Test / Exam Name: Revision **Standard: 12th Science**

Q1. In the depletion region of a diode: **1 Mark**

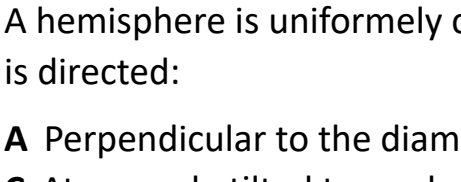
A There are no mobile charges.

B Equal number of holes and electrons exist, making the region neutral.

C Recombination of holes and electrons has taken place.

D Immobile charged ions exist.

Q2. Two source S_1 and S_2 of intensity I_1 and I_2 are placed in front of a screen [Fig. (a)]. The patteren of intensity distribution seen in the central portion is given by Fig. (b). **1 Mark**



In this case which of the following statements are true.

A S_1 and S_2 have the same intensities.

B S_1 and S_2 have a constant phase difference.

C S_1 and S_2 have the same phase.

D S_1 and S_2 have the same wavelength.

Q3. A set of atoms in an excited state decays. **1 Mark**

A In general to any of the states with lower energy.

B Into a lower state only when excited by an external electric field.

C All together simultaneously into a lower state.

D To emit photons only when they collide.

Q4. An electron (mass m) with an initial velocity $\mathrm{v} = \mathrm{v}_0\hat{\mathrm{i}}$ is in an electric field $\mathrm{E} = \mathrm{E}_0\hat{\mathrm{j}}$. If $\lambda_0 = \frac{\mathrm{h}}{\mathrm{mv}_0}$, it's de Breoglie wavelength at time t is given by: **1 Mark**

A λ_0

B $\lambda_0\sqrt{1+\frac{\mathrm{e}^2\mathrm{E}_0^2\mathrm{t}^2}{\mathrm{m}^2\mathrm{v}_0^2}}$

C $\frac{\lambda_0}{\sqrt{1+\frac{\mathrm{e}^2\mathrm{E}_0^2\mathrm{t}^2}{\mathrm{m}^2\mathrm{v}_0^2}}}$

D $\frac{\lambda_0}{\left(1+\frac{\mathrm{e}^2\mathrm{E}_0^2\mathrm{t}^2}{\mathrm{m}^2\mathrm{v}_0^2}\right)}$

Q5. A hemisphere is uniformely charged positively. The electric field at a point on a diameter away from the centre is directed: **1 Mark**

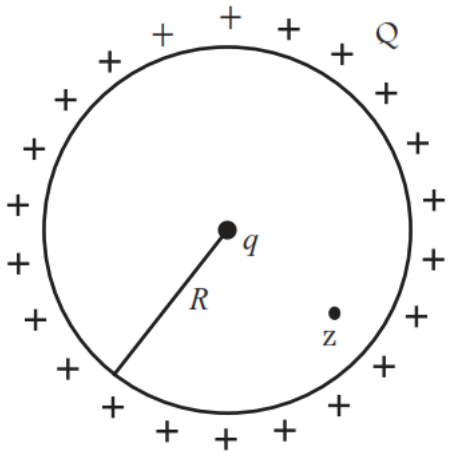
A Perpendicular to the diameter.

B Parallel to the diameter.

C At an angle tilted towards the diameter.

D At an angle tilted away from the diameter.

Q6. A positive charge Q is uniformly distributed along a circular ring of radius R.A. small test charge q is placed at the centre of the ring Fig. Then: **1 Mark**



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A If q > 0 and is displaced away from the centre in the plane of the ring, it will be pushed back towards the centre.

B If q < 0 and is displaced away from the centre in the plane of the ring, it will never return to the centre and will continue moving till it hits the ring.

C If q < 0, it will perform SHM for small displacement along the axis.

D q at the centre of the ring is in an unstable equilibrium within the plane of the ring for q > 0.

Q7. **1 Mark**

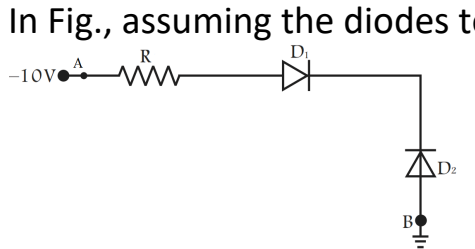
An alternating current generator has an internal resistance R_g and an internal reactance X_g. It is used to supply power to a passive load consisting of a resistance R_g and a reactance X_L. For maximum power to be delivered from the generator to the load, the value of X_L is equal to:

A Zero. **B** X_g. **C** $-X_g$. **D** R_g.

