PHYSICS CBSE - 2015 (By: Pinku Paul.)
XII

1) A ray of light, incident on an equilateral glass prism $(\mu_g = \sqrt{3})$ moves parallel to the base of the prism, inside it. What is the angle of incidence for this ray?

2) The motion of a copper plate is damped when it is allowed to oscillate between the pole pieces of a magnet. State the cause of this damping.

3) A dipole of dipole moment $\vec{P}$, is present in a uniform electric field $\vec{E}$. Write the value of the angle between $\vec{P}$ and $\vec{E}$ for which the torque experienced by the dipole is minimum.

4) ~~A double corr~~ what is the power dissipated in an AC circuit in which voltage and current are given by
$$V = 240 \sin(\omega t - \pi/2) \quad \text{and} \quad I = 10\sqrt{3} \sin \omega t?$$

5) Write the following radiations in ascending order in respect of their frequencies:
x-ray, microwave, infrared, radio wave.

6) The mean life of a radioactive sample is T_m. What is the time in which 25% of this sample would be decayed?

7) A narrow stream of protons and deuterons, having the same momentum values, enter a region of a uniform magnetic field perpendicular to their common direction of motion. What would be the ratio of the radii of the circular paths, described by the two deuterons?

8) How does the mutual inductance of a pair of coils changes, when i) distance between the coils is increased ii) number of turns in each coil is decreased?

9) An electric dipole of length 10 cm having charges 6×10^{-3} C placed at $30°$ with respect to a uniform electric field, experience a torque of magnitude $6\sqrt{3}$ Nm. Calculate i) magnitude of electric field and ii) potential energy of electric dipole.

10) An electron moving through a magnetic field does not experience any force. Under what condition is this possible?

11) The current flows through a pure inductor of inductance 2mH is $i = 15\cos300t$ A. what is the (i) rms and (ii) average value of current for a complete cycle?

12) How are infrared waves produced? why are these referred to as 'heat waves'? write one important use.

13) Two identical coherent waves, each of intensity I, are producing an interference pattern. Find the value of the resultant intensity at a point of (i) constructive interference and (ii) destructive interference.

14) The half-life of ^{14}C is 5700 years. what does it mean? Two radioactive nuclei X and Y initially contain an equal number of atoms. Their half lives are 1 hour and 2 hours respectively. Calculate the ratio of their rates of disintegration after two hours.
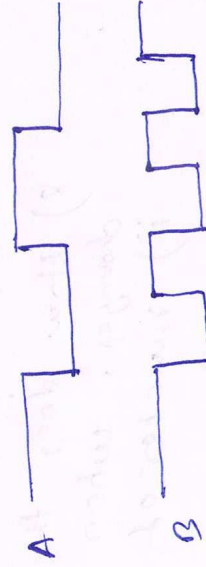
15) The circuit symbol of a logic gate and two input waveforms A and B are shown:
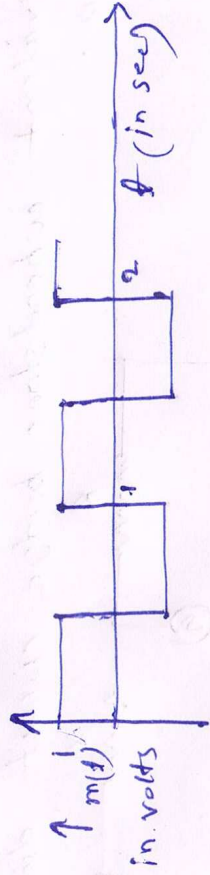

i) Name the logic gate
ii) write truth table
iii) Give output waveform.

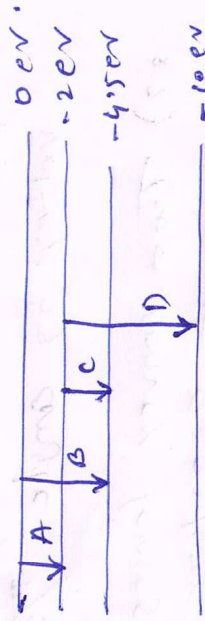16) A modulating signal is a square wave as shown in fig:

$$c(t) = 2 \, Sin(8\pi t) \text{ volts}$$

(i) Sketch the amplitude modulated waveform
(ii) What is the modulating index

17) A resistor of resistance 400Ω, and a capacitor of reactance 220Ω are connected in series to a 220 V, 100 Hz AC source. If the current in the circuit is 0.50 A, find the (i) voltage across the resistor and capacitor (ii) value of inductance required to so that voltage and current are in phase.

18) The energy levels of hypothetical atom given in fig:

which of the transmission corresponds to emission of radiation of (i) maximum (ii) minimum wavelength?
which of the transmission will result in the emission of a photon of wavelength 275 nm?

