This Question Paper contains 20 printed pages.
(Part - A & Part - B)
Sl.No.

054 (E)

(MARCH, 2019)
SCIENCE STREAM
(CLASS - XII)

Part - A : Time : 1 Hour / Marks : 50
Part - B : Time : 2 Hours / Marks : 50

પ્રશ્ન પેપરનો સેટ નંબર જેની સામેનું વર્તુળ OMR શીટમાં ઘટ્ટ કરવાનું રહે છે.
Set No. of Question Paper, circle against which is to be darken in OMR sheet.
09

(Part - A)

Time : 1 Hour] ***[Maximum Marks : 50***

Instructions :

1) **There are 50 objective type (M.C.Q.) questions in Part - A and all questions are compulsory.**
2) **The questions are serially numbered from 1 to 50 and each carries 1 mark.**
3) **Read each question carefully, select proper alternative and answer in the O.M.R. sheet.**
4) **The OMR sheet is given for answering the questions. The answer of each question is represented by (A) O, (B) O, (C) O, (D) O. Darken the circle ● of the correct answer with ball-pen.**
5) **Rough work is to be done in the space provided for this purpose in the Test Booklet only.**
6) **Set No. of Question Paper printed on the upper-most right side of the Question Paper is to be written in the column provided in the OMR sheet.**
7) **Students may use a Calculator and log-table, if necessary.**

Rough Work

1) Current of $\frac{50}{\pi}$ Hz frequency is passing through an A.C. circuit having series combination of resistance R = 100 Ω and inductor L = 1 H, then phase difference between voltage and current is _____.

(A) 45° (B) 60°

(C) 30° (D) 90°

Rough Work

2) For voice communication, cellular phones use which band of electromagnetic spectrum?

(A) LF (B) HF

(C) VHF (D) UHF

3) The maximum value of $\vec{E}$ in an electromagnetic wave is equal to 1.8 Vm^{-1}. Thus the maximum value of $\vec{B}$ is _____.

(A) 6×10^{-8} T

(B) 3×10^{-6} T

(C) 6×10^{-9} T

(D) 2×10^{-10} T

4) For a radiation of 6 GHz passing through air, the wave number (number of waves) per 1 m length is _____(1 GHz = 10^9 Hz).

(A) 5

(B) 3

(C) 20

(D) 30

5) Detailed information can be obtained by the Oil Immersion objective of a microscope because the objective has _____.

(A) greater value of resolution

(B) Large value of magnification

(C) large diameter

(D) smaller value of resolution

Rough Work

6) The distance between two slits in Young's experiment is 0.2 mm. If the wavelength of light used is 5000Å, the angular position of 3rd bright fringe from the central bright fringe is _____ rad.

(A) 0.75

(B) 0.075

(C) 0.0075

(D) 0.057

7) To determine the position of a point like object precisely, _____ light should be used.

(A) long wavelength

(B) polarized

(C) short wavelength

(D) intense

8) The ratio of resolving power of telescope, when lights of wavelengths 5000 Å and 4000 Å are used, is _____.

(A) 5 : 4

(B) 16 : 25

(C) 4 : 5

(D) 9 : 1

Rough Work

9) If the potential energy of the electron in the hydrogen atom is $\frac{-e^2}{4\pi\varepsilon_0 r}$, then what is its kinetic energy?

(A) $\frac{e^2}{8\pi\varepsilon_0 r}$ (B) $\frac{-e^2}{4\pi\varepsilon_0 r}$

(C) $\frac{-e^2}{8\pi\varepsilon_0 r}$ (D) $\frac{e^2}{4\pi\varepsilon_0 r}$

10) What is the angular momentum of an electron of Li - atom in n = 5 orbit?

(A) 6.625×10^{-34} Js (B) 5.27×10^{-34} Js

(C) 1.325×10^{-34} Js (D) 16.56×10^{-34} Js

11) A hydrogen atom absorbs 12.1 eV of energy and gets excited to higher energy level. How many photons are emitted during downward transition. Assume during each downward transition, one photon is emitted.

(A) 2 or 3 (B) 1 or 3

(C) 1 or 2 (D) 5 or more

12) Which are the isotone, isobar and isotope nuclei respectively of ${}^{12}_{6}C$ from among ${}^{14}_{6}C, {}^{12}_{5}B, {}^{13}_{7}N$?