Q8. Consider sunlight incident on a pinhole of width 10^3Å The image of the pinhole seen on a screen shall be: **1 Mark**

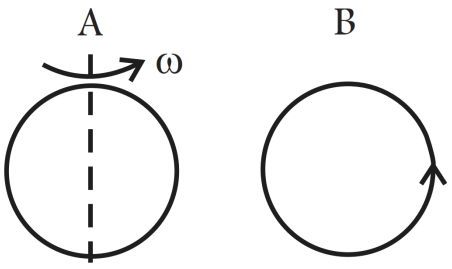
A A sharp white ring.
B Different from a geometrical image.
C A diffused central spot, white in colour.
D Diffused coloured region around a sharp central white spot.

Q9. In Fig., assuming the diodes to be ideal: **1 Mark**



A D_1 is forward biased and D_2 is reverse biased and hence current flows from A to B.
B D_2 is forward biased and D_1 is reverse biased and hence no current flows from B to A and vice versa.
C D_1 and D_2 are both forward biased and hence current flows from A to B.
D D_1 and D_2 are both reverse biased and hence no current flows from A to B and vice versa.

Q10. Same as problem 4 except the coil A is made to rotate about a vertical axis (Fig). No current flows in B if A is at rest. The current in coil A, when the current in B (at t = 0) is counterclockwise and the coil A is as shown at this instant, t = 0, is: **1 Mark**

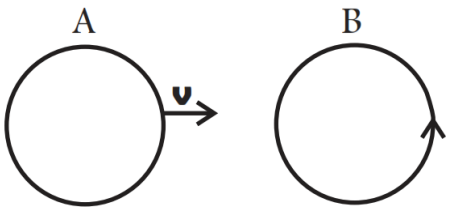


A Constant current clockwise.
B Varying current clockwise.
C Varying current counterclockwise.
D Constant current counterclockwise.

Q11. The mutual inductance M_{12} of coil 1 with respect to coil 2:I **1 Mark**

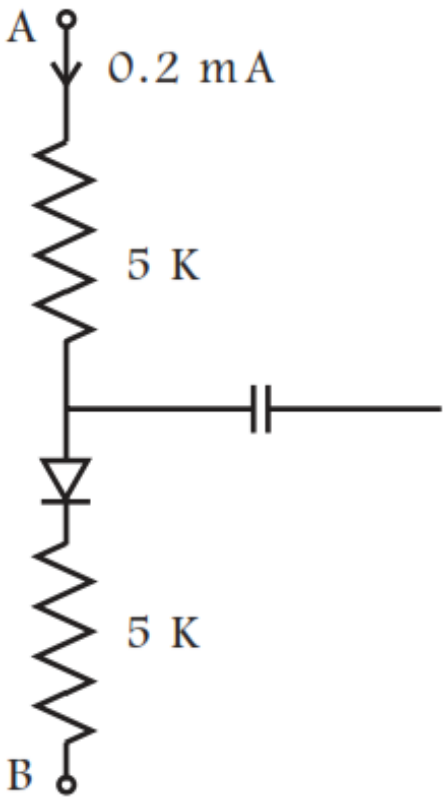
A ncreases when they are brought nearer.
B Depends on the current passing through the coils.
C Increases when one of them is rotated about an axis.
D Is the same as M_{21} of coil 2 with respect to coil 1.

Q12. There are two coils A and B as shown in Fig. A current starts flowing in B as shown, when A is moved towards B and stops when A stops moving. The current in A is counterclockwise. B is kept stationary when A moves. We can infer that: **1 Mark**



A There is a constant current in the clockwise direction in A.
B There is a varying current in A.
C There is no current in A.
D There is a constant current in the counterclockwise direction in A.

Q13. In the circuit shown in Fig., if the diode forward voltage drop is 0.3V, the voltage difference between A and B is: **1 Mark**



A 1.3V. **B** 2.3V. **C** 0. **D** 0.5V.

Q14. A basic communication system consists of **1 Mark**

1. Transmitter.
2. Information source.
3. User of information.
4. Channel.
5. Receiver.

Choose the correct sequence in which these are arranged in a basic communication system:

A ABCDE. **B** BADEC. **C** BDACE. **D** BEADC.

