Q1. The minimum orbital angular momentum of the electron in a hydrogen atom is: **1 Mark**
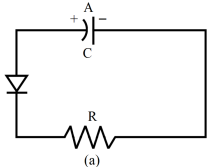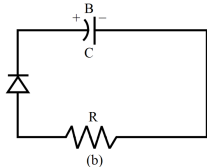
A h

B $\frac{h}{2}$

C $\frac{h}{2\pi}$

D $\frac{h}{\lambda}$

Q2. A freshly prepared radioactive source of half-life 2h emits radiation of intensity which is 64 times the permissible safe level. The minimum time after which it would be possible to work safely with this source is: **1 Mark**

A 6h   B 12h   C 24h   D 128h

Q3. In a semiconductor: **1 Mark**

A There are no free electrons at 0K.

B There are no free electrons at any temperature.

C The number of free electrons increases with temperature.

D The number of free electrons is less than that in a conductor.

Q4. The mass number of a nucleus is equal to: **1 Mark**

A The number of neutrons in the nucleus.

B The number of protons in the nucleus.

C The number of nucleons in the nucleus.

D None of them.

Q5. In which of the following pairs of temperature scales, the size of a degree is identical? **1 Mark**

1. Mercury scale and ideal gas scale.
2. Celsius scale and mercury scale.
3. Celsius scale and ideal gas scale.
4. Ideal gas scale and absolute scale.

Q6. A solid sphere and a hollow sphere of the same material and of equal radii are heated to the same temperature: **1 Mark**

1. Both will emit equal amount of radiation per unit time in the biginning.
2. Both will absorb equal amount of radiation from the surrounding in the biginning.
3. The initial rate of cooling $\left(\frac{dT}{dt}\right)$ will be the same for the two spheres.
4. The two spheres will have equal temperatures at any instant.

Q7. Let n_p and n_e be the number of holes and conduction electrons in an intrinsic semiconductor. **1 Mark**

A $n_p > n_e$

B $n_p = n_e$

C $n_p < n_e$

D $n_p \neq n_e$

Q8. X-ray incident on a material: **1 Mark**

A Exerts a force on it.

B Transfers energy to it.

C Transfers momentum to it.

D Transfers impulse to it.

E All of the above

Q9. When no current is passed through a conductor: **1 Mark**

A The free electrons do not move.

B The average speed of a free electron over a large period of time is zero.

C The average velocity of a free electron over a large period of time is zero.

D The average of the velocities of all the free electrons at an instant is zero.

Q10. To convert mechanical energy into electrical energy, one can use: **1 Mark**

A DC dynamo.   B AC dynamo.   C Motor.   D Transformer.

Q11. Which of the following is a wrong description of binding energy of a nucleus? **1 Mark**

A It is the energy required to break a nucleus into its constituent nucleons.

B It is the energy made available when free nucleons combine to form a nucleus.

C It is the sum of the rest mass energies of its nucleons minus the rest mass energy of the nucleus.

D It is the sum of the kinetic energy of all the nucleons in the nucleus.

Q12. 50% of the X-ray coming from a Coolidge tube is able to pass through a 0.1mm thick aluminium foil. The potential difference between the target and the filament is increased. The thickness of the aluminium foil that will allow 50% of the X-ray to pass through will be: **1 Mark**

A zero   **B** < 0.1mm   **C** 0.1mm   **D** > 0.1mm

Q13. A steady electric current is flowing through a cylindrical conductor. **1 Mark**

A The electric field at the axis of the conductor is zero.

B The magnetic field at the axis of the conductor is zero.

C The electric field in the vicinity of the conductor is zero.

D The magnetic field in the vicinity of the conductor is zero.

