ANSWER KEY NEET (FINAL TRACK)									
_		EST-09 (	XII)						
<b>Q.4</b> (4)	Q.5(2)	<b>Q.6</b> (3)	Q.7(4)	<b>Q.8</b> (2)	<b>Q.9</b> (2)				
Q.14(3)	Q.15(1)	Q.16(3)	Q. 17 (4)	Q.18 (2)	Q.19(4)				
$\mathbf{Q.24}(3)$	$\mathbf{Q.25}(1)$	$\mathbf{Q.26}(2)$	$\mathbf{Q.27}(3)$	$\mathbf{Q.28}$ (3)	$\mathbf{Q.29}(3)$				
Q.34(2)	$\mathbf{Q.35}(2)$	Q.36(1)	$\mathbf{Q.37}(2)$	Q.38(1)	<b>Q.39</b> (1)				
<b>Q.44</b> (2)	<b>Q.45</b> (3)	<b>Q.46</b> (2)	<b>Q.47</b> (3)	Q.48(2)	<b>Q.49</b> (4)				
CHEMISTRY									
<b>Q.54</b> (1)	<b>Q.55</b> (2)	<b>Q.56</b> (3)	Q.57(3)	<b>Q.58</b> (2)	<b>Q.59</b> (3)				

#### 0.51(3)0.52(3)0.53(3)0

Q.3(3)

Q.13(4)

Q.23(3)

Q.33(2)

Q.43(2)

Q.1(4)

Q.11(2)

Q.21(3)

**Q.31**(1)

**Q.41** (1)

Q.2(4)

Q.12(2)

Q.22(3)

Q.32(2)

Q.42 (4)

Q.51(3)	<b>Q.52</b> (3)	<b>Q.53</b> (3)	<b>Q.54</b> (1)	Q.55(2)	<b>Q.56</b> (3)	<b>Q.57</b> (3)	Q.58(2)	<b>Q.59</b> (3)	<b>Q.60</b> (1)
<b>Q.61</b> (1)	<b>Q.62</b> (1)	<b>Q.63</b> (3)	<b>Q.64</b> (4)	$\mathbf{Q.65}(1)$	Q.66(3)	<b>Q.67</b> (1)	<b>Q.68</b> (1)	<b>Q.69</b> (4)	$\mathbf{Q.70}(3)$
Q.71 (4)	Q.72(4)	<b>Q.73</b> (4)	<b>Q.74</b> (3)	$\mathbf{Q.75}(1)$	<b>Q.76</b> (3)	<b>Q.77</b> (1)	Q.78(4)	$\mathbf{Q.79}(2)$	<b>Q.80</b> (1)
Q.81 (4)	<b>Q.82</b> (1)	<b>Q.83</b> (3)	<b>Q.84</b> (1)	Q.85(2)	Q.86(4)	Q.87(2)	<b>Q.88</b> (1)	<b>Q.89</b> (3)	<b>Q.90</b> (4)
Q.91(4)	<b>Q.92</b> (2)	Q.93(2)	Q.94(3)	Q.95(3)	Q.96 (2)	$\mathbf{Q.97}(1)$	$\mathbf{Q.98}(3)$	<b>Q.99</b> (1)	Q.100(4)

