	PHYSICS (054) (E)	Set No. 2
PHYSICS	BOARD Q. PAPER-1 (Self Practice)	Standard-12
Time : 3 Hours	AUGUST 2020	Total Marks : 100

• Part-A : Time 1 hour / Marks 50 • Part-B : Time 2 hour / Marks : 50

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 spare 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 Simple Calculator and long-table, if necessary.

1. Obtain approximately the ratio of the nuclear radii of the gold isotope $^{197}_{79}Au$ and the silver isotope $^{107}_{47}Ag$.

(A) 1.68 (B) 1.35 (C) 1.84 (D) 1.23

2. Carbon, silicon and germanium have four valence electrons each. These are characterised by valence and conduction bands seprated by energy band gap respectively $(E_g)_C$, $(E_g)_{Si}$ and $(E_g)_{Ge}$ Which of the following statements is true?

(A) $(E_g)_C > (E_g)_{Si} > (E_g)_{Ge}$ (B) $(E_g)_C < (E_g)_{Ge} > (E_g)_{Si}$
(C) $(E_g)_{Si} < (E_g)_{Ge} < (E_g)_C$ (D) $(E_g)_C = (E_g)_{Si} = (E_g)_{Ge}$

3. When a forward bias applied to a p-n junction, it.

(A) raises the potential barrier
(B) reduce the majority currier current to zero
(C) lowers the potential barrier
(D) none of the above

4. In fullwave rectification, what is the cotput frequency if the input frequency is 50 Hz

(A) 100 Hz (B) 25 Hz (C) 50 Hz (D) $50\sqrt{2}$ Hz

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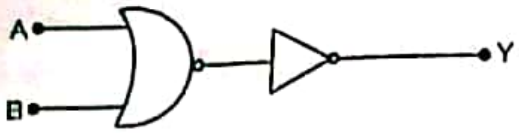
5. Shown in the following figure, circuit act as_____gate



(A) NOT (B) OR (C) AND (D) NOR

6. _____C is the number of positieve charge for cup having 180g water.

(A) 1.34×10^6 (B) 0.963×10^7 (C) 1.34×10^7 (D) 0.963×10^6

7. _____is the dimensional formula for electrion dipolemoment.

(A) $M^0L^1T^{-1}A^1$ (B) $M^0L^1T^{-1}A^{-1}$ (C) $M^0l^1T^1A^1$ (D) $M^0L^{-1}T^1A^1$

8. A conducting sphere of radius 10cm has an unknown charge. If the electric field 20cm form the centre of the sphere is 1.5×10^3 N/C and points radially inward, what is the net charge on the sphere ?

(A) –66.8 μc (B) +6.68 nc (C) –6.68 nc (D) +66.8 μc

9. An infinite line charge produces a field of 9×10^4 NC^{-1} at a distance of 2 cm _____ Cm^{-1} is the linear charge density.

(A) 1×10^{-5} (B) 1×10^{-6} (C) 10×10^{-6} (D) 1×10^{-3}

10. The cnpacitance of a parallel-plate capacitor with vacuum is 5 μF . If a dielectric slad with K = 1.5 is inserted between the plates, the capacitance will be equal to _____

(A) 0.75 μF (B) 7.5 μF (C) 3.33 μF (D) 0.33 μF

11. _____ m^2 is the area for a parallel plate capacitor having capacitance 8.85 μF plates are kept at distance of 1 mm.

(A) 1×10^3 (B) 10 (C) 1 (D) 1×10^2

12. An electric dipole kept in unif0orm electric field at an angle "θ" has minimum potential energy. The value of "θ" is _____ .

(A) 90° (B) 45° (C) 0° (D) 180°

13. Which of the following physical quantities has a unit similar to the electric energy density?

(A) Angualr momentum (B) Pressure

(C) Work (D) Electric current density

14. The storage battery of a car emf 12V If the internal resistance of the bettery is 0.4 Ω What is the maximum current that be drawn form the battery ?

(A) 0.3A (B) 30.A (C) 3A (D) 0.03A

15. The four arms of a wheatstone bridge have the resistances $R_1 = 100\Omega$, $R_2 = 10\Omega$, $R_3 = 500\Omega$ and R_4. What will be the value of R_4 if the wheatstone bridege is blanced ?

(A) 5 KΩ (B) 2 Ω (C) 2 KΩ (D) 50 Ω

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16. Form the follwing which one is a colour code for a carbon resistance having resistance (2200 Ω) ± 5%.

(A) Borwn, Red, Red Gold (B) Red, Red, Red, No Colour

(C) Red, Red Red, Silver (D) Red, Red, Red, Gold

17. The resistance of the platinum wire of a platinum resistance thermometer at the ice point is 5Ω and at steam point is 5.23Ω. When the thermometer is inserted in a hot bath, the resistance of the platinum wire is 5.46Ω. Calculate the temperature of the bath.