(A) ${}^{12}_{5}B, {}^{14}_{6}C, {}^{13}_{7}N$

(B) ${}^{14}_{6}C, {}^{13}_{7}N, {}^{12}_{5}B$

(C) ${}^{13}_{7}N, {}^{12}_{5}B, {}^{14}_{6}C$

(D) ${}^{14}_{6}C, {}^{12}_{5}B, {}^{13}_{7}N$

Rough Work

13) Half - life of a radioactive element is 5 min. At the end of 20 min. its _____% quantity will be disintegrated.

(A) 75

(B) 93.75

(C) 25

(D) 6.25

14) Which one of the following is true for the relative ionizing power of α, β, and γ?

(A) It is maximum for β particle

(B) It is maximum for α particle

(C) It is maximum for γ radiation

(D) It is equal for α, β and γ

15) The half - life of a radioactive element is 2 hr and that of the other is 4 hr. Their initial activities are equal. After 4 hr what will be the ratio of their activities?

(A) 1 : 3

(B) 1 : 4

(C) 1 : 2

(D) 1 : 1

Rough Work

16) When will the conductivity of a Ge semiconductor decrease?

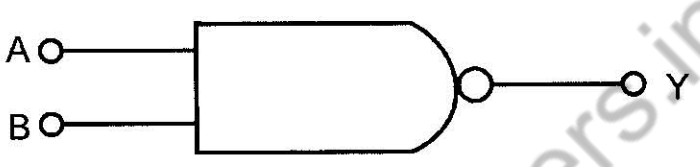
(A) On adding acceptor impurity

(B) On adding donor impurity

(C) On making UV light incident

(D) On decreasing the temperature

17) Given figure is the symbol of which logic gate?



(A) NOR gate

(B) AND gate

(C) NAND gate

(D) OR gate

18) For an N-P-N transistor in common base circuit about 7% of the electron entering the base from the emitter recombines with the hole. This results in the collector current being 18.6 mA. Calculate the emitter current.

(A) 0.020 A

(B) 20 μA

(C) 2 mA

(D) 2 A

Rough Work

19) V_m is the maximum voltage between the ends of the secondary terminal of a transformer used in a half wave rectifier. When the P-N junction diode is reverse biased, what will be the potential difference between the two ends of the diode?

(A) $\frac{V_m}{2}$

(B) Zero

(C) V_m

(D) $2V_m$

20) The emitter junction of the CE transistor amplifier is ____ biased, while the collector junction is _____ biased.

(A) forward, forward

(B) reverse, forward

(C) reverse, reverse

(D) forward, reverse

21) $\alpha = 0.99$ for a CE transistor amplifier circuit. The input resistance is equal to 1 KΩ and the load resistance is equal to 100 KΩ. The voltage gain of the circuit is _____.

(A) 990

(B) 9.9

(C) 9900

(D) 99000

Rough Work

22) The liquid drop of mass 'm' has a charge 'q'. What should be the magnitude of electric field E to balance this drop?

(A) $\frac{E}{m}$ (B) $\frac{mg}{q}$

(C) mgq (D) $\frac{mq}{g}$

23) The number of electric field lines emerged out from 1mC charge is _____. ($\varepsilon_o = 8.85 \times 10^{-12}$ MKS)

(A) 1.13×10^8

(B) 9×10^9

(C) 1.13×10^{11}

(D) 9×10^{-9}

24) For a uniform electric field $\vec{E} = E_0(\hat{j})$, if the electric potential at y = 0 is zero, then the value of electric potential at $y = +y$ will be _____.

(A) $-yE_0$ (B) yE_0

(C) y^2E_0 (D) $-y^2E_0$

25) Energy of a charged capacitor is U. Now it is removed from a battery and then is connected to another identical uncharged capacitor in parallel. What will be the energy of each capacitor now?

(A) U (B) $\frac{3U}{2}$

(C) $\frac{U}{4}$ (D) $\frac{U}{2}$

Rough Work

26) Two metallic spheres of radii R_1 and R_2 are charged. Now they are brought into contact with each other with a conducting wire and then are separated. If the electric fields on their surfaces are E_1 and E_2 respectively, $\frac{E_1}{E_2} =$ _____ .

