EDT - 14 - Physics (2017 Aspirants)
(SOLUTION)

1. (2)

$r = \frac{mv}{qB} = \frac{\sqrt{2mk}}{qB}$

$r \alpha \sqrt{m}$

$\because m_p > m_e$

So $r_p > r_e$, hence path of proton is less curved

2. (1)

$r = \sqrt{\frac{2mk}{qB}}$

Area, $A = \pi r^2 = \frac{\pi(2mk)}{q^2B^2}$

$A \alpha k$

3. (4)

$\frac{1}{2} m v^2 = q V$

$\therefore v = \sqrt{\frac{2qV}{m}}$

Magnetic force on charge particle, $F = q vB$

$F \alpha v$

$\therefore F \alpha \sqrt{v}$

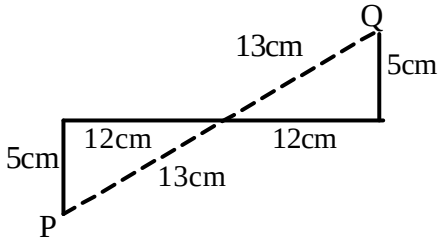
Which gives $F' = \sqrt{2}F$

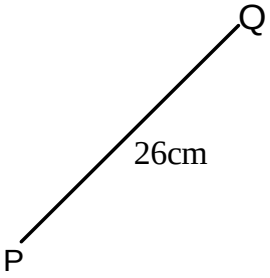
4. (2)

Particle is moving un-deflected in the presence of both electric and magnetic field , so

$v = \frac{E}{B} \Rightarrow B = \frac{E}{v} = \frac{10^5}{10} = 10^4 wb/m^2$

5. (2) The given wire an be replaced by a straight wire as shown





Force experienced by the wire, $F = iLB = 10 \times 0.26 \times 5 = 13N$

6. (4)

$\vec{F} = I\vec{\ell} \times \vec{B}$

Here $\theta = 90^\circ$, $F = I\ell B$

In this case $\ell = \frac{L}{2}$

$\therefore F = I.\frac{L}{2}.B = \frac{BIL}{2}$

7. (2)

8. (1)

As current is in the same direction for each of the turns, hence similar current will attract each other.

9. (2)

$\vec{F} = i\vec{\ell} \times \vec{B} = i\left[\ell\hat{i} \times B_0\left(\hat{i} + \hat{j} - \hat{k}\right)\right]$

$\vec{F} = B_0 i\ell\left[\hat{k} + \hat{j}\right]$

Magnitude, $F = B_0 i\ell.\sqrt{2}$

10. (2)

The loop can be divided into two square loops. The two magnetic moments of loops are perpendicular to each other

For each square loop, $M = Ia^2$

We have $M_1 = M_2 = Ia^2$

Net magnetic moment , $M = \sqrt{M_1^2 + M_2^2} = \sqrt{2}M_1 = \sqrt{2}Ia^2$

11. (4)

Current sensitivity $\frac{I}{\theta} = \left(\frac{C}{nAB}\right)$

12. (3)

An ammeter can be converted into a voltmeter by connecting a high resistance in series with it.

13. (1)

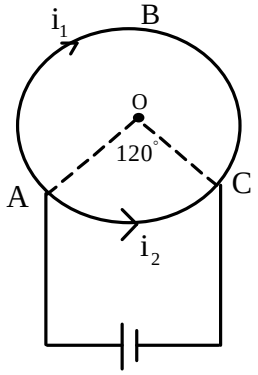
$F = iLB$

Magnitude of magnetic force on the conductor

$F = I\lambda B$

This force is directed along positive z-axis

14. (3)



$$B = \frac{\mu_0}{4\pi}.\frac{i}{r}.\theta$$

$$B \alpha i\theta$$

$$\therefore \frac{B_1}{B_2} = \frac{\theta_1}{\theta_2} \times \frac{i_1}{i_2} \qquad i_1\ell_1 = i_2\ell_2$$

$$= \frac{\theta_1}{\theta_1} \times \frac{\theta_2}{\theta_1} = 1 \qquad \frac{i_1}{i_2} = \frac{\ell_2}{\ell_1} = \frac{\theta_2}{\theta_1}$$

