Mock Test -1 (CBSE)

Time: 3 Hours **Max. Marks: 70**

General Instructions

(a) All questions are compulsory.
(b) There are 30 questions in total. Questions 1 to 8 carry one mark each, questions 9 to 18 carry two marks each, questions 19 to 27 carry three marks each and questions 28 to 30 carry five marks each.
(c) There is no overall choice. However, an internal choice has been provided in one question of two marks, one question of three marks and all three questions of five marks each. You have to attempt only one of the given choices in such questions.
(d) Use of calculators is not permitted.

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1. What are others name of Biot-Savart law.

2. Which phenomena establish the wave nature of light?

3. Why is the transistor called a junction transistor?

4. Give the number of protons and neutrons in $^{234}_{92}U$?

5. Name the part of electromagnetic spectrum to which waves of wavelength (*i*) 1 A° and (*ii*) 10^{-2} m belong.

6. Does change in magnetic flux induce e.m.f. or current?

7. Out of electron and hole, which one has higher mobility and why.

8. What is a phasor?

9. Derive an expression for magnetic field strength *B* at a point P due to current flowing through a straight conductor using Biot-Savart law.

10. What is a wavefront? State its relation with ray of light.

11. If there are *n* capacitors in parallel connected to *V* volt source, find the energy stored in the arrangement.

12. Write down Maxwell's equations for steady electric field.

13. If the frequency of the incident radiation on the cathode of a photocell is doubled, how the following change;

(a) Kinetic energy of the electrons

(b) Photoelectric current

(c) Stopping potential.

Justify your answer.

14. A current of 5.0 A flows through an electric press of resistance 11 Ω. Calculate the energy consumed by the press in 5 minutes.

15. You are given two nuclei $_3X^7$ and $_3X^4$. Are they isotopes of the same element? State the reason, which one of the two nuclei is likely to be more stable?

16. A transmitter or 10 kW is emitting radio waves of wavelength 500 m. How many photons per second are emitted by the transmitter?

OR

Prove that the instantaneous rate of change of the activity of a radioactive substance is inversely proportional to the square of its half life.

17. Kirchhoff's first law obeys law of conservation of charge. Explain.

18. Define surface wave propagation?

19. (a) Differentiate analog and digital communication.

(b) Write three merits of digital communication.

20. A biconvex lens has a focal length $\frac{2}{3}$ times the radius of curvature of either surface. Calculate the refractive index of the lens material.

21. A uniformly charged conducting spheres of 2.4 m diameter has a surface charge density of 80.0 μCm^{-2}.

(a) Find the charge on sphere.

(b) What is the total electric flux leaving the surface of the sphere.

OR

Define the term 'modulation index' for an AM wave. What would be the modulation index for an AM wave for which the maximum amplitude is 'a' while the minimum amplitude is 'b'?

22. Explain electric power. State its different relations and define SI unit of electric power.

23. State two characteristics of nuclear force. Why does the binding energy per nucleon decrease with increase in mass number for heavy nuclei like ^{235}U?

24. State Coulomb's law of electrostatic force in vector form?

25. Prove Snell's laws of refraction on the basis of Huygens principle.

26. State and explain Faraday's laws of electromagnetic induction

27. A sinusoidal voltage of frequency 60 hertz and peak value 150 V is applied to a series *LR* circuit; where $R = 20$ ohm and $L = 40$ mH. Compute T, ω, X_L, Z and ϕ. Calculate the amplitude of voltage across *R* and *L*.

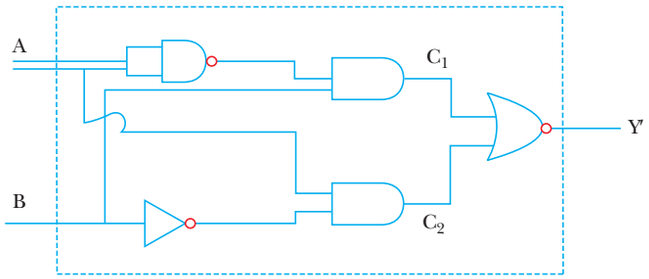
28. Draw the symbolic representation of (*i*) *p-n-p*, (*ii*) *n - p - n* transistor. Why is the base region of transistor thin and lightly doped? With proper circuit diagram, show the biasing of a *p-n-p* transistor in common base configuration. Explain the movement of charge carriers through different parts of the transistor in such a configuration and show that $I_e = I_c + I_b$.

OR

Input signals A and B are applied to the input terminals of the 'dotted box' set-up shown here. Let Y be the final output signal from the box.

Draw the wave forms of the signals labelled as C_1 and C_2 within the box, giving (in brief) the reasons for getting these wave forms. Hence draw the wave form of the final output signal Y. Give reasons for your choice.

What can we state (in words) as the relation between the final output signal Y and the input signals A and B?



29. State the Biot-Savart law for the magnetic field due to a current carrying element. Use this law to obtain a formula for magnetic field at the centre of a circular loop of radius *R* and carrying current *I*. Sketch the magnetic field lines for a current loop clearly indicating the direction of the field.

OR

A student has to study the input and output characteristics of a *n-p-n* silicon transister in the Common Emitter configuration. What kind of a circuit arrangement should she use for this purpose?

Draw the typical shape of input characteristics likely to be obtained by her. What do we understand by the cut off, active and saturation states of the transistor? In which of these states does the transistor not remain when being used as a switch?

30. What is meant by linear magnification of spherical mirrors? Deduce the formulae for the same.

OR

Is current density a vector or scalar quantity? Deduce the relation between current density and potential difference across a current carrying conductor of length *l*, area of cross-section *A*, and number density of free electrons *n*. How does the current density, in a conductor vary with

(a) increase in potential gradient?

(b) increase in temperature?

(c) increase in length?

(d) increase in area of cross-section?

(Assume that the other factors remain constant in each case)