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MOCK TEST PAPER

Instructions

Attempt only 40 questions out of the given 50 questions. Each question carries 5 marks. One mark will be deducted for a wrong answer.

Full Marks: 200 ***(Time: 60 Minutes)***

1. Two charged spheres separated at a distance R exert a force F on each other. If they are immersed in a liquid of dielectric constant 5 then what is the new force between them

(*a*) $\frac{F}{5}$ (*b*) F

(*c*) 5F (*d*) $\frac{F}{2}$

2. A 2μF capacitor is charged to a potential 500V and then the plates of the capacitor are joined through a resistance. The heat produced in the resistance in joule is

(*a*) 60×10^{-2} Joule (*b*) 25×10^{-2} Joule

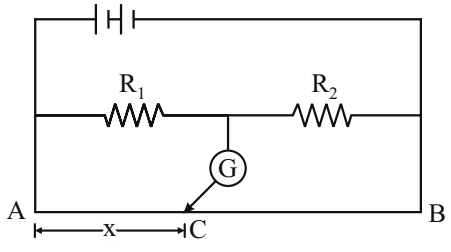
(*c*) 0.25×10^{-2} Joule (*d*) 0.5×10^{-2} Joule

3. The kinetic energy of an electron which is accelerated in the potential difference of 100V is

(*a*) 1.6×10^{-17} J (*b*) 1.6×10^{-14} J

(*c*) 1.6×10^{-10} J (*d*) 1.6×10^{-8} J

4. In the shown arrangement of the experiment of the meter bridge if AC corresponding to null deflection of galvanometer is x, what would be its value if the radius of the wire AB is doubled?



(*a*) x (*b*) x/4 (*c*) 4x (*d*) 2x

5. The potential of the electric field produced by point charge at any point (x,y,z) is given by $V = 3x^2 + 5$ where x,y are in meter and V is in volt. The intensity of electric field at (–2, 1, 0) is

(*a*) +17 Vm^{-1} (*b*) –19 Vm^{-1}

(*c*) +12 Vm^{-1} (*d*) –12 Vm^{-1}

6. Ohm's law is true

(*a*) For metallic conductors at constant temperature

(*b*) For metallic conductors at variable temperature

(*c*) For electrolytes when current passes through them

(*d*) For diode when current flows

7. The lowest resistance which can be obtained by connecting 10 resistors each of $\frac{1}{10}$ ohm is

(*a*) $\frac{1}{250}$ ohm (*b*) $\frac{1}{200}$ ohm

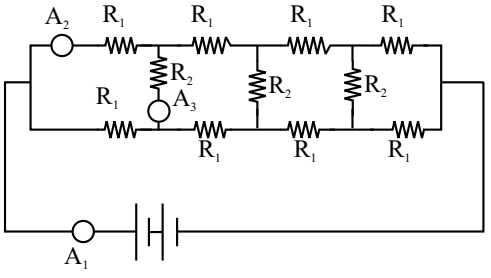
(*c*) $\frac{1}{100}$ ohm (*d*) $\frac{1}{10}$ ohm

8. The sun delivers 10^3 W/m^2 of electromagnetic flux to the surface of the earth. The total power that is incident on a roof of dimensions 8m × 20m, is

(*a*) 8.4×10^3 W (*b*) 4.4×10^4 W

(*c*) 1.6×10^5 W (*d*) None of these

9. In the given circuit, $R_1 = 10\ \Omega$, $R_2 = 6\ \Omega$ and E = 10 V. Then effective resistance of the circuit is:



(*a*) 20Ω (*b*) 30Ω (*c*) 40Ω (*d*) 50Ω

10. Among two interfering sources, let A be ahead in phase by 54° relative to B. If the observations be taken from point P, such that PB – PA = 1.5 λ, deduce the phase difference between the waves from A and B reaching P.