BIOLOGY									
Q.101(3)	<b>`Q.102</b> (3)	Q.103(2)	Q.104(3)	Q.105(3)	Q.106(3)	Q.107(3)	<b>Q.108</b> (1)	Q.109(3)	<b>Q.110</b> (1)
<b>Q.111</b> (1)	Q.112(2)	Q.113(2)	Q.114 (4)	Q.115(2)	Q.116(3)	Q.117(3)	<b>Q.118</b> (3)	<b>Q.119</b> (1)	Q.120(3)
Q.121(2)	Q.122(2)	Q.123(3)	Q.124(3)	Q.125(3)	Q.126(1)	Q.127(3)	<b>Q.128</b> (1)	Q.129(4)	<b>Q.130</b> (1)
Q.131 (3)	Q.132(2)	<b>Q.133</b> (1)	<b>Q.134</b> (3)	Q.135(3)	<b>Q.136</b> (1)	<b>Q.137</b> (1)	Q.138 (4)	Q.139(2)	Q.140(2)
<b>Q.141</b> (1)	Q.142 (4)	Q.143 (4)	<b>Q.144</b> (4)	Q.145 (4)	Q.146(3)	<b>Q.147</b> (1)	<b>Q.148</b> (1)	<b>Q.149</b> (1)	Q.150(4)
Q.151 (4)	Q.152(3)	Q.153(2)	<b>Q.154</b> (1)	Q.155(2)	Q.156(2)	Q.157(4)	<b>Q.158</b> (1)	Q.159(3)	Q.160(3)
<b>Q.161</b> (1)	<b>Q.162</b> (1)	Q.163 (4)	<b>Q.164</b> (1)	Q.165(3)	<b>Q.166</b> (1)	<b>Q.167</b> (1)	<b>Q.168</b> (1)	Q.169 (4)	Q.170(3)
Q.171(2)	Q.172(2)	Q.173(3)	Q.174(4)	Q.175(3)	Q.176(4)	Q.177(3)	$\mathbf{Q.178}(3)$	Q.179(3)	<b>Q.180</b> (1)
Q.181 (4)	Q.182(3)	<b>Q.183</b> (3)	Q.184(2)	Q.185(3)	Q.186 (4)	Q.187 (4)	<b>Q.188</b> (1)	Q.189(2)	Q.190(3)
Q.191 (2)	Q.192(2)	Q.193 (2)	Q.194(2)	Q.195(2)	Q.196 (4)	<b>Q.197</b> (1)	<b>Q.198</b> (3)	<b>Q.199</b> (1)	Q.200 (4)
1									

# **SOLUTIONS**

# **PHYSICS** SECTION-A

Q.1 Image is inverted, so it is real. u and v both are negative. Magnification is  $\frac{1}{3}$  . therefore,  $v = \frac{u}{3}$ Given, u = -30 cm, v = -10 cmUsing the mirror formula,

$$\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$$
We have,  $\frac{1}{f} = \frac{1}{-10} + \frac{1}{-30} = \frac{-2}{15}$ 
 $f = -7.5 \text{ cm}$ 



**Q.2 (4)** Focal length of a mirror only depends on radii of curvature so after dipping in water focal length of mirror remains as it is while focal length of lens depends on both radii of curvature and refractive index of surrounding medium. So, after dipping in water focal length of lens get changed.



Q.3

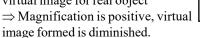
$$Power = \frac{1}{focal\ length} = \frac{1}{f} = \left(\frac{\mu_L}{\mu_m} - 1\right) \left(\frac{1}{R_1} - \frac{1}{R_2}\right)$$

$$= \frac{\mu_{\scriptscriptstyle m} R_{\scriptscriptstyle l} \bigwedge_{\mu_{\scriptscriptstyle L}} R_{\scriptscriptstyle 2}}{\mu_{\scriptscriptstyle m} \prod_{\mu_{\scriptscriptstyle L}} R_{\scriptscriptstyle 2}} = \frac{\mu_{\scriptscriptstyle m} R_{\scriptscriptstyle l} \bigwedge_{\mu_{\scriptscriptstyle L}} R_{\scriptscriptstyle 2}}{\mu_{\scriptscriptstyle L}}$$

After cut, none of the parameters  $\mu_M$ ,  $\mu_I$ ,  $R_1$   $R_2$  got changed. So, focal length and power of lens remains same.

**Q.4** (4)

(a) Convex mirror always produces virtual image for real object



- (b) Concave mirror forms both real and critical image. Virtual image is enlarged.
- $\Rightarrow$  Magnification is positive and greater than one. Real image is both enlarged and diminished
- $\Rightarrow$  Magnification is negative and |m| < 1 and |m| > 1

Q.10(3)

Q.20(1)

Q.30(1)

Q.40(1)

Q.50(3)

 $\frac{2}{Q.5}$ 

Equivalent power,  

$$P_{eq} = P_1 + P_2 = -15D + 5D$$
  
 $= -10D$ 



$$\Rightarrow \frac{1}{f_{eq}} = -10$$

$$\Rightarrow \frac{1}{f_{eq}} = -\frac{1}{10} m = -10 cm$$





$$\sin\theta_{C} = \frac{\mu_{R}}{\mu_{D}} = \frac{v_{D}}{v_{R}}; \frac{4}{5} = \frac{v_{D}}{3 \times 10^{8}}$$

$$v_D^{} = 2.4 \times 10^8 \, \text{m/s}$$

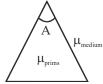
**Q.7** 



Angle of minimum deviation,  $\delta_{\rm m} = (\mu_{\rm relative} - 1) A$ where A = angle of prism



$$\mu_{relative} = \frac{\mu_{prism}}{\mu_{medium}} = \frac{\frac{3}{2}}{\frac{4}{2}} = \frac{9}{8}$$



