

+2 PUBLIC EXAMINATION - March: 2014**Physics****Answers for Three Marks questions****31. Define electric dipole moment.****Electric dipole moment:**

The magnitude of the dipole moment is given by the product of the magnitude of the one of the charges and the distance between them.

$$\text{Electric dipole moment, } p = q \cdot 2d$$

32. Calculate the potential at a point due to a charge of $4 \times 10^{-7} \text{ C}$ located at 0.09 m away.

$$\begin{aligned} \text{Electric Potential } V &= \frac{1}{4\pi\epsilon_0} \cdot \frac{q}{r} \\ &= \frac{(9 \times 10^9 \times 4 \times 10^{-7})}{9 \times 10^{-2}} \\ &= 4 \times 10^4 \text{ volt} \end{aligned}$$

33. What are the changes observed at the transition temperature in superconductors?

At the transition temperature the following changes are observed:

- i. The electrical resistivity drops to zero.
- ii. The conductivity becomes infinity.
- iii. The magnetic flux lines are excluded from the material.

34. State Kirchoff's voltage law.**Kirchoff's voltage law:**

The algebraic sum of the products of resistance and current in each part of any closed circuit is equal to the algebraic sum of the emf's in that closed circuit. This law is a consequence of conservation of energy.

35. An incandescent lamp is operated at 240 V and the current is 0.5 A. What is the resistance of the lamp?

$$\text{Resistance } R = \frac{V}{I}$$

$$\therefore \text{Resistance } R = \frac{240}{0.5}$$

$$R = 480 \text{ ohm}$$

36. Define Peltier coefficient.

Peltier coefficient:

The amount of heat energy absorbed or evolved at one of the junctions of a thermocouple when one ampere current flows for one second (one coulomb) is called Peltier coefficient.

It is denoted by π . Its unit is volt.

37. State Lenz's law in electromagnetic induction.

Lenz's law:

The induced current produced in a circuit always flows in such a direction that it opposes the change or cause that produces it.

38. Magnetic field through a coil having 200 turns and cross sectional area 0.04 m^2 changes from 0.1 wb m^{-2} to 0.04 wb m^{-2} in 0.02 s . Find the induced emf.

$$\text{Induced emf } e = - \frac{d(NBA)}{dt}$$

$$e = - NA \frac{(B_2 - B_1)}{dt}$$

$$e = - \frac{200 \times 0.04 \times (0.04 - 0.1)}{0.02}$$

$$\therefore \text{Induced emf } e = 24 \text{ volt}$$

39. Give the uses of ultraviolet radiation.

Uses of ultra- violet radiations:

- (i) They are used to destroy the bacteria and for sterilizing surgical instruments.
- (ii) These radiations are used in detection of forged documents, finger prints in forensic laboratories.
- (iii) They are used to preserve the food items.
- (iv) They help to find the structure of atoms.

40. State the conditions for total internal reflection.**For total internal reflection**

- i) Light must travel from a denser medium to a rarer medium
- ii) The angle of incidence inside the denser medium must be greater than the critical angle ($i > C$).

41. Distinguish between soft X-rays and hard X-rays.

Soft X - rays	Hard X - rays
i) Wavelength is 4\AA or above	i) Wavelength is in the order of 1\AA
ii) Have lesser frequency	ii) Have high frequency
iii) Have lesser energy	iii) Have high energy
iv) Have low penetrating power	iv) Have high penetrating power
v) Produced at low potential difference	v) Produced at high potential difference

42. An electron beam passes through a transverse magnetic field of 2×10^{-3} tesla and an electric field E of 3.4×10^4 V/m acting simultaneously. If the path of the electrons remain undeviated, calculate the speed of the electrons.

$$\text{Speed of electrons } v = \frac{E}{B}$$

$$v = \frac{3.4 \times 10^4}{2 \times 10^{-3}}$$

$$\therefore v = 1.7 \times 10^7 \text{ ms}^{-1}$$

43. Write any three applications of photoelectric cells.**Applications of photoelectric cells:**

- (i) Photoelectric cells are used for reproducing sound in cinematography.
- (ii) They are used for controlling the temperature of furnaces.
- (iii) Photoelectric cells are used for automatic switching on and off the street lights.
- (iv) Photoelectric cells are used in the study of temperature and spectra of stars.
- (v) Photoelectric cells are used in burglar alarm and fire alarm.
- (vi) These cells are used in instruments measuring light illumination.
- (vii) These cells are used in opening and closing of doors automatically.

44. Write any three properties of neutrons.**Properties of neutrons:**

- (i) Neutrons are the constituent particles of all nuclei, except hydrogen.
- (ii) As they are neutral particles, they are not deflected by electric and magnetic fields.
- (iii) As neutrons are neutral, they can easily penetrate any nucleus.
- (iv) Neutrons are stable inside the nucleus. But outside the nucleus they are unstable.
- (v) Energy of slow neutrons = 0 to 1000 eV; Energy of fast neutrons=0.5MeVto10MeV.

45. What is pair production and annihilation of matter?**Pair production:**

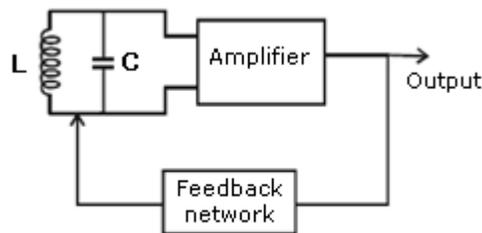
The conversion of a photon into an electron–positron pair on its interaction with the strong electric field surrounding a nucleus is called pair production.

Pair annihilation:

The converse of pair production in which an electron and positron combine to produce a photon is known as annihilation of matter.

46. What are the essential components of an oscillator? Draw its block diagram.**Components of an oscillator:**

- (i) Tank circuit
- (ii) Amplifier
- (iii) Feedback circuit.



Oscillator block diagram

47. What are the advantages of integrated Circuits (IC)?**Advantages of integrated Circuits:**

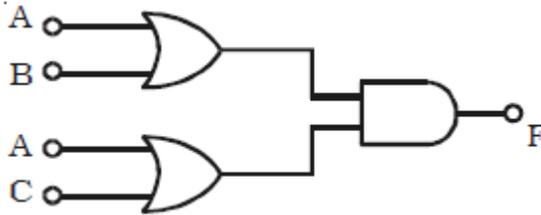
- (i) Extremely small in size.
- (ii) Low power consumption
- (iii) Reliability
- (iv) Reduced cost
- (v) Very small weight
- (vi) Easy replacement.

48. What are the important characteristics of an operational amplifier (OP-AMP)?

The important characteristic of OP-AMP:

- (i) Very high input impedance or even infinity which produces negligible current at the inputs.
- (ii) Very high gain.
- (iii) Very low output impedance or even zero so as not to affect the output of the amplifier by loading.

49. Find the output F of the logic circuit given below.



- (i) Output of the OR gate with A and B inputs = $(A + B)$
- (ii) Output of the OR gate with A and C inputs = $(A + C)$
- (iii) Output of the AND gate = $(A + B)(A + C)$
 $= AA + AC + AB + BC$
 $= A + AC + AB + BC$
 $= A(1 + C + B) + BC$
 $= A + BC$

50. What is 'Skip distance'?

Skip distance:

In the Sky wave propagation, for a fixed frequency, the shortest distance between the point of transmission and the point of reception along the surface is known as the skip distance.

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