(A) 345.65 °C (B) 200 °C (C) 200 K (D) 345.65 K

18. Three resistros 4Ω, 8Ω, and 10Ω are combined in parallel. what is the total resistance of the combination ?

(A) 2.10 Ω (B) 19/20 Ω (C) 1.05 Ω (D) 22 Ω

19. A solenoid of length 0.5 m has a radius of 1cm and is made up of 500 turns. It carries a current of 6A. What is the magnitude of the magnetic field inside the solenoid ?

(A) $24\pi \times 10^{-4}$ T (B) $20\pi \times 10^{-4}$ T (C) Zero (D) $24\pi \times 10^{-4}$ G

20. What is the freqency of an electron (mass 9×10^{-31}kg and charge 1.6×10^{-19}C) moving at a speed of 3×10^{7} m/s in a magnetic field of 4×10^{-4}T perpendicular to it?

(A) 11.32 MHz (B) 1.7 MHz (C) 17 MHz (D) 1.132 MHz

21. From the following _____ is the formula for Lorentz force.

(A) $\vec{F} = q\left[\vec{E} + \left(\vec{B} \times \vec{v}\right)\right]$ (B) $\vec{F} = -q\left[\vec{E} - \left(\vec{v} \times \vec{B}\right)\right]$

(C) $\vec{F} = -q\left[\vec{E} + \left(\vec{v} \times \vec{B}\right)\right]$ (D) $\vec{F} = q\left[\vec{E} + \left(\vec{v} \times \vec{B}\right)\right]$

22. What is the magnitude of the equitorial magnetic field due to a bar magnet of length 5.0 cm and having magnetic dipole moment 0.40 Am^2 at a distance of 50 cm from its mid point?

(A) 0.8×10^{-7} T (B) 6.4×10^{-7} T (C) 1.6×10^{-7} T (D) 3.2×10^{-7} T

23. A short bar magnet placed with its axis at 30° with a uniform external magnetic field of 0.15 T experiences a torque of magnitude equal to 4.5×10^{-2} N.m _____ $\frac{Nm}{T}$ is the magnitude of magnetic moment of the magnet.

(A) 0.60 (B) 0.36 (A) 0.45 (D) 0.18

24. Ferromagnetic materials are having _____ retentivity and _____ permeability. (For electromagnetic core)

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(A) High, Low (B) Low, High (C) High, High (D) Low, Low

25. A jet plane is travelling towars west at a speed of 500 ms^{-1}. What is the voltage difference developed between the ends of the wing having a span of 25m. If the

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Eath's vertical magnetic field component at a location has a magnitude of 2.5×10^{-4}T and the dip angle is 30°.

(A) 1.562 mV (B) 3.125 mV (C) 1.562 V (D) 3.125 V

26. T m^2 A^{-1} is unit of _____ physical quantity.

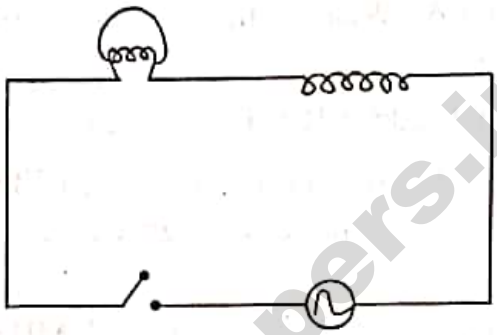
(A) Magnetic field (B) Magnetic flux

(C) Inductance (D) Magnetic dipole moment

27. A square of L meters lies in the xy plane in a region, where the magnetic field is given by $\vec{B} = B_0(2\hat{i} + 3\hat{j} + 4\hat{k})$T, where B_0 is constant. The magnitude of flux passing through the square is _____ Wb.

(A) $4\ B_0L^2$ (B) $3\ B_0L^2$ (C) $2\ B_0L^2$ (D) $\sqrt{29}\ B_0L^2$

28. A light bulb and an open coil inductor are connected to an ac source through a key as shown in figure. The switch is closed and after some time. an iron rod is inserted in to the interior of the inductor. The glow of the light bulb _____.



(A) Unchanged (B) Decrease

(C) Increase (D) Increase and Decrease

29. A Peak voltage of an ac supply is 300V. _____ V is the value of rms voltage.

(A) 212 (B) 173 (C) 423 (D) 269

30. For LCR series circuit, L = 2.0 H, C = 32 μF and R = 10 Ω, _____ is the Q value for this circuit.

(A) 395 (B) 279 (C) 40 (D) 25

31. A plane electromagnetic wave of frequency 25 MHz travel in free space along the X-direction. At a particular point in space and time. $\vec{E} = 6.3\ j\ Vm^{-1}$. Value of $\vec{B}$ at this point will be _____.