15. (2)

The magnetic fields at the centre O due to the inner and outer arcs are opposite to each other. Net magnetic field at centre O is

$$B = \frac{\mu_0 I}{4r_2} - \frac{\mu_0 I}{4r_1} = \frac{\mu_0 I}{4}\left(\frac{1}{r_2} - \frac{1}{r_1}\right) = \frac{\mu_0 I}{4}\left(\frac{r_1 - r_2}{r_1 r_2}\right)$$

16. (4)

When $x > r$, $B \alpha \frac{1}{x}$

When $x < r$, $B \alpha x$

17. (1)

The magnetic field will inside a solenoid is given by $B = \mu_0 ni$, n = no. of turns per unit length

$$n = \frac{10}{10^{-2}}$$

$$B = \left(4\pi \times 10^{-7}\right) \times \frac{10}{10^{-2}} \times 5 = 2\pi \times 10^{-3} T$$

18. (1)

As, $\frac{M}{L} = \frac{q}{2m}$

$$\therefore L = M\left(\frac{2m}{q}\right)$$

19. (2)

$$f = \frac{qB}{2\pi m} = \frac{1.6 \times 10^{-19} \times 0.02}{2\pi \times 9.1 \times 10^{-31}} = 6.6 \times 10^8 \text{ Hz}$$

20. (4)

Magnetic force $\vec{F}$ is always perpendicular to the velocity of the proton $\therefore \vec{F}.\vec{v} = 0$

$$\Rightarrow \vec{a}.\vec{v} = 0$$

$$\left(3\hat{i} + x\hat{j}\right).\left(3\hat{i} + 4\hat{j}\right) = 0$$

$$9 + 4x = 0 \qquad \therefore x = -2.25 \text{ unit}$$

21. (2)

The electric current enclosed by Amperean loop inside the pipe is zero. Hence, the magnetic field inside the pipe is zero.

22. (2)

$$B_{tot} = 4B = 4.\left[\frac{\mu_0 I}{4\pi d}(\sin\theta_1 + \sin\theta_2)\right]$$

$$= \frac{\mu_0 I}{\pi\left(\frac{L}{2}\right)}\left[2\sin 45^\circ\right] \qquad \theta_1 = \theta_2 = 45^\circ$$

$$= \frac{4\mu_0 I}{\pi L} \times \frac{1}{\sqrt{2}} = 2\sqrt{2}\,\frac{\mu_0 I}{\pi L}$$

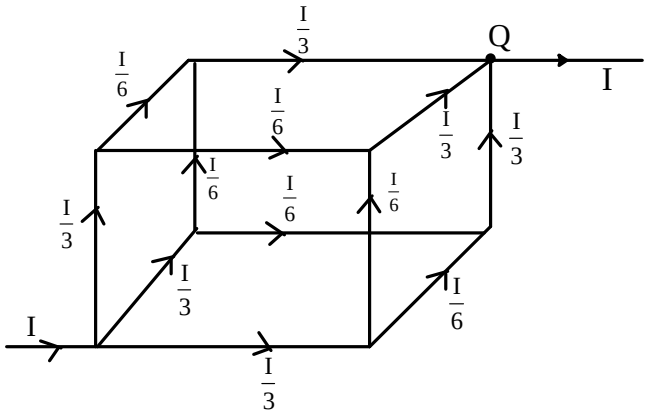
23. (1)

$$\text{Sensitivity} = \frac{NAB}{C}$$

$$\Rightarrow \text{Sensitivity} \propto N$$

24. (1)

