KENDRIYA VIDYALAYA ,IIT CAMPUS,CHENNAI

PHYSICS
CLASS XII

- Use of calculators is not permitted. However, you can use log tables if necessary.
- You may use the following values of physical constants, where ever necessary.

$c = 3x10^8 m/s$

$h=6.63 \times 10^{-34} Js$

$e= 1.6x10^{-19} C$

$\mu_o = 4\pi x10^{-7} Tm\ A^{-1}$

$\frac{1}{4\pi\varepsilon_o} = 9x10^9\ \frac{Nm^2}{C^2}$

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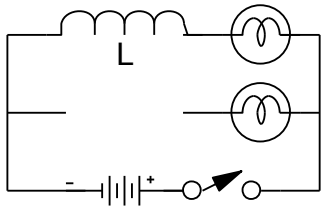
1. What is the work done in moving a test charge 'q' through a distance of 1cm along the equatorial axis of an electric dipole? (1)
2. Two heating coils, one of fine wire and the other of thick wire made of same material and of the same length are connected in turn to a source of e.m.f. Which of the coils will produce more heat? (1)
3. Which constituent of radiation of the electromagnetic spectrum is used in Radar? (1)
4. Two nuclei have same mass numbers in the ratio 8:125. What is the ratio of the nuclear radii? (1)
5. What is the average power consumed in purely inductive and purely capacity a.c circuit? (1)
6. What is the angle of dip at a place where the horizontal and vertical components of earth's magnetic fields are equal? (1)
7. A substance has a critical angle of 45º for yellow light. What is its refractive index? (1)
8. Name a phenomenal which illustrates particle nature of light. (1)
9. Fig. Shows an inductor L and a resistor R connected in parallel to a battery through a switch. The resistance of R is same as that of the coil that makes L. Two identical bulbs are put in each arm of the circuit. (i) Which of the bulbs lights up earlier when S is closed? (ii) Will the two bulbs be equally bright after some time? (2)



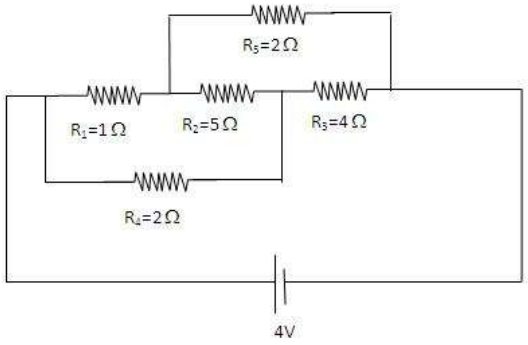
10. Discuss the inconsistency in Ampere's circuital law .What Modification was made by Maxwell in this law? (2)

11. Why sky-wave propagation of electromagnetic waves cannot be used for T.V. transmission? (2)
12. The output of an AND gate is connected to both the inputs of a NAND gate. Draw the logic circuit of this combination of gates and write its truth tables. (2)
13. The radioactive substance decays to 1/32th of its initial activity 25 days. Calculate its half live.

Or

What is meant by the activity of a radioactive sample? How does it vary with time? (2)

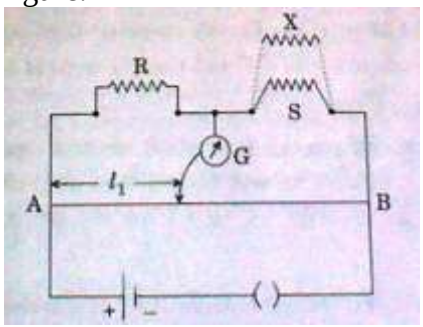
14. A 12pF capacitor is connected to a 50v battery. How much electrostatic energy is stored in the capacitor? (2)
15. Show that Lenz's law follows from the principle of conservation of energy. (2)
16. How can we increase the resolving power of a Microscope? (2)
17. Calculate the current drawn from the battery in the given network.



Or

i. State the Principle of working of a metre bridge.

ii. In a metre bridge, balance point is found at a distance l_1 with resistences R and S as shown in figure.