(A) $\frac{R_1}{R_2}$ (B) $\frac{R_2}{R_1}$

(C) $\frac{R_2^2}{R_1^2}$ (D) $\frac{R_1^2}{R_2^2}$

27) For a capacitor the distance between two plates is $4x$ and the electric field between them is E_0. Now a dielectric slab having dielectric constant 3 and thickness x is placed between them in contact with one plate. In this condition what is the p.d. between its two plates?

(A) $\frac{11E_0x}{3}$

(B) $\frac{13E_0x}{3}$

(C) $\frac{10E_0x}{3}$

(D) $\frac{9E_0x}{3}$

28) A particle having mass 1g and electric charge 10^{-8}C travels from a point A having electric potential 600 V to the point B having zero potential. What would be the change in its kinetic energy?

(A) – 60 erg (B) -6×10^{-6} erg

(C) 60 erg (D) 6×10^{-6} erg

Rough Work

29) The unit of conductance of the material of the given conductor is _____.

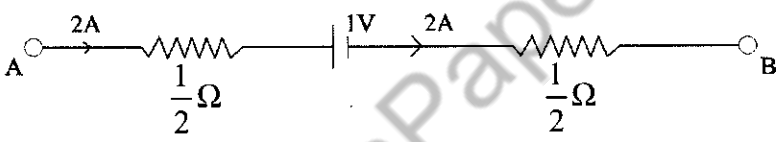
(A) volt

(B) $\frac{\text{volt}}{\text{ampere}}$

(C) $\frac{\text{volt}}{\text{metre}}$

(D) $\frac{\text{ampere}}{\text{volt}}$

30) Figure shows a part of closed circuit. If the current flowing through it is 2A then $V_B - V_A$ is _____



(A) + 2 V

(B) + 3 V

(C) – 3 V

(D) – 2 V

31) The resistance of a 10m long potentiometer wire is 20 Ω. It is connected in series with a 3 V battery and 10 Ω resistor. The potential difference between two points separated by distance 0.3 m is equal to _____.

(A) 0.06 V

(B) 0.02 V

(C) 0.1 V

(D) 1.2 V

Rough Work

32) Two bulbs of 220V and 100W are first connected in parallel and then in series with a supply of 220V. Total power in both the cases will be _____ respectively.

(A) 100W, 50W (B) 50W, 100W

(C) 200W, 50W (D) 50W, 200W

33) Two parallel long thin wires, each carrying current I are kept at a separation r from each other. Hence the magnitude of force per unit length of one wire due to the other wire is _____.

(A) $\frac{\mu_0 I^2}{2\pi r}$ (B) $\frac{\mu_0 I^2}{r^2}$

(C) $\frac{\mu_0 I}{2\pi r}$ (D) $\frac{\mu_0 I}{2\pi r^2}$

34) Two concentric rings are kept in the same plane. Number of turns in both the rings is 20. Their radii are 40 cm and 80 cm and they carry electric currents of 0.4 A and 0.6 A respectively, in mutually opposite directions. The magnitude of the magnetic field produced at their centre is _____ T.

(A) $2\mu_0$ (B) $4\mu_0$

(C) $\frac{10}{4}\mu_0$ (D) $\frac{5}{4}\mu_0$

35) At a place a uniform electric field and a uniform magnetic field are in the upward direction. There an electron moves in the downward direction. Hence this electron _____.

(A) will bend towards right

(B) will bend towards left

(C) will gain velocity

(D) will lose velocity

Rough Work

36) When a charged particle moves in a uniform magnetic field its kinetic energy _____.

(A) can increase

(B) remains constant

(C) can decrease

(D) can increase or decrease

37) For superconductors, μ_r = _____.

(A) Zero

(B) Infinite

(C) positive

(D) negative

38) A straight steel wire of length l has magnetic moment m. If the wire is bent in the form of a semicircle, what is the new value of the magnetic dipole moment ?

(A) $\frac{2m}{\pi}$

(B) m

(C) $\frac{m}{2}$

(D) $\frac{m}{\pi}$

39) For plane mirror, value of magnification m = 1, then its focal length f = _____.

