





- 23. The eccentricity of the ellipse  $25x^2 + y^2 - 150x - 90y + 225 = 0$**   
 1)  $\frac{3}{5}$                       2)  $\frac{4}{5}$                       3)  $\frac{2}{3}$                       4)  $\frac{1}{3}$
- 24.  $(-4,1)(6,1)$  are the vertices of an ellipse and one of the foci lie  $x - 2y = 2$  then the eccentricity is**  
 1)  $\frac{3}{5}$                       2)  $\frac{4}{5}$                       3)  $\frac{2}{5}$                       4)  $\frac{1}{5}$
- 25. A circle is described with major axis of the ellipse as diameter. If the foci lie on the circle, then the eccentricity of the ellipse is**  
 1)  $\frac{1}{\sqrt{3}}$                       2)  $\frac{1}{\sqrt{2}}$                       3)  $\frac{1}{\sqrt{2}}$                       4)  $\frac{1}{\sqrt{5}}$
- 26. If the angle between the lines joining the foci to an extremity of minor axis of an ellipse is  $90^\circ$  its eccentricity is**  
 1)  $\frac{1}{2}$                       2)  $\frac{\sqrt{3}}{2}$                       3)  $\frac{1}{\sqrt{3}}$                       4)  $\frac{1}{\sqrt{2}}$
- 27. The centre of the ellipse  $\frac{(x+y-2)^2}{9} + \frac{(x-y)^2}{16} = 1$**   
 1) (0,0)                      2) (1,1)                      3) (1,0)                      4) (0,1)
- 28.  $e$  is the eccentricity of the ellipse  $4x^2 + 9y^2 = 36$ , and  $c$  is the centre and  $s$  is the focus and  $A$  is the vertex then  $CS : SA =$**   
 1)  $3 - \sqrt{5} : \sqrt{5}$                       2)  $\sqrt{5} : 3 - \sqrt{5}$                       3)  $3 + \sqrt{5} : \sqrt{5}$                       4)  $\sqrt{5} : 3 + \sqrt{5}$
- 29. An ellipse with centre at (0,0) cuts  $x$  axis at (3,0) and (-3,0) if its  $e = \frac{1}{2}$  then the length of the semi minor axis is**  
 1)  $2\sqrt{3}$                       2)  $\sqrt{5}$                       3)  $3\sqrt{2}$                       4)  $\frac{3\sqrt{3}}{2}$
- 30.  $PSP'$  is focal chord of the ellipse  $4x^2 + 9y^2 = 36$ , if  $SP = 4$  then  $SP'$**   
 1)  $\frac{2}{3}$                       2)  $\frac{3}{5}$                       3)  $\frac{4}{5}$                       4)  $\frac{4}{3}$
- 31. The distance of the point ' $\theta$ ' on the ellipse  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$  from a focus is**  
 1)  $a(e + \cos\theta)$                       2)  $a(e - \cos\theta)$                       3)  $a(1 + e\cos\theta)$                       4)  $a(1 + 2e\cos\theta)$
- 32. If  $\frac{x}{a} + \frac{y}{b} = \sqrt{2}$  touches the ellipse  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$  then the eccentricity angle  $\theta$  of the point of contact is equal to**  
 1)  $0^\circ$                       2)  $90^\circ$                       3)  $45^\circ$                       4)  $60^\circ$
- 33. Equation to the pair of tangents drawn from (2,-1) to the ellipse  $x^2 + 3y^2 = 3$  is**  
 1)  $y^2 + 4xy + 4x - 6y - 7 = 0$                       2)  $y^2 - 4xy - 8x + 5y + 9 = 0$   
 3)  $y^2 - 4xy - 6x - 8y + 5 = 0$                       4)  $y^2 + 4xy + 4x + 6y + 9 = 0$
- 34. The locus of point of intersection of perpendicular tangents to the ellipse  $\frac{(x-1)^2}{16} + \frac{(y-2)^2}{9} = 1$  is**  
 1)  $(x-1)^2 + (y-2)^2 = 25$                       2)  $(x-1)^2 + (y-2)^2 = 7$   
 3)  $(x+1)^2 + (y+2)^2 = 25$                       4)  $(x+1)^2 + (y+2)^2 = 7$

