DAV Public School Gandhi Nagar (CCL), Ranchi – 8

Holiday Home – Work (2018-19)

Class : XII (Science)

English

1. Read the novel "The Invisible Man".
2. On the basis of your reading the novel prepare the character sketch of Mrs Hall and Griffin.

Maths

1. If * is a binary operation on set Q of rational numbers defined as a*b = ab/5. Write the identity for Binary *

2. If the binary operation * is defined on the set Q^+ of all positive rational numbers by a*b =ab/4. Then find the value of $3*\left(\frac{1}{5}*\frac{1}{2}\right)$

3. On the set of S = M(x) = $\begin{cases} \begin{pmatrix} x & x \\ x & x \end{pmatrix} : x \epsilon R \end{cases}$ of 2x2 matrices , find the identity element for the multiplication of matrices as a binary operation.

4. Let f :R→ R : f(x) = Sinx and g :R→ R : g(x) = x^2 . Find fog and gof and also show that fog ≠ gof

5. If f : R→ R is given by f(x) = $(3 - x^3)^{1/3}$ then show that fof = I_R . where I_R is the identity function on R.

6. Let R be the set of real numbers. If f : R→ R is given by f(x) = 3x + 2 ,∀ x ∈ R and g :R→ R is given by g(x) = $\frac{x}{x^2+1}$,∀ x ∈ R then find gof , fog , fof , gog

7. If f : R→ R and g : R→ R be functions defined by f(x) = $[x]$ and g(x) = $|x|$ then evaluate the following:

   (i) (f + 2g)(-2)   (ii) (f − g) (1/2)   (iii) gof (7/3) - fog (7/3)

8. Let A = { 1,2,3,5}, let f = {(1,5),(2,1),(3,3),(5,2)} and g = { (1,3),(2,1),(3,2),(5,5)} . Find gof ,fog, fof , gog

9. If f : R→ R be signum function defined as $\begin{cases} 1, if\ x > 0 \\ 0, if\ x = 0 \\ -1, if x < 0 \end{cases}$ and g : R→ R be the greatest integer function defined as g(x) = $[x]$, then find whether gof and fog coinside in (0,1]

10. Let f : R→ R be defined by f(x) = 1 + αx , $\alpha \neq 0$ ∀ x ∈ R . Show that 'f' is invertible and find its inverse function. Also find the value(s) of α for which inverse of 'f' is 'f' itself.

11. Let f : N U {0} → N U {0} be defined by f(x) = $\begin{cases} x + 1, if\ x\ is\ even \\ x - 1, if\ x\ is\ odd \end{cases}$ Show that f is invertible and f = f^1

12. If the function f : R→ R be defined by f(x) = 2x − 3 and g : R→ R by f(x) = x^3 + 5 , then find the value of $(f0g)^{-1}(x)$**(CBSE 2015)**

13. Consider $f : R - \left\{\frac{-4}{3}\right\} \to R - \left\{\frac{4}{3}\right\}$ given by $f(x) = \frac{4x+3}{3x+4}$. Show that f is bijective. Find the inverse of f and hence find $f^{-1}(0)$ and x such that $f^{-1}(x) = 2$ **(CBSE 2017)**

14. Show that the function $f : R \to R$ defined by $f(x) = \frac{x}{x^2+1}$, $\forall x \in R$ is neither one – one nor onto. Also if $g : R \to R$ is defined as $g(x) = 2x - 1$, find fog (x). **(CBSE 2018)**

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

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

17. Let A = QXQ where Q is the set of rational numbers and * be a binary operation on 'A' defined by (a,b) * (c,d) = (ac , b + d) for all (a, b) , (c, d) ε A, then find :**(2015)**

   (i)   Identity element of * in A

   (ii)   Invertible elements of A , and hence write the inverse of elements of (5,3) and (1/2, 4)

18. Given a non empty set X , consider the binary operation * : P(X) X P(X) → P(X) given by A * B = A ∩ B ∀ A , B in P(x) is the power set of X. Show that X is the identity element for this operation and X is the only invertible element in P(X) with respect to the operation *.