Q14. Two capacitors each having capacitance C and breakdown voltage V are joined in series. The capacitance and the breakdown voltage of the combination will be: **1 Mark**

A $2C$ and $2V$

B $\frac{C}{2}$ and $\frac{V}{2}$

C $2C$ and $\frac{V}{2}$

D $\frac{C}{2}$ and $2V$

Q15. Two identical capacitors A and B are charged to the same potential V and are connected in two circuits at t = 0 as shown in figure. The charges on the capahltors at a time t = CR are, respectively: **1 Mark**

**A** VC, VC

B $\frac{VC}{e}, VC$

C $VC, \frac{VC}{e}$

D $\frac{VC}{e}, \frac{VC}{e}$

Q16. A uniform wire of resistance 50Ω is cut into 5 equal parts. These parts are now connected in parallel. The equivalent resistance of the combination is: **1 Mark**

A 2Ω **B** 10Ω **C** 250Ω **D** 6250Ω

Q17. A charged particle moves along a circle under the action of possible constant electric and magnetic fields. Which of the following are possible? **1 Mark**

A $E = 0, \ B = 0$

B $E = 0, \ B \neq 0$

C $E \neq 0, \ B = 0$

D $E \neq 0, \ B \neq 0$

Q18. The saturation current in a triode valve can be changed by changing: **1 Mark**
1. The grid voltage.
2. The plate voltage.
3. The separation between the grid and the cathode.
4. The temperature of the cathode.

Q19. Free ^{238}U nuclei kept in a train emit alpha particles. When the train is stationary and a uranium nucleus decays, a passenger measures that the separation between the alpha particle and the recoiling nucleus becomes x in time t after the decay. If a decay takes place when the train is moving at a uniform speed v, the distance between the alpha particle and the recoiling nucleus at a time t after the decay, as measured by the passenger will be: **1 Mark**

A x + vt

B x - vt

C x

D depends on the direction of the train.

Q20. Because to the space charge in a diode valve: **1 Mark**
1. The plate current decreases.
2. The plate voltage increases.

3. The rate of emission of thermions increases.
4. The saturation current increases.

Q21. The figure shows the intensity-wavelength relations of X-rays coming from two different Coolidge tubes. The solid curve represents the relation for the tube A in which the potential difference between the target and the filament is V_A and the atomic number of the target material is Z_A. These quantities are V_B and Z_B for the other tube. Then: **1 Mark**
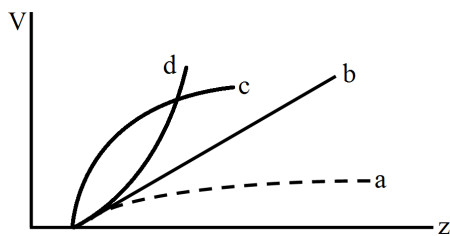
A $V_A > V_B, Z_A > Z_B$ **B** $V_A > V_B, Z_A < Z_B$

C $V_A < V_B, Z_A > Z_B$ **D** $V_A > V_B, Z_A < Z_B$

**Q22.** When the intensity of a light source is increased: **1 Mark**

A The number of photons emitted by the source in unit time increases.   **B** The total energy of the photons emitted per unit time increases.

C More energetic photons are emitted.   **D** Faster photons are emitted.

Q23. Figure. shows two processes A and B on a system. Let ΔQ_1 and ΔQ_2 be the heat given to the system in processes A and B respectively. Then, **1 Mark**

1. $\Delta Q_1 > \Delta Q_2$
2. $\Delta Q_1 = \Delta Q_2$
3. $\Delta Q_1 < \Delta Q_2$
4. $\Delta Q_1 \leq \Delta Q_2$
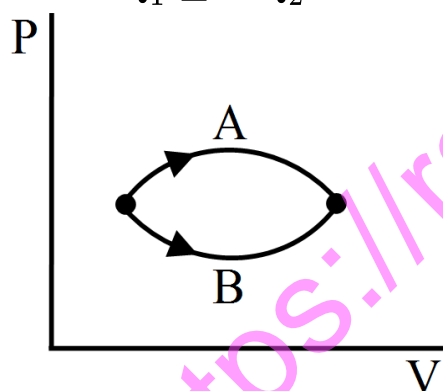
Q24. An inductor, a resistance and a capacitor are joined in series with an AC source. As the frequency of the source is slightly increased from a very low value, the reactance: **1 Mark**

A Of the inductor increases.   **B** Of the resistor increases.

C Of the capacitor increases.   **D** Of the circuit increases.

