Pre-Board Examination (2014-2015)
Subject : Physics
Class : XII

Time: 3 Hrs. **M.M. 70**

General Instructions :

(i) All the questions are compulsory.
(ii) Question numbers 1 to 5 are very short answer questions carrying 1 mark each.
(iii) Question numbers 6 to 10 are short answer question carrying 2 marks each.
(iv) Question numbers 11 to 22 are also short answer questions carrying 3 marks each
(v) Question number 23 is a value based questions carrying 4 marks.
(vi) Question numbers 24 to 26 are long answer questions carrying 5 marks each.
(vii) Use long tables, if necessary. Use of calculator is not allowed.

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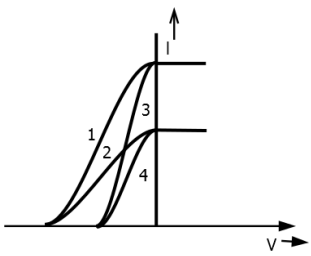
1 What is the geometrical shape of equipotential surface due to a single isolated point charge?
2 Which of the following wave can be polarized?
(i) Heat Wave
(ii) Sound waves
Give reason to support your answer.
3. Why photoelectric effect cannot be explained on the basis of wave nature of light?
4. Write any two basic features of photon picture of electromagnetic radiation i.e. particle theory of light.
5. Name the device used in voltage regulation.
6. The emf of a cell is generally greater than its terminal voltage. Why? Also write the condition in which emf is less than terminal voltage.
7. State Lenz's law.
A metallic rod held horizontally along east-west direction on pole is allowed to fall under gravity. Will there be an *emf* induced across its ends? Give reason for your answer.
8. Can light be 'piped' like sound in a doctor's stethoscope? If yes, then how is it possible? and what is the principal behind it?
9. The given graph shows the variation of photo electric current (I) versus applied voltage (V) for two different photosensitive materials and for two different intensities of the incident radiations. Identify the pairs of curve that correspond to same materials. Give reason too.



10.
a) Give example of any one URL.
b) Write any one difference in transmission though mobile phone and cordless Phone.

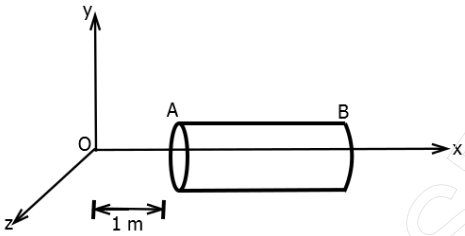
OR

(a) Write the full from of SIM and IMEL.
(b) Write any two uses of GPS.

11. A capacitor of unknown is connected across a battery of V Volts. The charge stored in it is 360 μC. When potential across the capacitor is reduced by 120 V, the charge stored in it becomes 120 μC. calculate:
(a) The potential V and the unknown capacitance C.
(b) What will be the charge stored in the capacitor. If the voltage applied had increased by 120V ? (Capacitor can withstand the increased potential safely.)

OR

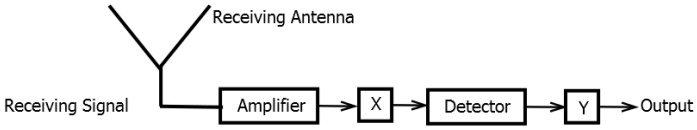
A hollow cylindrical box of length I m and area of corss section 25 cm^2 is placed in a three dimensional coordinate system as shown in the figure. The electric field in the region is given by $E = 50xi$, where E is in NC^{-1} and x is in metres. Find:
(a) Net flux through the cylinder:
(b) Change enclosed by the cylinder.



12. In an experiment, when a tiny circular obstacle is placed in the path of light from a distant source, on the screen a bright spot is seen at the centre of the shadow of the obstacle. Explain. State two points of difference between the interference pattern obtained in Young's double slit experiment and the diffraction pattern due to a single slit.
13. (a) Differentiate between three segment of a transistor on the basis of their size and level of doping.
(b)How is a transistor biased to be in active state?
14. In a series LCR circuit connected to an c source of variable frequency and voltage $V = V_m \sin \omega t$, , draw a plot showing the variation of current (I) with angular frequency (ω) for two different value of resistance R1 and $R_2 (R_1 > R_2)$. Write the condition under which the phenomenon of resonance occurs. For which value of the resistance out of the two curves, a shaper resonance is produced Define Q-factor of circuit and give its significance.
15. In a plane electromagnetic wave travelling in vaccum, the electric field oscillate sinusoidally at frequency of $2.0x10^{10} Hz$ and amplitude 48^{+}Vm^{-1}
(a) What is the wavelength of the wave.

(b) Show that the average energy density of the electric field equals the average energy density of the magnetic field in an EM wave.

