HIGHER SECONDARY EXAMINATION, MARCH 2018
PHYSICS(new Pattern)

Second year ,March 2018

key with hints

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HSSLIVE.IN

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1. Force $F_1 = \frac{1}{4\pi\varepsilon_0}\frac{q_1 q_2}{r^2}$ and $F_2 = \frac{1}{4\pi K\varepsilon_0}\frac{q_1 q_2}{r^2}$ and therefore; $F_1/F_2 = K/1$ ➔ **K:1(a)**

2. As per charge quantisation charge on any body is the integral multiple of fundamental charge e

Q= ±ne or Q cannot be less than **e = 1.6x10^{-19}C.** (d)

3. (a)Carbon

4. Current in purely inductive or capacitive circuit does not do any work, since power dissipation in these Circuits are ZERO. Such a Current is called as a **WATTLESS CURRENT.**

Power P = V_{rms} x I_{rms} x cosϕ (In Puerly inductive and capacitive circuit $\phi=90^O$)

5. $M^{-1}L^{-3}T^4I^2$

6. Soft iron – Low coercivity/ High Retentivity / used for making Electromagnets.

Steel – High coercivity / Low retentivity / used for making Permanent magnets.

7. $_8O^{16}$

8. Phenomenon is total internal reflection.

Snells Law is given by sini/sinr = $n_{21} = n_2/n_1$ [½ score]

For TIR if i = c critical angle and r = 90^o [½ score]

Sin c /Sin 90 = 1/n {For air $n_2 = 1$} [½ score]

Sin c = 1/n Or n = 1/Sin c [½ score]

9. (a) Micro waves ➔ Infrared waves ➔ Visible light ➔ X – Rays {increasing order of frequency}

(b) One correct application of each. Eg: Infrared : Remote sensing X – Ray :Clinical diagnostics

10. Work done = τ.dθ [½ score]

τ = P X E or PEsinθ [½ score]

dw = PESinθ.dθ

$W = \int_{\theta_1}^{\theta_2} PE\sin\theta.d\theta$ [½ score]

$W = PE(\cos\theta_1 - \cos\theta_2)$ [½ score]

11. (a) 2m/π

(b) Keep bar A horizontally on a table and touch its end and center point with end of bar B if it will attract Bar A on these three points, we can conclude that bar A is softiron and B is magnet. Magnet has

Magnetic field concentrated at its ends.

12. (a) 931 Mev

(b) $\beta \rightarrow \alpha \rightarrow \gamma$

13. 1 – e

2 – d

3 – b

4 – f

14. For series connection R = nR = 10R

Parallel Connection R = R/n = R/10

15. i)NOR gate

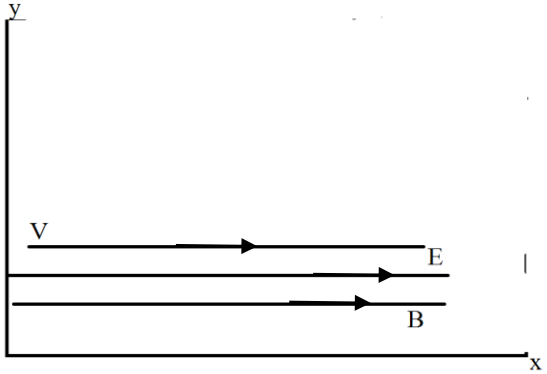
ii) NAND gate

16. (a) i) FALSE ii) FALSE

(b) Correct derivation and $E_a = \sigma/\varepsilon_0$

17. (a) Question is **IMPORTANT**

Path will be **STRAIGHT LINE**. It is because, assume that the electric field is acting along X – axis. Since charged particle is released from rest it experiences an **electric force** in the direction or in opposite direction of that of electric field depending on nature of charge that is along X – axis (towards right or be towards left). This motion of charge particle in electric field in turn creates a Magnetic field. But the **magnetic Lorentz force on the Particle is ZERO,** as Magnetic field and Motion of charge are in same direction. (Parallel / antiparallel)



Since $F = qVB\sin\theta$ Here, $\theta = 0^o$ or 180^0 Parallel or antiparallel.

So motion is only due to electric force. – **Straight line.** **[1 score]**

(b) Correct Derivation as per NCERT [2 score]

18. (a) ½ $mV_{max}^2 = h\upsilon - h\upsilon_o$

m , h , and υ_o are constant for a given metal. Hence

$V_{max}^2 \alpha \upsilon$

$V_{max}^2 \alpha c / \lambda$

$V \alpha 1 / \lambda$ If wavelength of light decreased velocity of photoelectrons **increases** **[1 score]**

(b) $\lambda = \frac{12.3}{\sqrt{V}}$ A^o [1 score]

$\lambda = 12.3 / \sqrt{10} = 12.3/10 = 1.23A^o$ Result with correct unit [1score]

19. (a)correct derivation with final equation $W = ½ Li_o^2$ [1½ score]

(b) According to Faraday's Law of electromagnetic induction,

$\varepsilon = -d\phi/dt$ But $\phi = Li$; where L is the self inductance.