Q25. The mean square speed of the molecules of a gas at absolute temperature T is proportional to: **1 Mark**

1. $\frac{1}{T}$
2. $\sqrt{T}$
3. T
4. T^2

Q26. When a ferromagnetic material goes through a hysteresis loop, the magnetic susceptibility: **1 Mark**

A Has a fixed value.   **B** May be zero.   **C** May be infinity.   **D** May be negative.

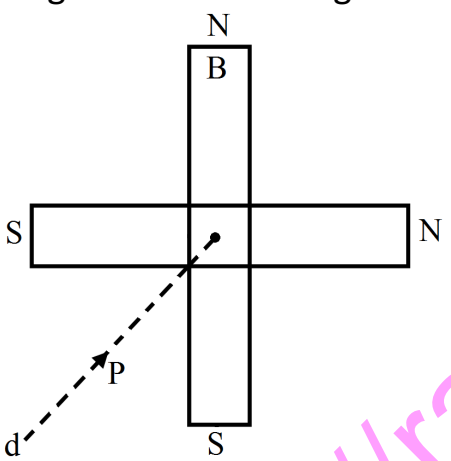**Q27.** A compass needle which is allowed to move in a horizontal plane is taken to a geomagnetic pole. It: **1 Mark**

A Will stay in north-south direction only.   **B** Will stay in east-west direction only.

C Will become rigid showing no movement.   **D** Will stay in any position.

Q28. When a photon stimulates the emission of another photon, the two photons have: **1 Mark**

A Same energy.   **B** Same direction.   **C** Same phase.   **D** Same wavelength.

E All of the above

Q29. The energy contained in a small volume through which an electromagnetic wave is passing oscillates with: **1 Mark**

A Zero frequency. **B** The frequency of the wave.

C Half the frequency of the wave. **D** Double the frequency of the wave.

Q30. If a body is charged by rubbing it, its weight **1 Mark**

A Remains precisely constant. **B** Increases slightly.

C Decreases slightly. **D** May increase slightly or may decrease slightly.

Q31. An AC source is rated 220V, 50Hz. The average voltage is calculated in a time interval of 0.01s, It: **1 Mark**

A Must be zero. **B** May be zero.

C Is never zero. **D** Is $\left(\dfrac{200}{\sqrt{2}}\right)\mathrm{V}.$

Q32. Displacement current goes through the gap between the plates of a capacitor when the charge of the capacitor: **1 Mark**

A Increases. **B** Decreases. **C** Does not change. **D** Is zero.

Q33. Transformers are used: **1 Mark**

A In DC circuits only. **B** In AC circuits only.

C In both DC and AC circuits. **D** Neither in DC nor in AC circuits.

Q34. Two short magnets of equal dipole moments M are fastened perpendicularly at their centre (figure). The magnitude of the magnetic field at a distance d from the centre on the bisector of the right angle is: **1 Mark**

A $\dfrac{\mu_0}{4\pi}\dfrac{\mathrm{m}}{\mathrm{d}^3}$

B $\dfrac{\mu_0}{4\pi}\dfrac{\sqrt{2}\mathrm{M}}{\mathrm{d}^3}$

C $\dfrac{\mu_0}{4\pi}\dfrac{\sqrt[2]{2}\mathrm{M}}{\mathrm{d}^3}$

D $\dfrac{\mu_0}{4\pi}\dfrac{2\mathrm{M}}{\mathrm{d}^3}$

Q35. Electric conduction in a semiconductor takes place due to: **1 Mark**

A Electrons only. **B** Holes only.

C Both electrons and holes. **D** Neither electrons nor holes.

Q36. A capacitor of capacitance C is charged to a potential V. The flux of the electric field through a closed surface enclosing the capacitor is: **1 Mark**

A $\dfrac{\mathrm{CV}}{\epsilon_0}$

B $\dfrac{2\mathrm{CV}}{\epsilon_0}$

C $\dfrac{\mathrm{CV}}{2\epsilon_0}$

D Zero.

Q37. The electric potential decreases uniformly from 120V to 80V as one moves on the x-axis from x = -1cm to x = + 1cm. The electric field at the origin. **1 Mark**

A Must be equal to 20Vcm^{-1} **B** May be equal to 20Vcm^{-1}

C May be greater than 20Vcm^{-1} **D** May be lees than 20Vcm^{-1}

Q38. Which of the following quantities do not depend on the choice of zero potential or zero potential energy? **1 Mark**

A Potential at a point. **B** Potential difference between two points.