(*a*) 33π radian (*b*) 2.3π radian

(*c*) 11π radian (*d*) 3.3π radian

11. Read the following statements carefully:

Statement-I: A solenoid tends to expand when a current passes through it.

Statement-II: Two straight parallel metallic wires carrying current in the same direction repel each other.

Statement-III: The magnetic field inside a long straight solenoid is uniform and along the axis of the solenoid.

Statement-IV: A charged particle moving parallel to a magnetic field experiences no force.

Choose the correct statements:

(*a*) Statements I and II only (*b*) Statements III, and IV only
(*c*) Statements II and III only (*d*) Statements I, III, and IV only

12. A bar magnet is placed in the position of stable equilibrium in a uniform magnetic field of induction B. If it is rotated through an angle 180°, then the work done is:

(*a*) MB (*b*) 2MB (*c*) MB/2 (*d*) Zero

13. Four types of magnetic materials are listed below:

A. Ferromagnetics
B. Diamagnetics
C. Paramagnetics

Choose the correct order of the materials in increasing order of magnetic susceptibility.

(*a*) (B), (C), (A) (*b*) (B), (A), (C)
(*c*) (B), (C), (A) (*d*) (C), (A), (B)

14. The nature of light which is verified by the interference event will be

(*a*) Dual nature (*b*) Wave nature
(*c*) Particle nature (*d*) Quantum nature

15. Which of the following is constructed on the principle of electromagnetic induction?

(*a*) Galvanometer (*b*) Electric motor
(*c*) Generator (*d*) Voltmeter

16. Match Column-I with Column-II:

	Column-I		Column-II
A.	Electrical conductivity of conductor depends on	(i)	dimensions (length, area of cross section etc.)
B.	Conductance of a conductor depends on	(ii)	temperature
C.	For a conductor of given dimensions and at a given temperature, current density depends on	(iii)	nature of conductor
D.	For a given potential difference applied across a conductor of given length, current in it will depend on	(iv)	electric field strength

(*a*) A-(i), B-(ii, iii), C-(iv), D-(ii)
(*b*) A-(ii, iii), B-(i, ii, iii), C-(iii, iv), D-(i, ii, iii)
(*c*) A-(v), B-(ii), C-(iii), D-(iv)
(*d*) A-(iii), B-(v), C-(ii), D-(i)

17. The impedance (Z) in an AC circuit with different configurations of resistors, capacitors, and inductors is as follows: (Take R = 20Ω, X_C = 5Ω, X_L = 10Ω)

A. Purely resistive circuit
B. RC series circuit
C. RL series circuit

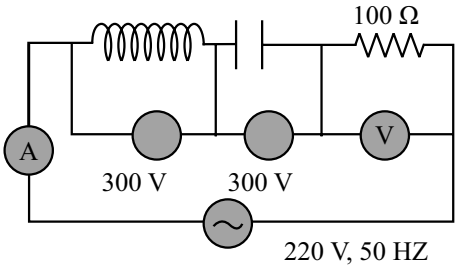
The impedance of these circuits arranged in increasing order is _____.

(*a*) (B), (C), (A) (*b*) (A), (B), (C)
(*c*) (B), (A), (C) (*d*) (C), (A), (B)

18. If net reactance in a circuit is $\sqrt{3}$ times of resistance, then find phase difference.

(*a*) Zero (*b*) 30°
(*c*) 60° (*d*) Data is incomplete

19. In the circuit shown below, what will be the readings of the voltmeter and ammeter



(*a*) 800 V, 2A (*b*) 300 V, 2A
(*c*) 220 V, 2.2 A (*d*) 100 V, 2A

20. What is the cause of "Green house effect"

(*a*) Infra-red rays (*b*) Ultra violet rays
(*c*) X-rays (*d*) Radio waves

21. Biological importance of Ozone layer is

(*a*) It stops ultraviolet rays
(*b*) Ozone layer reduces green house effect
(*c*) Ozone layer reflects radio waves
(*d*) Ozone layer controls O_2/H_2 ratio in atmosphere