(A) zero (B) positive

(C) negative (D) infinite

Rough Work

40) An object is placed at a distance of 25 cm on the axis of a concave mirror having focal length 20 cm. What will be the lateral magnification of an image?

(A) 4 (B) 2

(C) –4 (D) –2

41) Depth of a completely filled well is 11 m and refractive index of water is 1.33. If viewed normally from top, by how much height would the bottom of the well appear to be shifted up?

(A) 2.73 m (B) 11 m

(C) 4.13 m (D) 1.37 m

42) Which of the following is responsible for glittering of a diamond?

(A) Diffraction

(B) Interference

(C) Total internal reflection

(D) Refraction

43) A defect of vision in which lines in one plane of an object appear in focus while those in another plane are out of focus is called _____

(A) distortion

(B) astigmatism

(C) myopia

(D) hypermetropia

Rough Work

44) The uncertainty in position of a particle is same as it's de Broglie wavelength, uncertainty in its momentum is _____.

(A) $\frac{2\hbar}{3\lambda}$ (B) $\frac{\hbar}{\lambda}$

(C) $\frac{\lambda}{\hbar}$ (D) $\frac{3\lambda}{2\hbar}$

45) Which of the following physical quantity has the dimension of planck constant (h)?

(A) Angular momentum

(B) Force

(C) Energy

(D) Power

46) If photoelectric effect is not seen with the ultraviolet radiations in a given metal, photo electrons may be emitted with the ____.

(A) radio waves

(B) infrared waves

(C) X - rays

(D) visible light

47) In AC generator, induced emf is zero at time t = 0. The induced emf at time $\frac{\pi}{w}$ is _____.

(A) $-V_m$ (B) $+V_m$

(C) zero (D) $+2V_m$

Rough Work

48) A small square loop of wire of side 1 mm is placed inside a large square loop of wire of side 10 m. The loops are coplanar and their centres coincide. Find the mutual inductance of the system. ($\mu_0 = 4\pi \times 10^{-7}$ S.I.).

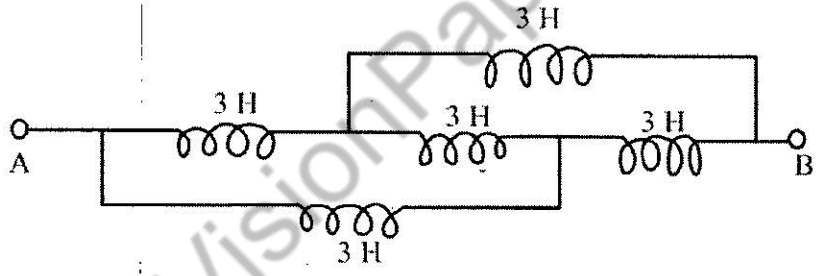
(A) $2\sqrt{2} \times 10^{-14}$ H

(B) $4\sqrt{2} \times 10^{-14}$ H

(C) $8\sqrt{2} \times 10^{-14}$ H

(D) $6\sqrt{2} \times 10^{-14}$ H

49) Five pure inductors each of 3H are connected as shown in figure. The equivalent inductance of this connection between points A and B is _____.



(A) 2 H (B) 1 H

(C) 3 H (D) 9 H

50) In an L - C oscillator circuit having a completely charged capacitor, with the passage of time _____.

(A) The energy of the circuit continuously increases.

(B) The electric current increases gradually.

(C) The energy of the circuit continuously decreases.

(D) There is a continuous absorption of the electromagnetic wave.

054 (E)

(MARCH, 2019)
SCIENCE STREAM
(CLASS - XII)

(Part - B)

Time : 2 Hours] *[Maximum Marks : 50*

Instructions :

1) **Write in a clear legible handwriting.**
2) **There are three sections in Part - B of the question paper and total 1 to 18 questions are there.**
3) **All the questions are compulsory. Internal options are given.**
4) **The numbers at right side represent the marks of the question.**
5) **Start new section on new page.**
6) **Maintain sequence.**
7) **Students may use a Calculator and log-table, if necessary.**

SECTION - A

■ **Question No. 1 to 8 do as directed. Each question carries 2 marks.** **[16]**

1) Define surface charge density and volume charge density of an electric charge. Also state its unit.

2) Derive the expression to find the unknown resistance in the balanced condition of wheatstone bridge.

