PHYSICS (054) (E)

PHYSICS | QUESTION PAPER - 1 | STD. 12th

Time : 3 Hours | JULY 2018 (Science Stream) | Total Mark : 100

PART - A : 50 Marsk ● Part - B : 50 Marks

Time : 1 Hour | PART - A | Maximum Marks : 50

Instructions :

1. There are 50 objective type (M.C.Q.) question in Part-A and all questions are compulsory.
2. The questions are serially numbered from 1 to 50 and each carries 1 marks.
3. Read each question carefully, select proper alternative and answere in the O.M.R. Sheet.
4. The OMR sheet is given for answereing the questions. The answer of each question is represented by (A) ○, (B) ○, (C) ○, (D) ○. Darken the cricle ● of the correct answere 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 on the upper-most right side of the Question paper is to be written in the column provided in the OMR sheet.
7. Student may use a calculator and log table, if necessary.

1. The distance between two slits in Young's experiment is 0.2 mm. If the wave length of the light used is 5000 Å, the angular position of 5th dark fringe from the central bright fringe is _____ rad.

(A) 0.11 (B) 1.1 (C) 0.011 (D) 0.0011

2. The diameter of the lens of a telescope is 1.22 m. The wave length of light is 4000 Å. The resolving power of the telescope is _____ m^{-1}.

(A) 2.5×10^5 (B) 2.5×10^2 (C) 2.5×10^6 (D) 2.5×10^4

3. According to Bohr's hypothesis, the angular momentum of the electron in any stationary orbit of radius r is proportional to _____

(A) r (B) $\sqrt{r}$ (C) $\frac{1}{r}$ (D) r^2

4. The wave length of K_α spectral line is λ for an element of atomic number 46. The wave length of K_α line for an element with atomic number 28 is _____ λ

(A) $\frac{46}{28}$ (B) $\frac{45}{27}$ (C) $\frac{25}{9}$ (D) $\frac{5}{3}$

5. The ratio of energies of electron in second excited state to first excited state in H-atom is _____

(A) 1 : 4 (B) 9 : 4 (C) 4 : 9 (D) 4 : 4

6. Which of the following is true for the relative penetrating power of α, β, γ.

(A) It is maximum for α particle. (B) It is maximum for β particle.

(C) It is maximum for γ radiation. (D) It is equal for α, β & γ

7. If the radii of $^{64}_{30}Zn$ and $^{27}_{13}Al$ nuclei are R_1 and R_2 respectively then $\frac{R_1}{R_2}$ = _____

(A) $\frac{64}{27}$ (B) $\frac{4}{3}$ (C) $\frac{3}{4}$ (D) $\frac{13}{30}$

8. The band gaps of an insulator, semiconductor and conductor are respectively Eg_1, Eg_2 and Eg_3. The relationship between them can be given as _____.
(A) $Eg_1 = Eg_2 = Eg_3$ (B) $Eg_1 < Eg_2 < Eg_3$ (C) $Eg_1 > Eg_2 > Eg_3$ (D) $Eg_1 < Eg_2 > Eg_3$

9. A potential barrier of 0.2 V exists across an PN junction. If the depletion region is 5.0×10^{-7}m wide the intensity of electric field in this region is _____ V/m.
(A) 1×10^5 (B) 4×10^5 (C) 1×10^6 (D) 2×10^5

10. The frequency of the output signal becomes _____ times by increasing the value of the capacitance 4 times the original in the LC oscillator circuit.
(A) $\frac{1}{\sqrt{2}}$ (B) $\frac{1}{2}$ (C) $\sqrt{2}$ (D) 2

11. $\alpha = 0.99$ for a CE transistor amplifier circuit. The input resistance is equal to $1k\Omega$ and the load resistance is equal to $10k\Omega$. The voltage gain of the circuit is _____.
(A) 99 (B) 9900 (C) 990 (D) 99000

12. For an efficient transmission of 150 MHz frequency the minimum required length of antenna should be _____.
(A) $\frac{1}{4}$ m (B) $\frac{1}{3}$ m (C) $\frac{1}{2}$ m (D) 2 m

13. If the frequency of 5k Hz signal has to be transmitted through amplitude modulation. Which of the following frequency should be used as a carrier frequency.
(A) 5 kHz (B) 5 MHz (C) 500 Hz (D) 5 Hz