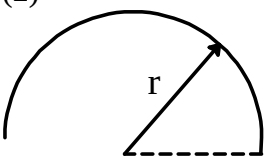
The given system shows symmetry with respect to diagonally opposite corners. Hence the resultant magnetic field at the centre of the cube is zero



25. (4)

A moving charge produces both an electric field and a magnetic field while a stationary change produces only an electric field

26. (2)



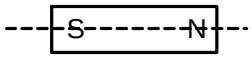
$$M = m.L$$

$$M' = m(2r)$$

$$M' = m\left(2.\frac{l}{\pi}\right)$$

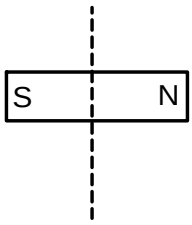
$$\therefore m' = \frac{2m}{\pi}$$

27. (2)



$M' = m' \times \ell'$

$M' = \frac{m}{2} \times \ell = \frac{M}{2}$



$M' = m' \times \ell'$

$M' = m \times \frac{\ell}{2} = \frac{M}{2}$

28. (2)

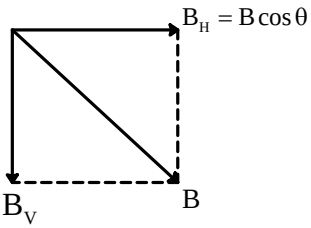
$T = 2\pi\sqrt{\frac{I}{M.B_H}} = \sqrt{\frac{I}{MB\cos\theta}}$, since I and M of the magnet are constant

$T^2 \propto \frac{1}{B_H \cos\theta}$

$T_1 = \frac{60}{20}\text{sec}$

$T_2 = \frac{60}{15}\text{sec}$

$\therefore \frac{T_1}{T_2} = \frac{15}{20} = \frac{3}{4}$



$\frac{T_1^2}{T_2^2} = \frac{B_2 \cos\theta_2}{B_1 \cos\theta_1}$

$\left(\frac{15}{20}\right)^2 = \frac{B_2}{B_1}\frac{\cos 60^\circ}{\cos 30^\circ}$

$\frac{9}{16} = \frac{B_2}{B_1} \times \frac{\frac{1}{2}}{\frac{\sqrt{3}}{2}}$

$\frac{B_1}{B_2} = \frac{16}{9} \times \frac{1}{\sqrt{3}}$

29. (2)

For a diamagnetic material, $\mu_r < 1$, hence it has tendency to move away from the magnetic field.

30. (3)

31. (3)

$\tan\theta = \frac{B_V}{B_H} = 1 \qquad \therefore \theta = 45^\circ$

32. (1)

$$B = \frac{\mu_0 I}{2r}$$

$$7\times10^{-5} = \frac{4\pi\times10^{-7}\times I}{2\times5\times10^{-2}}$$

$$I = \frac{7\times5}{2\pi} = 5.6A$$

33. (3)

$$x_m = \frac{C}{T}$$

$$x_m^{'} = \frac{C}{T'}$$

$$\therefore T' = \left(\frac{x_m}{x_{m'}}\right)T = \left(\frac{1.2\times10^{-5}}{1.8\times10^{-5}}\right)\times200 = 200\,K$$

34. (4)

Fact

35. (2)

$$\mu = \frac{B}{H} = \frac{1.2}{1600} = 7.5\times10^{-4}\,N/m^2$$

As $B = \frac{2.4\times10^{-5}}{0.2\times10^{-4}} = 1.2\,wb/m^2$

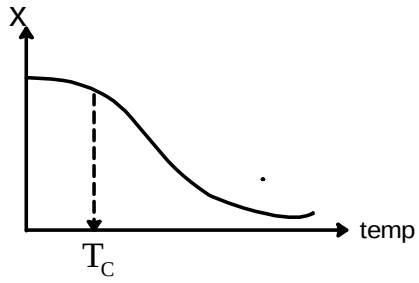
Susceptibility $x = \mu_r - 1 = \frac{\mu}{\mu_0} - 1$

$$x = \frac{7.5\times10^{-4}}{4\pi\times10^{-7}} - 1 = 596$$

36. (1)