19) Find the position of the image formed of the object 'O' by the lens combination given.
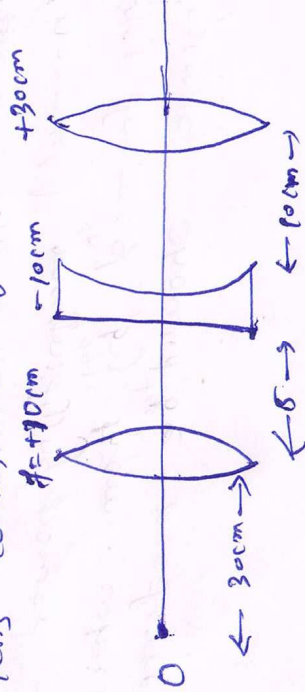
20) In the meter bridge experiment, a student observed a balance point at the point J, where AJ = I. Draw the equivalent wheatstone bridge circuit diagram for this set up.
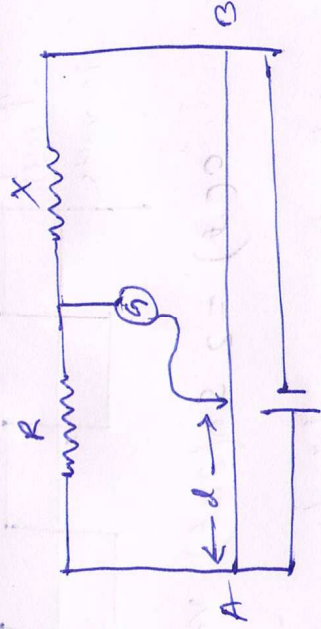
The value of R and X are both doubled and then interchanged. What would be the new position of the balance point? If, in this setup, the galvanometer and battery are interchanged at the balance point position, how will the balance point get affected?

21) Define the term capacitive reactance. Show graphically the variation of capacitive reactance with frequency of applied alternating voltage.

An ac voltage V = V₀ sin ωt is applied across a pure capacitor of capacitance C. Find an expression expression for current flowing through it. Show mathematically the current flowing through it leads the applied voltage by angle π/2.

22) Two convex lenses, of equal focal length, but of different aperture A₁ and A₂ (A₁ < A₂), are used as the objective lense in two astronomical telescope having identical eyepieces.

Compare the ratio of their (i) resolving power (ii) (normal) magnifying power and (iii) intensity of images formed by them. Why out of the two telescopes, we prefer a primary shows telescope?

23) What is GPRS system? Write its uses, Write the application of internet.

24) Find the potential difference across each cell and the rate of energy dissipation in R.

$r_1 = 2\Omega$

$E_1 = 12V$

$R = 4\Omega$

$E_2 = 6V$ $r_2 = 1\Omega$
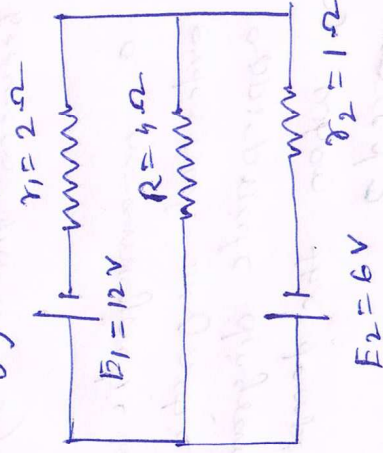
25) Define the terms (i) cut-off voltage and (ii) threshold frequency in relation to the phenomenon of photoelectric effect.

Using Einstein's photoelectric equation show how the cut-off voltage and threshold frequency for a given material can be determined with the help of a suitable graph.

26) Poonam went to the occurred with her mother and decided to come back home by metro. At the Metro station they made to pass through a gateway for security check. Poonam passed through it and way occurring for her mother to come. She heard a long beep when her mother passed through the gateway detector gateway. Poonam was confused why they have detector beeped in case of her mother. She asked to the duty staff, who explained her in details. Both were satisfied with the security system.

(i) What values are displayed by Poonam?

ii) What is the range of sound through useful detectors?

iii) Write the possible on which a useful detector working.

27) Find an expression for the capacitance of a parallel plate capacitor when an dielectric slab of dielectric constant k and thickness $t = d/2$ but of some area on the plates is inserted between the capacitor plates.

(d = separation between the plates)

28) a) How does a paramagnetic material behave in the presence of an external magnetic field? Explain with the help of an appropriate diagram.

b) what happens when the temperature of a paramagnet sample is lowered?

c) To which of the two, a polar dielectric or a non-polar dielectric, does a paramagnetic material corresponds? Justify your answer.

29) a) which special type of diode can be used as a voltage regulator. Give the symbol of this diode and draw the general shape of its $V-I$ characteristic.

b) Draw the common emitter transistor circuit of p-n-p transistor and explain how it works as a switch.

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