Ratio = 
$$\frac{\delta_{m_1}}{\delta_{m_2}} = \frac{\left(\frac{9}{8} - 1\right)}{\left(\frac{3}{2} - 1\right)} = \frac{\frac{1}{8}}{\frac{1}{2}} = \frac{1}{4}$$



$$u = -30; f = -20$$

$$v = \frac{uf}{u+f} = \frac{(-30)(-20)}{-30-20} = -12cm$$
 (left of the lens)

$$m = \frac{-v}{u} = \frac{-(-12)}{-30} = \frac{2}{5}$$

[erect and diminsished]

**Q.9** 

(2)



Applying snell's law at P and Q,  $1 \times \sin i = \mu \sin r_1$ 

$$\Rightarrow \sin 45^\circ = \sqrt{2} \sin r_1$$



 $\Rightarrow \frac{1}{\sqrt{2}} = \sqrt{2}$  $\sin r_1 \Rightarrow \sin r_1 = \frac{1}{2}$  $\Rightarrow r_1 = 30^{\circ}$   $As r_1 + r_2 = A = 60^{\circ}$   $\Rightarrow 30^{\circ} + r_2 = 60^{\circ}$  $\mu \sin r_2 = 1 \times \sin e$  $\sqrt{2}\sin 30^{\circ} = \sin e$  $\Rightarrow$  sin e =  $\sqrt{2} \left( \frac{1}{2} \right) = \frac{1}{\sqrt{2}}$  $\Rightarrow r_2 = 30^{\circ}$ 

Q.10 (3)

Light will retrace its path if it falls normally on reflecting surface



$$\Rightarrow r_2 = 0$$
As  $r_1 + r_2 = 30^\circ$ 

As 
$$r_1 + r_2 = 30^\circ$$
  
 $\Rightarrow r_1 + 0 = 30^\circ$   
Applying snell's law

$$1 \times \sin 45^\circ = \mu \sin 30^\circ \Rightarrow \frac{1}{\sqrt{2}} = \mu \frac{1}{2}$$

$$\Rightarrow \mu = \sqrt{2}$$

Q.11

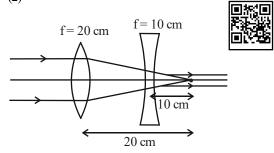


When light goes from one medium to other, then speed and wavelength changes. Frequency of light remains constant

 $\Rightarrow$  ratio is 1:1



Q.12 (2)



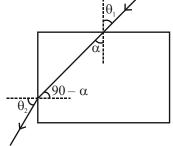
d = 10 cm

Q.13

Equivalent focal length of lenses does not depend on orientation of lenses.



Q.14 (3)





If  $\theta_1$  increases, then  $\alpha$  also increases So,  $90-\alpha$  decreases so,  $\theta_2$  also decreases. **Q.15** (1)

(1) 
$$P_{eq} = +5 D$$
 1 100

$$f_{eq} = \frac{1}{P_{eq}} = \frac{100}{5} \text{cm}$$



Magnifying power = 
$$\frac{D}{f_{eq}} = \frac{25}{20} = 1.25$$

**Q.16** (3)

For concave mirror distance between real object and real image is zero.



Q. 17 (4)



 $\begin{array}{l} \mu_{turpentine} > \mu_{water} \\ \Rightarrow light goes from denser to rarer medium, bends \\ away from normal or total internal reflection takes \\ place. \end{array}$ 

Path 2 shows TIR.