C Potential energy of a two-charge system. **D** Change in potential energy of a two-charge system.

Q39. A bar magnet is moved along the axis of a copper ring placed far away from the magnet, Looking from the side of the magnet an anticlockwise current is found to be induced in the ring. Which of the following may be true? **1 Mark**

A The south pole faces the ring and the magnet moves towards it. **B** The north pole faces the ring and the magnet moves towards it.

C The south pole faces the ring and the magnet moves away from it.

D The north pole faces the ring and the manget moves away from it.

Q40. Let r be the distance of a point on the axis of a bar magnet from its centre. The magnetic field at such a point is proportional to: **1 Mark**

A $\frac{1}{r}$

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

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

D None of these.

Q41. Three photons coming from excited atomic-hydrogen sample are picked up. Their energies are 12.1eV, 10.2 eV and 1.9eV. These photons must come from: **1 Mark**

A A single atom.

B Two atoms.

C Three atoms.

D Either two atoms or three atoms.

Q42. Consider a photon of a continuous X-ray coming from a Coolidge tube. Its energy comes from: **1 Mark**

A The kinetic energy of the striking electron.

B The kinetic energy of the free electrons of the target.

C The kinetic energy of the ions of the target.

D An atomic transition in the target.

Q43. Which of the following quantities do not change when a resistor connected to a battery is heated due to the current? **1 Mark**

A Drift speed.

B Resistivity.

C Resistance.

D Number of free electrons.

Q44. When the separation between two charges is increased the electric potential energy of the charges. **1 Mark**

A Increases.

B Decreases.

C Remains the same.

D May increase or decrease.

Q45. A beam consisting of protons and electrons moving at the same speed goes through a thin region in which there is a magnetic field perpendicular to the beam. The protons and the electrons: **1 Mark**

A Will go undeviated.

B Will be deviated by the same angle and will not separate.

C Will be deviated by different angles and hence separate.

D Will be deviated by the same angle but will separate.

Q46. A free electron is placed in the path of a plane electromagnetic wave. The electron will start moving: **1 Mark**

A Along the electric field.

B Along the magnetic field.

C Along the direction of propagation of the wave.

D In a plane containing the magnetic field and the direction of propagation.

Q47. Suppose a container ia evacuated to leave just one molecule of a gas in it. Let V_a and v_{rms} represent the average speed and the rms speed of the gas. **1 Mark**

1. $v_a > v_{rms}$
2. $v_a < v_{rms}$
3. $v_a = v_{rms}$
4. v_{rms} is undefined

Q48. Mark the correct options: **1 Mark**

A An atom with a vacancy has smaller energy that a neutral atom..

B K X-ray is emitted when a hole makes a jump from the K shell to some other shell.

C The wavelength of K X-ray is smaller than the wavelength of L X-ray of the same material.

D The wavelength of K_α X-ray is smaller than the wavelength of K_β X-ray of the same material

Q49. In a coaxial, straight cable, the central conductor and the outer conductor carry equal currents in opposite directions. The magnetic field is zero: **1 Mark**

A Outside the cable.

B Inside the inner conductor.

C Inside the outer conductor.

D In between the tow conductors.

Q50. **1 Mark**

A parallel-plate capacitor has plates of unequal area. The larger plate is connected to the positive terminal of the battery and the smaller plate to its negative terminal. Let Q_+ and Q_- be the charges appearing on the positive and negative plates respectively:

A $Q_+ > Q_-$

C $Q_+ < Q_-$

B $Q_+ = Q_-$

D The information is not sufficient to decide the relation between Q_+ and Q_-.