35. The radius of the director circle of the ellipse  $9x^2 + 25y^2 - 18x - 100y - 116 = 0$  is  
 1)  $\sqrt{34}$                       2)  $\sqrt{29}$                       3) 5                      4) 8
36. A conic passing through origin has its foci at  $(5,12), (24,7)$  then its eccentricity is  
 1)  $\frac{\sqrt{386}}{38}$                       2)  $\frac{\sqrt{386}}{39}$                       3)  $\frac{\sqrt{386}}{47}$                       4)  $\frac{\sqrt{386}}{51}$
37. The points on the ellipse  $3x^2 + y^2 = 37$  where the normal to it are perpendicular to  $6x + 5y - 2 = 0$  are  
 1)  $(3,5)(-3,-5)$                       2)  $(2,5)(-2,-5)$                       3)  $(5,3)(-5,-3)$                       4)  $(-5,3)(5,-3)$
38. A line touches the ellipse  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$  and the circle  $x^2 + y^2 = r^2$  then the slope  $m$  of the common tangent is given by  $m^2 =$   
 1)  $\frac{a^2 - r^2}{b^2 - r^2}$                       2)  $\frac{r^2 - b^2}{a^2 - r^2}$                       3)  $\frac{r^2 + b^2}{a^2 - r^2}$                       4)  $\frac{r^2 - 2b^2}{a^2 - 2r^2}$
39. Let  $SS'$  be the foci of an ellipse of  $\angle BSS' = \theta$  then its eccentricity is  
 1)  $\tan \theta$                       2)  $\sin \theta$                       3)  $\cos \theta$                       4)  $\cot \theta$
40. If the major axis is  $n$  times the minor axis of the ellipse then eccentricity is  
 1)  $\frac{\sqrt{n-1}}{n}$                       2)  $\frac{\sqrt{n-1}}{n^2}$                       3)  $\frac{\sqrt{n^2-1}}{n^2}$                       4)  $\sqrt{\frac{n^2-1}{n^2}}$

### PHYSICS

#### **Syllabus: Moving Charges & Magnetism**

41. Current sensitivity of a galvanometer can be increased by decreasing  
 1) Torsional Constant                      2) restoring couple per unit twist  
 3) Both 1 and 2                      4) neither 1 nor 2
42. To convert galvanometer in to a voltmeter of given range, a suitable high resistance should be connected in \_\_\_\_\_ with the galvanometer.  
 1) must be series                      2) must be parallel  
 3) may be series or parallel                      4) no need to connect any resistance
43. When a magnetic dipole of moment  $\vec{M}$  rotates freely about its axis from unstable equilibrium to stable equilibrium in a magnetic field  $\vec{B}$ , the rotational kinetic energy gained by it is  
 1) zero                      2)  $MB$   
 3)  $2MB$                       4) impossible to rotate
44. An electron passes undeflected when passes through a region with electric and magnetic fields. When electric field is switched off its path will change to \_\_\_\_  
 1) circular                      2) parabolic                      3) elliptical                      4) no change in path
45. The ratio of angular momentum (L) to magnetic moment (M) of an electron of mass  $m$  charge  $e$  revolving in a circular orbit is \_\_\_\_  
 1)  $\frac{e}{2m}$                       2)  $\frac{2m}{e}$                       3)  $\frac{e}{m}$                       4)  $\frac{m}{e}$
46. The path of charged particle moving perpendicularly with  $\vec{B}$  is \_\_\_\_  
 1) elliptical                      2) parabolic                      3) circular                      4) will be straight