14. Charge Q each is placed on four corners of a regular pentagon. The distance of each corner from the centre of the regular pentagon is r. The electric field at its centre is _____.
(A) $\frac{KQ}{r^2}$ (B) $\frac{5KQ}{4r^2}$ (C) $4\frac{KQ}{r^2}$ (D) $\frac{4KQ}{5r^2}$

15. A sphere of radius R is uniformly charged with volume charge density ρ. The electric field at a point lying inside the sphere at a distance r is _____.
(A) $\frac{\rho r}{3\epsilon_0}$ (B) $\frac{Kqr}{R^2}$ (C) $\frac{pR^3}{3r^2\epsilon_0}$ (D) Zero

16. When a 10 μC charge is enclosed by a closed surface, the flux passing through the surface is ϕ. Now another -5μC charge is placed inside the same closed surface, then the flux passing through the surface is _____.
(A) 2ϕ (B) $\phi/2$ (C) ϕ (D) Zero

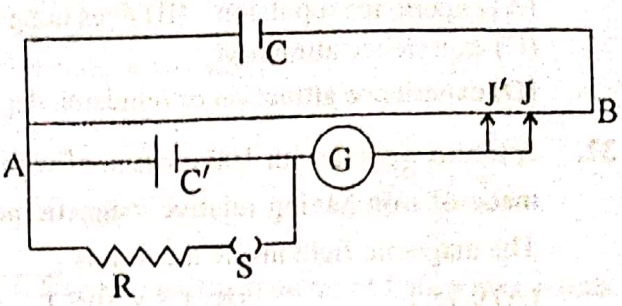
17. An electric dipole is placed in a uniform electric field. The resultant force acting on it is _____.
(A) always zero (B) never zero
(C) depends on the relative postion (D) depends upon dipole moment

18. For a capacitor the distance between two plates is $5x$ 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, the potential difference between the two plates is _____.
(A) $15\,E_0x$ (B) $7\,E_0x$ (C) $\frac{13\,E_0x}{3}$ (D) $\frac{9\,E_0x}{2}$

19. The angle between electric field lines and an equipotential surface is _____.
(A) 0 (B) $\pi/4$ (C) $\pi/3$ (D) $\pi/2$

20. A point P is 40 m away from 20 μC point charge and 20 m from 4 μC point charge. The electric potential at P is _____ V. [$K = 9 \times 10^9\ Nm^2\ C^{-2}$]
(A) 1300 (B) 6300 (C) 2700 (D) 4500

21. In potentiometer circuit shown in the figure the balance length AJ = 60 cm when switch S is open when switch S is closed, the value of R=3 Ω, the balance length AJ' = 40 cm. The internal resistance of the cell is _____.



(A) 1.5Ω (B) 0.5Ω
(C) 1Ω (D) 0.1Ω

22. A student is asked to connect four cells of emf ε each and internal resistance r each in series helping condition. By mistake he connects one cell in opposite way. What will be the effective emf and effective internal resistance ?
(A) 4ε, 2r (B) 2ε, 4r (C) 3ε, 2r (D) 4ε, 4r

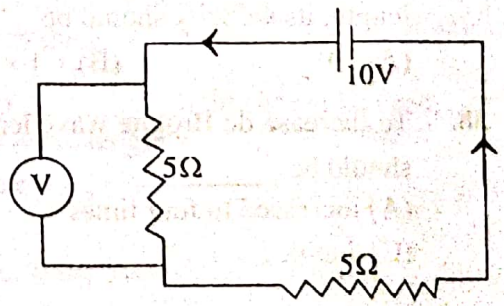
23. In a hydrogen atom, the electron is moving in a circular orbit of radius 5.0×10^{-11} m with a constant speed of 2×10^6 m/s. The electric current formed due to the motion of electron is _____.
(A) 1.12 A (B) 1.02 A (C) 1.02 mA (D) 1.12 mA

24. P & R are two points on a uniform ring of resistance R. O is the centre of the ring. If POQ = π rad, the equivalent resistance of the ring between the points P & Q will be _____.
(A) R (B) R / 3 (C) R / 2 (D) R / 4

25. At a place an electric field and amagnetic field are in downward direction. There an electron moves in the downward direction. Hence this electron _____.
(A) will bend towards left (B) will gain velocity
(C) will bend towards right (D) will lose velocity

26. When a charge particle moves in a magnetic field its kinetic energy _____.
(A) remains constant (B) can decrease (C) can increase (D) becomes zero

27. A voltmeter of very high resistance is joined in the circuit as shown in the figure. The voltage shown by the voltmeter will be _____.