Q51. Let Q and W denote the amount of heat given to an ideal gas and the work done by it in an isothermal process. **1 Mark**
1. Q = 0
2. W = 0
3. Q ≠ W
4. Q = W

Q52. Consider the process on a system shown in figure. During the process, the work done by the system: **1 Mark**
1. Continuously increases.
2. Continuously decreases.
3. First increases then decreases.
4. First decreases then increases.
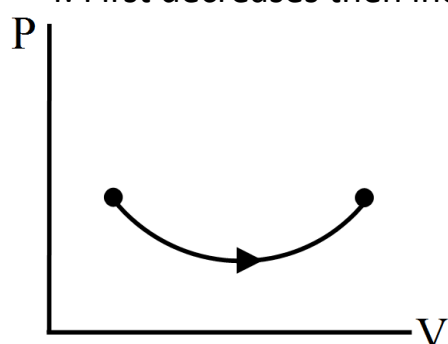
Q53. Visible light passing through a circular hole forms a diffraction disc of radius 0.1mm on a screen. If an X-ray is passed through the same setup, the radius of the diffraction disc will be: **1 Mark**

A zero   **B** < 0.1mm   **C** 0.1mm   **D** > 0.1m

Q54. Consider a mixture of oxygen and hydrogen kept at room temperature. AB compared to a hydrogen molecule an oxygen molecule hits the wall: **1 Mark**
1. With greater average speed.
2. With smaller average speed.
3. With greater average kinetic energy.
4. With smaller average kinetic energy.

Q55. For a given material, the energy and wavelength of characteristic X-rays satisfy: **1 Mark**

A $E(K_\alpha) > E(K_\beta) > E(K)_\gamma$

C $\lambda(K_\alpha) > \lambda(K_\beta) > \lambda(K_\gamma)$

B $E(M_\alpha) > E(L_\alpha) > E(K_\alpha)$

D $\lambda(M_\alpha) > \lambda(K_\beta) > \lambda(K_\alpha)$

Q56. A rigid container of negligible heat capacity contains one mole of an ideal gas. The temperature of the gas increases by 1°C if 3.0cal of heat is added to it. The gas may be: **1 Mark**
1. Helium.
2. Argon.
3. Oxygen.
4. Carbon dioxide.

Q57. A hydrogen atom in ground state absorbs 10.2eV of energy. The orbital angular momentum of the electron is increased by: **1 Mark**

A 1.05×10^{-34}Js   **B** 2.11×10^{-34}Js   **C** 3.16×10^{-34}Js   **D** 4.22×10^{-34}Js

**Q58.** During a negative beta decay: **1 Mark**

A An atomic electron is ejected.

B An electron which is already present within the nucleus is ejected.

C A neutron in the nucleus decays emitting an electron.

D A proton in the nucleus decays emitting an electron.

Q59. Figure shows a horizontal solenoid connected to a battery and a switch. A copper ring is placed on a frictionless track, the axis of the ring being along the axis of the solenoid. As the switch is closed, the ring will: **1 Mark**
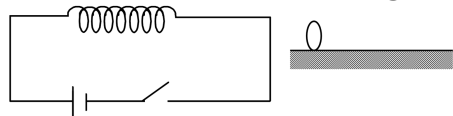

A Remain stationary.

B Move towards the solenoid.

C Move away from the solenoid.

D Move towards the solenoid or away from it depending on which terminal (positive or negative) of the battery is connected to the left end of the solenoid.

Q60. Vapour is injected at a uniform rate in a closed veseel which was initially evacuated. The pressure in the vessel: **1 Mark**

1. Increaaes continuously.
2. Decreases continuously.
3. First increases and then decreases.
4. First increases and then becomes constant.

Q61. Which of the following curves may represent the speed of the electron in a hydrogen atom as a function of the principal quantum number n? **1 Mark**
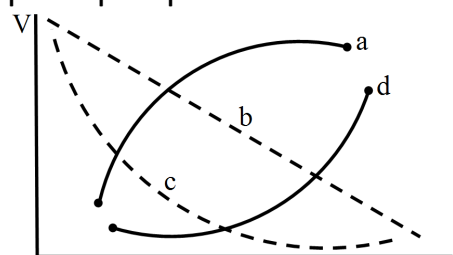
Q62. The decay constant of a radioactive sample is λ. The half-life and the average-life of the sample are respectively: **1 Mark**