Q15. A cubical region of space is filled with some uniform electric and magnetic fields. An electron enters the cube across one of its faces with velocity v and a positron enters via opposite face with velocity -v. At this instant, **1 Mark**

A The electric forces on both the particles cause identical accelerations.
B The magnetic forces on both the particles cause equal accelerations.
C Both particles gain or loose energy at the same rate.
D The motion of the centre of mass (CM) is determined by B alone.

Q16. When an electric field is applied across a semiconductor: **1 Mark**

A Electrons move from lower energy level to higher energy level in the conduction band.
B Electrons move from higher energy level to lower energy level in the conduction band.
C Holes in the valence band move from higher energy level to lower energy level.
D Holes in the valence band move from lower energy level to higher energy level.

Q17. Photons absorbed in matter are converted to heat. A source emitting n photon/sec of frequency v is used to convert 1kg of ice at 0°C to water at 0°C. Then, the time T taken for the conversion: **1 Mark**

A Decreases with increasing n, with v fixed.
B Decreases with n fixed, v increasing.
C Remains constant with n and v changing such that nv = constant.
D increases when the product nv increases.

Q18. Heavy stable nucle have more neutrons than protons. This is because of the fact that: **1 Mark**

A Neutrons are heavier than protons.
B Electrostatic force between protons are repulsive.
C Neutrons decay into protons through beta decay.
D Nuclear forces between neutrons are weaker than that between protons.

Q19. For the ground state, the electron in the H-atom has an angular momentum = h, according to the simple Bohr model. Angular momentum is a vector and hence there will be infinitely many orbits with the vector pointing in all possible directions. In actuality, this is not true, **1 Mark**

A Because Bohr model gives incorrect values of angular momentum.
B Because only one of these would have a minimum energy.
C Angular momentum must be in the direction of spin of electron.
D Because electrons go around only in horizontal orbits.

Q20. The conductivity of a semiconductor increases with increase in temperature because: **1 Mark**

A Number density of free current carriers increases.
B Relaxation time increases.
C Both number density of carriers and relaxation time increase.
D Number density of current carriers increases, relaxation time decreases but effect of decrease in relaxation time is much less than increase in number density.

Q21. A resistance R is to be measured using a meter bridge. Student chooses the standard resistance S to be 100Ω. He finds the null point at l_1 = 2.9cm. He is told to attempt to improve the accuracy. Which of the following is a useful way? **1 Mark**

A He should measure l_1 more accurately.
B He should change S to 1000O and repeat the experiment.
C He should change S to 3O and repeat the experiment.
D He should give up hope of a more accurate measurement with a meter bridge.

Q22. Consider a wire carrying a steady current, I placed in a uniform magnetic field B perpendicular to its length. Consider the charges inside the wire. It is known that magnetic forces do no work. This implies that: **1 Mark**

A Motion of charges inside the conductor is unaffected by B since they do not absorb energy.
B Some charges inside the wire move to the surface as a result of B.
C If the wire moves under the influence of B, no work is done by the force.
D If the wire moves under the influence of B, no work is done by the magnetic force on the ions, assumed fixed within the wire.

Q23. If E and B represent electric and magnetic field vectors of the electromagnetic wave, the direction of propagation of electromagnetic wave is along, **1 Mark**

A E. **B** B. **C** B × E. **D** E × B.

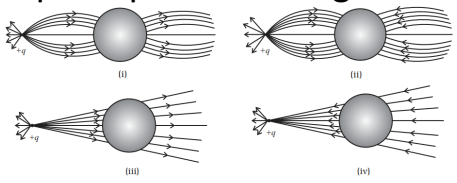
Q24. As the frequency of an ac circuit increases, the current first increases and then decreases. What combination of circuit elements is most likely to comprise the circuit? **1 Mark**

A Inductor and capacitor.
B Resistor and inductor.
C Resistor and capacitor.
D Resistor, inductor and capacitor.

