancel{47.7} \times 10^{-11} \text{ m} \\
 &= 4.77 \times 10^{-10} \text{ m} = 4.77 \text{ \AA}
 \end{aligned}$$

$n = \text{principal quantum no.}$

PATTERN CLASSES

2010

 If the work function of two metals X and Y are 4.17 eV and $8.24 \times 10^{-19} \text{ J}$ respectively, then for which metal lesser amount of energy required to emit an electron?

Solⁿ: $W_0^A = 4.17 \text{ eV}$
 and $W_0^B = 8.24 \times 10^{-19} \text{ J}$
 $= \frac{8.24 \times 10^{-19}}{1.6 \times 10^{-19}} \text{ eV}$
 $= 5.15 \text{ eV}$

As the work function for the metal Y is greater than for the metal X, therefore lesser amount of energy is required for the metal X, to emit an electron.

2019
Q25) The sparkle of diamonds can be explained by which phenomenon of light?

Solⁿ: By total internal reflection of light.

2018
Q26) What is impact parameter?

Solⁿ: In α -particle scattering experiment, the impact parameter is defined as the perpendicular distance betⁿ the velocity vector of the α -particle from the centre of the nucleus, when the α -particle is far away from the nucleus.

2018
Q27) Which layer of atmosphere protects us from ultra violet ray?

Solⁿ: Ozone layer.

PATTERN CLASSES

2018
Q28) What is current sensitivity of a galvanometer?

Solⁿ: The current sensitivity of a galvanometer is defined as the deflection produced per unit current flowing through it.

$$I_s = \frac{\theta}{I}, \text{ its SI unit is } - \text{ rad/A}$$

2018
Q29) Which experiment established the fact that electric charge is quantised.

Ans: Millikan oil drop experiment.

2018
Q30) How are eddy currents minimised in a transformer?

Ans: ~~Eddy~~ Not in syllabus —

PATTERN CLASSES

2017

(31) In an electric field a unit positive charge is displaced from one point to another point along a straight line of length 2m and the work is 2mJ. If it is displaced along a parabolic path betⁿ the same points of length 5m. what will be the work done.

Solⁿ: As the electrostatic force is a conservative force so the work done in an electric field depends only on the initial and final position and does not depend upon the path. So in the both the cases work done will be same.

(32) The product of permeability of free space and permittivity is -

- (i) c (ii) c^{-1} (iii) c^2 (iv) c^{-2}

Solⁿ: $c^2 = \frac{1}{\mu_0 \epsilon_0}$ option (iv)

$$\mu_0 \epsilon_0 = \frac{1}{c^2}$$

$$= c^{-2}$$

PATTERN CLASSES

(33) State the utility of eddy current.

- Solⁿ:
- (i) Magnetic braking in trains. (বিদ্যুৎ চুম্বকীয় ব্রেক)
 - (ii) Electro magnetic ~~Ind~~ damping
 - (iii) Induction furnace (আল্ট্রা হিট)
 - (iv) Electric power meters.
 - (v) Speedometer.

PATTERN CLASSES

Q34) An object is placed at the focus of a convex lens, where will the image be formed?

Solⁿ: At infinity

Q35) What is the dimension of Planck's constant?

Solⁿ → $[E] = [h\nu]$

$$\Rightarrow [h] = \frac{[E]}{[\nu]}$$

$$= \left[\frac{ML^2T^{-2}}{T^{-1}} \right]$$

$$= [ML^2T^{-1}]$$

2016

Q35) What is the SI unit of permittivity?

Solⁿ → $F = \frac{k q_1 q_2}{4\pi\epsilon_0 r^2}$

SI unit is = C^2/Nm^2

$$\Rightarrow \epsilon_0 = \frac{1}{4\pi} \frac{q_1 q_2}{F r^2}$$

Q36) Define mobility of charge carrier? (5 marks)

Solⁿ → It is defined as the drift velocity per unit applied electric field. ($\mu = \frac{v_d}{E}$). SI unit - m^2/Vs

Q37) What is the ~~an~~ missing term in Ampere's circuital law?

Solⁿ → Displacement current.

[PATTERN CLASSES]

Q38) What is the range of wavelength of e-m radiation that nature has endowed our retina to detect?

Solⁿ → $\lambda \rightarrow 700 \text{ nm to } 400 \text{ nm}$

and frequency $\rightarrow 4 \times 10^{14} \text{ Hz to } 7 \times 10^{14} \text{ Hz}$

30) What is the dimension of work function?

Solⁿ $[W] = [Work]$
 $= [ML^2T^{-2}]$

40) Choose the correct answer -

Accelerated electrons can show -

(i) Interference only

(ii) Diffraction only

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for Both.

41) What do you mean by an electric dipole?

Solⁿ Two equal and opposite charges separated by a small distance is called electric dipole.

42) The colours on a carbon resistor are yellow, violet, brown, golden respectively from left to right. If the corresponding numbers from the colours are, 4, 7, 1 and 5, what will be the resistance of the resistor.

Solⁿ Ans. 12

PATTERN CLASSES

43) Write down the dimensional formula for permeability of free space.

Solⁿ $[μ] = [MLT^{-2}A^{-2}]$

44) Define mutual Induction of 1 Henry.

Solⁿ (Any No - 22)

(45) An object is placed betⁿ the pole and the focus of a convex lense. what will be the nature of the image?

solⁿ → The image formed will be virtual, & erect and magnified.

(46) What is the shape of interference fringe in Young's double slit experiment.

solⁿ → Straight line. [PA

(47) What is the de-Broglie wave length associated with an e⁻ accelerated through a p.d. of 100 volts?

$$\begin{aligned} \text{solⁿ} \rightarrow \lambda &= \frac{12.3}{\sqrt{V}} \text{ \AA} \\ &= \frac{12.3}{\sqrt{100}} \text{ \AA} \end{aligned} \quad \left| \begin{aligned} \lambda &= \frac{12.3}{10} \text{ \AA} \\ &= 1.23 \text{ \AA} \end{aligned} \right.$$

(48) What is the scattering angle of the impact parameter has a zero value.

solⁿ → $\theta = 180^\circ$

PATTERN CLASSES

(49) If the radius of the 1st orbit of H-atom is 5.3×10^{-11} m what is the radius of the 3rd orbit?

solⁿ → see Q no - (23)