CBSE 12th Physics 2015 Unsolved Paper

Outside Delhi

CBSE 12th Physics 2015 Unsolved Paper Outside Delhi

TIME - 3HR. | QUESTIONS - 26

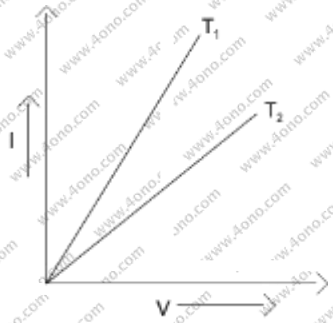
THE MARKS ARE MENTIONED ON EACH QUESTION

SECTION-A

Q. 1. Define the term 'self-inductance' of a coil. Write its S.I. unit. *1 mark*

Q. 2. Why does bluish color predominate in a clear sky? *1mark*

Q. 3. I-V graph for a metallic wire at two different temperatures, T_1 and T_2 is as shown in figure. Which of the two temperatures is lower and why? *1 mark*



Q.4. Which basic mode of communication is used for telephonic communication? *1 mark*

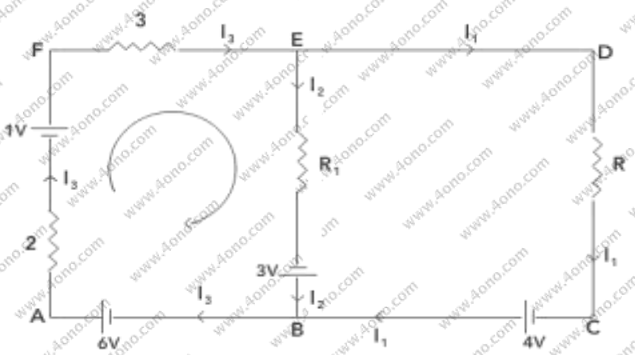
Q. 5. Why do the electrostatic field lines not form closed loops? *1 mark*

SECTION – B

Q. 6. When an electron in hydrogen atom jumps from the third excited state to the ground state. how would the de Broglie wavelength have associated with the electron change? your answer. *2 mark*

Q. 7. Write two factors which justify the need of modulating a low frequency signal into high frequencies before transmission. *2 mark*

Q. 8. Use Kirchhoff's rules to determine the potential difference between the points A and D when no current flows in the arm BE of the electric network shown in the figure. *2 mark*



Q. 9. You are given two converging lenses of focal lengths 1.25 cm and 5 cm to design a compound microscope. If it is desired to have a magnification of 30, find out the separation between the objective and the eyepiece. *2 mark*

OR

A small telescope has an objective lens of focal Length 150 cm and eyepiece of 5 cm. What is the magnifying power of the telescope viewing distant in normal adjustment?

If this telescope is used to view a 100 m tall tower 3 km away. what is height of the image O\of the tower formed by the objective lens?

Q.10. Calculate the shortest wavelength in the Balmer series of hydrogen atom. In which region (infra- red, visible, ultraviolet) of hydrogen spectrum does this wavelength lie? *2 mark*

SECTION - C

Q.11. Calculate the potential difference and the energy stored in the capacitor C_2 in the circuit shown in the figure. Given potential at A is 90 V, C_1 = 20 μF, C_2 = 30 μF and C_3 = 15 μF. *3 marks*

Q.12. Find the relation between drift velocity and relaxation time of charge carriers in a conductor. A conductor of length L is connected to a *d.c.* source of *emf* 'E'. If the length of the conductor is tripled by stretching it, keeping 'E' constant, explain how its drift velocity would be affected. *3 marks*

Q.13. State clearly how an unpolished light gets linearly polarized when passed through a polaroid. *3 mark*

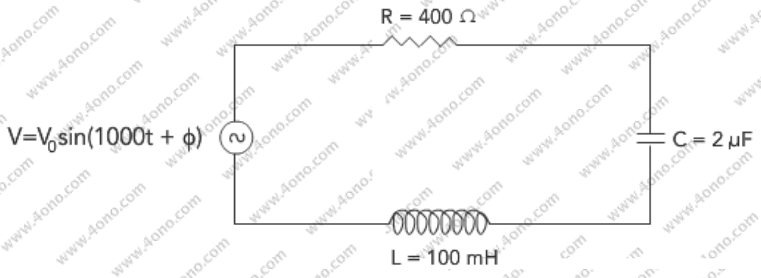
(I) Unpolished light of intensity I_0 is incident on a polaroid P_1which is kept near another polaroid P_2 whose pass axis is parallel to that of P_1. How will the intensities of light, I_1 and I_2 , transmitted by the polaroid's P_1 and P_2 respectively, change on rotating P_1without disturbing P_2?

(ii) Write the relation between the intensities I_1 and I_2.

Q.14. Define modulation index. Why is its value kept, in practice, less than one? A carrier Wave of frequency 1.5 MHz and amplitude 50 V is modulated by a sinusoidal wave of frequency 10 kHz producing 50 % amplitude modulation. Calculate the amplitude of the AM wave and frequencies of the side bands produced. ***2 mark***

Q.15. A uniform magnetic field $\vec{B}$ is set up along the positive x-axis. A particle of charge 'q' and mass 'm' moving with a velocity $\vec{v}$ enters the field at the origin in X-Y plane such that it has velocity components both along and perpendicular to the magnetic field. $\vec{B}$ Trace, giving reason, the trajectory followed by the particle. Find out the expression for the distance moved by the particle along the magnetic field in one rotation. *3 mark*

Q. 16. (a) Determine the value of phase difference between the current and the voltage in the given series LCR circuit.

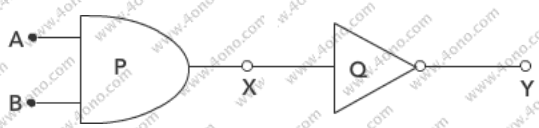


(b) Calculate the value of the additional capacitor which may be joined suitably to the capacitor C that would make the power factor of the circuit unity. *3 marks*

Q. 17. Write the expression for the generalized form of Ampere's circuital law. Discuss significance and describe briefly how the concept of displacement current is explained through Charging/discharging of a capacitor in an electric circuit. *3 marks*

Q. 18. Use Huygens' principle to show how a plane wave front propagates from a denser to rarer medium. Hence verify Snell's law of refraction. *3 mark*

Q.19. Identify the gates P and Q shown in the figure. Write the truth table for the combination of the gates shown. *3 marks*



Name the equivalent gate representing this circuit and write its logic symbol.