Q25. An electromognetic wave travels in vacuum along z direction: $\mathrm{E} = \left(\mathrm{E}_1\,\hat{\mathrm{i}} + \mathrm{E}_2\hat{\mathrm{j}}\right)\cos(\mathrm{kz} - \omega\mathrm{t})$. Choose the correct options from the following: **1 Mark**

A The associated magnetic field is given as $\mathrm{B} = \frac{1}{\mathrm{c}}\left(\mathrm{E}_1\,\hat{\mathrm{i}} + \mathrm{E}_2\hat{\mathrm{j}}\right)\cos(\mathrm{kz} - \omega\mathrm{t})$.
B The associated magnetic field is given as $\mathrm{B} = \frac{1}{\mathrm{c}}\left(\mathrm{E}_1\,\hat{\mathrm{i}} + \mathrm{E}_2\hat{\mathrm{j}}\right)\cos(\mathrm{kz} - \omega\mathrm{t})$.
C The given electromagnetic field is circularly polarised.
D The given electromagnetic wave is plane polarised.

Q26. A point positive charge is brought near an isolated conducting sphere. The electric field is best given by: **1 Mark**



A Fig (i). **B** Fig (ii). **C** Fig (iii). **D** Fig (iv).

Q27. Two identical current carrying coaxial loops, carry current I in an opposite sense. A simple amperian loop passes through both of them once. Calling the loop as C: **1 Mark**

A $\oint \mathrm{B.dl} = \pm 2\mu_0\mathrm{I}$.
B The value of $\oint \mathrm{B.dl}$ is independent of sense of C.
C There may be a point on C where B and dl are perpendicular.
D B vanishes every where on C.

Q28. In a region of constant potential: **1 Mark**

A The electric field is uniform.
B The electric field is zero.
C There can be no charge inside the region.
D The electric field shall necessarily change if a charge is placed outside the region.

Q29. A circular coil expands radially in a region of magnetic field and no electromotive force is produced in the coil. This can be becausen. **1 Mark**

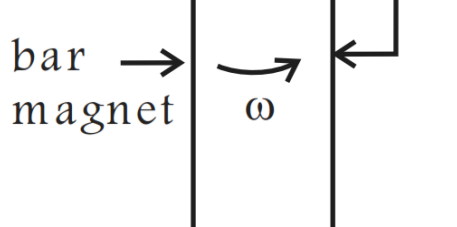
A The magnetic field is constant.

B The magnetic field is in the same plane as the circular coil and it may or may not vary.

C The magnetic field has a perpendicular (to the plane of the coil) component whose magnitude is decreasing suitably.

D There is a constant magnetic field in the perpendicular (to the plane of the coil) directio

Q30. The output of the given circuit in Fig. **1 Mark**



A Would be zero at all times.

B Would be like a half wave rectifier with positive cycles in output.

C Would be like a half wave rectifier with negative cycles in output.

D Would be like that of a full wave rectifier.

Q31. A 1 KW signal is transmitted using a communication channel which provides attenuation at the rate of -2dB per km. If the communication channel has a total length of 5 km, the power of the signal received is, **1 Mark**

$$\left[\text{gain in dB} = 10\log\left(\frac{P_0}{P_1}\right)\right]$$

A 900W. **B** 100W. **C** 990W. **D** 1010W.

Q32. A cylindrical bar magnet is rotated about its axis (Fig). A wire is connected from the axis and is made to touch the cylindrical surface through a contact. Then, **1 Mark**

A A direct current flows in the ammeter A.

B No current flows through the ammeter A.

C An alternating sinusoidal current flows through the ammeter A with a time period $T = \frac{2\pi}{\omega}$.

D A time varying non-sinosoidal current flows through the ammeter A.

Q33. A circular current loop of magnetic moment M is in an arbitrary orientation in an external magnetic field B. The work done to rotate the loop by 30° about an axis perpendicular to its plane is: **1 Mark**

A MB.

B $\sqrt{3}\frac{MB}{2}$

C $\frac{MB}{2}$

D Zero.

Q34. A particle moves in a closed orbit around the origin, due to a force which is directed towards the origin. The de Broglie wavelength of the particle varies cyclically between two values λ_1, λ_2 with $\lambda_1 > \lambda_2$. Whichof the following statement are true? **1 Mark**

A The particle could be moving in a circular orbit with origin as centre.

B The particle could be moving in an elliptic orbit with origin as its focus.

C When the de Broglie wave length is λ_1, the particle is nearer the origin than when its value is λ_2.

D When the de Broglic wavelength is λ_2, the particle is nearer the origin than when its value is λ_1.