OR

A cylindrical wire having 10 Ω resistance is stretched to increase its length by 10%. Calculate its new resistance.

3) State and explain Curie's law for paramagnetic materials and explain saturation magnetization for paramagnetic materials.

4) Calculate the energy of photon in eV for a radiation of wavelength 5000 Å. ($h = 6.625 \times 10^{-34}$ Js, $c = 3 \times 10^{8}$ ms^{-1}, $e = 1.6 \times 10^{-19}$C).

5) Deduce an equation $U = \frac{1}{2}LI^2$ for an inductor.

6) Using $P = V_{rms} I_{rms} \cos \delta$, discuss any two special cases for power consumed in an AC circuit.

OR

In an ideal step - up transformer input voltage is 110 V and current flowing in the secondary is 10 A. If transformation ratio is 10 then calculate output voltage and current in primary.

7) State and prove Brewster's law.

8) A modulating signal of frequency 5 KHz and peak voltage of 5 V is used to modulate a carrier of frequency 10 MHz and peak voltage of 10 V. Determine

a) Modulation index

b) Frequency of LSB and USB.

SECTION - B

■ **Question No. 9 to 14 do as directed. Each question carries 3 marks.** **[18]**

9) A charge Q is uniformly distributed on the circumference of a circular ring of radius *a*. Find the intensity of electric field at a point at a distance *x* from the centre on the axis of the ring.

10) A capacitor consists of three parallel plates of equal area A. The distance between them is d_1 and d_2. Dielectric material having permittivity ε_1 and ε_2 is present between the plates.

a) Calculate the capacitance of such a system.

b) Express this capacitance is terms of K_1 and K_2.

OR

Derive the formula for the electric potential energy of an electric dipole in an uniform electric field. Discuss its stable and unstable equilibrium state.

11) Two rings X and Y are placed in such a way that their axes are along the X and Y axes respectively and their centres are at the origin. Both the rings X and Y have the same radii of 3.14 cm. If the current through X and Y rings are 0.3 A and 0.4 A respectively then find the value of the resultant magnetic field at the origin. $\mu_0 = 4\pi \times 10^{-7}$ SI.

12) Intensity of diffracted light at any point on the screen is given by the formula $I = I_0\left(\frac{\sin\alpha}{\alpha}\right)^2$, using this formula obtain condition for central maximum, minima and maxima. Where I_0 = maximum intensity and $\alpha = \frac{\pi d \sin\theta}{\lambda}$.

OR

In Young's experiment, the distances between two slits and that between slits and the screen are 0.05 cm and 1 m, respectively. Find the distance between 3rd bright and 5th dark fringes. Take the wavelength of light equal to 5000Å.

13) Calculate the atomic number of the element which gives minimum X - ray wavelength of 0.1 nm of K - series. $R = 1.09737 \times 10^7\ m^{-1}$.

14) In a sphere of 10^2 m radius, radioactive material emits β^- - particles at the rate of $5 \times 10^7\ s^{-1}$. If 40% of these emitted β^- - particles escape from the sphere, how long would it take to raise the potential of the sphere from 0 to 16 V? (Take $K = 9 \times 10^9$ SI unit)?

SECTION - C

■ **Question No. 15 to 18 do as directed. Each question carries 4 marks.** **[16]**

15) A battery having an emf of 12 volt and an internal resistance of 2 Ω is connected to another battery having an emf of 20 Volt and an internal resistance of 2 Ω in such a way that they are opposing each other and the circuit is closed. Calculate the following.

a) Current flowing in the circuit.

b) Electrical power in the two batteries.

c) Terminal voltage of the two batteries.

d) electric power consumed in the two batteries.

16) Derive an equation $\delta = i + e - A$ for an equilateral prism and using it obtain an equation for refractive index (n) of material of prism.

17) Write the differential equation for charge in L-C-R series A.C. circuit and obtain equation for complex current from it.

18) Draw the circuit diagram of a full wave rectifier and explain the working of the circuit.

OR

In a N-P-N transistor about 10^{10} electrons enter the emitter in 1 μs when it is connected to a battery. About 2% electrons recombine with the holes in the base. Calculate the values of I_E, I_B, α_{dc} and β_{dc} ($e = 1.6 \times 10^{-19}$ C).

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