CLASS XII
SAMPLE PAPER
PHYSICS(Theory)

Time allowed: 3 hours **SET B** *Maximum Marks: 70*

General Instructions

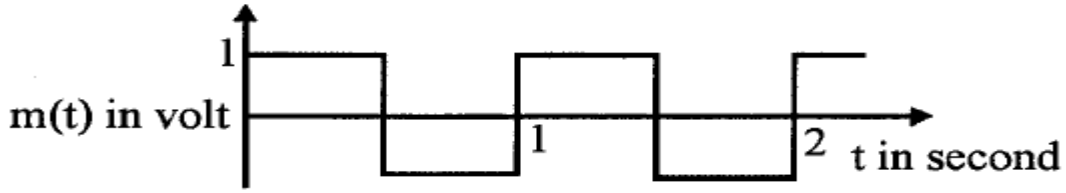
1. *All questions are compulsory. There are 26 questions in all.*
2. *This question paper has five sections: Section A, Section B, Section C, Section D and Section E.*
3. *Section A contains five questions of one mark each, Section B contains five questions of two marks each, Section C contains twelve questions of three marks each, Section D contains one value based question of four marks and Section E contains three questions of five marks each.*
4. *.There is no overall choice. However, an internal choice has been provided in one question of two marks, one question of three marks and all the three questions of five marks weight age. You have to attempt only one of the choices in such questions.*
5. *You may use the following values of physical constants wherever necessary.*

$c=3x10^8$ m/s $h=6.6 \times 10^{-34}$ Js $e=1.6 \times 10^{-19}$ C $N_A = 6.023 \times 10^{23}$ /mole $m_n = 1.67 \times 10^{-27}$ kg

SECTION A

1. Draw the graph showing the distribution of kinetic energy of electrons emitted during beta decay.

2. The modulating signal is a square wave as shown with c(t)= 3sin8πt volt . Find modulation index.



3. Why is choke coil needed in the use of fluorescent tubes with ac mains ?

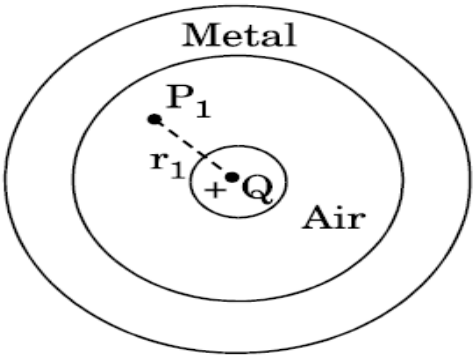
4. Draw resistivity temperature graph for alloys.

5. Because this defect of an eye a person can focus either in vertical OR horizontal plane at a time. This arises due to distortion in the shape of cornea. Name the defect and suggest the correction for it.

SECTION B

6. Explain Zener diode working. Draw its V – I characteristics and represent zener breakdown.

7. A small metal sphere carrying charge +Q is located at the centre of a spherical cavity in a large uncharged metallic spherical shell. Write the charges on the inner and outer surfaces of the shell. Write the expression for the electric field at the point P1



8. Draw a plot of the binding energy per nucleon as a function of mass number for a large number of nuclei. Explain the constancy of binding energy per nucleon in the range $30 < A < 170$ using the property that nuclear force is short-ranged?

OR

How long can an electric lamp of 100W be kept glowing by fusion of 2.0 kg of deuterium? Take the fusion reaction as

$$_1H^2 + {}_1H^2 \rightarrow {}_2He^4 + n + 3.27 \text{ MeV}$$

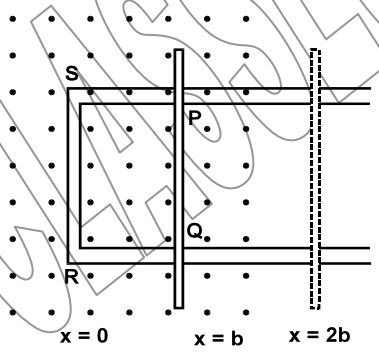
9. A small compass needle of magnetic moment 'M' and moment of inertia 'I' is free to oscillate in a magnetic field 'B'. It is slightly disturbed from is equilibrium position and then released. Show that it execute simple harmonic motion. Hence write the expression for its time period.