A $\frac{1}{\lambda}$ and $\left(\ln\frac{2}{\lambda}\right)$

B $\left(\ln\frac{2}{\lambda}\right)$ and $\frac{1}{\lambda}$

C $\lambda(\ln 2)$ and $\frac{1}{\lambda}$

D $\frac{\lambda}{(\ln 2)}$ and $\frac{1}{\lambda}$

Q63. 70 calories of heat are required to raise the temperature of 2 mole of an ideal gas at constant pressure from 30° C to 35° C. The amount of heat required to raise the temperature of the same gas through the same range at constant volume is: **1 Mark**

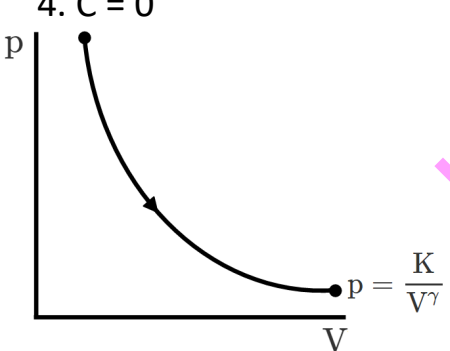1. 30 calories.
2. 50 calories.
3. 70 calories.
4. 90 calories.
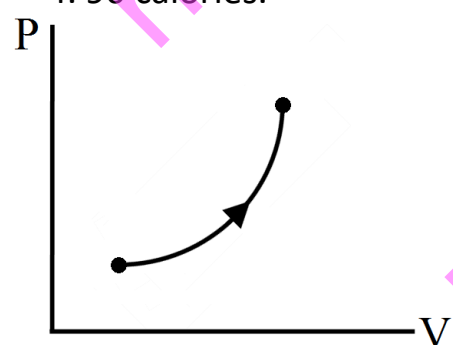
Q64. A hot liquid is kept in a big room. The logarithm of the numerical value of the temperature difference between the liquid and the room is plotted against time. The plot will be very nearly: **1 Mark**

1. A straight line.
2. A circular are.
3. A parabola.
4. An ellipse.

Q65. The specific heat capacity of a body depends on: **1 Mark**

1. The heat give.
2. The temperature raised.
3. The mass of the body.
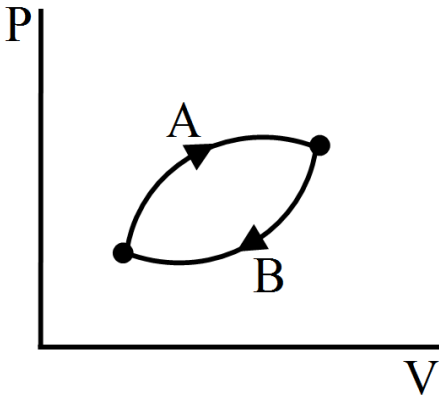4. The material of the body.

Q66. The magnetic field at the origin due to a current element $id\vec{l}$ placed at a position $\vec{r}$ is: **1 Mark**

A $\frac{\mu_0 i}{4\pi} \frac{\vec{d l} \times \vec{r}}{r^3}$

B $-\frac{\mu_0 i}{4\pi} \frac{\vec{r} \times \vec{d l}}{r^3}$

C $\frac{\mu_0 i}{4\pi} \frac{\vec{r} \times \vec{d l}}{r^3}$

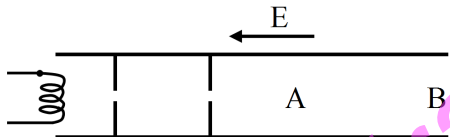**D** $-\frac{\mu_0 i}{4\pi} \frac{\vec{d l} \times \vec{r}}{r^3}$

Q67. Which of the following particles will describe the smallest circle when projected with the same velocity perpendicular to a magnetic field? **1 Mark**

A Electron   **B** Proton   **C** He$^+$ **D** Li$^+$

Q68. An aluminium sphere is dipped into water at 10°C. If the temperature is increased, the force of buoyancy: **1 Mark**
   1. Will increase.
   2. Will decrease.
   3. Will remain constant.
   4. May increase or decrease depending on the radius of the sphere.

Q69. A blackbody does not: **1 Mark**
   1. Emit radiation.
   2. Absorb radiation.
   3. Reflect radiation.
   4. Refract radiation.