22. Monochromatic light is refracted from air into glass of refractive index μ. The ratio of the wavelength of incident and refracted waves is:

(*a*) 1 : μ (*b*) 1 : μ^2 (*c*) μ : 1 (*d*) 1 : 1

23. Which one of the following happens when light rays enters from air to a glass slab?

(*a*) Wavelength increases (*b*) Wavelength decreases
(*c*) Frequency increases (*d*) Frequency decreases

24. In an RLC series circuit, the source of emf is given by E = 50 sin(200t), with R = 50Ω, L = 200 mH, and C = 50 μF.

A. The numerical value of resistance R
B. The numerical value of inductive reactance
C. The numerical value of capacitive reactance
D. The numerical value of impedance

Arrange the values of quantities mentioned in (A, B, C, D) in increasing order.

(*a*) (A), (C), (B), (D) (*b*) (C), (A), (B), (D)
(*c*) (B), (A), (D), (C) (*d*) (C), (B), (D), (A)

25. A telescope has focal length of objective and eye-piece as 200 cm and 5 cm. What is the magnification of telescope?
(*a*) 40 (*b*) 80 (*c*) 50 (*d*) 101

26. Find the numbers of photons emitted per second by a 25watt source of monochromatic light of wavelength 6000 Å?
(*a*) 4.86×10^{-19} (*b*) 7.55×10^{-16}
(*c*) 3.25×10^{2} (*d*) 7.55×10^{19}

27. If we consider electrons and photons of same wavelength, then they will have same
(*a*) Momentum (*b*) Angular momentum
(*c*) Energy (*d*) Velocity

28. Outside a nucleus
(*a*) Neutron is stable
(*b*) Proton and neutron both are stable
(*c*) Neutron is unstable
(*d*) Neither neutron nor proton is stable

29. Consider the following nuclei:
A. ${}_{1}^{3}H$ (Tritium),
B. ${}_{2}^{4}He$ (Alpha particle),
C. ${}_{1}^{1}He$ (Proton).
For neutron-to-proton (n/p) ratio of the above nuclei, we can say:
(*a*) (B) > (A) > (C) (*b*) (A) > (B) > (C)
(*c*) (C) > (B) > (A) (*d*) (B) = (C) < (A)

30. In order to obtain a real image of magnification 2 using a converging lens of focal length 20 cm, where should an object be placed?
(*a*) 50 cm (*b*) 30 cm (*c*) –50 cm (*d*) –30 cm

31. If the wavelength of the first line of the Balmer series of hydrogen is 6561Å, then find the wavelength of the second line of the series
(*a*) 13122 Å (*b*) 3400 Å (*c*) 4860 Å (*d*) 2187 Å

32. Two identical photo cathodes receives light having frequencies f_1 and f_2. If the velocities of the photoelectrons (of same mass 'm') coming out are respectively v_1 and v_2 then we have
(*a*) $v_1^2 - v_2^2 = \frac{2h}{m}(f_1 - f_2)$ (*b*) $v_1 - v_2 = \left(\frac{2h}{m}(f_1 + f_2)\right)^{1/2}$
(*c*) $v_1^2 + v_2^2 = \frac{5h}{m}(2f_1 + f_2)$ (*d*) $v_1 + v_2 = \left(\frac{2h}{m}(f_1 + f_2)\right)^{1/2}$

33. Germanium can be doped using one of the following elements as a dopant:
A. Gallium B. Antimony
C. Aluminum D. Phosphorus
To get a p-type semiconductor, the dopants that can be used are _____.
Fill in the blank with the correct answer from the options given below.
(*a*) (A) and (B) only (*b*) (B) and (D) only
(*c*) (A), (C), and (D) (*d*) (A) and (C) only