19. Given a non empty set X , consider the binary operation * : P(X) X P(X) → P(X) be defined as A * B = (A- B) ∪ (B – A) , ∀ A,B ∈ P(X) . Show that the empty set φ is the identity for the operation * and all the elements A of P(X) are invertible with A^{-1} = A

20. Define a binary operation * on the set {0,1,2,3,4,5} as $a * b = \begin{cases} a + b; if\ a + b < 6 \\ a + b - 6; if\ a + b - 6 \geq 6 \end{cases}$

   Show that the zero is the identity for this operation and each element 'a' of the set is invertible with 6 – a being the inverse of 'a'.

21. Let A = { x ∈ Z : 0 ≤ x ≤ 12 } . Show that R = { (a , b) : a , b ∈ A , $|a - b|$ is divisible by 4 } is an equivalence relation. Find the set of all elements related to 1. Also write the equivalence class [2].

22. Let N be the set of all natural numbers and R be the relation on N X N defined by (a ,b) R (c ,d) if

   ad (b + c) = bc (a + d). Check whether R is an equivalence relation.

23. Prove that a relation R on a set A is symmetric iff R = R^{-1}

24. If R is an equivalence relation on a set A , then R^{-1} is also an equivalence relation on A.

 Chemistry
Answer all the questions in a separate copy
Submit on the day of School opening after summer vacation
   1.   How many octahedral voids are there in 1 mole of a compound having cubic closed packed structure?
   2.   Arrange simple cubic, bcc and fcc lattice in decreasing order of the fraction of the unoccupied space.

3.	Explain:
	(a) List two differences between metallic and ionic crystals.
	(b) Sodium chloride is hard but sodium metal is soft.
4.	Derive the formula for the density of a crystal whose length of the edge of the unit cell is known?
5.	In a fcc arrangement of A and B atoms A are present at the corners of the unit cell and B are present at the face centres. If one atom of A is missing from its position at the corner, what is the formula of the compound?
6.	Explain the terms with examples:
	(a) Intrinsic semiconductor
	(b) Extrinsic semiconductor.
7.	How is impurity defects introduced in sodium chloride?
8.	Ferrous oxide crystals acquire the non-stoichiometric composition with formula $Fe_{0.95}O$. Give reason.
9.	An element 'X' (At. Mass = 40 g mol^{-1}) having f.c.c. structure,has unit cell edge length of 400 pm. Calculate the density of 'X' and the number of unit cells in 4 g of 'X'.
10.	the composition of a sample cobalt oxide is $Co_{0.92}O_{1.00}$. What percentage of the cobalt is present in the form of Co(III)?
11.	Classify the following substances as paramagnetic, ferromagnetic, anti- ferromagnetic, ferromagnetic and diamagnetic substances.
		CrO_2, $Mg_2Fe_2O_4$, plastic, Ni, KCl, MnO_2, Co^{3+}, CuO, NO, H_2O
12.	The density of an element (Atomic mass 208 $gMol^{-1}$) is 11.25 gcm^{-3} and the metal crystallizes with fcc unit cell. Determine the radius of the atom of the element.
13	Potassium crystallizes in bcc. The atomic radius of potassium atom is 210 pm. Determine the number of unit cells of potassium in 1 cm^3 of potassium metal.
14.	A metal crystallizes in a body centered cubic lattice with unit cell edge 5.26 Å. Determine the diameter of the metal atom.
15.	Give one example of the following:
	(i)	Crystal with metal deficiency defect.
	(ii)	Metal oxide which is Anti-ferromagnetic.
	(iii)	A metal oxide that behaves as metallic.

SOLUTION

1.	A 0.01m aqueous solution of K3[Fe(CN)$_6$] freezes at -0.062^{0}c. What is the apparent percentage of dissociation? (K_f for water= 1.86 kkg /mol).
2.	The boiling point of a solution of 5 gm of sulphur in 100 gm of carbon disulphide is 0 .476 ^{0}c above that of pure solvent. Determine the molar mass of sulphur in this solvent. The boiling point of pure carbon disulphide is 46.3^{0}c and its heat of vaporization is 84.1cal/gm.
3.	The molar volume of a liquid benzene (density = 0.877 gm/ml) increases by a factor 2750 as it vaporizes at 20^{0}c and that of liquid tolune (density =0.867 gm/ml) increases by a factor of 7720 at 20^{0}c has a vapour pressure of 46 torr. Find mole fraction of benzene in vapour above the solution.
4.	1000 gm of 1m aqueous solution of sucrose is cooled and maintained at -3.534^{0}c. Find how much ice separate out. K_F for water =1.86 K Kg/mol.
5.	What is the significance of K_H. ?
6.	What is reverse osmosis? Give its use.
7.	State the following :
	i)	Henry' s law about partial pressure of a gas in amixture.
	ii)	Raoult's law in its general form in reference to solution.
8.	Explain why a solution of chloroform and acetone shows negative deviation from raoults law.