47. There is no change in the \_\_\_\_\_ as a charged particle moving in a magnetic field, although magnetic force is acting on it.  
 1) momentum                      2) velocity                      3) both 1 and 2                      4) kinetic energy
48. Two linear parallel conductors carrying currents in the opposite direction \_\_\_\_\_ each other.  
 1) repel                                  2) attract  
 3) no effect                              4) depends on type of metal
49. **A: Two parallel wires carrying current in the same direction attract each other**  
**B: Two parallel wires carrying current in the same direction repel each other**  
 1) A correct                              2) B correct                              3) B wrong                              4) we cannot say
50. A charge moves in a circle inside magnetic field. The time period of revolution is ...  
 1)  $T = \frac{\pi m}{2qB}$                               2)  $T = \frac{2\pi m}{qB}$                               3)  $T = \frac{\pi m}{qB}$                               4) none of these
51. **A: Electron enters into a magnetic field at an angle of 60 degree with boundary. Its path shape depends on angle.**  
**B: Electron enters into a magnetic field at an angle of 60 degree with boundary. Its path shape does not depend on angle, it is arc of a circle.**  
 1) A only true                              2) B only true                              3) both A and B wrong                              4) none of these
52. To convert a moving coil galvanometer into an ammeter of a given range we must connect a suitable low resistance in ....  
 1) must be series                              2) must be parallel  
 3) may be series or parallel                              4) no need to connect any resistance
53. A wire of length 'l' carries a current I along X-axis a magnetic field exists given by  $B = B_0(\hat{i} + \hat{j} + \hat{k})T$ . The magnitude of magnetic force acting on wire is  
 1)  $\sqrt{2}B_0il$                               2)  $\frac{B_0il}{\sqrt{2}}$                               3)  $B_0il$                               4)  $\frac{B_0il}{2}$
54. **A: The magnetic field due to a very long wire carrying a current, decreases as the square of the distance from the wire.**  
**B: The magnetic field due to a very long wire carrying a current inversely proportional to the distance from the wire**  
 1) A only correct                              2) B only correct                              3) both are wrong                              4) we cannot say
55. **A: Magnetic field lines always form closed loops**  
**B: Electric field lines always form open loops**  
 1) A: true, B: false                              2) A: true, B: true                              3) A: false, B: false                              4) A: false, B: true

56. **A: Static charge is a source of electric field but not of magnetic field**  
**B: Current carrying conductor is a source of magnetic field but not of electric field**  
 1) A: true, B: false      2) A: true, B: true      3) A: false, B: false      4) A: false, B: true
57. **When a coil carrying current is set with its plane perpendicular to the direction of magnetic field, then torque on the coil is (N: number of turns of coil, A: area of the coil, B: magnetic field and i: current)**  
 1)  $NiAB$       2) zero      3)  $\frac{NiAB}{\sqrt{2}}$       4)  $\frac{NiAB}{2}$
58. **A linear conductor carrying current if placed parallel to the direction of magnetic field, then it experiences \_\_\_\_\_ force**  
 1) maximum magnetic force      2) undefined magnetic force  
 3) zero magnetic force      4) none of these
59. **Electric current flows through a thick wire. Magnetic field at a point on its surface is \_\_\_\_\_ and is \_\_\_\_\_ on its axis.**  
 1)  $B = \frac{\mu_0 I}{2\pi R}$ , infinity      2)  $B = \frac{\mu_0 I}{2\pi R}$ , zero      3)  $B = \frac{\mu_0 I}{2\pi R}$ ,  $B = \frac{\mu_0 I}{2\pi R}$       4) none of these
60. **The force between two current carrying conductors parallel to each other and carrying current in same direction of 1A which are placed at 1meter distance the force per unit length on the conductor is (in SI units)**  
 1)  $2 \times 10^{-7} N$       2)  $1 \times 10^{-7} N$       3)  $3 \times 10^{-7} N$       4) not defined