16. An ammeter of resistance 0.80 Ω can measure current upto 1.0A.
    a) What must be the value of shunt resistance to enable the ammeter to measure current upto 5.0A?
    b) What is the combined resistance of the ammeter and the shunt?
    (shunt is connected across ammeter given)
17. Block diagram of a receiver is shown in the figure:



    (a) Identify X and Y
    (b) Write their functions.
18. A metallic rod of length/is rotated with a frequency v with one end hinged at the centre and other end at the circumference of a circular metallic ring of radius τ, about an axis passing through the centre and perpendicular to the plane o the ring. A Constant uniform magnetic field B parallel to the axis is present everywhere. Using Lorentz force, explain how emf is induced between the centre nd the metallic ring and hence obtained and expression for it.
19. (a) In a typical nuclear reaction e. g.
    ${}_1H^2 + {}_1H^2 \rightarrow {}_2He^3 + {}^1_0n + 3.27MeV$
    Although number of nucleons is conserved, yet energy is released. How? Explain.
    (b) Show that nuclear density in given nucleus is independent of mass number A.
20. In a double slit intereference pattern ($\lambda = 6000\,\overset{0}{A}$), the zero order and tenth order maxima all at 12.34 mm and 14.73 mm from the particular reference point. If λ is changed to $550\,\overset{0}{A}$, find the position of the Zero order and tenth order fringes, other arrangements remaining the same.
21. Determine the age of an ancient wooden piece if it is known that the specific activity of C^{14} nuclide in it amount of 3/5 of the in freshly felled trees. The half-life of C^{14} nuclide is 5570 years.
22.
    a) Can one slab of p-type semi-conductor be physically joined to another n-type semiconductor to get p-n junction? Explain
    b) Explain with the help of a circuit diagram, how ac is converted into dc using full wave rectifier.
23. While travelling back to his residence in the car. Dr. Pathak was caught up in thunder storm. It became very dark. He stopped driving the car and waited for thunder storm to stop. Suddenly he noticed his neighbour's son walking alone on the road. He asked the boy to come inside the car till the thunder storm stopped. Dr. Pathak dropped the boy at his residence.

The boy said thanks to him. His neighbour expressed their gratitude to Dr. Pathak for his concern for safety of the child.

Answer the following questions based on the above information:

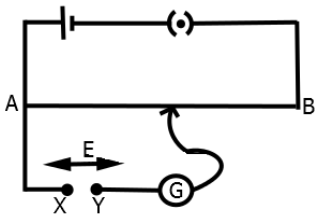
(a) Why is it safer to sit inside a car during a thunderstorm?

(b) Which two value are displayed by Dr. Pathak in his action?

(c) Which two values are reflected in neighbour's response to Dr. Pathak?

(d) Give an example of similar action on your part in the past from everyday life.

24. For the potentiometer circuit shown in the given figure. Point X and Y represent the two terminals of an unknown emfE'. A student observed that when the jokey is moved form he end A to the end B of the potentiometer wire, the deflection in the galvanometer remains in the same direction.



What may be the two possible faults in the circuits that could result in this observation? If the galvanometer deflection at the end B is (a) more, (b) less than that at the end A, which of the two faults, listed above, would be there in the circuit? Give reason in support of your answer in each case.

a) You are given n resistors, each of resistance r. These are first connected to get minimum possible resistance. In the second case, these are again concocted differently to get maximum possible résistance. Compute the ratio between the minimum values and maximum values of resistance obtained.

b) A cylindrical metallic wire is stretched uniformly to increase its length by 5%. Calculate the percentage change in its resistance.

25.

a) Derive the expression for the torque on a rectangle current carrying loop, suspended in a uniform magnetic field.

b) A proton and a deuteron having equal momenta enter in a region of a uniform magnetic field at right angle to the direction of the magnetic field. Depict their trajectory in the field with radius.

OR

a) A compass needle of magnetic moment m is free to turn about on axis perpendicular to the direction of uniform magnetic field B. The moment of inertia of the needle about the axis is l. The needle is slightly disturbed from its stable position and then released. Prove that it execute harmonic motion. Hence deduce the expression for its time period.

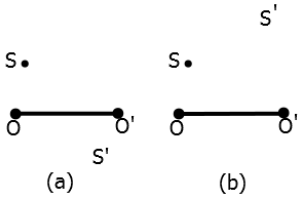
b) A Compass-needle, free to turn in a vertical plane orients itself with its axis vertical at a certain place on the earth. find out the value of :

(i) Horizontal component of earth's magnetic field and

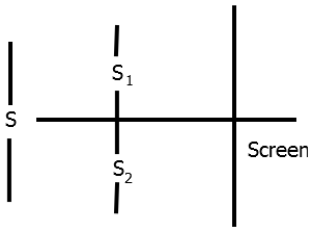
(ii) angle of dip at the place.

26.

a) Find by construction the position of a lens and its main foci on the optic axis OO' if S and S' are respectively, the object and image point S.



b) Is it possible for a given lens to act as a converging lens in one medium, and as a diverging lens another? If yes, then explain.



OR

a) If a single lens is used to form and image. It is better to use a lens of larger diameter, in which the outer parts near the rim are blocked off. Explain why?

b) In Young's double slit experiment, what would happen on the screen if one gradually enlarges the size the hole S? Write any observation what reason.

c) What is the function of the circular stop at the focal plane of the objective of a telescope?