Q35. An electron is moving with an initial velocity $v = v_0\hat{i}$ and is in a magnetic field $B = B_0\hat{j}$. Then it's de Broglie wavelength: **1 Mark**

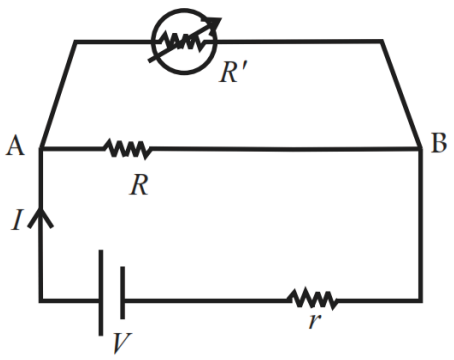
A Remains constant.

B Increases with time.

C Decreases with time.

D Increases and decreases periodically.

Q36. Consider a simple circuit shown in Fig. stands for a variable resistance R'. R' can vary from R_0 to infinity. r is internal resistance of the battery ($r << R << R_0$). **1 Mark**



A Potential drop across AB is nearly constant as R' is varied.

B Current through R' is nearly a constant as R' is varied.

C Current I depends sensitively on R'.

D $I \geq \frac{V}{r+R}$ always

Q37. An EM wave radiates outwards from a dipole antenna, with E_0 as the amplitude of its electric field vector. The electric field E_0 which transports significant energy from the source falls off as: **1 Mark**

A $\frac{1}{r^3}$

B $\frac{1}{r^2}$

C $\frac{1}{r}$

D Remains constant.

Q38. An ionised H-molecule consists of an electron and two protons. The protons are separated by a small distance of the order of angstrom. In the ground state: **1 Mark**

A The electron would not move in circular orbits.

B The energy would be $(2)^4$ times that of a H-atom.

C The electrons, orbit would go arround the protons.

D The molecule will soon decay in a proton and a H-atom.

Q39. A ray of light incident at an angle θ on a refracting face of a prism emerges from the other face normally. If the angle of the prism is 5º and the prism is made of a material of refractive index 1.5, the angle of incidence is: **1 Mark**

A 7.5º. **B** 5º. **C** 15º. **D** 2.5º.

Q40. The primary origin(s) of magnetism lies in: **1 Mark**

A Atomic currents.

B Pauli exclusion principle.

C Polar nature of molecules.

D Intrinsic spin of electron.

Q41. The breakdown in a reverse biased p-n junction diode is more likely to occur due to: **1 Mark**

A Large velocity of the minority charge carriers if the doping concentration is small.

B Large velocity of the minority charge carriers if the doping concentration is large.

C Strong electric field in a depletion region if the doping concentration is small.

D Strong electric field in the depletion region if the doping concentration is large.

Q42. Two H atoms in the ground state collide inelastically. The maximum amount by which their combined kinetic energy is reduced is: **1 Mark**

A 10.20eV. **B** 20.40eV. **C** 13.6eV. **D** 27.2eV.

Q43. Essential difference between electrostatic shielding by a conducting shell and magnetostatic shielding is due to: **1 Mark**

A Electrostatic field lines can end on charges and conductors have free charges.

B Lines of B can also end but conductors cannot end them.

C Lines of B cannot end on any material and perfect shielding is not possible.

D Shells of high permeability materials can be used to divert lines of B from the interior region.

Q44. The electric field intensity produced by the radiations coming from 100W bulb at a 3 m distance is E. The electric field intensity produced by the radiations coming from 50W bulb at the same distance is: **1 Mark**

A $\frac{E}{2}$.

B $2E$.

C $\frac{E}{\sqrt{2}}$.

D $\sqrt{2}E$.

Q45. A positively charged particle is released from rest in an uniform electric field. The electric potential energy of the charge: **1 Mark**

A Remains a constant because the electric field is uniform.

B Increases because the charge moves along the electric field.

C Decreases because the charge moves along the electric field.

D Decreases because the charge moves opposite to the electric field.

Q46. When an AC voltage of 220V is applied to the capacitor C: **1 Mark**

A The maximum voltage between plates is 220V.

B The current is in phase with the applied voltage.

C The charge on the plates is in phase with the applied voltage.

D Power delivered to the capacitor is zero.