(A) $2.1 \times 10^8\ \hat{k}$ T (B) $2.1 \times 10^{-8}\ \hat{j}$ T

(C) $2.1 \times 10^{-8}\ \hat{k}$ T (D) $2.1 \times 10^8\ \hat{j}$ T

32. _____ is used for Lasik eye surgency.

(A) Ultra violet rays (B) Micro waves

(C) Infared rays (D) Radio waves

33. An object is placed at 10 cm in from of a concave mirror of radius curvature 15 cm. Then magnification of image is _____.

(A) $-\frac{1}{3}$ (B) –3 (C) 3 (D) $\frac{1}{3}$

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34. The Earth takes 24th to rotate once about its axis. The sun will take _____ time to shift by 1° when viewed from the earth

(A) 240 s (B) 24 s (A) 4 s (D) 60 s

35. A magician during a show makes a glass lens with n = 1.47 disappear in a trough of liquid. The refractive index of liquid is _____.

(A) 1.56 (B) 1.47 (C) 1.33 (D) 2.42

36. For compound microscope f_0 = 1 cm, f_e = 2 cm and tube length (L) = 20cm. Then the total magnification is _____.

(A) 200 (B) 250 (C) 2.5 (D) 20

37. Dimensional formula for power of lens is _____ .

(A) $M^0L^1T^0$ (B) $M^1L^2T^{-3}$ (C) $M^0L^{-1}T^0$ (D) $M^1L^{-1}T^{-1}$

38. Assume that a light of wave length 6000Å is coming from a star. What is the limit of resolution of a telescope whose objective has a diameter of 254 cm?

(A) 2.9×10^7 radian (B) 2.9×10^6 radian

(C) 2.9×10^{-6} radian (D) 2.9×10^{-7} radian

39. For what distance is ray optics a good approximation when the aperture is 3 mm wide and the wavelength is 500 nm?

(A) 18 m (B) 1.8 m (C) 18 cm (D) 1.8 cm

40. Unpolarised light is incident on a plane glass surface. What should be the angle of incidence so that the reflected and refracted rays are perpendicular to each other. [μ = 1.54]

(A) 55° (B) 30° (C) 57° (D) 45°

41. The refractive index of water is 4/3. What is the speed of light in water?

(A) 3×10^8 ms^{-1} (B) 2.25×10^8 ms^{-1}

(C) 4×10^8 ms^{-1} (D) 2×10^8 ms^{-1}

42. From _____ phenomenon of optics, one can say that light rays are transverse.

(A) Reflection (B) Diffraction (C) Interference (D) Polarisation

43. Monochromatic light of frequency 6.0×10^8 MHz is produced by a laser. The power emitted is 2×10^{-3} W. What is the energy of photon in the light beam.

(A) 3.98×10^{-19} J (B) 3.98×10^{-19} eV

(C) 3.98 eV (D) 3.98×10^{-19} kJ

44. The photoelectric cut-off voltage in a certain experiment is 1.6 V. The maximum kinetic energy of emitted photoelectron is _____.

(A) 1.6 k eV (B) 2.56 eV

(C) 2.56×10^{-19} J (D) 1.6×10^{-19} J

45. The de-Broglie wavelength of a ball of mass 120g moving with a speed of $20ms^{-1}$ is _____.

(A) 2.76×10^{-34}Å (B) 2.76×10^{-34}m

(C) 2.76×10^{-24}m (D) 2.76×10^{24}Å

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46. Velocity of electron moving around a proton in hydrogen atom in an orbit of radius 5.3×10^{-11}m is 2.2×10^{6} ms^{-1}. Calculate an angular frequency of the electron moving around the proton.

(A) 6.6×10^{15} rad s^{-1} (B) 4.15×10^{11} rad s^{-1}

(C) 4.15×10^{17} rad s^{-1} (D) 4.15×10^{16} rad s^{-1}

47. Lyman series of spectra for hydrogen atom is found _____ region of spectra.

(A) Ultraviolet (B) Visible (C) Infrared (D) Microwaves

48. The ground state energy of hydrogen atom is –13.6 eV. What are the kinetic and potential energy of the electron in this state?

(A) 13.6 eV, 27.2 eV (B) –13.6 eV, –27.2 eV

(C) 13.6 eV, –27.2 eV (D) 27.2 eV, –13.6 eV

49. Complete the following nuclear fission reaction.

$${}^{1}_{0}n + {}^{235}_{92}U \rightarrow {}^{236}_{92}U \rightarrow {}^{144}_{56}Ba + \_\_\_\_\_ + 3{}^{1}_{0}n$$

(A) ${}^{89}_{36}Kr$ (B) ${}^{99}_{41}Nb$ (C) ${}^{94}_{38}Sr$ (D) ${}^{133}_{51}Sb$

50. A radioactive isotope has a half-life time of 2.2 years. How long years will it take the activity to reduce to 3.125%.