9. Define molar conductivity of a solution .Explain how molar conductivity changes with change in concentration of solution.

10. The conductivity of 0.20M KCl at 298 k is 0.025s/cm. calculate its molar conductivity.

11. Zinc granules are added in excess to 500ml of 1M nickel nitrate solution at $25^{\circ}c$ until the equilibrium is reached. If the standard reduction potential of Zn/Zn^{2+} and Ni^{2+}/Ni are -0.75v and -0.24v respectively, find the concentration of Ni^{2+} in solution at equilibrium.

12. What is K_c for the following at $25^{\circ}c$?

$Cu^{2+}(aq)$ + $Sn^{2+}(aq)$ ---------.> $Sn^{4+}(aq)$ + $Cu(s)$

$E^0cu^{2+}/cu =0.34v$, $E^0sn^{4+}/sn^{2+} =0.15v$.

BIOLOGY

Q1. Explain the mechanism of sex determination in birds. How does it differ from that of human beings ?

Q2. **A.** Write the scientific name of the organism Thomas Hunt Morgan and his colleagues worked with for their experiments. Explain the correlation between linkage and recombination with respect to genes as studied by them.

B. How did Sturtevant explain gene mapping while working with Morgan.

Q3. What is a test cross ? How can it decipher the heterozygosity of a plant ?

Q4. How are pleitropy and Mendelian pattern of inheritance different from polygenic pattern of inheritance?

Q5. Explain how trisomy of 21st chromosome occurs in humans. List any four characteristic features in an individual suffering from it ?

Q6. How is it that human femalrs are rarely haemophilic ?

Q7. Why is thalassemia categorized as a Mendelian disorder ? Write the symptoms and explain the cause of the disease. How does it differ from sickle cell anaemia?

Q8. Describe the mechanism of pattern of inheritance of ABO blood group in humans.

Q9. Explain the cause ,inheritance patterns and symptoms of any two Mendelian genetic disorders .

Q10. State and explain with the help of a cross, the law of segregation as proposed by Mendel .

Computer Science

1. (a) What is the difference between global and local variable? Also, give a suitable C++ code to illustrate both.
   (b) Write the name of the header files which is/are essentially required to run/execute the following C++ code:

```
void main( )
{
char ch, word[ ] = "Sample Paper Gandhinagarl";
for(int i= 0; word[i] ! = '\0' ; i++)
if (word[i] == ' ')
cout<<endl ;
else
{
ch = tolower(word[i]);
cout<<ch;
}
}
```

(c) Rewrite the following program code after removing all syntax error (if any). Underline each correction:

```
include<iostream.h>
class User
{
long UId;
char ph_no[8];
public
void Authorize( )
{
cin>>UId; cin>>Ph_no;
}
void Show( )
{
cout<<UId << ":" << Ph_no << endl;
}
};
void main( )
{
User U;
Authorize. U( );
Show( );
}
```

(d) Find the output of the following program:

```
#include<iostream.h>
struct SQUARE
{
int X,Y,Z; };
void MoveIn(SQUARE &T,int Step=2)
{
T.X-=Step;
T.Y+=Step;
T.Z+=Step;
}void MoveOut(SQUARE &T,int Step=5)
        {
        T.X+=Step;
        T.Y-=Step;
        T.Z+=Step;
        }
        void main( )
        {
        SQUARE T1={10,20,5}, T2={30,10,40};
        MoveIn(T1);
        MoveOut(T2,10);
        cout<<T1.X<<"&"<<T1.Y<<"," <<T1.Z<<endl;
        cout<<T2.X<<"&"<<T2.Y<<","<<T2.Z<<endl;
        MoveIn(T2,20);
        cout<<T2.X<<"&"<<T2.Y<<","<<T2.Z<<endl;
        }
```