(A) 5 V
(B) 2.5 V
(C) 10 V
(D) 7.5 V

28. There are 100 turns per cm length in a veery long solenoid. It carries a current of 2.5 A. The magnetic field at its centre on the axis is _____ T.
(A) 3.14×10^{-2} (B) 9.42×10^{-2} (C) 6.28×10^{-2} (D) 12.56×10^{-2}

29. A bar magnet is oscillating in Earth's magnetic field with periodic time T. If a similar magnet with the same mass and dimensions has magnetic dipole moment which is 4 times that of this magnet, then the periodic time will be _____.
(A) $\frac{T}{2}$ (B) T (C) 2 T (D) 4 T

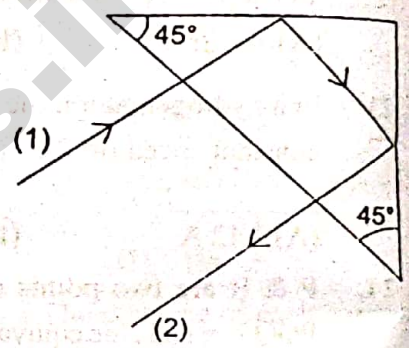
30. Magnetic meridian is a plane _____
(A) Perpendicular to magnetic axis of Earth (B) passing through the magnetic axis of Earth
(C) Perpendicular to geographic axis of Earth (D) passing through geographic axis of Earth

31. When a paramagnetic substance is brought near a north pole or a south pole of a bar magnet, it _____
(A) experience repulsion (B) does not experience attraction or repulsion
(C) experience attraction
(D) experience attraction or repulsion depending upon which pole is brought near to it.

32. A toroid wound with 100 turns/m of wire carries a current of 3A. The core of the torioid is made of iron having relative magnetic permeability $\mu_r = 5000$ under the given conditions. The magnetic field inside the iron is _____. $(\mu_0 = 4\pi \times 10^{-7}\ TmA^{-1})$
(A) 0.15 T (B) 1.5×10^{-2} T (C) 0.47 T (D) 1.88 T

33. Stoke's and antistokes lines observed in Raman scattering is due to _____ of light.
(A) reflection (B) inelastic scattering (C) elastic scattering (D) dispersion

34. For a right angled prism ray 1 is the incident ray and ray 2 is the emergent ray, as shown in the figure. Refractive index of the prism is _____.



(A) $\frac{1}{\sqrt{2}}$ (B) $\frac{2}{\sqrt{3}}$
(C) $\frac{3}{\sqrt{2}}$ (D) $\sqrt{2}$

35. The focal length of a thin lens made from the material of refractive index 1.5 is 20 cm. When it is placed in a liquid of refractive index 4/3 its focal length will be _____ cm
(A) 80.00 (B) 60.25 (C) 45.48 (D) 78.23

36. Photo electric effect represents
(A) Electron has a wave nature (B) Light has particle nature
(C) Light has wave nature (D) None of these

37. If the momentum of an electron is required to be same as that of wave having 5200 Å wave length, its velocity should be _____ ms^{-1}.
(A) 10^3 (B) 1.4×10^3 (C) 1.2×10^3 (D) 2.8×10^3

38. To increase de Broglie wave length of an electron from 0.5×10^{-10}m to 10^{-10}m, its energy should be _____.
(A) increased to four times (B) halved
(C) doubled (D) decreased to fourth part

39. In A.C. generator, induced emf is zero at t = 0. The induced emf at time $\frac{\pi}{w}$ is _____.
(A) + Vm (B) Zero (C) – Vm (D) + 2 Vm

40. A magnet is moving towards a coil along its axis and the emf induced in the coil is ε. If the coil also starts moving towards the magnet with the same speed, the induced emf will be _____.
(A) $\frac{\varepsilon}{2}$ (B) 2ε (C) ε (D) 4ε

41. The dimensional formula of self inductance is _____.
(A) $M^1L^2T^{-2}A^{-2}$ (B) $M^1L^1T^{-2}A^{-2}$ (C) $M^1L^1T^{-2}A^{-2}$ (D) $M^1L^1T^{-1}A^{-1}$

42. In and L-C oscillator circuit having a completely charged capacitor, with the passage of time ____
(A) The electric current increases gradually
(B) The energy of the circuit continuously decreases
(C) The energy of the circuit continuously increases
(D) There is a continuous absorption of the electromagnetic wave