(A) 6.8 (B) 11 (C) 8.8 (D) 13.2

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PART-B

Time : 2 Hours] **054 (E) August 2020** **[Maximum marks : 50**

Instructions : (1) Write in a clear handwriting.
(2) There are three sections in Part-B of the question paper and total 1 to 18 question 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) Use of simple calculator and log table is allowed if required.

SECTION-A

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

1. What is the force between two small charged spheres having charges 2×10^{-7} C and 3×10^{-7} C placed 30 cm apart in air? Ch1

2. Write four important general properties of an electric field lines.

3. Write four points for electric dipole and magnetic dipole analogy.

OR

Write the equation for magnetic dipole kept at angle "θ" in an uniform magnetic field and derive the equation of periodic time for its motion.

4. For circuit containing only Resistance represent AC current and voltage by rotating vectors (Phasors).

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5. A radio can tune into any station in the 7.5 MHz to 12 MHz band. What is the corresponding wave length band?

6. Explain refraction through a prism and derive the equation $\delta = i + e - A$.

7. Using Huygen's principle explain reflection of plane wave.

OR

Explain the polarisation by reflection and derive Brewster's Law.

8. Explain briefly Beta decay.

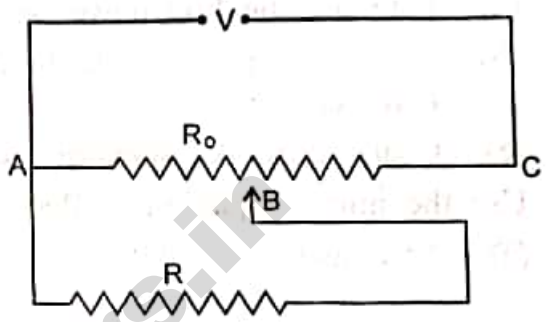
SECTION-B

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

9. Derive the formula for equivalent Emf and equivalent internal resistance for two cells having Emf ε_1 and ε_2, internal resistance r_1 and r_2 are connected in parallel.

OR

9. A resistance of R Ω draws current from a potentiometer. The potentiometer has a total resistance R_o Ω. A voltage V is supplied to the potentiometer. Derive an expression for the voltage across R when the sliding contact is in the middle of the potentiometer.



10. An electron emitted by a heated cathode and accelerated through a potential difference of 2.0 kV, centers a region with uniform magnetic field of 0.15T. Determine the trajectory of the electron if the field.

(a) Is transverse to it initial velocity.

(b) Makes an angle of 30° with the initial velocity.

11. (a) Obtain the expression for the magnetic energy stored in a solenoid in terms of magnetic field B, area A and length *l* *of the solenoid.

(b) Derive the equation for magnetic energy density.

12. A parallel beam of light of wavelength 500 nm falls on a narrow slit and the resulting diffraction pattern is observed on a screen 1m away. It is observed that the first minimum is at a distance of 2.5 mm from the centre of screen. Find the width of the slit.

13. For photo electric effect explain effect of frequency of incident radiation on stopping potential.

OR

Calculate the

(a) Momentum, and

(b) de-Broglie wavelength of the electrons accelerated through potential difference of 56 V.

14. The number of silicon atoms per m^3 is 5×10^{28}. This is doped simultaneously with 5×10^{22} atoms per m^3 of Arsenic and 5×10^{20} per m^3 of atoms of Indium. Calculate the number of electrons and holes. Given that $n_i = 1.5 \times 10^{16}$ m^{-3}. Is the material n-type or p-type ?

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SECTION-C

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

15. An electrical technician requires a capacitance of 2μf in a circuit across a potential difference of 1 kV. A large number of 1 μf capacitors are available to him each of which can with stand a potential difference of not more than 400V. Suggest a possible arrangement that requires the minimum number of capacitors.

16. Write the voltage equation for L-C-R series ac circuit. Using analytical solution method derive equation for current and phase difference.

OR

A small town with a demand 800 kW of electric power at 220V is situated 15 km away from an electric plant generating power at 440 V. The resistance of the wire line carrying power is 0.5 Ω per km. The town gets power from the line through a 4000 – 220 V step down transformer at a sub-station in the town.

(a) Estimate the line power loss in the form of heat.

(b) How much power must the plant supply, assuming there is negligible power loss due to leakage?

(c) Characterise the step up transformer at the plant.

17. Use the mirror equation to deduce that.

(a) An object placed between f and 2f of a concave mirror produces a real image beyond 2f.

(b) The virtual image produced by a convex mirror is always diminished in size and is located between the focus and the pole.

18. Using the Rydberg formula. Calculate the wavelengths of the first four spectral lines in the Lyman series of the hydrogen spectrum.

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