Q47. The gravitational force between a H-atom and another particle of mass m will be given by Newton's law: **1 Mark**
$\mathrm{F} = \mathrm{G}\frac{\mathrm{M.m}}{\mathrm{r}^2}$, where r is in km and,).

A M = m_{proton} + $m_{electron}$.

B M = m_{proton} + $m_{electron}$ - $\frac{\mathrm{B}}{\mathrm{C}^2}$ (B = 13.6eV).

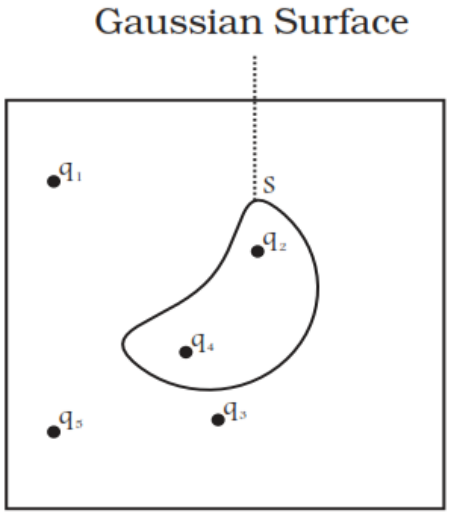
C M is not related to the mass of the hydrogen atom.

D M = m_{proton} + $m_{electron}$ - $\frac{|\mathrm{V}|}{\mathrm{c}^2}$ (|V| = magnitude of the potential energy of electron in the H-atom

Q48. Five charges q_1, q_2, q_3, q_4, and q_5 are fixed at their positions as shown in. S is a Gaussian surface. The Gauss's law is given by **1 Mark**

$$\oint_S \mathrm{E.ds} = \frac{\mathrm{q}}{\epsilon_0}$$

Which of the following statements is correct?



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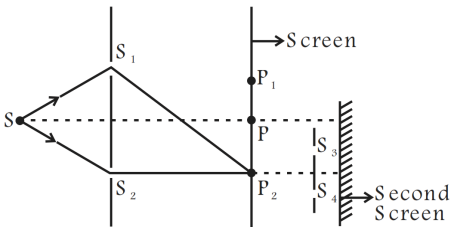
A E on the LHS of the above equation will have a contribution from q_1, q_5 and q_3 while q on the RHS will have a contribution from q_2 and q_4 only.

B E on the LHS of the above equation will have a contribution from all charges while q on the RHS will have a contribution from q_2 and q_4 only.

C E on the LHS of the above equation will have a contribution from all charges while q on the RHS will have a contribution from q_1, q_3 and q_5 only.

D Both E on the LHS and q on the RHS will have contributions from q_2 and q_4 only

Q49. Figure shows a standard two slit arrangement with slits S_1, S_2. P_1, P_2 are the two minima points on either side of P (Fig). At P_2 on the screen, there is a hole and behind P_2 is a second 2- slit arrangement with slits S_3, S_4 and a second screen behind them. **1 Mark**



A There would be no interference pattern on the second screen but it would be lighted.

B The second screen would be totally dark.

C There would be a single bright point on the second screen.

D There would be a regular two slit pattern on the second screen.

Q50. In a cyclotron, a charged particle: **1 Mark**

A Undergoes acceleration all the time.

B Speeds up between the dees because of the magnetic field.

C Speeds up in a dee.

D Slows down within a dee and speeds up between dees.

Q51. Tritium is an isotope of hydrogen whose nucleus Triton contains 2 neutrons and 1 proton. Free neutrons decay into $\mathrm{p} + \overline{\mathrm{e}} + \overline{\mathrm{v}}$. If one of the neutrons in Triton decays, it would transform into He^3 nucleus. This does not happen. This is because: **1 Mark**

A Triton energy is less than that of a He^3 nucleus.

B The electron created in the beta decay process cannot remain in the nucleus.

C Both the neutrons in triton have to decay simultaneously resulting in a nucleus with 3 protons, which is not a He^3 nucleus.

D Because free neutrons decay due to external perturbations which is absent in a triton nucleus.

Q52. The electrostatic potential on the surface of a charged conducting sphere is 100V. Two statments are made in this regard: **1 Mark**

S_1 : At any point inside the sphere, electric intensity is zero.

S_2 : At any point inside the sphere, the electrostatic potential is 100V.

Which of the following is a correct statement?

A S_1 is true but S_2 is false.

