GITA NIKETAN AWASIYA VIDYALAYA
Salarpur Road, Kurukshetra (Haryana)

Holidays Homework_XII-A_2

(English)

- **Complete the reading and writing part in your Bravia.**

(Multimedia & Web Technology)

- Solve last 4 years question papers of Java Script based and Html based questions.
- Search all question papers from Google.

(Sanskrit)

- कक्षा द्वाद्वशी का ग्रीष्मावकाश गृह कार्य ऋतिका के पहले चार पाठ याद करने हैं । पाठाधारित संधि, समास, प्रत्यय, उपपद विभक्ति शब्दार्थ याद करने हैं ।

  अपठित गद्यांश पत्र लेखन व कथा लेखन का अभ्यास करना है ।

(Chemistry)

- Write NCERT intext and exercise questions of unit 11 to 16 in the notebook.

(Physics)

A. Questions based on capacitor:-

Q.1. Derive an expression for capacitance of a parallel plate capacitor.

Q.2. A parallel plate capacitor each with plate area A and separation 'd' is charged to a potential difference V. The battery used to charge it is then disconnected. A dielectric slab of thickness d and dielectric constant K is now placed between the plates. What change if any, will take place in

(i) charge on the plates
(ii) electric field intensity between the plates,
(iii) capacitance of the capacitor

Justify your answer in each case.

Q.3. A parallel plate is charged by a battery. When the battery remains connected, a dielectric slab is inserted in the space between the plates. Explain what changes if any, occur in the values of

(i) potential difference between the plates
(ii) electric field strength between the plates
(iii) capacitance
(iv) charge on the plates
(v) energy stored in the capacitor ?

Q.4. Two parallel plate capacitors X and y have the same area of plates and same separation between them. X has air between the plates while Y contains a dielectric medium $\varepsilon_r = 4$.

(i) Calculate the capacitance of each capacitor if equivalent capacitance of the combination is $4\mu F$.

(ii) Calculate the potential difference between the plates of X and Y.

(iii) Estimate the ratio of electrostatic energy stored in X and Y.

Q.5. A parallel plate capacitor of capacitance C is charged to a potential V. It is then connected to another uncharged capacitor having the same capacitance. Find out the ratio of the energy stored in the combined system to that stored initially in the single capacitor.

Q.6. Net capacitance of three identical capacitors in series is $2\mu F$. What will be their net capacitance if connected in parallel ?

Find the ratio of energy stored in the two configurations if they are both connected to the same source.

Q.7. (a) Deduce the expression for the energy stored in a charged capacitor.

(b) Show that the effective capacitances, C of a series combination of three capacitors C_1, C_2 and C_3 is given by

$$C = \frac{C_1 C_2 C_3}{(C_1 C_2 + C_2 C_3 + C_3 C_1)}$$

B. Questions based on Gauss Theorem:-

Q.8. Two charges of magnitudes $-2Q$ and + Q are located at points (a,0) and (4a,0) respectively. What is the electric flux due to these charges through a sphere of radius '3a' with its centre at the origin ?

Q.9. A charge q is placed at the centre of a cube of side l. What is the electric flux passing through two opposite faces of the cube ?

Q.10. An arbitrary surface encloses a dipole. What is the electric flux through this surface ?

Q.11. (i) Using Gauss Theorem show mathematically that for any point outside the shell, the field due to a uniformly charged spherical shell is same as the entire charge on the shell is concentrated at the centre.

(ii) Why do you expect the electric field inside the shell to be zero according to this theorem ?

OR

A thin conducting spherical shell of radius R has charge Q spread uniformly over its surface. Using Gauss's theorem, derive an expression for the electric field at a a point outside the shell.

Draw a graph of electric field $E(r)$ with distance r from the centre of the shell for $0 \le r \le \infty$.

OR

Find the electric field intensity due to a uniformly charged spherical shell at a point (i) outside the shell and (ii) inside the shell. Plot the graph of electric field with distance from the centre of the shell.

OR

Using Gauss's law obtain the expression for the electric field due to a uniformly charged thin spherical shell of radius R at a point outside the shell. Draw a graph showing the variation of electric field with r, for $r >$ R and $r < R$.

Q.12. Apply Gauss's Theorem to find the electric field near a charged conductor.

Show that the electric field at the surface of a charged conductor is $\vec{E} = \frac{\sigma}{\varepsilon_0}\ \hat{n}$ where σ is surface charge density and $\hat{n}$ is a unit vector normal to the surface in the outward direction.