(e) Find the output of the following program:

```
#include<iostream.h>
void Func1 (char inf [ ], char CH)
```

```
{
for (int C = 0 ; inf[C] ! ='\0' ; C ++ )
{
if (inf[C] > = 'B' && inf[C] <= 'G')
inf[C] = '*';
else
if (inf[C] == 'A' || inf[C] == 'a')
inf[C]=tolower (inf[C]);
else
if (C % 2 = =0)
inf[C] = toupper (inf[C]);
else
inf[C] = CH;
}
void main( )
{
char Code [ ] = "BluEHeAvEn";
Func1 ( Code, '@');
cout<< "New Text:" <<Code <<endl;
}
```

(f) Go through the C++ code shown below, and find out the possible output or outputs from the suggested output options (i) to (iv). Also write the minimum and maximum value, which can be assigned to the variable MyNum.

```
#include<iostream.h>
#include<stdlib.h>
void main( )
{
randomize( );
int MyNum, Max = 5;
YourNum = 20 + random (Max );
for (int N = MyNum ; N < 25 ; N++ )
cout<< N << "*";
}       (i) 20 * 21 * 22 * 23 * 24 * 25
        (ii) 22 * 23 * 24 * 25 *
        (iii) 23 * 24
        (iv) 21 * 22 * 23 * 24 * 25
```

2. (a) What do you understand by Data Encapsulation and Data Hiding? Also, give an example in C++ to illustrate both.

    (b) Give the output of the following C++ code. Also write the name of the feature of Object Oriented Programming used in the following program jointly illustrated by the function [i] to [iv].

```
#include<iostream.h>
void Sample( )                                // Function  i
{
for( int J = 1 ; J<=80 ; J++) cout <<"-";
cout<<endl;
}
void Sample(int N)                            // Function ii
```

```
{
for( int J = 1 ; J<=N ; J++) cout <<"*";
cout<<endl;
}
void Sample (char Ch, int N)                        // Function iii
{
for( int J = 1 ; J<=N ; J++) cout <<Ch;
cout<<endl;
}
void Sample( int M, int N)                          // Function iv
{
for( int J = 1 ; J<=N ; J++) cout <<M*J;
cout<<endl;
}
void main( )
{
int X = 9, Y = 4, Z = 3;
char C = '#';
Sample(C, Y);
Sample(X, Z);
}
```

3. Define a class RENTAL in C++ with following description:
4

Private Members:
- Hno of type integer
- Abouthouse of type string
- houseType of type string
- Rent of type float
- A Function Assign_Rent( ) to calculate Rent of Car as per the following rules:

CarType	Rent
Bunglow	10000
MIG	8000
LIG	5000

Public Members:
- A function Gethouse( ) to allow user to enter values for Hno, Abouthouse, houseType, and call function Assign_Rent ( ) to calculate the House Rent.
- A function Showrent( ) to allow user to view the content of all the data members.

4 Write a function Swap2Change(int p[ ], int N) in C++ to modify the content of the array in such a way that elements, which are multiples of 10 swap with the values present in the very next position in the array.

For Example:
    If the content of the array P
    91, 50, 54, 22, 30, 54
    Then the content of the array should become:
    91, 54, 50, 22, 54, 30

5   Write a function in C++ to find the sum of left diagonal elements from a two dimensional array MAT[3][3].

For Example:
If the array MAT contents the elements:
   5 9 4
        2 5 3
        6 7 8
Then the output should be:
Sum of left diagonal : 15

Fine Art: Any Five Composition

PHYSICS

1.   A proton is released from rest, 10 cm from a charged sheet carrying charge density of $-2.21 \times 10^{-9} \text{ m}^2$. At what time the proton will strike the sheet.

2.   A uniform electric field exists in x-y plane. The potential of point A (2m,2m), B (-2m,2m) and C (2m,4m) are 4V, 16 V and 12V respectively. What will be the value of the electric field in the region?

3.   Two conducting concentric, hollow spheres A and B have radii a and b respectively, with A inside B. There common potential is V. A is now given some charge such that its potential becomes zero. What will be the potential of B?

4.   A positive point charge 50 μC is located in the plane x -y at the point with radius vector $r0 = 2i + 3j$, where i and j are the unit vectors of the x and y axes. Find the vector of the electric field strength E and its magnitude at the point with radius vector $r = 8i — 5j$ here r and r_0 are expressed in meters.