Emf, $E = \frac{-d}{dt}(Li) = -L\frac{di}{dt}$

If di/dt = 1 (unit rate of change of current in the circuit)

Emf ε = -L ➔ Numerically equal , but directionally opposite. (PROVED) [1½ score]

20.(a) (d) or 0.05mA

$\mathbf{I_E = I_C + I_B}$

$\mathbf{I_B = I_E - I_C \Rightarrow I_B =}$ 1 – 0.95mA = **0.05mA** [1 score]

(b)The diagram given is a **Zener Diode** [l score]

Used for **Voltage Regulation** [1score]

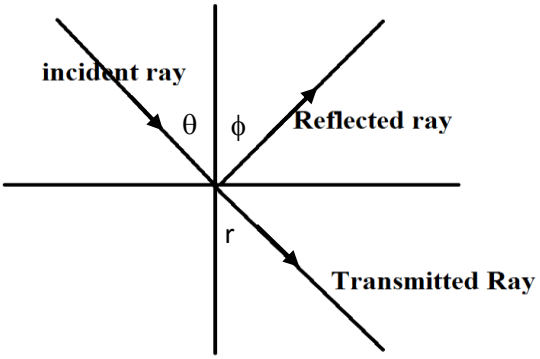
Explanation:

21. Orthogonal means Perpendicular.

By Brewester's Law, $Tan\theta = n$

$$\frac{Sin\ \theta}{\cos\theta} = n$$

By laws of reflection θ = ϕ (see fig.)



$\therefore \frac{Sin\theta}{Cos\,\phi} = n$

$\therefore \frac{Sin\theta}{Sin\,(90-\phi)} = n$ ⟶ (1)

By Snells Law $\frac{Sin\theta}{Sin\,r} = n$ ⟶ (2)

By comparing (1) and (2) we get,

90 - ϕ = r

Or **r + ϕ = 90º reflected and transmitted rays are Perpendicular / orthogonal.** **[2 score]**

(b) Light waves are **Transverse waves. Only Transverse waves show polarization.**

22. Correct derivation of equation for finding out the internal resistance as $\mathbf{r = R\left(\frac{l_1}{l_2} - 1\right)}$ [3 score]

23.(a) iv) Helps to guide light signals to core.

(b) Coverage Range, d = $\sqrt{2hR}$ = $\sqrt{2 \times 100 \times 6.37 \times 10^6}$ = 35.7Km

Population covered = Population density x covered area

= 1000 x πd^2 = 1000xπx$(35.7)^2$

= **4.0×10^6**

(c)6MHz

24. (a) Cadmium

(b) 931 MeV

(c) basic equation is **$N = N_0 e^{-\lambda t}$**

Or **(N/N_0)** = $(1/2)^n$

(0.1/0.75) = $(½)^n$ taking log on both side and calculating we get n = 2.9 = 3

n = $t/T_{1/2}$ =➔ **t = 3x3.823 = 11.46days.**

25.(a) P/Q = R/S

9/11 = 4/S =➔ S = (4x11)/9 = 44/9

1/S = 1/6 + 1/R ➔ 9/44 = 1/6 + 1/R Solving **R = 132/5 = 26.4Ω**

(b)Correct statement = algebraic sum of potential around any closed loop involving resistors and

Cell in the loop is ZERO.

26.(a) When accelerating potential increases, photocurrent increases and reaches a maximum value or it saturates. When we apply a negative Photoelectrons get retarded hence photocurrent decreases.At a particular potential It becomes Zero called **Stopping potential/ cut off Potential.**

(b) Since green light emit electrons the frequency of green light is the **Threshold frequency.**

Yellow light doesnot emitt means, Frequency below green does not allow photoelectric emission. And above frequencies allows the same.

So, **Emission occurs** for Blue light and **no emission for** Red light.

27.(a)**Total Internal Reflection.**

(b)Refer Qn.8

(c) i)Light should travel from denser to rarer medium.

ii) Angle of incidence should be greater than the critical angle.

28.(a)**Correct statement or equation** $\boldsymbol{db = \frac{\mu_0}{4\pi}\frac{idl\ sin\theta}{r^2}}$

(b) Correct derivation with final equation as dB = $\frac{\mu_0 iR^2}{(R^2+x^2)^{\frac{3}{2}}}$

29. (a)Correct Explanation with figure

(b) Let D be the distance b/w slit and screen,

Band width $\beta = \lambda D/d$ ➔ $d = \lambda D/\beta$

$= Dx5000x10^{-10}/\ 0.6x10^{-2}$ ----------→(1)

When D becomes D/2 $d = (D/2)x5000x10^{-10}/\ \beta^{|}$. ----------→(2)

Equating (1) and (2) we get

$\beta^{|} = \mathbf{0.3x10^{-2}m}$

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