Q.13. The flux of electrostatic field through the closed spherical surface S' is found to be four times that through the closed spherical surface S. Find the magnitude of the charge Q. Given $q_1 = 1\mu C, q_2 = -2\mu C, q_3 = 9.84\mu C.$

Q.14. A thin straight infinitely long conducting wire having charge density λ is enclosed by a cylindrical surface of radius r and length l, its axis coinciding with the length of the wire. Find the expression for the electric flux through the surface of the cylinder.

C. Questions based on current electricity:-

Q.15. Two identical cells, each of emf E, having negligible internal resistance, are connected in parallel with each other across an external resistance R. What is the current through this resistance ?

Q.16. Two heating elements of resistance R_1 and R_2 when operated at a constant supply of voltage, V, consume powers P_1 and P_2 respectively. Deduce the expressions for the power of their combination when they are, in turn, connected in (i) series and (ii) parallel across the same voltage supply.

Q.17. Define the terms (i) drift velocity, (ii) relaxation time.

Q.18. Sketch a graph showing the variation of resistivity of carbon with temperature.

OR

Plot a graph showing temperature dependence of resistivity for a typical semiconductor. How is this behaviour explained ?

Q.19. Establish a relation between electric current and drift velocity.

OR

Prove that the current density of a metallic conductor is directly proportional to the drift speed of electrons.

Q.20. Deduce Ohm/s law using the concept of drift velocity.

OR

Define the term 'drift velocity' of charge carriers in a conductor. Obtain the expression for the current density in terms of relaxation time.

OR

Define relaxation time of the free electrons drifting in a conductor. How is it related to the drift velocity of free electrons ? Use this relation to deduce the expression for the electrical resistivity of the material.

(i) On the basis of electron drift, derive an expression for resistivity of a conductor in terms of number density of free electrons and relaxation time. On what factors does resistivity of a conductor depend ?

(ii) Why alloys like constantan and manganin are used for making standard resistors ?

Q.21. Draw the circuit diagram of a potentiometer which can be used to determine the internal resistance (r) of a given cell of emd (E). Describe a method to find the internal resistance of a primary cell.

Why is a potentiometer considered to be superior or better than a voltmeter to measure the emf of a cell ?

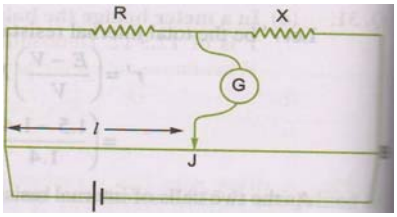
Q.22. Two conducting wires X and Y of same diameter but different materials are joined in series across a battery. If the number density of electrons in X is twice that in Y, find the ratio of drift velocity of electrons in the two wires.

Q.23. Estimate the average drift speed of conduction electrons in a copper wire of cross-sectional area 1.0×10^{-7} m^2 carrying a current of 1.5 Assume the density of conduction electrons to be 9×10^{28} m^{-3}.

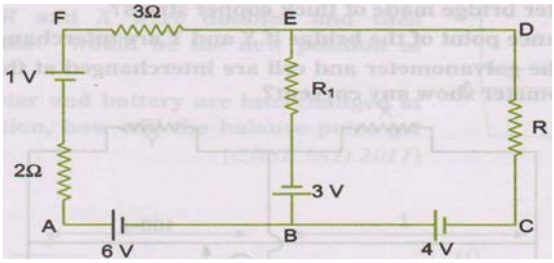
Q.24. In the meter bridge experiment, balance point was observed at J with AJ=l.

(i) The values of R and X were doubled and then interchanged. What would be the new position of balance point ?

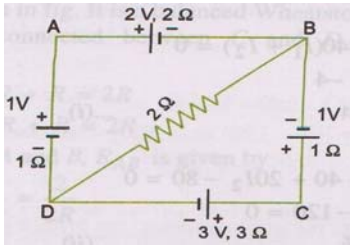
(ii) If the galvanometer and battery are interchanged at the balance position, how will the balance point get affected ?