B Both S_1 & S_2 are false.

C S_1 is true, S_2 is also true and S_1 is the cause of S_2.

D S_1 is true, S_2 is also true but the statements are independant.

Q53. The source of electromagnetic waves can be a charge: **1 Mark**

A Moving with a constant velocity.

B Moving in a circular orbit.

C At rest.

D Falling in an electric field.

Q54. An electromagnetic wave travelling along z-axis is given as: $\mathrm{E} = \mathrm{E}_0 \cos(\mathrm{kz} - \omega \mathrm{t})$. Choose the correct options from the following; **1 Mark**

A The associated magnetic field is given as $\mathrm{B} = \frac{1}{\mathrm{c}}\mathrm{k} \times \mathrm{E} = \frac{1}{\omega}(\hat{\mathrm{k}} \times \mathrm{E})$.

B The electromagnetic field can be written in terms of the associated magnetic field as $\mathrm{E} = \mathrm{c}(\mathrm{B} \times \hat{\mathrm{k}})$.

C $\hat{\mathrm{k}}.\mathrm{E} = 0, \hat{\mathrm{k}}.\mathrm{B} = 0$.

D $\hat{\mathrm{k}} \times \mathrm{E} = 0, \hat{\mathrm{k}} \times \mathrm{B} = 0$.

Q55. The work done to move a charge along an equipotential from A to B: **1 Mark**

A Cannot be defined as $-\int_{\mathrm{A}}^{\mathrm{B}} \mathrm{E}.\,\mathrm{dl}$.

B Must be defined as $-\int_{\mathrm{A}}^{\mathrm{B}} \mathrm{E}.\,\mathrm{dl}$.

C Is zero.

D Can have a non-zero value.

Q56. An EM wave of intensity I falls on a surface kept in vacuum and exerts radiation pressure p on it. Which of the following are true? **1 Mark**

A Radiation pressure is I/c if the wave is totally absorbed.

B Radiation pressure is I/c if the wave is totally reflected.

C Radiation pressure is 2I/c if the wave is totally reflected.

D Radiation pressure is in the range $I/c < p < 2I/c$ for real surfaces.

Q57. Consider a beam of electrons (each electron with energy E_0) incident on a metal surface kept in an evacuated chamber. Then **1 Mark**

A No electrons will be emitted as only photons can emit electrons.

B Electrons can be emitted but all with an energy, E_0.

C Electrons can be emitted with any energy, with a maximum of $\mathrm{E}_0 - \phi$ (ϕ is the work function).

D Electrons can be emitted with any energy, with a maximum of E_0.

Q58. Consider the two idealized systems: (i) a parallel plate capacitor with large plates and small separation and (ii) a long solenoid of length L > > R, radius of cross-section. In (i) E is ideally treated as a constant between plates and zero outside. In (ii) magnetic field is constant inside the solenoid and zero outside. These idealised assumptions, however, contradict fundamental laws as below: **1 Mark**

A Case (i) contradicts Gauss's law for electrostatic fields.

B Case (ii) contradicts Gauss's law for magnetic fields.

C Case (i) agrees with $\oint \mathrm{E}.\mathrm{dl}=0$.

D Case (ii) contradict $\oint \mathrm{H}.\mathrm{dl} = \mathrm{I}_{\mathrm{en}}$.

Q59. To reduce the ripples in a rectifier circuit with capacitor filter: **1 Mark**

A R_L should be increased.

B Input frequency should be decreased.

C Input frequency should be increased.

D Capacitors with high capacitance should be used.

Q60. M_x and M_y denote the atomic masses of the parent and the daughter nuclei respectively in a radioactive decay. The Q-value for a β^- decay is Q_1 and that for a β^+ decay is Q_2. If me denotes the mass of an electron, then which of the following statements is correct? **1 Mark**

A $Q_1 = (M_x - M_y)\, c_2$ and $Q_2 = (M_x - M_y - 2m_e)c^2$.

B $Q_1 = (M_x - M_y)\, c_2$ and $Q_2 = (M_x - M_y)c_2$.

C $Q_1 = (M_x - M_y - 2m_e)\, c^2$ and $Q_2 = (M_x - M_y + 2m_e)c^2$.

D $Q_1 = (M_x - M_y + 2m_e)\, c^2$ and $Q_2 = (M_x - M_y + 2m_e)c^2$.