## CHEMISTRY

### Syllabus: 16<sup>th</sup> & 17<sup>th</sup> Group Elements

61. **When sulphur is treated with excess of fluorine, the compound formed is**  
 1)  $SF_4$       2)  $S_2F_2$       3)  $SF_6$       4)  $S_2F_6$
62. **Hybridisation of oxygen in  $O_2F_2$ .**  
 1) SP      2)  $SP^2$       3)  $SP^3$       4)  $SP^3d$
63. **Which of the following oxides reacts with both HCl and NaOH**  
 1) CaO      2) ZnO      3)  $N_2O_5$       4)  $CO_2$
64. **The strongest acid among the following**  
 1)  $H_2SO_4$       2)  $H_2SeO_4$       3)  $H_2TeO_4$       4)  $H_2PoO_4$
65. **Which of the following brings about dry bleaching?**  
 1) Ozone      2) Chlorine      3) Sulphurdioxide      4) Hydrogen peroxide
66. **One of the following has O-O bond.**  
 1)  $H_2S_2O_6$       2)  $H_2S_2O_7$       3)  $H_2S_2O_5$       4)  $H_2S_2O_8$
67. **The gas that cannot be collected over water is**  
 1)  $N_2$       2)  $O_2$       3)  $SO_2$       4)  $PH_3$
68. **Caro's acid is**  
 1)  $H_2SO_5$       2)  $H_2S_2O_8$       3)  $H_2SO_3$       4)  $H_2S_2O_3$

- 69. Metal reacts with sulphur to give**  
 1) sulphide                      2) sulphite                      3) sulphate                      4) thiosulphate
- 70. Conc  $H_2SO_4$  is not**  
 1) Hygroscopic                      2) Dehydrating agent  
 3) Sulphonating agent                      4) Efflorescent
- 71. Halogen with highest bond energy**  
 1)  $F_2$                       2)  $Cl_2$                       3)  $Br_2$                       4)  $I_2$
- 72. Hybridisation of iodine in  $IF_7$  molecule**  
 1)  $SP^3$                       2)  $SP^3d$                       3)  $SP^3d^2$                       4)  $SP^3d^3$
- 73. Chlorine is manufactured in Nelson's cell by**  
 1) Electrolysis of brine                      2) Electrolysis of  $CaOCl_2$   
 3) Electrolysis of  $HClO_4$                       4) Electrolysis of  $ClO_2$
- 74. Gas is soluble in**  
 1)  $\Delta HF$                       2)  $H_2SO_4$                       3)  $HClO_4$                       4) Aqua regia
- 75. Which is strongest oxidation agent**  
 1)  $F_2$                       2)  $Cl_2$                       3)  $Br_2$                       4)  $I_2$
- 76. Shape of  $ClO_2^-$  ion is**  
 1) Linear                      2) Angular                      3) Pyramid                      4) None
- 77. The stability of hydrogen halides is in the order**  
 1)  $HF > HI > HBr > HCl$                       2)  $HI > HBr > HCl > HF$   
 3)  $HF > HCl > HBr > HI$                       4)  $HCl > HBr > HI > HF$
- 78. Which of the following halogens does not form oxyacids**  
 1)  $F_2$                       2)  $Cl_2$                       3)  $Br_2$                       4)  $I_2$
- 79. Which of the following is the weakest acid**  
 1) HF                      2) HCl                      3) HBr                      4) HI
- 80. The chemical formula of tear gas is**  
 1)  $COCl_2$                       2)  $CO_2$                       3)  $Cl_2$                       4)  $CCl_3NO_2$

**KEY SHEET**

**MATHS**

1) 1	2) 4	3) 1	4) 1	5) 1	6) 2	7) 4	8) 1	9) 2	10) 2
11) 2	12) 1	13) 1	14) 2	15) 1	16) 2	17) 2	18) 2	19) 3	20) 3
21) 3	22) 4	23) 2	24) 1	25) 2	26) 4	27) 2	28) 2	29) 4	30) 4
31) 3	32) 3	33) 1	34) 1	35) 1	36) 1	37) 2	38) 2	39) 3	40) 4