5.   A rectangular tank of mass m_0 charge Q over it is placed over a smooth horizontal floor. A horizontal electric field E exists in the region . Rain drops are falling vertically in the tank at the constant rate of n drops per second. Mass of each drop is m. Find the velocity of the tank as function of time.

6.   The electric potential varies in space according to the relation V= 3x + 4y. A particle of mass 10 kg starts from rest from point (2, 3.2) m under the influence of this field. Find the velocity of the particle when it crosses the x- axis. The charge on the particle is +1μ C. Assume V (x, y) are in SI units.

7.   Find the equivalent capacitance of the network shown in the figure:

(i)   A   2μF   (ii)   A

(iii)   A   (iv)   A

8 | P a g e
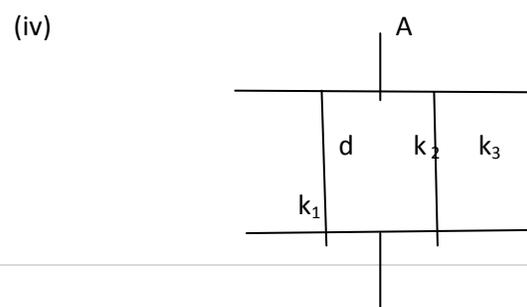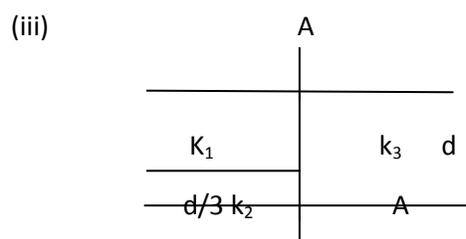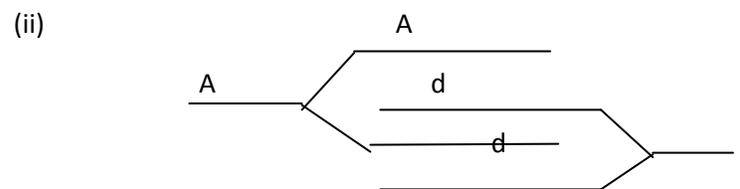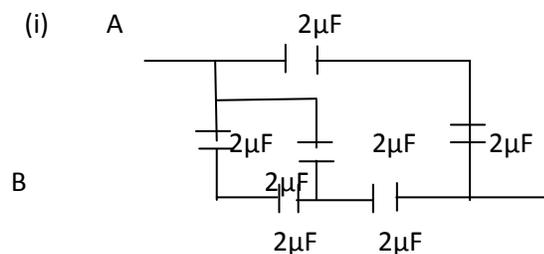
8.   Two small equally charged spheres each of mass m are suspended from the same point by silk threads of length l. The distance between the spheres x<<l ,Find the rate dq/dt with which the charge leaks off from each sphere if their approach velocity varies as $v=a/\sqrt{x}$ where a is constant.

9.   The plate A of a parallel plate capacitor is connected to a spring of force constant k and can move while the plate B is fixed . The arrangement is held between two rigid supports as shown in the figure . If a charge +q is placed on plate A and –q on plate B how much is the spring elongate?

A   C   B
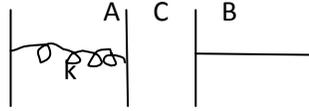
10.   Two identical metal plates are given charges q_1 and q_2 ($<q_1$) respectively. If they are now brought closet together to form a parallel plate capacitor with capacitance C what will be the potential difference between the plates?

11.   Draw and distribute charges in different geometric figures in which the electric field at the centre of the figure is zero but not the electric field.

12:    Write 08 different properties of electric lines of force.

13:    Write the properties of equipotential surfaces.(at least six).

14:     Write on your own 05 questions based on electric flux where in the flux is zero .Solve the questions and prove that the flux is zero in all five questions.

15:    Given below a charged body AB of length L containing charge Q and having uniform charge density λ.

D

A   O   B
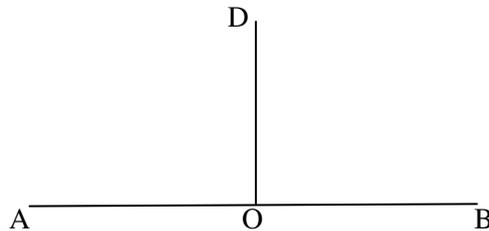
OD is the perpendicular bisector of AB.Find the electric potential at the point D at a distance r from O