When an unknown resistance X is connected in parallel with resistance S, the balance point shifts to a distance l_2. Find the expression for X in terms of l_1,l_2 and S. (3)

18. With the help of a circuit diagram, explain how a potentiometer can be used to compare the emfs of two primary cells. (3)
19. A proton and an alpha particle enter at right angles into a uniform magnetic field of intensity B .Calculate the ratio of the radii of their path when they enter the field with the(i) same momentum (ii) same kinetic energy. (3)
20. An a.c circuit consists of a series combination of circuit elements 'X' and 'Y'. The current is ahead of the voltage in phase by ¶/4.If element 'X' is a pure resistor of 100

ohm (i) Name the circuit element 'Y 'and (ii) Calculate the rms value of current if rms value of voltage is 141V. (3)

21. With the help of the binding energy curve, explain how nuclear energy can be released? (3)
22. Explain the need of modulation in communication system. (3)
23. If the frequency of the incident radiation on the cathode of a photo-cell is doubled ,how will the following change:
    i. Kinetic energy of the electrons?
    ii. Photoelectric current?
    iii. Stopping potential? Justify your answer. (3)
24. Deduce the laws of reflection on the basis of Huygen's wave theory. (3)
25. The fringe width in a Young's double slit interference pattern is 2.4×10^{-4}, when red light of wavelength 6400A is used. By how much will it change, if blue light of wavelength 4000A is used? (3)
26. Radha's uncle was advised by his doctor to have an MRI scan of his chest. Her uncle did not know much about the details and the significance of this test. He also felt that it was too expensive and thought of postponing it. When Radha learnt about her uncle's problems, she immediately decided to do something about it. She took the help of her family, friends and neighbours and arranged for the cost of the test. She also told her uncle that an MRI (Magnetic Resonance Imaging) scan of his chest would enable the doctors to know of the condition of his heart and lungs without causing any (test related) harm to him. This test was expensive because of its set up that needed strong magnetic fields (0.5 T to 3T) and pulses of radio wave energy. Her uncle was convinced and had the required MRI scan of his chest done. The resulting information greatly helped his doctors to treat him well.
    (a) What according to you, are the values displayed by Radha and her family, friends and neighbours to help her uncle?
    (b) Assuming that the MRI scan of her uncle's chest was done by using a magnetic field of 1.0 T, find the maximum and minimum values of force that this magnetic field could exert on a proton (charge = 1.6×10^{-19}) that was moving with a speed of 10^4 m/s. State the condition under which the force has its minimum value. (4)
27. State Gauss's theorem in electrostatic. Using this theorem, derive an expression for electric field intensity due to an infinitely long straight wire of linear charge density λ C/m
28. Give the Principle, construction and working of Vande Graff generator. (5)
29. With the help of a labeled circuit diagram, explain full wave rectifier.
30. Draw the circuit diagram of a common emitter amplifier using n-p-n transistor. What is the phase difference between the input signal and output voltage? Draw the input and output waveforms of the signal? Write the expression for its voltage gain? (5)
31. Explain the construction and working of an astronomical telescope .Derive an expression for its magnifying power in normal adjustment.
32. Explain Diffraction of light due to a single slit illuminated by a monochromatic source. Explain the formation of pattern of fringes obtained on the screen. (5)

33. State Huygens' Principle. For reflection of a plane wave front at a plane reflecting surface, construct the corresponding reflected wave front. Using this diagram, prove that angle of incidence is equal to angle of reflection.

34. **A neutron is absorbed by a Li^{6}_{3} nucleus with the subsequent emission of an alpha particle.**

(I) write the corresponding nuclear reaction.

(II) Calculate the energy released in Mev in this reaction.

Given: mass (Li^{6}_{3}) = 6.01512126u; mass (neutron) = 1.0086654u; Mass (alpha particle) = 4.0026044u and mass (triton) = 3.01000000u Take 1u = 931Mev/c^2.

35. **Draw a plot showing the variation of binding energy per nucleon with mass number A. Write two important conclusions which you can draw from this plot. Also, from the graph explain the release of energy in the process of nuclear fission and fusion.**

36. A proton and an alpha particle enter at right angles into a uniform magnetic field of intensity B .Calculate the ratio of the radii of their path when they enter the field with the(i) same momentum (ii) same kinetic energy.

37. **With the help of a circuit diagram explain how a zener diode can be used as a Voltage regulator?**