Q70. Speed of electromagnetic waves is the same: **1 Mark**

A For all wavelengths.   **B** In all media.   **C** For all intensities.   **D** For all frequencies.

Q71. A gas behaves more closely as an ideal gas at: **1 Mark**
   1. Low pressure and low temperature.
   2. Low pressure and high temperature.
   3. High pressure and low temperature.
   4. High pressure and high temperature.

Q72. The AC voltage across a resistance can be measured using: **1 Mark**

A A potentiometer.

B A hot-wire voltmeter.

C A moving-coil galvanometer.

D A moving-magnet galvanometer.

Q73. The molar heat capacity for the process shown in the figure is: **1 Mark**
   1. C = C$_p$
   2. C = C$_v$
   3. C > C$_v$
   4. C = 0

$$p = \frac{K}{V^\gamma}$$

Q74. A spinning wheel is brought in contact with an identical wheel spinning at identical speed. The wheels slow down under the action of friction. Which of the following energies of the first wheel decreases? **1 Mark**
   1. Kinetic.
   2. Total.
   3. Mechanical.
   4. Internal.

Q75. A paramagnetic material is kept in a magnetic field. The field is increased till the magnetization becomes constant. If the temperature is now decreased, the magnetization **1 Mark**

A Will increase.

B Decrease.

C Remain constant.

D May increase or decrease.

Q76. When a hot liquid is mixed with a cold liquid, the temperature of the mixture:　　**1 Mark**
1. First decreases then becomes constant.
2. First increases then becomes constant.
3. Continuously increases.
4. Is undefined for some time and then becomes nearly constant.

Q77. Refer to figure. Let ΔU_1 and ΔU_2 be the change in internal energy in processes A and B respectively, ΔQ be the net heat given to the system in process A + B and ΔW be the net work done by the system in the process A + B.　　**1 Mark**

1. $\Delta U_1 + \Delta U_2 = 0$
2. $\Delta U_1 - \Delta U_2 = 0$
3. $\Delta Q - \Delta W = 0$
4. $\Delta Q + \Delta W = 0$

Q78. A solid object is placed in water contained in an adiabatic container for some time. The temperature of water falls during this period and there is no appreciable change in the shape of the object. The temperature of the solid object:　　**1 Mark**
1. Must have increased.
2. Must have decreased.
3. May have increased.
4. May have remained constant.

Q79. In a p-n junction:　　**1 Mark**

A New holes and conduction electrons are produced continuously throughout the material.

B New holes and conduction electrons are produced continuously throughout the material except in the depletion region.

C Holes and conduction electrons recombine continuously throughout the material.

D Holes and conduction electrons recombine continuously throughout the material except in the depletion region.

Q80. The pressure p and volume V of an ideal gas both increase in a process.　　**1 Mark**
1. Such a process is not possible.
2. The work done by the system is positive.
3. The temperature of the system must increase.
4. Heat supplied to the gas is equal to the change in internal energy.

Q81. The capacitance of a capacitor does not depend on:　　**1 Mark**

A The shape of the plates.　　**B** The size of the plates.
C The charges on the plates.　　**D** The separation between the plates.

Q82. Each plate of a parallel plate capacitor has a charge q on it. The capacitor is now connected to a batter. Now:　　**1 Mark**

A The facing surfaces of the capacitor have equal and opposite charges.

B The two plates of the capacitor have equal and opposite charges.

C The battery supplies equal and opposite charges to the two plates.

D The outer surfaces of the plates have equal charges.

Q83. A vessel A baa volume V and a vessel B has volume 2V. Both contain some water which has a constant volume. The pressure in the space above water is p_a for veesel A and p_b for vessel B.　　**1 Mark**
1. $p_a = p_b$
2. $p_a = 2p_b$

3. $p_b = 2p_a$
4. $p_b = 4p_a$

Q84. A perpendicular material is place in a magnetic fields. Consider the following statemetns: **1 Mark**
    1. If the magnetic field is increased, the magnetization is increased.
    2. If the temperature is increased, the magnetization is increased.