**PHYSICS**

41) 3	42) 2	43) 3	44) 1	45) 2	46) 3	47) 4	48) 1	49) 2	50) 2
51) 2	52) 1	53) 1	54) 2	55) 2	56) 2	57) 2	58) 3	59) 2	60) 1

**CHEMISTRY**

61) 3	62) 3	63) 2	64) 1	65) 1	66) 4	67) 3	68) 1	69) 1	70) 4
71) 2	72) 4	73) 1	74) 1	75) 1	76) 2	77) 3	78) 1	79) 1	80) 4

**HINTS & SOLUTIONS**

**MATHS**

1.  $(1-x)^2(1-x^5)^{-2}$   
Expand and find coefficient of  $x^{10}$
2.  $\left((1+x)^{-2}\right)^2$   
 $= (1+x)^{-4}$   
Expand
3.  $\left(\frac{1-x}{1+x}\right)^{1/2} = 1 - \frac{1}{2}\left(\frac{2x}{1+x}\right) + \dots$   
 $A = -1$
4.  $\frac{3x-8}{(2-x)^2} = \frac{3x-8}{4}\left(1-\frac{x}{2}\right)^{-2}$
5. Use  $(1-x)^{-p/q}$
6. Put  $\frac{1}{x} = t, (1-t)^{-2} = \frac{1}{2}$
7.  ${}^{216}C_0(\sqrt{2})^6 + {}^6C_2(\sqrt{2})^4 + {}^6C_4(\sqrt{2})^2 + {}^6C_6$
8.  $(x-1+1)^4 = x^4$
9.  $(101)^{50} - (99)^{50} = (100+1)^{50} - (100-1)^{50}$