10. Use this principle to draw the refracted wave front for a plane wave incident from a denser to a rarer medium. Hence obtain Snell's law of refraction.

SECTION C

11. Answer the following questions : (i) Show, by giving a simple example, how em waves carry energy and momentum. (ii) How are microwaves produced ? Why is it necessary in microwave ovens to select the frequency of microwaves to match the resonant frequency of water molecules ? (iii) Write two important uses of infra-red waves.

12. Figure shows a rectangular conductor PQRS in which the conductor PQ is free to move in a uniform magnetic field B perpendicular to the plane of the paper. The field extends from x = 0 to x = b and is zero for x > b. Assume that only the arm PQ=L posses resistance (R). When the arm PQ is pulled outward form x = 0 with constant speed v, obtain the expressions for the flux and the induced emf. Sketch the variation of these quantities with distance

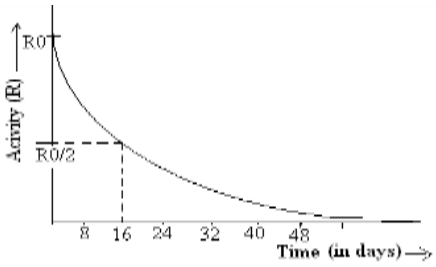


13. Show that the force on each plate of a parallel plate capacitor has a magnitude equal to (½) *QE*, where *Q* is the charge on the capacitor, and *E* is the magnitude of electric field between the plates. Explain the origin of the factor ½.

14. Draw a schematic sketch of a moving coil galvanometer and describe briefly its working.
Increasing the current sensitivity of a galvanometer does not necessarily increase the voltage sensitivity. Justify this statement.

15. Derive an expression for electric potential by an electric dipole at any general point. Draw equipotential surface for an electric dipole.

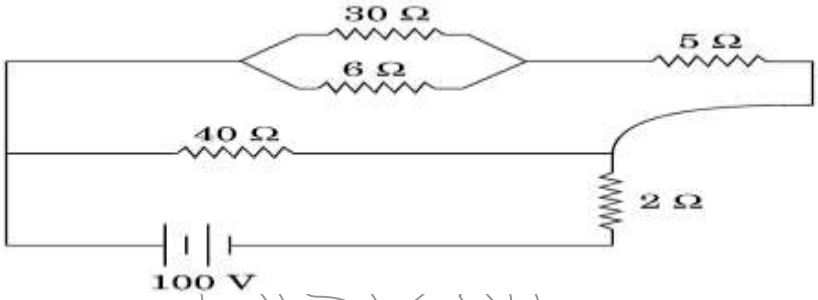
16. Define decay constant. Give the mass number and atomic number of elements on the right hand side of the decay process. ${}_{86}Ru^{220} \rightarrow Po + He$ The graph shows how the activity of sample of radon-220 changes with time. Using this graph calculate (1) half life (2) decay constant



17. Define internal resistance .A battery has an emf E and internal resistance r.A variable resistance R is connected across the terminals of the battery .Find the value of R such that (a) the current in the circuit is maximum (b) the potential difference across the terminals is maximum.

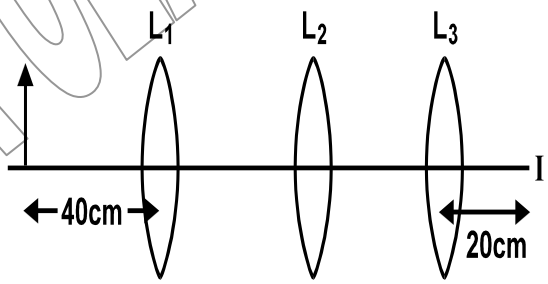
18. Write two conditions for the polarization of light .Unpolarised light of intensity $32W/m^2$ passes through three polarisers such that the transmission axis of the last polarizer is crossed with the first .If the intensity of emerging light is $3W/m^2$, What is the angle between the transmission axis of the first two polarisers? At what angle will the transmitted intensity be maximum ?