Permanent magnet has larger area under I-H curve

37. (4)



$$x \propto \frac{1}{T_1 - T_c}$$ where T_c = curie temperature

$$x = \frac{c}{T - T_c}$$

38. (3)

Work done, $W = MB(1-\cos\theta) = MB(1-\cos 60^\circ)$

$= 2\times10^{-4}\times6\times10^{4}\left(1-\frac{1}{2}\right)$

$= 6J$

39. (1)

$I = \frac{\text{magnetic moment}}{\text{volume}} = \frac{(A-\text{meter})(\text{meter})}{\text{meter}^3} = \frac{A}{\text{meter}}$

40. (4) Paramagnetic materials are weakly attracted by magnets.

41. (2)

For high efficiency of the transformer, there should be minimum energy loss in the transformer cone material.

42. (2)

Magnetic moment, $M = NIA, N = \text{no. of turns} = 1$

$M = I.A = I(\pi r^2) = \pi I\left(\frac{\ell}{2\pi}\right)^2 = \frac{I\ell^2}{4\pi}$

43. (2)

$E = \frac{q^2B^2r^2}{2m}$ $\qquad$ $E \propto \frac{q^2}{m}$

$\therefore \frac{E_p}{E_d} = \frac{\left(\frac{q^2}{m_p}\right)}{\left(\frac{q^2}{m_d}\right)} = 2$

$E_p = 2.E_d = 2\times40 = 80\,Mev$

44. (1)

Magnetic moment, $M = NIA$, $\qquad$ $N =$ no. of turns $=1$

$M = IA = (qf)A$

$= q\left(\frac{v}{2\pi R}\right)(\pi R^2) = \frac{qvR}{2}$

45. (2)

The magnetic field due to the current loops P and Q are opposite directions.

$B_p = B_Q$

$\frac{\mu_0 I_1}{2r_1} = \frac{\mu_0 I_2}{2r_2}$

$\therefore \frac{I_1}{r_1} = \frac{I_1}{r_2}$

EDT - 14 - Chemistry (2017 Aspirants)
(SOLUTION)

(46) 2 $CH_3 - CH_3$

(47) 2 greater the value of K greater will be the stability

(48) 3

(49) 2

(50) 2

(51) 3

(52) 1 $K_3[Cr(C_2O_4)_3]$ coordination no. = 6

$3 + x - 6 = 0$ Oxidation state no. = +3

$x = +3$

(53) 2

(54) 3

(55) 1

(56) 2

(57) 4

(58) 4

(59) 2 EAN = $46 - 4 + 2 \times 6 = 54$

(60) 4

(61) 3

(62) 4 $[Co(NO_2)(NH_3)_5]Cl$

(63) 2

(64) 3

(65) 2

(66) 3

(67) 4

(68) 3

(69) 1 $x + 0 + 0 - 2 = 0$ $x = +2$

(70) 1 EDTA

(71) 2

(72) 2 Linkage isomerism

(73) 1 Sc^{3+} [Ar] colorless & diamagnetic

(74) 2

(75) 2

(76) 4

(77) 4 Spectrochemical series

(78) 3

(79) 2 Neutral complex

(80) 1

(81) 4

(82) 2

(83) 1 $x + 1 - 2 = 0$

$x = +1$

(84) 4

(85) 1 $d_{x^2-y^2}, d_{z^2}$

(86) 1

(87) 4 electrostatic

(88) 3 Synergic effect

(89) 2

(90) 1

EDT - 14 - Botany (2017 Aspirants)
(SOLUTION)

91. (3)

	Ab	**ab**
Ab	**AAbb**	**Aabb**
ab	**Aabb**	**aabb**
	= 3:1	

92. (1) Polymorphism

93. (1) 8×8

94. (2)

A. Inhibitory gene ratio = 13 :3
B. Complementary gene ratio = 9 :7
C. Recessive epistasis ratio = 9 : 3 : 4
D. Dihybrid test cross ratio = 1 : 1 : 1
E. Dominant epistasis ratio = 12 : 3 : 1

95. (2) mRNA,rRNA, tRNA

96. (2) Transformation of plant cells

97. (3) the ratio of number of X-chromosomes to the set of autosomes.