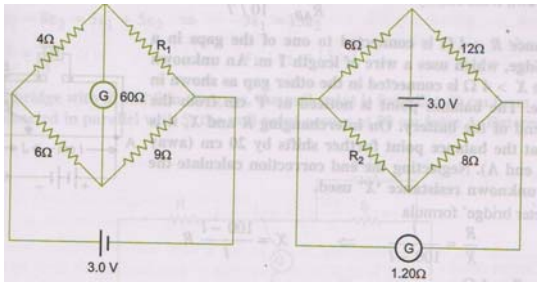
Q.25. Use Kirchhoff's rules to determine the potential difference between the points A and D when no current flows in the arm be of the electric network shown in the figure.



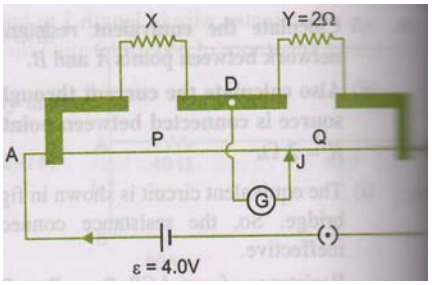
Q.26. For the circuit shown here, calculate the potential difference between points B and D.



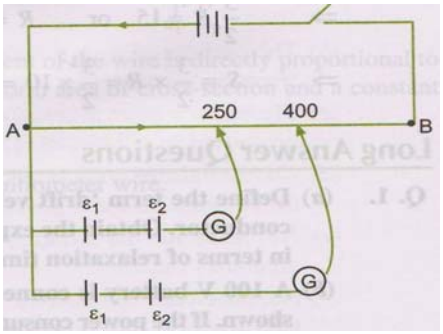
Q.27. Figure shows two circuits each having a galvanometer and a battery of 3V. When the galvanometers in each arrangement do not show any deflection, obtain the ratio $\frac{R_1}{R_2}$.



Q.28. In a practical Wheatstone bridge circuit, wire AB is 2m long. When resistance and jockey is in position J such that AJ=1.20 m, there is no current in galvanometer, find the value of unknown resistance X. The resistance per unit length of wire $AB = 0.01\ \Omega / cm.$ Also calculate the current drawn by the cell of emf 4.0 V and negligible internal resistance.



Q.29. Two primary cells of emfs wire ε_1 and $\varepsilon_2(\varepsilon_1 > \varepsilon_2)$ are connected to a potentiometer wire AB as shown in fig. If the balancing lengths for the two combinations of the cells are 250 cm and 400 cm, find the ratio of ε_1 and ε_2.



Q.30. Figure shows a potentiometer with a cell of 2.0 V and internal resistance of 0.40 Ω maintaining a potential drop across the resistor wire AB. A standard cell which maintains a constant emf of 1.02 V (for very moderate currents upto a few mA) gives a balance point at 67.3 cm length of the wire. To ensure very low currents drawn from the standard cell, a very high resistance of 600 $k\Omega$ is put in series with it, which is shorted close to the balance point. The standard cell is then replaced by a cell of unknown emf ε and the balance point found similarly, turns out to be at 82.3 cm length of the wire.

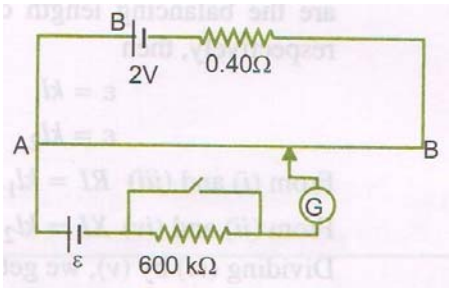
(a) What is the value of ε ?

(b) What purpose does the high resistance of 600 $k\Omega$?

(c) Is the balance point affected by this high resistance ?

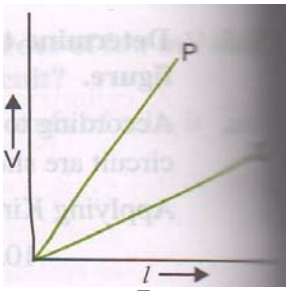
(d) Is the balance point affected by the internal resistance of the driver cell ?

(e) Would the method work in the above situation if the driver cell of the potentiometer had an emf of 1.0 V instead of 2.0 V ?

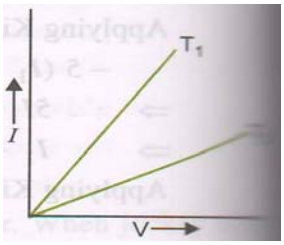


Q.31. Two wires one of manganin and the other of copper have equal length and equal resistance. Which one of these wires will be thicker ?