A Both A and B are true.   **B** A is true but B is false.
C B is true but A is false.   **D** Both A and B are false.

Q85. In an AC series circuit, the instantaneous current is zero when the instantaneous voltage is maximum. **1 Mark**
Connected to the source may be a:

A Pure inductor.   **B** Pure capacitor.
C Pure resistor.   **D** Combination of an inductor and a capacitor.

Q86. An electron with kinetic energy 5eV is incident on a hydrogen atom in its ground state. The collision: **1 Mark**

A Must be elastic.   **B** May be partially elastic.
C Must be completely inelastic.   **D** May be completely inelastic.

Q87. Two bodies at different temperatures are mixed in a calorimeter. Which of the following quantities remains **1 Mark**
conserved?
    1. Sum of the temperatures of the two bodies.
    2. Total heat of the two bodies.
    3. Total internal energy of the two bodies.
    4. Internal energy of each body.

Q88. Electrons are emitted by a hot filament and are accelerated by an electric field, as shown in the figure. The two **1 Mark**
stops at the left ensure that the electron beam has a uniform cross-section.

A The speed of the electrons is more at B than at A.   **B** The electric current is from left to right.
C The magnitude of the current is larger at B than   **D** The current density is more at B than at A.
at A.

Q89. Electromagnetic waves are produced by: **1 Mark**

A A static charge.   **B** A moving charge.   **C** An accelerating charge.   **D** Chargeless particles.

Q90. A metal sheet with a circular hole is heated. The hole: **1 Mark**
    1. Gets larger.
    2. Gets smaller.
    3. Remains of the same size.
    4. Gets deformed.

Q91. If a positive charge is shifted from a low-potential region to a high-potential region, the electric potential energy. **1 Mark**

A Increases.   **B** Decreases.
C Remains the same.   **D** May increase or decrease.

Q92. In which of the following transitions will the wavelength be minimum? **1 Mark**

A n = 5 to n = 4   **B** n = 4 to n = 3
C n = 3 to n = 2   **D** n = 2 to n = 1

Q93. A horizontal circular loop carries a current that looks clockwise when viewed from above. It is replaced by an **1 Mark**
equivalent magnetic dipole consisting of a south pole S and a north pole N:

A The line SN should be along a diameter of the loop.   **B** The line SN should be perpendicular to the plane of
the loop.
C The south pole should be slow the loop.   **D** The north pole should be below the loop.

Q94. A moving charge produces: **1 Mark**

| A Electric field only. | B Magnetic field only. | C Both of them. | D None of them. |

Q95. A system can be taken from the initial state p$_1$, V$_1$ to the final state p$_2$, V$_2$ by two different methods. Let ΔQ and ΔW represent the heat given to the system and the work done by the system. Which of the following must be the same in both the methods? **1 Mark**

1. ΔQ
2. ΔW
3. $\Delta Q + \Delta W$
4. $\Delta Q - \Delta W$

Q96. A triode is operated in the linear region of its characteristics. If the plate voltage is slightly increased, the dynamic plate resistance will: **1 Mark**

| A Increase. | B Decrease. | C Remain almost the same. | D Become zero. |

Q97. A positive point charge Q is brought near an isolated metal cube. **1 Mark**

| A The cube becomes negatively charged. | B The cube becomes positively charged. |
| C The interior becomes positively charged and the surface becomes negatively charged. | D The interior remains charge free and the surface gets nonuniform charge distribution. |

Q98. A current passes through a wire of non-uniform cross-section. Which of the following quantities are independent of the cross-section? **1 Mark**

| A The charge crossing in a given time interval. | B Drift speed. |
| C Current density. | D Free-electron density. |

Q99. Consider the quantity $\frac{MkT}{pV}$ of an ideal gas where M is the mass of the gas. It depends on the, **1 Mark**

1. Temperature of the gas.
2. Volume of the gas.
3. Pressure of the gas.
4. Nature of the gas.

Q100. If the temperature of a uniform rod is slightly increased by Δt, its moment of inertia Iabout a line parallel to itself will increase by: **1 Mark**

1. Zero
2. $\alpha I \Delta t$
3. $2\alpha I \Delta t$
4. $3\alpha I \Delta t$