98. Gametes produced by AABb = AB and Ab
Gametes produced by aaBb = aB and ab
Thus ,

	AB	**Ab**
aB	**AaBB**	**AaBb**
ab	**AaBb**	**Aabb**

$\therefore$ AaBB = 1 AaBb = 2 Aabb = 1 aabb = 0
$\therefore$ 1:2:1:0

99. (3) Identifying all the genes that are expressed as RNA

100. (2) 50 % black : 50 % blue

	B	**b**
B	**BB**	**Bb**
B	**BB**	**Bb**
	50% Black	**50% Blue**

101. (3) A homozygous dominant and a heterozygous form

102. (1) association of 30S, mRNA with formyl-met-t-RNA

103. (2) 12 units

$$\frac{\text{No. of recombinants}}{\text{Total no.offsprings}}\times 100 = \frac{5+7}{(48+48)(5+7)}\times 100$$

$$= 11.11 \sim 12$$

104. (2) UAGAC

105. Test cross ratio = 1 : 1 that is approximately 481 Aa : 519 aa.

106. (2) Euploidy

107. (1) Down's syndrome

108. (1) 2

2^n where n = no. of heterozygotes x

$$T \xleftarrow{8\%} S \xleftarrow{12\%} O$$

109. 20%

$\therefore$ T – S – O

110. (2) Supplementary genes

111. (3) $DD \times Dd$

	D	**D**
D	**DD**	**DD**
d	**Dd**	**Dd**
	All phenotypically alike.	

112. (3) 50% blue eyed and 50% brown eyed

Brown (BB) color is eye is dominant over blue (bb), thus the man who has brown eyes is heterozygous for brown eyes. (Bb) as his mother has blue eyes. Whrn hr marries a blue eyed women (bb) his expected to have 50% blue eyed and 50% brown eyed.

	B	**b**
b	**Bb**	**bb**
b	**Bb**	**bb**
	50% Brown	**50% Blue**

113. In transcription, adenosine pairs with uracil

Haemophilia is a sex-linked recessive disease.

(2) two

114. (4) $\frac{1}{64}$

2^n where n = no. of heterozygotes $\therefore 2^{(3)} = 8$ types of gametes will be produced by one parent and 8 types of gametes by other parent. $\therefore$ checker board of 64 boxes would be formed. Only one combination of aabbcc would be formed among 64 combination .

115. (2) four

116. (1) co-repressor binds with repressor

117. (3) $Ww \times Ww$

$9:3 = 3:1$

	W	**w**
W	**WW**	**Ww**
w	**Ww**	**ww**
	3 :1	

118. (1) Instead of glutamic acid, valine comes at number 6^{th} position in one of β chain of Hb

119. (4) 13 : 3

Inhibitory genes ratio = 13 : 3

120. (1) $\frac{A+G}{T+C}=1$

121. (1) UGU and GUG

122. (2)

$$\frac{\text{No. of recombinants}}{\text{Total no.offsprings}}\times 100=\frac{58+54}{(450+440)(58+54)}\times 100=11\sim 11.2$$

123. (2) Sex influenced

124. (3) DHU arm of tRNA has ribosomal binding loop.

125. (3) 600

	A	**a**
A	**AA**	**Aa**
a	**Aa**	**aa**
	Aa = Parental = 600	

126. (1) All axial colored

$CCAA \times ccaa$

CA ca

CcAa

127. (4) Satellite DNA occurring as highly repeated short DNA segments.