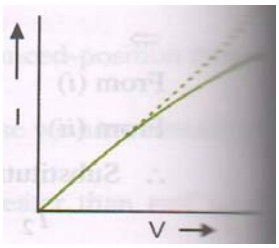
Q.32. The variation of potential difference V with length l in the case of two potentiometer P and Q is as shown. Which of these two will you prefer for comparing the emfs of two primary cells and why ?



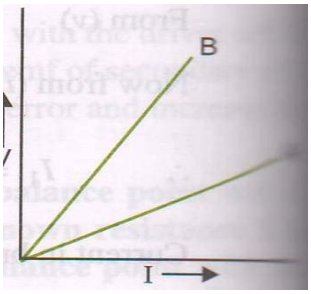
Q.33. I-V graph for a metallic wire at two different temperatures T_1 and T_2 is shown in the figure. Which of these two temperatures is higher and why ?



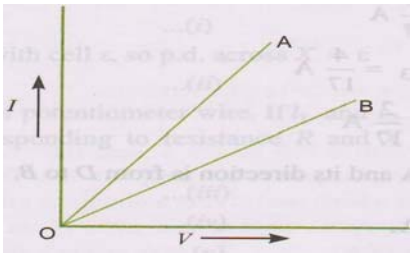
Q.34. The I-V characteristics of a resistor are observed to deviate from a straight line for higher values of current as shown in the adjoining figure why ?



Q.35. V-I graphs for parallel and series combinations of two metallic resistors are shown in figure. Which graph represents parallel combination ? Justify your answer.



Q.36. I-V graph for two identical conductors of different materials A and B is shown in the figure. Which one of the two has higher resistivity ?



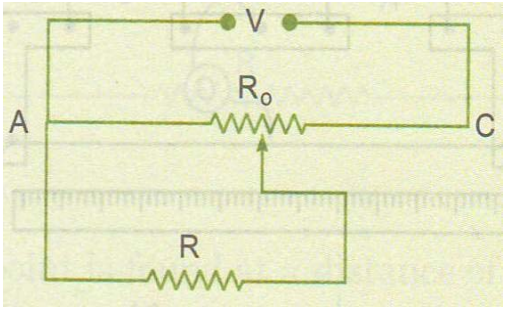
Q.37. The following graph shows the variation of terminal potential difference V, across a combination of three cells in series to a resistor, versus current i:

(i) calculate the emf of each cell.

(ii) for what current I, will the power dissipation of the circuit be maximum ?

Q.38. Calculate the value of the resistance R in the circuit shown in the figure so that the current in the circuit is 0.2 A. What would be the potential difference between points B and E ?

Q.39. A resistance of R Ω draws current from a potentiometer as shown in the figure. The potentiometer has a total resistance $R_o\Omega$. 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.



Note:- Solve NCERT solved and unsolved questions of chapter 1-5 in the Holiday Assignment notebo

(Maths)

Q.1. Show that the relation R on the set of real numbers defined as $R=\{(a,b):a\le b^2\}$ is neither reflexive, nor symmetric nor transitive.

Q.2. The binary operation $*:RxR\to R$ defined by $a*b=2a+b$ find $(2*3)*4$.

Q.3. $f:N\to N$ defined by $f(n)=\begin{cases}\frac{n+1}{2}, & \text{if n is odd}\\ \frac{n}{2}, & \text{if n is even}\end{cases}$ for all $n\in N$. Find whether f is bijection.

Q.4. Let $f:N\to R$ be a function defined as $f(x)=4x^2+12x+15$. Show $f:N\to S$ where $S=R(f)$ is invertible and find f^{-1}.

Q.5. Consider $f:R^+\to[-9,\infty)$ given by $f(x)=5x^2+6x-9$. Prove that f is invertible with $f^{-1}(y)=\frac{\sqrt{54+5y}-3}{5}$.

Q.6. Let $A=NxN$ and $*$ be binary operation on A defined by $(a,b)*(c,d)=(a+c,b+d)$ show that $*$ is commutative and associative. Also find identity element for $*$ on A, if any.

Q.7. Let N denotes set of all natural Nos let R is relation on NxN defined by $(a,b)R(c,d)$ if $ad(b+c)=bc(a+d)$. Show that R is an equivalence relation.

Q.8. Find principal value of $\sin^{-1}\left(\sin\frac{4\pi}{5}\right)$.