Q.18 (2)



O.19 (4

$$\delta = i + e - A$$

for minimum deviation i = e

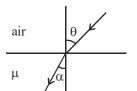
 $\therefore$  minimum deviation =  $2i - A \Rightarrow A = 60^{\circ}$ 



$$\mu = \frac{\sin\left(\frac{A + \delta_m}{2}\right)}{\sin(A/2)} = \frac{\sin\left(\frac{60 + 60}{2}\right)}{\sin\left(\frac{60}{2}\right)} = \sqrt{3}$$

$$\delta_1 = i_1 = e - A$$
 $65^{\circ} = i_1 + 70^{\circ} - 60^{\circ}$ 
 $i_1 = 55^{\circ}$ 

**Q.20** (1)





From Snell's law,  $1 \times \sin \theta = \mu \sin \alpha$ 

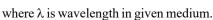
$$\Rightarrow \frac{1}{\mu} = \frac{\sin \alpha}{\sin \theta}$$

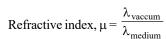
Critical angle,  $\theta_{\rm C} = \sin^{-1} \left( \frac{1}{\mu} \right)$ 

$$\theta_{\rm C} = \sin^{-1}\left(\frac{\sin\alpha}{\sin\theta}\right) \Rightarrow \sin\theta_{\rm C} = \frac{\sin\alpha}{\sin\theta}$$

Q.21 (3

Fringe width, 
$$\beta = \frac{\lambda D}{d}$$



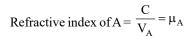


$$\Rightarrow \lambda_{medium} = \frac{\lambda_{vaccum}}{\mu}$$

$$\Rightarrow \beta_{\text{medium}} = \frac{\beta_{vaccum}}{\mu}$$

$$=\frac{0.6}{1.5}=0.4$$

**Q.22** (3)

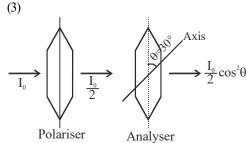


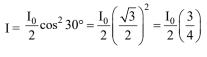


Refractive index of B =  $\frac{C}{V_B}$  =  $\mu_B$ 

$$\Rightarrow \frac{\mu_{A}}{\mu_{B}} = \frac{V_{B}}{V_{A}} \Rightarrow \frac{1.5}{2} = \frac{30}{x}$$
$$\Rightarrow x = 40 \text{ m}$$

Q.23 (







$$\Rightarrow I = \frac{3I_0}{8}$$

Q.24 (3)
Fringe width is distance between two consecutive fringes = 0.5 mm



$$\Rightarrow \beta = \frac{\lambda D}{d} = 0.5 \times 10^{-3}$$

$$\Rightarrow \frac{500 \times 10^{-9} \times D}{0.1 \times 10^{-3}} = 0.5 \times 10^{-3}$$
$$\Rightarrow D = \frac{1}{10} \text{ m} = 0.1 \text{ m}$$

Q.25 Distance of 5th bright fringe from central maximum is  $5\beta = 2cm$ 

$$\Rightarrow \beta = \frac{2}{5} \text{cm}$$

Distance of 3rd dark fringe from central maximum is

$$2\beta + \frac{\beta}{2} = \frac{5\beta}{2}$$
$$= \frac{5}{2} \times \frac{2}{5} = 1 \text{ cm}$$

Q.26 (2)

Q.28

Q.30



When intensity due to two sources are equal then minima is complete dark and best contrast is observed.



Also, intensity  $\propto$  (amplitude)<sup>2</sup>

Q.27 Path difference between interfering wave for minimum intensity is  $\frac{(2n-1)\lambda}{2}$ 

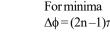


 $\frac{I_{\text{max}}}{I_{\text{min}}} = \frac{\left(\sqrt{I_1} + \sqrt{I_2}\right)^2}{\left(\sqrt{I_1} - \sqrt{I_2}\right)}$  $=\left(\frac{2+1}{2-1}\right)^2$ =9:1

(3)



0.29 For minima  $\Delta \phi = (2n-1)\pi$ 





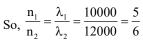
In medium, 
$$\theta' = \frac{\theta}{\mu} = \theta' = \frac{0.08 \times 3}{4}$$

$$= 0.02 \times 3$$
  
 $\theta' = 0.06^{\circ}$ 



Q.31

According to question  $n_1 \lambda_1 = n_2 \lambda_2$ 





so minimum n<sub>1</sub> and n<sub>2</sub> are 5 and 6 respectively.

$$X_{min} = \frac{n_1 \lambda_1 D}{d} = \frac{5(12000 \times 10^{-10}) \times 1}{2 \times 10^{-3}}$$
$$= 3 \times 10^{-3} \text{ m} = 3 \text{ mm}$$