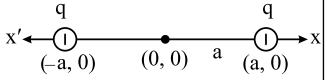
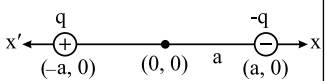
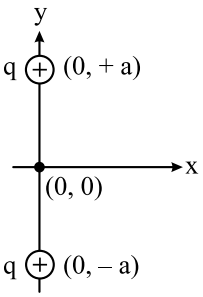
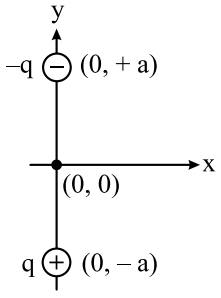
34. In the Bohr model of the hydrogen atom, the lowest orbit corresponds to:
(*a*) Infinite energy (*b*) Maximum energy
(*c*) Minimum energy (*d*) Zero energy

35. The forbidden energy gap of Ge is 0.72 eV. Given, hc = 12400 eV-Å. The maximum wavelength of radiation that will generate electron hole-pair is
(*a*) 172220 Å (*b*) 172.2 Å (*c*) 17222 Å (*d*) 1722 Å

36. A thin bar magnet of length 2L is bent at the mid point so that the angle between the two sides is 60°. The new magnetic length of the magnet is
(*a*) $\sqrt{2}$L (*b*) $\sqrt{3}$L (*c*) 2L (*d*) L

37. Electric field at the equator of a dipole is E. If strength and distance is now doubled then the electric field will be:
(*a*) E/2 (*b*) E/8 (*c*) E/4 (*d*) E

38. The Column-I gives the two point charge system separated by 2a and the column-II gives the variation of magnitude of electric field intensity along *x*-axis. Match the situation in Column-I with the results in Column-II.

Column-I		Column-II	
A.		(i)	Increases as x increases in the interval $0 \le x < a$
B.		(ii)	Decreases as x increases in the interval $0 \le x < a$
C.		(iii)	Zero at x = 0
D.		(iv)	Decreases as x increases in the interval $a < x < \infty$

(*a*) A-(i, ii), B-(ii), C-(i, ii), D-(iii)
(*b*) A-(i, iii, iv), B-(i, iv), C-(iii, iv), D-(ii, iv)
(*c*) A-(i, ii), B-(iii), C-(ii), D-(iv)
(*d*) A-(iii, iv), B-(iv), C-(iii, i), D-(ii)

39. As the refractive index of the medium increases the corresponding value of critical angle for that medium _____
(*a*) Decreases
(*b*) Increases
(*c*) Remains same
(*d*) Independent of refractive index of the medium

40. In case of total internal reflection, for angle of incidence greater than critical angle the refraction of light is not possible because _____

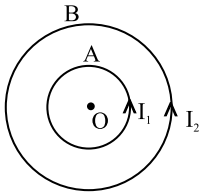
(*a*) Snell's law of refraction get satisfied

(*b*) Snell's law of refraction cannot be satisfied

(*c*) Laws of refraction cannot be satisfied

(*d*) Can't say

41. A and B are two concentric circular coils having centre at O and carrying currents I_1 and I_2 as shown in the adjacent figure. If ratio of their radii is 1:2 and ratio of the magnetic flux densities at O due to A and B is 1 : 3 then the value of I_1/I_2 is



(*a*) 1/6 (*b*) 1/4 (*c*) 1/3 (*d*) 1/2

42. The fringe width in a double-slit interference experiment depends on the wavelength of light used. The wavelengths of light used are as follows:

A. Red light B. Green light

C. Blue light D. Violet light

The fringe widths produced by these wavelengths arranged in decreasing order are _____.

(*a*) (A), (B), (C), (D) (*b*) (C), (A), (B), (D)

(*c*) (D), (B), (C), (A) (*d*) (A), (C), (D), (B)

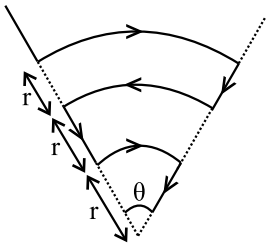
43. A charged particle is projected in a magnetic field $\vec{B} = (2\hat{i} + 4\hat{j}) \times 10^2$ T. The acceleration of the particle is found to be $\vec{a} = (x\hat{i} + 2\hat{j})$ m s^{-2}. Find the value of x.