Q.9. Write the principal value of $\cos^{-1}\left(\frac{1}{2}\right)+2\sin^{-1}\left(\frac{1}{2}\right)$.

Q.10. Prove that $\cot^{-1}\left(\frac{\sqrt{1+\sin x}+\sqrt{1-\sin x}}{\sqrt{1+\sin x}-\sqrt{1-\sin x}}\right)=\frac{x}{2}, x\in(0,\pi/4)$.

Q.11. Show $\tan\left(\frac{1}{2}\sin^{-1}\frac{3}{4}\right)=\frac{4-\sqrt{7}}{3}$.

Q.12. Prove $\cos\left(\sin^{-1}\frac{3}{5}+\cot^{-1}\frac{3}{2}\right)=\frac{6}{5\sqrt{13}}$.

Q.13. If $0<x<1$ then solve $\tan^{-1}(x+1)+\tan^{-1}(x-1)=\tan^{-1}\frac{8}{31}$ *for x.*

Q.14. Solve $\cos\left(\tan^{-1}x\right)=\sin\left(\cot^{-1}\frac{3}{4}\right)$.

Q.15. Solve for x $2\tan^{-1}(\cos x)=\tan^{-1}(\cos ecx)$.

Q.16. If $\sin^{-1}x+\sin^{-1}y+\sin^{-1}z=\pi$ then prove that $x\sqrt{1-x^2}+y\sqrt{1-y^2}+z\sqrt{1-z^2}=2xyz$.

Q.17. Prove that $\tan\left(\frac{\pi}{4}+\frac{1}{2}\cos^{-1}\frac{a}{b}\right)+\tan\left(\frac{\pi}{4}-\frac{1}{2}\cos^{-1}\frac{a}{b}\right)=\frac{2b}{a}$.

Q.18. By using properties of determinants prove that $\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix}=(a+b+c)^3$.

Q.19. If $a=b=c\neq 0$ and $\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix}=0$ then prove that $\frac{1}{a}+\frac{1}{b}+\frac{1}{c}+1=0$

Q.20. If A is an invertible matrix of order 3 and $|A|=5$ then find $|adjA|$.

Q.21. If A=$\begin{bmatrix} 1 & -1 & 0 \\ 2 & 5 & 3 \\ 0 & 2 & 1 \end{bmatrix}$ find A^{-1} by using elementary row transformations.

Q.22. A school wants to award its students for the values of honesty, regularity and hardwork with a total cash award of Rs. 6000/-. Three times the award money for hardwork added to that given for honestly amounts to Rs. 11000/-. The award money given for honesty and hardwork together is double the one given for regularity, Represent the above situation algebraically and find the award money for each value using matrix method. Apart from these values, namely honesty, regularity and hardwork suggest one more value which the school must include for awards.

Q.23. Find equation of line joining (1,2) and (3,6) using determinants.

Q.24. Using properties of determinant prove that

$$\begin{vmatrix} a & a+b & a+b+c \\ 2a & 3a+2b & 4a+3b+2c \\ 3a & 6a+3b & 10a+6b+3c \end{vmatrix}=a^3$$

Q.25. Find value of K if area of a triangle is 4sq unit when its vertices are (K,0), (4,0) and (0,2).

Q.26. Using properties of determinant prove that

$$\begin{vmatrix} x+y & x & x \\ 5x+4y & 4x & 2x \\ 10x+8y & 8x & 3x \end{vmatrix} = x^3$$

Q.27. If $A=\begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$ then prove that $A^n=\begin{bmatrix} \cos n\theta & \sin n\theta \\ -\sin n\theta & \cos n\theta \end{bmatrix}, n \in N$

Q.28. Show that $A=\begin{bmatrix} 2 & -3 \\ 3 & 4 \end{bmatrix}$ satisfies $x^2-6x+17=0,$ hence find A^{-1}.

Q.29. Let $A=\begin{bmatrix} 3 & 2 & 5 \\ 4 & 1 & 3 \\ 0 & 6 & 7 \end{bmatrix}$ express A as a sum of a symmetric matrix and a skew symmetric matrix.

Q.30. Find the matrix X so that $X\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}=\begin{bmatrix} -7 & -8 & -9 \\ 2 & 4 & 6 \end{bmatrix}$.

<u>Note</u>:- A test will be conducted on topics relations, functions, binary operations and inverse trigonometric functions after summer vacations.