19. A 100 V battery is connected to the electric network as shown. If the power consumed in the 2Ω resistor is 200 W, determine the power dissipated in the 5Ω resistor.



20. (i) Show that the time period of ions in a cyclotron is independent of both the speed and radius of circular path. (ii) What is resonance condition? How is it used to accelerate the charged particles?

21. You are given three lenses each of focal length 20cm. An object is kept at 40cm in front of , as shown . The final real image is formed at the focus 'I' of . Find the separation between the lenses.



22. Mention the significance of Davission - Germer experiment. An α particle an a proton are accelerated from rest through the same potential difference V.Find the ratio of de broglie wavelengths associated them.

OR

X –rays of wavelength λ fall on a photosensitive surface, emitting electrons. Assuming that the work function of the surface can be neglected, Prove that the de-broglie wavelength of electrons emitted will be $(h\lambda/2mc)^{1/2}$

SECTION D

23. Anuj's mother was having constant headaches. After a medical check-up, she was diagnosed with tumour. Anuj realized there was a telecommunication tower very close to their house. He enquired from the doctor if the radiation from the tower could have caused the tumour. As the doctor supported his anxiety, he lodged a complaint with the police and ultimately succeeded in getting the tower removed to a distant place away from the residential colony.
Answer the following :

(i) What values were displayed by Anuj ?
(ii) Anuj made a rough estimate about the height of the antenna to be about 20 m from the ground. Calculate the maximum distance upto which radiations from the tower are likely to reach. Use the value of radius of the Earth = 6400Km.

SECTION E

24. Draw a labelled ray diagram of an compound microscope to show the image formation at distinct vision.Write the main considerations required in selecting the objective and eyepiece lenses in order to have large magnifying power and high resolution of the microscope.
(b) An angular a magnification of 30X is desired using an objective of focal length 1.25cm and an eyepiece of focal length 5cm .How will you set up the compound microscope?

OR

(a) Light waves each of amplitude "a" and frequency "w", emanating from two coherent light sources superpose at a point. If the displacements due to these waves is given by y_1=a coswt and y_2=a cos(wt + θ) where θ is the phase difference between the two, obtain the expression for the resultant intensity at the point.
(b) Determine angular separation between central maximum and first order maximum of the diffraction pattern due to a single slit of width 0.25mm when light of wavelength 5890 A^0 is incident on it normally.

25. (a) A series LCR circuit is connected to an a.c. source of variable frequency. Draw a suitable phasor diagram to deduce the expressions for the amplitude of the current and phase angle. (b) Obtain the condition at resonance. Draw a plot showing the variation of current with the frequency of a.c. source for two resistances R1 and R2 (R1 > R2). Hence define the quality factor, Q and write its role in the tuning of the circuit.

OR

(a)Draw a labelled diagram of a.c. generator and state its working principle.
(b)How is magnetic flux linked with the armature coil changed in a generator ?
(c) Derive the expression for maximum value of the induced emf and state the rule that gives the direction of the induced emf.
(d) Show the variation of the emf generated versus time as the armature is rotated with respect to the direction of the magnetic field

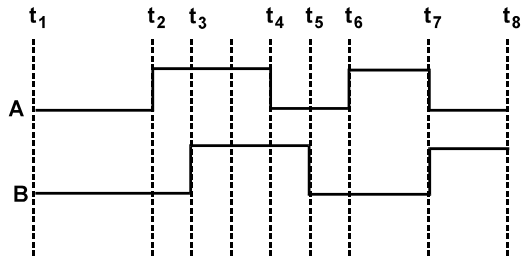
26. A student has to study the input and output characteristics of a npn silicon transistor in the common emitter configuration. What kind of a circuit arrangement should he use for this purpose? What do you understand by cut-off, active and saturation states of the transistor?
Draw the circuit diagram of transistor as an amplifier. Explain its working

OR

(a) Draw the circuit diagrams of a p-n junction diode in (i) forward bias, (ii) reverse bias. Draw the typical V – I characteristics of solar cell ? Mention two important criteria fabrication of solar cell.

(b) Show the output waveforms (Y) for the following inputs A and B of

(i)OR gate (ii) NAND gate



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