CLASS XII
GUESS PAPER
PHYSICS (Theory)

Time allowed: 3 hours *Maximum Marks: 70*

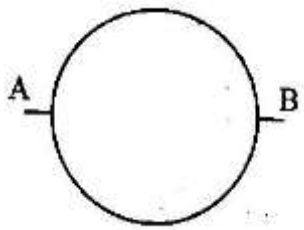
General Instructions

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. A wire of resistance 16R is bent in the form of a circle. What is the effective resistance between the ends of a diameter AB?



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

3. What is the minimum number of satellites that enables a Global Positioning System (GPS) receiver to determine one's longitude/latitude position, i.e., to make a 2D position fix.

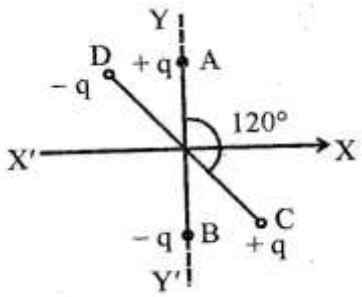
4. Why is choke coil needed in the use of fluorescent tubes with ac mains ?

5. A partially plane polarized beam of light is passed through Polaroid. Show graphically the variation of the transmitted light intensity and angle of rotation of the Polaroid.

SECTION B

6. Explain photodiode working. Draw its V – I characteristics for two different intensities of illumination.

7. Two small identical electrical dipoles AB and CB, each of dipole moment 'p' are kept at angle of 120^0 as shown in figure. What is the resultant dipole moment of this combination? If this system is subjected to electric field *E* directed along +X direction, what will be the magnitude and direction of torque acting this?



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. For a single slit of width 'a', the monochromatic light of wavelength λ first minimum of the interference pattern occurs at an angle of λ/a .At the same angle λ/a, get a maximum for two narrow slits separated by a distance 'a'. Explain.

SECTION C

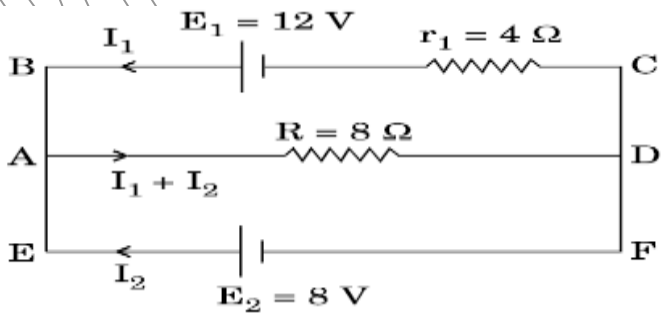
11. (a) How does oscillating charge produce electromagnetic waves ?
(b) Sketch a schematic diagram depicting oscillating electric and magnetic fields of an em wave propagating along + z-direction.

12. A charge Q is distributed over two concentric hollow spheres of radii a and b (b>a) such that the surface densities are the same .Calculate the potential at the common centre of the two spheres.

13. 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.

14. Derive an expression for dipole intensity at any point on equatorial line of short electric dipole. Is there any force and torque in an electric dipole in a non uniform electric dipole

15. In the electric network shown in the figure use Kirchhoff's rules to calculate the power consumed by the resistance R = 8Ω



16. An observer, in a laboratory, starts with nuclei of a radioactive sampe and keeps on observing the number (N) of left over nuclei at regular intervals of 10 minutes each. She prepares the following table on the basis of her observation :Use this data to plot a graph for the given table and calculate the (i) decay constant and (ii) half-life of the given sample.

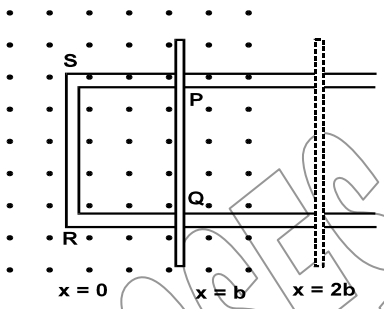
Time (t) in minutes →	0	10	20	30	40
$\log_e\left(\frac{N_0}{N}\right)\rightarrow$	0	3.465	6.930	10.395	13.860

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. In Young's double slit experiment, the two slits 0.12 mm apart are illuminated by monochromatic light of wavelength 420 nm. The screen is 1.0 m away from the slits.(a) Find the distance of the second (i) bright fringe (ii) dark fringe from the central maximum. How will the fringe pattern change if screen moves away from the slits ?

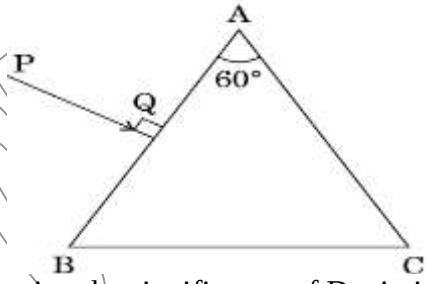
19. Figure shows a rectangular conductor PQRS in which the conductor PQ is free to move in a uniform magnetic field B perpendicular to the plane of the paper. The field extends from x = 0 to x = b and is zero

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



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. A ray PQ is incident normally on the face AB of a triangular prism of refracting angle of 60^0, made of a transparent material of refractive index $2/\sqrt{3}$, as shown in the figure. Trace the path of the ray as it passesthrough the prism. Also calculate the angle of emergence and angle of deviation.



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

Define threshold wavelength . A photon and electron have got same de-broglie wavelength .Prove that the energy of photon is $2mc\lambda/h$ of the kinetic energy of photon.

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 astronomical telescope to show the image formation of a distant object at normal adjustment . Write the main considerations required in selecting the objective and eyepiece lenses in order to have large magnifying power and high resolution of the telescope.
(b) A compound microscope has an objective of focal length 1.25 cm and eyepiece of focal length 5 cm. A small object is kept at 2.5 cm from the objective. If the final image formed is at infinity, find the distance between the objective and the eyepiece.

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) A parallel beam of light of wavelength 500 nm falls on a narrow slit and the resulting diffraction pattern is observed on a screen 1 m away. It is observed that the first minimum is a distance of 2.5 mm away from the centre. Find the width of the slit.

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

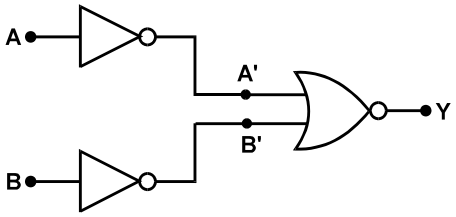
26. A student has to study the input and output characteristics of a npn silicon transistor in the common emitter configuration. What kind of a circuit arrangement should she use for this purpose? What do you understand by cut-off, active and saturation states of the transistor?

Draw the input and output characteristics curve for common emitter transistor why base is thin doped in transistors?

OR

a) Explain briefly the principle on which a transistor-amplifier works as an oscillator. Draw the necessary circuit diagram and explain its working.

b) Identify the equivalent gate for the following circuit and write its truth table.



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