

Physics
Sample Question Paper
Class XII

Class:12
Time 3hrs

Max Mks:70
No of pages:5

General Instructions:

- All questions are compulsory.
- Questions 1 to 5 are one mark questions.
- Questions 6 to 10 are two marks questions.
- Questions 11 to 22 are three marks questions.
- Question 23 is four marks question.
- Question 24 to 26 are five marks questions.
- There is no overall choice in the question paper, but internal choice is there.
- Use of calculator is not permitted.

1. Name the series of hydrogen spectrum which has least wavelength.
2. Write the mathematical form of the law which is a statement of the fact that magnetic monopoles do not exist.
3. Suppose that you are in a cave deep within the earth. Are you safe from electrical storms?
4. Two wires of equal cross-sectional area, one of iron and the other of manganin, have the same resistance. Which one will be longer?
5. Define the SI unit for electrical capacity.
6. A conducting loop is held stationary normal to the field between the poles of a fixed permanent magnet. By choosing the magnet sufficiently strong, is it possible to generate the electric current in the loop. Give reason also.

7. a) Define stopping potential. b) How does stopping potential depend on i) Intensity of incident radiation ii) Frequency of incident radiation?
8. A sphere of radius 0.03 m has a point charge $q = 7.6 \mu\text{C}$ located at its centre. Find the electric flux through it.
9. Write down the function of (i) transducer and (ii) antenna?
10. Define: mean life of a radioactive sample. The half-life of a radioactive sample is 3 hours. If at $t=0$, you start with 240g of the sample, what mass will remain undecayed after 12 hours?
11. When a circuit element 'X' is connected across an a.c. source, a current of A flows through it and this current is in phase with the applied voltage. When another element 'Y' is connected across the same a.c. source, the same current flows in the circuit but it leads the voltage by $\frac{\pi}{2}$ radians.
- (i) Name the circuit elements X and Y.
- (ii) Find the current that flows in the circuit when the series combination of X and Y is connected across the same a.c. voltage.
- (iii) Plot a graph showing variation of the net impedance of this series combination of X and Y as a function of the angular frequency of the applied voltage.
12. Two wires A and B have the same length equal to 44 cm and carry a current of 10 A each. Wire A is bent into a circle and wire B is bent into a square.
- (i) Which wires produces a greater magnetic field at their centre?
- (ii) Also find the magnitude of the magnetic field at their centres.

13. Define: Magnifying power for a compound microscope for the case when the final image is at the near point for the normal eye. A compound microscope uses an objective lens of focal length 4 cm and an eye piece of focal length 10 cm. an object is placed 6 cm from the objective. Calculate the magnifying power for this situation. Also, determine the length of the microscope.

OR

Draw a labelled diagram to show the image formation in a refracting type astronomical telescope.

14. Give reasons for the following :

- (a) Astronomers prefer to use telescopes with large objective diameters to observe astronomical objects.
- (b) Two identical but independent monochromatic sources of light cannot be coherent.
- (c) The value of the Brewster angle for a transparent medium is different for lights of different colours.

15. Identify the part of the electromagnetic spectrum which is : (i) suitable for radar systems used in aircraft navigation, (ii) produced in nuclear reactions, (iii) produced by bombarding a metal target target by high speed electrons.

16. Two heating elements of resistance R_1 and R_2 when operated at a constant supply of voltage V , consume power P_1 and P_2 respectively. Deduce the expression for the power of the combination when they are in-turn connected in a) series and b) parallel across another source of voltage V . Your results must be in terms of P_1 and P_2 only.

17. State the conditions of total internal reflection of light to take place at an interface separating two transparent media. Hence derive an expression for the critical angle in terms of the speed of light in the two media. The velocity of light in a liquid is 1.5×10^8 m/s and in air it is 3×10^8 m/s. If a ray of light passes from this liquid into air, calculate the value of critical angle.
18. What is a wavefront? Distinguish between a plane wavefront and a spherical wavefront. Explain with the help of a diagram, the refraction of a plane wavefront at a plane surface using Huygen's construction.
19. Discuss the working of transistor as a switch.
20. What are de Broglie waves? What is the de Broglie wavelength associated with an electron accelerated through a potential difference of 100 V?
21. The input resistance of a common emitter amplifier is $2\text{k}\Omega$ and ac current gain is 20. If the load resistor used is $5\text{k}\Omega$, then calculate a) the voltage gain of the amplifier and b) the transconductance of the transistor used.
22. Define mutual inductance. Derive an expression for mutual inductance of two long coaxial solenoids of same lengths wound over each other.
23. (a) Draw a ray diagram to show the refraction of light through a glass prism. Hence obtain the relation for the angle of deviation in terms of the angle of incidence, angle of emergence and the angle of the prism.
- (b) A right angled isosceles glass prism is made from glass of refractive index 1.5. Show that a ray of light incident normally on
- (i) one of the equal sides of this prism is deviated through 90°

(ii) the hypotenuse of this prism is deviated through 1800

24. (a) Show mathematically that the electric field intensity due to a short dipole at a distance d along its axis is twice the intensity at the same distance along the equatorial axis.

(b) Two charges of $+0.2 \mu\text{C}$ and $-0.2 \mu\text{C}$ are 10^{-6} cm apart. Calculate the electric field at an axial point at a distance of 10 cm from their mid point.

OR

(a) Deduce an expression for the capacitance of a parallel plate capacitor when a conducting slab is inserted between the plates. Assume that the slab thickness to be less than the plate separation.

(b) A capacitor of $20 \mu\text{F}$ and charged to 500 V is connected in parallel to another capacitor of $10 \mu\text{F}$ charged to 200 V. Find the common potential.

25. State the principle of AC generator. Draw a labelled diagram of an AC generator. What is the source of energy production in this device? An AC generator consist of a coil of 500 turns and area 0.4 m^2 rotating at an angular speed of 60 rads^{-1} in a uniform magnetic field $B = 0.50 \text{ T}$ between two fixed pole pieces. The resistance of the circuit including that of the coil is 500Ω .

a) What is the flux through the coil when the current is zero? What is the flux when the current is maximum?

b) What is the maximum current drawn from the generator?

c) Would the generator work if the coils were stationary and instead, the pole pieces were rotated together with the same speed as earlier?

OR

A $100/\mu\text{F}$ capacitor in series with a 100Ω resistance is connected to a $200\text{ V} - 50\text{ Hz}$ supply.

- a) Determine the average power dissipated per cycle of the AC.
- b) Determine the current amplitude in the circuit.
- c) Determine the time lag between the current maximum and the voltage maximum.
- d) Determine the impedance of the circuit.

26. a) An ac generator consists of a coil of 50 turns and area 2.5 m^2 rotating at an angular speed of 60 rad/s in uniform magnetic field $B = 0.30\text{ T}$ between two fixed pole pieces. The resistance of the circuit including the coil is $500\ \Omega$.

b) Write the principle and working of ac generator.

(i) What is the maximum current drawn by the generator?

(ii) What is the flux through the coil when the current is zero and when the current is maximum?

(iii) Would the generator work if the coil were stationary and instead the pole pieces rotated together with the same speed as above?