Q. 20. What is ground wave communication? On what factors does the maximum range of propagation in this mode depend *3 marks*

Q.21. (a) Write three characteristics properties of nuclear force.

(b) Draw a plot of potential energy of a pair of nucleons as a function of their separatism. Write two important conclusions that can be drawn from the graph. *3 marks*

Q.22. (a) Describe briefly three experimentally observed features in the phenomenon of photoelectric effect.

(b) Discuss briefly how wave theory of light cannot explain these features. *3 marks*

OR

(a) write the important properties of photons which are used to establish Einstein's photoelectric equation.

(b) Use this equation to explain the concept of (i) threshold frequency and (ii) stopping potential

SECTION-D

Q.23. One morning an old man walked bare-foot to replace the fuse wire in kit Kat fitted with the power supply mains for his house. Suddenly he screamed and collapsed on the floor. His wife cried loudly for help. His neighbor's son Anil heard the cries and rushed to the place with shoes on. He took a wooden baton and used it to switch off the main supply.

Answer the following questions: *4 marks*

(i) What is the voltage and frequency of mains supply in India?

(ii) These days most of the electrical devices we use require a.c. voltage. Why?

(iii) Can a transformer be used to step up d.c. voltage?

(iv) Write two qualities displayed by Anil by his action.

SECTION-E

Q. 24. (a) Define electric flux. Write its S.I. unit. *5 marks*

"Gauss's law in electrostatics is true for any closed surface, no matter what its shape or size is." Justify this statement with the help of a suitable example.

(b) Use Gauss's law to prove that the electric field inside a uniformly charged spherical shell is zero. ***3 marks***

OR

(a) Derive the expression for the energy stored in a parallel plate capacitor. Hence obtain the expression for the energy density of the electric field.

(b) A fully charged parallel plate capacitor is connected across an uncharged identical capacitor. Show that the energy stored in the combination is less than that stored initially in the single capacitor.

Q.25. Explain, using a labelled diagram, the principle and working a moving coil gal vinometer. What is the function of (i) uniform radial magnetic field, (ii) soft iron core?
Define the terms (i) current sensitivity and (ii) voltage sensitivity of a galvanometer. Why does increasing the current sensitivity not necessarily increase voltage sensitivity? *5 marks*

OR

(a) Write, using Biot-Savart law, the expression for the magnetic field $\vec{B}$ due to an element $\overrightarrow{dl}$ carrying current I at a distance $\vec{r}$ from it in a vector form.

Hence derive the expression for the magnetic field due to a current carrying loop of radius R at a point P distant x from its center along the axis of the loop.

(b) Explain how Biot-Savart law enables one to express the Ampere's circuital law in the integral form, viz., $\oint \vec{B} \cdot \overrightarrow{dl} = \mu_o I$
where I is the total current passing through the surface *5 marks*

Q 26. (a) Consider two coherent sources S_1 and S_2 producing monochromatic waves to produce interference pattern. Let the displacement of the wave produced by S_1 be given by

$$Y_1 = a \cos \omega t$$

and the displacement by S_2 be

$$Y_2 = a \cos (\omega t + \phi).$$

Find out the expression for the amplitude of the resultant displacement at a point and show that the intensity at that point will be

$$I = 4a^2 \cos^2 \phi/2$$

Hence establish the conditions for constructive and destructive interference.

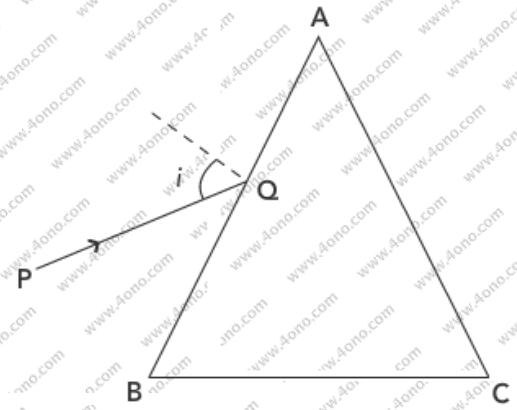
(b) What is the effect on the interference fringes in Young's double slit experiment when (i) the Width of the source slit is increased; (ii) the monochromatic source is replaced by a source of white light? *5 marks*

OR

(a) A ray 'PQ' of light is incident on the face AB of a glass prism ABC (as shown in the figure) and emerges out of the face AC. Trace the path of the ray. Show that

$$\angle i + \angle e = \angle A + \angle \delta$$

Where δ and e denote the angle of deviation and angle of emergence respectively.



Plot a graph showing the variation of the angle of deviation as a function of angle of incidence. State the condition under which $\angle\delta$ is minimum.

(b) Find out the relation between the refractive index (μ) of the glass prism and $\angle A$ for the case when the angle of prism (A) is equal to the angle of minimum deviation (δ_m). Hence obtain the value of the refractive index for angle of prism A = 60^0.