(*a*) 4 in ms^{-2} (*b*) –4 ms^{-2} (*c*) –2 ms^{-2} (*d*) 2 ms^{-2}

44. If a hypothetical galvanometer has a current sensitivity of 100 div/A and a voltage sensitivity of 25 div/V, what is the resistance of the galvanometer?

(*a*) 4 Ω (*b*) 2 Ω (*c*) 4.5 Ω (*d*) 0.25 Ω

45. A conductor carrying current I is in the shape as shown in figure. Find the magnetic field induction at the common center O of all the three area.

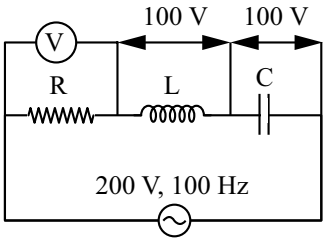


(*a*) $\frac{3\mu_0 I\theta}{4\pi r}$ (*b*) $\frac{5\mu_0 I\theta}{24\pi r}$ (*c*) $\frac{\mu_0 I\theta}{8\pi r}$ (*d*) $\frac{\mu_0 I\theta}{\pi r}$

46. A transformer has 100 turns in the primary coil and carries 8 A current. If input power is 1 kW, the number of turns in secondary coil to have 500 V output will be

(*a*) 150 (*b*) 240 (*c*) 400 (*d*) 360

47. In the circuit shown in figure, what will be the reading of the voltmeter ?



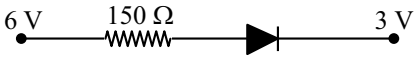
(*a*) 100 V (*b*) 900 V (*c*) 200 V (*d*) 600 V

48. The lower Bohr orbit in hydrogen atom has

(*a*) The maximum energy (*b*) The least energy

(*c*) Zero energy (*d*) Infinite energy

49. The current through the ideal diode as shown in figure is



(*a*) 0 A (*b*) 0.02 A (*c*) 0.05 A (*d*) 0.08 A

50. A cube of side x has a charge q at each of its vertices. The potential due to this charge array at the centre of the cube is

(*a*) $\frac{5q}{3\pi\varepsilon_0 x}$ (*b*) $\frac{4q}{\sqrt{3}\pi\varepsilon_0 x}$ (*c*) $\frac{3q}{4\pi\varepsilon_0 x}$ (*d*) $\frac{7q}{\sqrt{3}\pi\varepsilon_0 x}$

Answer Key

(Scan QR Code for Detailed Explanations)

1. (*a*)	**2.** (*b*)	**3.** (*a*)	**4.** (*a*)	**5.** (*c*)	**6.** (*a*)	**7.** (*c*)	**8.** (*c*)	**9.** (*a*)	**10.** (*d*)
11. (*b*)	**12.** (*b*)	**13.** (*c*)	**14.** (*b*)	**15.** (*c*)	**16.** (*b*)	**17.** (*b*)	**18.** (*c*)	**19.** (*c*)	**20.** (*a*)
21. (*a*)	**22.** (*c*)	**23.** (*b*)	**24.** (*c*)	**25.** (*a*)	**26.** (*d*)	**27.** (*a*)	**28.** (*c*)	**29.** (*b*)	**30.** (*d*)
31. (*c*)	**32.** (*a*)	**33.** (*d*)	**34.** (*c*)	**35.** (*c*)	**36.** (*d*)	**37.** (*c*)	**38.** (*b*)	**39.** (*a*)	**40.** (*b*)
41. (*a*)	**42.** (*a*)	**43.** (*b*)	**44.** (*a*)	**45.** (*b*)	**46.** (*c*)	**47.** (*c*)	**48.** (*b*)	**49.** (*b*)	**50.** (*b*)