Mock Test -3 (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.

(e) You may use the following physical constants whenever necessary:

$c = 3 \times 10^8$ m/s

$h = 6.6 \times 10^{-34}$ Js

$e = 1.6 \times 10^{-19}$ C

$\mu_o = 4\pi \times 10^{-7}$ T m A^{-1}

Boltzmann constant $k = 1.38 \times 10^{23}$ JK^{-1}

Avogadro's number $N_A = 6.023 \times 10^{23}$/mole

Mass of neutron $m_n = 1.6 \times 10^{-27}$ kg

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1. Why is a.c. more dangerous than d.c. for the same voltage?

2. What is a hole?

3. What is the frequency of direct current?

4. When does a concave mirror form a virtual image?

5. What is Rydberg formula?

6. How *p-n-p* and *n-p-n* transistor are represented symbolically?

7. When does a concave mirror form a virtual image?

8. Light can travel in vacuum whereas sound cannot do so. Why?

9. Alkali metals are most suitable for photo-electric effect. Explain why?

10. What is a communication system? Describe briefly the major constituents of a communication system.

11. Two wires of equal lengths, one of copper and the other of manganin have the resistance. Which wire is thicker?

12. Calculate the resistivity of the material of a wire 1.0 m long, 0.4 mm in diameter and having a resistance of 2.0 ohm.

13. What is the importance of Gauss' theorem.

14. (a) What is the raw material used in a fast breeder reactor?

(b) Name the important components of a nuclear reactor.

15. Calculate the frequency associated with a photon of energy $3{\cdot}3 \times 10^{-20}$ J. ($h = 6{\cdot}6 \times 10^{-34}$ Js).

16. State any four properties of electromagnetic waves.

17. What are optical fibres? Give three applications of these fibres.

OR

Draw a plot of the variation of 'amplitude' versus 'ω' for an amplitude modulated wave. Hence explain the need for keeping the broadcast frequencies sufficiently spaced out?

18. Describe the principle of potentiometer.

19. How can you charge a metal sphere positively without touching it?

20. Electric field inside a sphere varies with distance as Ar. Find the total electric charge enclosed within the sphere, if A=3,000 V m^{-2} and *R*=30 cm, where *R* is radius of the sphere.

21. Explain electric energy. Give the various relations of electric current and define the commercial unit of electric energy.

OR

Write the nature of path of free electrons in a conductor in the

(a) Presence of electric field
(b) Absence of electric field.

Between two successive collision each free electron acquires a velocity from 0 to *V* where $V = \frac{eE}{m}\tau$. What is the average velocity of a free electron in the presence of an electric field? Do all electrons have the same average velocity?

How does this average velocity of the free electrons, in the presence of an electric field, vary with temperature?

22. A light bulb is rated 50 W for a 220 V supply. Find (a) resistance of the bulb, (b) peak voltage of the source and (c) r.m.s. current through the bulb.

23. A coil of resistance 20 ohm and inductance 0.5 H is connected to direct current supply of 200 V. Calculate the rate of increase of current at

(a) The instant of closing the switch,

(b) At t = L/R seconds after the switch is closed, Also, calculate steady value of current in the circuit.

24. Describe briefly any three applications of total internal reflection.

25. Two lenses of powers +15 D and –5 D are in contact with each other forming a lens combination. (a) What is the focal length of this combination? (b) An object of size 3 cm is placed at 30 cm from this combination of lenses. Calculate the position and size of the image formed.

26. The radius of the inner most electron orbit (known as Bohr's radius) is 5.3×10^{-11}m. Calculate the radii of n = 2, n = 3 and n = 4 orbits.

27. A transmitting antenna at the top of a tower has a height of 32 m and the height of the receiving antenna is 50 m. What is the maximum distance between them for a satisfactory communication in line of sight mode?

28. Explain the function of base region of a transistor. Why is this region made thin and lightly doped? Draw a circuit diagram to study the input and output characteristics of n-p-n transistor in a common emitter (CE) configuration. Show these characteristics graphically. Explain how current amplification factor of the transistor is calculated using output characteristics.

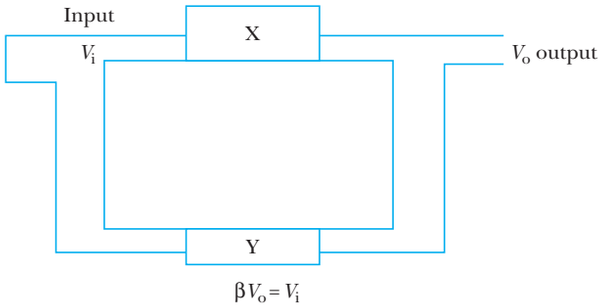
OR

Find the expression for the capacitance of parallel plate capacitor of area A and plate separation d if (a) a dielectric slab of thickness t, and (b) a metallic slab of thickness t, where ($t < d$) are introduced one by one between the plates of the capacitor. In which case would the capacitance be more and why?

29. In a single slit diffraction pattern, how is the angular width of central bright maximum changed when (a) the slit width is decreased, (b) the distance between the slit and screen is increased. (c) Light of smaller wavelength is used. Justify your answer.

OR

The set up, shown below, can produce an a.c output any external input signal. Identify the components X and Y of this set up. Draw the circuit diagram for this set up and briefly describe its working.



30. Find the magnetic field (in magnitude and direction) at the centre of the circular coil carrying current. Show the sketch of the magnetic field produced.

OR

A potentiometer circuit is set up as shown. The potential gradient across the potentiometer wire is 0.025 V/cm and the ammeter present in the circuit reads 0.1 A, when the two way key is completely switched off. The balance points, when the key between the terminals (a) 1 & 2 (b) 1 & 3, is plugged in, are found to be at lengths 40 cm and 100 cm respectively. Find the values of R and X.