43. The power factor for series L - R A.C. circuit is _____
(A) $\frac{R}{X_L}$ (B) $\frac{X_L}{R}$ (C) $\frac{R}{\sqrt{R^2+X_L^2}}$ (D) $\frac{\sqrt{R^2+X_L^2}}{R}$

44. For L-C-R A.C. circuit resonance frequency is 500 Hz and frequencies at half power points are 450 Hz and 550 Hz. What will be Q factor ?
(A) 5 (B) 1/5 (C) 6 (D) 1/6

45. An alternating voltage given as $V = 200\sqrt{2}\sin 100t$ (V) is applied to a capacitor of 5μF . The current reading of the ammeter will be equal to _____ mA.
(A) 80 (B) 20 (C) 40 (D) 100

46. An electromagnetic wave coming from infinity, enters a medium from the vacuum. For this wave _____ is independent of the medium. (will not change in the medium)
(A) W (B) $\frac{W}{K}$ (C) K (D) λ

47. Wave length range of Heat waves is _____
(A) 400 nm to 1 nm (B) 1 mm to 700 nm
(C) 0.1 m to 1 mm (D) 700 nm to 400 nm

48. The maximum value of $\vec{B}$ in an electromagnetic wave is equal to 6×10^{-8} T. Thus the maximum value of $\vec{E}$ is_____.
(A) 2 Vm^{-1} (B) 18 Vm^{-1} (C) 2.5 Vm^{-1} (D) 6 Vm^{-1}

49. Detailed information can be obtained by the oil immersion. Objective of a microscope because the objective has _____.
(A) large value of magnification (B) greater value of resolution
(C) large diameter (D) none of these

50. To determine the position of a point like object precisely _____ light should be used.
(A) Polarized (B) Short wave length
(C) Long wave length (D) Intense

Time : 2 Hours | PART - B | Maximum Marks : 50

JULY-2018 - (054) (G)

Instructions :

1. Write in a clear legible handwriting.
2. There are three section 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 number at right side represent the marks of the question.
5. Start new section on new page.
6. Maintain sequence.
7. Pupils can use a calculator and log table, if necessary.

SECTION - A

● **Question Nos. 1 to 8 do as directed. Each question carries 2 marks.** [16]

1. Write the Coulomb's Law and represent the forces between the two charges in vector form.
2. Obtain Joule's Law for Joule heating and State the Law. **OR**
2. Obtain the relation between the drift velocity and current density.
3. Obtain relation between focal length and radius of curvature for concave mirror.
4. Wave length of light incident on a photo sensitive surface is reduced from 3500 Å to 290 nm. Find the change in stopping potential. ($h = 6.625 \times 10^{-34}$ Js)
5. Deduce an equation $U = \frac{1}{2}LI^2$ for an inductor.
6. A plane polarized light is incident normally on the tourmaline plate. Its $\vec{E}$ vectors make an angle of 60^0 with the optic axis of the plate. Find the % difference between the initial and final maximum values of $\vec{E}$ vectors.
7. Write the equations of protone - proton cycle in the Sun. **OR**
7. Obtain the exponential law of radioactive disintegration.
8. For N - P - N transistor about 10% of the electron entering the base from the emitter recombines with the hole. This results in collector current being 18.0mA. Calculate the emitter current and current gain.

SECTION - B

● **Question Nos. 9 to 14 do as directed. Each question carries 3 marks.** [18]

9. An electric dipole of moment $\vec{P}$ is placed in a uniform electric field E. The dipole is rotated through a very small angle θ from equilibrium and is released. Prove that the executes simple harmonic motion with periodic time $T = 2\pi\sqrt{\frac{I}{PE}}$. Where I is moment of inertial of dipole.
10. Obtain the formula for Lorentz force on a moving electric charge in a uniform electric and magnetic field.

OR

10. A rectangular coil of 120 turns and an area of 10×10^{-4} m^2 is suspended in a radial magnetic field of 45×10^{-4} T. If a current of 0.2 mA through the coil gives it a deflection of 36^0. Find the effective torsional constant for the spring system holding the coil.
11. Define polar and nonpolar molecule. Expalin the behaviour of nonpolar molecule placed in a uniform electric field.