10. Use multinomial

$$\frac{6!}{a!b!c!}, 1^a 2^b c^c, a+b+c=6$$

$$(a \ b \ c) \Rightarrow (6, 0, 0), (4, 2, 0), (2, 4, 0)$$

$$(0 \ 6 \ 0), (3, 0, 3), (1, 2, 3), (0, 0, 6)$$

11.  $x+4 = A(x+2)(x+1) + B(x-2)(x+1) + C(x^2-4)$

Equating  $x^2$  coefficient

12.  $x+2 = Ax(x-1) + B(x^2-1) + Cx(x+1)$

13.  $1 = a(1-2x)(1-3x) + b(1-x)(1-3x) + c(1-x)(1-2x)$

14. Put  $x=1$  on both sides

15.  $A(x^2+1) + (Bx+C)x = x^2 + 2x + 1$

16.  $(Ax+B)(x^2-x+1) + (Cx+D)(x^2+x+1) = x^2 + 1$

Compare coefficient of  $x^2$

17.  $3x+2 = A(2x^2+3) + (Bx+c)(x+1)$

18. Put  $x=0$

19. Put  $x^2+1=y$

20. Find the value of  $f(-1)$

21.  $ae = 4, \frac{2b^2}{a} = \frac{20}{3}$

22.  $t\left(\frac{x}{a}+1\right) = \frac{y}{b}, \frac{x}{a}-1 = \frac{-ty}{b}$

$$t\left(\frac{x^2}{a^2}-1\right) = -t\frac{y^2}{b^2}$$

$$\Rightarrow \frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$

23.  $25(x^2-6x) + 9y^2 - 90y + 225 = 0$

$$25(x^2-6x+9-9) + 9(y^2-10y+25-25) + 225 = 0$$

$$25(x-3)^2 + 9(y-5)^2 = 225$$

$$\frac{(x-3)^2}{9} + \frac{(y-5)^2}{25} = 1$$

$$e = \sqrt{\frac{b^2-a^2}{b^2}}$$

24.  $(1+5e, 1)$  lies on  $x-2y=2$

25.  $CB = CS$

26.  $\tan 45^\circ = \frac{CB}{CS}$

27. Point of intersection of  $x+y-2=0, x-y=0$

28.  $CS : CA = ae : (a-ae)$

29.  $a=3, e = \frac{1}{2} b^2 = 9\left(1-\frac{1}{4}\right)$

$$b = \frac{3\sqrt{3}}{2}$$

30.  $\frac{1}{SP} + \frac{1}{SP'} = \frac{2a}{b^2}$

31.  $a + ex_1$

32.  $\frac{x}{a} \cos \theta + \frac{y}{b} \sin \theta = 1$

$$x + y\sqrt{2} = 2\sqrt{2}$$

Comparing two equations

33.  $S_1^2 = S.S_{11}$

34.  $(x-h)^2 + (y-k)^2 = a^2 + b^2$

35.  $r = \sqrt{a^2 + b^2}$

36.  $SP + S'P = 2a$

37. Sub the options in the ellipse

38.  $r = \sqrt{\frac{a^2 m^2 + b^2}{1 + m^2}}$

39.  $\cos \theta = \frac{CS}{CB}$

40.  $n = \frac{a}{b} \Rightarrow e = \frac{\sqrt{n^2 - 1}}{n}$

### PHYSICS

41.  $\left[ C_s = \frac{NBA}{C} \right]$  Torsional Constant or restoring couple per unit twist.

42. Series  $R = \left( \frac{V}{I_t} - G \right)$

43.  $2MB[\Delta K = \Delta U = MB - (-MB)]$

44. Circular

45.  $M = \frac{e}{2m} L$

46. Path of the charged particle will be circular.

47. When a charge particle moves through the magnetic field, its kinetic energy remains constant.

48. Repel

49. conceptual

50.  $\left[ T = \frac{2\pi m}{qB} \right]$

51. conceptual

52. conceptual

53. by using  $\vec{F} = i(\vec{L} \times \vec{B}) = B_0 il(\hat{k} - \hat{j})$

$$F = \sqrt{2} B_0 il$$

54.  $\left[ B = \frac{\mu_0 I}{2\pi r} \right]$

55. conceptual

56. conceptual

57.  $\vec{c} = \vec{M} \times \vec{B} = Ni(\vec{A} \times \vec{B})$

$\tau = NiAB \sin \theta$

$\theta$ : angle between normal to the plane and M and it is  $0^\circ$  here

58.  $F = Bil \sin \theta$

59. conceptual

60. definition of 'ampere'

**CHEMISTRY**

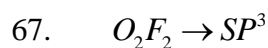
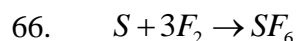
61.  $ClO_2^-$  has two lone pairs and two bond pairs Hence shape is angular

62. Thermal stability of halogens halides  $HF > HCl > HBr > HI$

63. E.N of F is higher than oxygen

64. HF has high bond dissociation energy

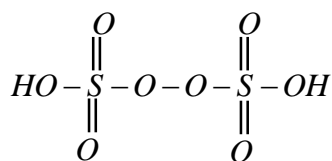
65. Trichloro nitro methane is called tear gas.



68. ZnO is amphoteric



70.  $O_3$  acts as dry bleach



71.

72.  $SO_2$  is dissolved in  $H_2O$  to form sulphurous acid

73.  $H_2SO_5$  - Caro's acid



75. Efflorescent

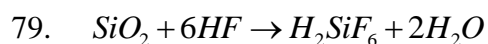
76. Bond dissociation energy =  $Cl_2 > Br_2 > F_2 > I_2$

77.  $IF_2: -7 + \frac{1}{2}(-7) \Rightarrow 7 + 0$

No of bond pairs =7, no of lone pair=0

Hybridisation =  $sp^3d^3$

78. Brine solution is electrolyte in nelson's method



80. Oxidising power =  $F_2 > Cl_2 > Br_2 > I_2$