128. (3) 1 : 4 : 6 : 4 : 1

129. (4) 16^{th}

130. (2) GCCGATATAAGCAATT
CGGCTATATTCGTTAA
Higher the no : of GC, more is the energy requirement.

131. (3)
While solving problems on Hardy Weinberg principle, we should remember two formulae:
$p + q = 1$ [p = frequency of dominant allele and q = frequency of recessive allele]
$p^2 + 2pq + q^2 = 1$ [p^2 = frequency of homozygous dominant individuals,
$2pq$ = frequency of heterozygous dominant individuals,
q^2 = frequency of homozygous recessive individual]
In the given question, value given are:
$AA = p^2 = 360/1000 = 0.36;\ p = 0.6$
$aa = q^2 = 160/1000 = 0.16;\ q = 0.4$

132. (1) (i) and (iii) are correct

133. (3) Reciprocal cross

134. (2) first

135. (2) loss of half of the short arm of chromosome no.5

136. (4) Reciprocal Translocation

137. (1) Marry and Mitchell

138. (1) Autosomal addition

139. (1) RNA polymerase I – formation of rRNA, mRNA is incorrect match as it does not form mRNA

140. (3) 23 S rRNA

141. (4) TATA

142. (3) All the linked genes of a chromosome

143. (3) 3 : 1

	YR	**yr**
YR	**YYRR**	**YyRr**
yr	**YyRr**	**yyrr**
	3:1 = 3= yellow 1= green	

144. (2) Helicase
145. (1) Inducer

146. (4) n=21 and x=7
Hexaploid wheat $(2n) = 6 \times 7 = 42$
$\therefore$ haploid (n) = 21 and Basic no. (x) = 7

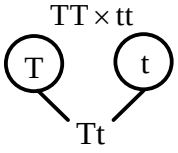
147. (3) transition

148. (2) tetraploid

149. (1) Vernon Ingram

150. (1) Turner's

151. (3) Genotypically Tt, phenotypically Tall



152. (1) Father is AA, mother is aa, husbands are aa

153. (1) 1 in 2

154. (2) Autosomal

155. (2) $2n = 32$ worker and queen honey bee are diploid females

156. (2) Female

157. (4) third member of a codon

158. (3) transcription factor

159. (1) Reverse transcriptase

160. (3) A, B, AB, O

	I^A	**i**
I^B	$I^A I^B$ **= AB**	$I^B i$ **= B**
i	$I^A i$ **= A**	**ii = O**

161. (1) complete linkage

162. (3) P (peptidyl)

163. (1) tRNA

164. (2) Super coiling in nucleosomes

165. (3) A polypeptide of 24 amino acids will be formed
25^{th} codon (UAU) when mutated to UAA acts as a stop codon. Thus a polypeptide of only 24 amino acid will be formed

166. (1) 4,6
Phenotype ; $A, B, AB, O = 4$
Genotypes: $I^A I^A, I^A i, I^A I^B, I^B I^B, I^B i, ii$

167. (1) Klinefelter's

168. (1) rye

169. (3) 30%
The number of adenine is always equal to the no. of thymine and no. of Guanine is always equal to the no. of cytosine. As T= 20 , A = 20 that is equal to 20 + 20 = 40
100 – 40 = 60 thus, $G = 30;\ C = 30$

170. (4) starch branching enzyme

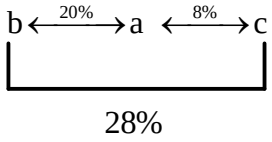
171. (4) Adenine, Thymine- Purine

172. (4) Both (1) and (B)

173. (4) any one of the parents

174. (1) 3′end of coding strand

175. (1) b,a,c



176. (4) 23

177. (2) Nucleosomes

178. (3) Satellite DNA does not code for any proteins though it forms a large portion of human genome.

179. (2) All normal

	X^h	Y
X	X^hX	**XY**
X	X^hX	**XY**
Daughter are carrier while son's are normal		

180. (3) 3