12. With proper diagram explain the resolving power of a microscope and obtain its formula.

13. Discuss an experimental setup of Geiger Marsden experiment of α - scattering.

OR

13. Wilson and Sommerfeld have defined a fine structure constant as, $\alpha = \frac{e^2}{4\pi\varepsilon_0 hC}$ in their atomic theory. Here $h = \frac{h}{2\pi}$. Find the

a) Dimensions of α.

b) Express energy of hydrogen atom in terms of α

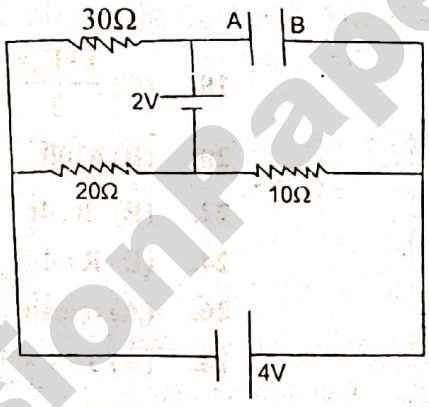
c) Find the speed of electron in the orbit n = 1 in terms of α

14. In the reaction ${}^{A}_{Z}X \rightarrow {}^{A-4}_{Z-2}Y + {}^{4}_{2}He + Q$ of the nucleus X at rest. Taking the ratio of mass of α–particle M_α and mass of Y nucleus as $\frac{M_\alpha}{M_y} = \frac{4}{A-4}$, show that the Q value of the reaction is given by $Q = K_\alpha\left(\frac{A}{A-4}\right)$. Where K_α Kinetic energy of α particle.

SECTION - C

• **Question Nos. 15 to 18 do as directed. Each question carries 4 marks.** **[16]**

15. Calculate the potential difference between plates A & B of the capacitor in the following circuit.



16. A converging lens of focal length 15 cm and converging mirror of focal length 20 cm and placed with principal axes coinciding. Point object is placed at a distance 12 cm from the lens. Refrected ray from the lens gets reflected from the mirror and again refracted by the lens is parallel to the principal axis. Find the distance between the mirror and lens.

17. Using the equation

$$\frac{di}{dt} + \frac{R}{L}i + \frac{1}{LC}\int i dt = \frac{Vm}{L}e^{j\omega t}$$

for L-C-R series A.C. circuit, obtain an equation for complex current 'i' and explain its different terms in the equation. Hence obtain the equation for real current 'i'.

18. What is rectification ? Explain the working of full wave rectifier with the circuit and wave forms.

OR

18. For OR GAte and NAND Gate give,

a) Circuit symbol

b) Truth table

c) Boolean equation.

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QUESTION PAPER - 1 - SOLUTION (JULY - 2018)

PART - A

1. (C) 0.011
2. (C) 2.5×10^6
3. (B) $\sqrt{r}$
4. (C) $\frac{25}{9}$
5. (C) 4 : 9
6. (C) It is maximum for γ radiation.
7. (B) $\frac{4}{3}$
8. (C) $Eg_1 > Eg_2 > Eg_3$
9. (B) 4×10^5
10. (B) $\frac{1}{2}$
11. (C) 990
12. (C) $\frac{1}{2}$ m
13. (B) 5 MHz
14. (A) $\frac{KQ}{r^2}$
15. (A) $\frac{\rho r}{3 \in_0}$
16. (A) 2ϕ
17. (A) always zero
18. (C) $\frac{13 E_0 x}{3}$
19. (D) $\pi / 2$
20. (B) 6300
21. (A) 1.5Ω
22. (B) 2ε, 4r
23. (C) 1.02 mA
24. (D) R / 4
25. (D) will lose velocity
26. (A) remains constant
27. (A) 5 V
28. (A) 3.14×10^{-2}
29. (A) $\frac{T}{2}$
30. (B) passing through the magnetic axis of Earth
31. (C) experience attraction
32. (D) 1.88 T
33. (B) inelastic scattering
34. (D) $\sqrt{2}$
35. (D) 78.23
36. (B) Light has particle nature
37. (C) 1.2×10^3
38. (D) decreased to fourth part
39. (B) Zero
40. (B) 2ε
41. (A) $M^1L^2T^{-2}A^{-2}$
42. (B) The energy of the circuit continuously decreases
43. (C) $\frac{R}{\sqrt{R^2 + X_L^2}}$
44. (A) 5
45. (D) 100
46. (A) W
47. (B) 1 mm to 700 nm
48. (B) 18 Vm^{-1}
49. (B) greater value of resolution
50. (B) Short wave length