THE VILLAGE
INTERNATIONAL SCHOOL
"We Nurture Dreams"

GRADE: XII Date: 11/12/24	MODEL 1 EXAMINATION 2024-25 PHYSICS MS	Marks:70 Time: 3h

SECTION A:

1. **(b) conductivity**
2. **(d) Zero**
3. **(c) decreases because charge moves along the electric field**
4. **(a) 3A in clockwise direction**
5. **(b) 1:1**
6. **(b) increases**
7. **(a) decrease**
8. **(b) Magnetic dipole moment**
9. **(c) 29 V**
10. **(c) a force and a torque**
11. **(b) 2062.5 Å**
12. **(b) 1.59×10-10**
13. **(b) Both A and R are true and R is NOT the correct explanation of A**
14. **(b) Both A and R are true and R is NOT the correct explanation of A**
15. **(a) Both A and R are true and R is the correct explanation of A**
16. **(d) A is false and R is also false**

SECTION B:

17. **Given L = 1 H, C = 20 μF, R = 300 Ω, frequency = 50/π Hz, V = 50 V**
    To find the rms current, we use the formula for impedance in an LCR circuit:

$$Z = \sqrt{R^2 + (X_L - X_C)^2}$$

    Where $X_L = 2\pi f L$ and $X_C = \frac{1}{2\pi f C}$.

    After calculating, we can find the rms current as $I = \frac{V}{Z}$.

18. **(a) For a point source, the wavefront is spherical.**
    (b) For a line source, the wavefront is cylindrical.
    OR
    B - Forward bias and **C - Reverse bias** of the diode.

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19. **(a) EM wave propagation sketch: Electric and magnetic fields oscillate perpendicular to each other and to the direction of propagation.**
    (b) The magnitudes of E and B are related to the velocity v of the EM wave by $v = \frac{E}{B}$.
    OR
    A biconvex lens in water will behave as a diverging lens because the refractive index of the lens material is less than the refractive index of water.

20. **(i) Specimen A is ferromagnetic and B is paramagnetic.**
    (ii) The magnetic susceptibility of A is much higher than that of B.

21. **Nuclear radius for 125Fe** can be calculated using the formula $R = R_0 A^{1/3}$, where $R_0 = 1.2\,\text{fm}$ and $A = 125$.

    OR
    Short wavelength limit for the Balmer series is 364.5 nm.

SECTION C:

22. **Using energy levels provided, calculate the transition that corresponds to the emission of a spectral line of wavelength 482 nm. This corresponds to the Balmer series.**

23. **The black box is a rectifier. It converts AC voltage to DC using diodes.**

24. **Using Kirchhoff's rules, we can apply them to the circuit and find the currents through the 40Ω and 20Ω resistors.**

25. **Kinetic energy of photoelectrons from the work function equation helps determine the threshold wavelength of the material, which is 1375 nm.**
    OR

    (a) X and A represent frequency and intensity on the horizontal axis.
    (b) Graphs show intensity versus photoelectron count and frequency versus kinetic energy of emitted electrons.

26. **The force between two parallel conductors with currents is attractive if currents are in the same direction. The expression for force per unit length is given by**

$$F = \frac{\mu_0 I_1 I_2}{2\pi d}$$

    OR
    Einstein's photoelectric equation explains the three observations of photoemission from surfaces A, B, and C.

27. **(a) The graph shows the binding energy per nucleon with mass number, with the peak at iron indicating energy release in fission and fusion.**
    (b) Nuclear reactions release energy due to the difference in binding energy per nucleon.

28. **For capacitors C1, C2, C3, C4, the net capacitance is calculated using series and parallel combinations. For charge calculations, use $Q = CV$ and energy stored in capacitors in series or parallel.**

SECTION D:

29. **(i) The image formed at infinity is considered ideal for viewing since it provides a relaxed eye position.**
    (ii) Multicomponent lenses in microscopes improve image quality by reducing chromatic and spherical aberrations.
    (iii) Compound microscopes use high magnification, and astronomical telescopes are designed for distant observation.
    (iv) Reflecting telescopes have no chromatic aberration and are more practical than refracting telescopes.

30. **(i) Moving coil galvanometer is a deflection instrument.**
    (ii) Radial field is achieved by cylindrical pole pieces.
    (iii) Deflection is directly proportional to current and the number of turns.

    (iv) The torque acting on the coil is given by $\tau = NABI$.

31. **(a) Electric flux is the product of electric field and area through which it passes, with SI unit Nm^2/C.**
    (b) Gauss's law gives the electric field due to an infinitely long wire as $E = \frac{\lambda}{2\pi\epsilon_0 r}$.
    OR
    (a) The ratio $Q : q$ is -1.
    (b) Electric field intensity outside a uniformly charged spherical shell is the same as if the charge were concentrated at the center.

32. **(a) Biot-Savart law states that the magnetic field at a point due to a current element is proportional to the current and inversely proportional to the square of the distance. The field at the center of a circular coil is given by**

$$B = \frac{\mu_0 NI}{2r}$$

    (b) Kirchhoff's laws: Current law (KCL) and Voltage law (KVL) are fundamental for circuit analysis. The balanced state of a Wheatstone bridge is obtained when the ratio of resistances in the bridge is equal.

33. **(a) The ray diagram shows the formation of an image in a convex lens, leading to the derivation of the lens maker's formula.**
    OR
    (b) The magnifying power of the compound microscope is the product of the powers of the objective and eyepiece. The preferred objective is 10 D and the preferred eyepiece is 5 D.