Q.32  $I = I_{1} + I_{2} + 2\sqrt{I_{1}}\sqrt{I_{2}} \cos \phi$  $I_1 = I_2 = I'$ for  $\Delta = \lambda$ ,  $\phi = 2\pi$  $I_{max} = 4I' = I_0$  $I' = \frac{I_0}{4}$ 



for  $\Delta = \frac{\lambda}{3}$ ,  $\phi = \frac{2\pi}{3}$ 

$$I = \frac{I_0}{4} + \frac{I_0}{4} + 2\sqrt{\frac{I_0}{4}}\sqrt{\frac{I_0}{4}}\cos{\frac{2\pi}{3}}$$

$$I = \frac{I_0}{2} + 2 \times \frac{I_0}{4} \times \left(-\frac{1}{2}\right) = \frac{I_0}{2} - \frac{I_0}{4} = \frac{I_0}{4}$$

Q.33  $a \sin\theta = \lambda \Rightarrow a \sin 30^\circ = \lambda \Rightarrow a = 2\lambda$  $a = 2 \times 5 \times 10^{-7} \,\mathrm{m}$  $a = 1.0 \times 10^{-4} \text{ cm}$ 



Q.34 (2)

All wavelengths have common central maxima. So, all central maxima coincide results white central maxima.



Q.35 (2)

In YDSE, if white light is used in place of a monochromatic light, then coloured fringes are obtained on the screen with red fringes of larger size than that of violet, because fringe width is directly proportional to wavelength and  $\lambda_{red} > \lambda_{violet}$ .



### **SECTION-B**

Q.36 Speed of blue light in vaccum =  $3 \times 10^8$  m/s

Frequency = 
$$\frac{\text{Speed}}{\text{work length}} = \frac{3 \times 10^8}{450 \times 10^{-9}}$$



When light goes from one medium to other medium, wavelength and speed changes.

Frequency remains same.

- $\Rightarrow$  f(in vaccum) = f(in medium)
- $=6.67 \times 10^{14} \,\mathrm{Hz}$
- Q.37 (2)

From Len's makers formula,



$$\frac{1}{f} = \left(\frac{\mu_{\text{lens}}}{\mu_{\text{medium}}} - 1\right) \left(\frac{1}{R_1} - \frac{1}{R_2}\right)$$

In air, 
$$\frac{1}{f} = \left(\frac{3}{2} - 1\right) \left(\frac{1}{R_1} - \frac{1}{R_2}\right)$$

$$\Rightarrow \frac{1}{f_{air}} = \frac{1}{f} = \frac{1}{2} \left( \frac{1}{R_1} - \frac{1}{R_2} \right)$$

In water,

$$\frac{1}{f_{\text{water}}} = \left(\frac{\frac{3}{2}}{\frac{4}{3}} - 1\right) \left(\frac{1}{R_1} - \frac{1}{R_2}\right)$$

$$\Rightarrow \frac{1}{f_w} = \left(\frac{9}{8} - 1\right) \left(\frac{1}{R_1} - \frac{1}{R_2}\right) = \frac{1}{8} \left(\frac{1}{R_1} - \frac{1}{R_2}\right)$$

Dividing both equations,

$$\frac{f_{w}}{f_{air}} = \frac{\frac{1}{2} \left( \frac{1}{R_{1}} - \frac{1}{R_{2}} \right)}{\frac{1}{8} \left( \frac{1}{R_{1}} - \frac{1}{R_{2}} \right)}$$

$$\Rightarrow f_w = 4f$$

0.38

From Len's maker's formula:

$$\frac{1}{f} = (\mu - 1) \left( \frac{1}{R_1} - \frac{1}{R_2} \right)$$



Applying sign convention,

$$\frac{3}{20} = (\mu - 1) \left( \frac{1}{5} - \frac{1}{-10} \right)$$

$$\Rightarrow \frac{3}{20} = (\mu - 1) \left( \frac{2+1}{10} \right) = (\mu - 1) \left( \frac{3}{10} \right)$$



$$\Rightarrow \frac{3}{20} = (\mu - 1) \left( \frac{3}{10} \right)$$

$$\Rightarrow \mu - 1 = \frac{1}{2} \Rightarrow \mu = \frac{3}{2}$$

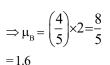
Q.39 (1)

> While changing medium, frequency remains same. Speed of light in medium  $A = Wavelength \times frequency$

Refractive index of A = 
$$\frac{C}{V_A} = \frac{3 \times 10^8}{1.5 \times 10^8} = 2$$

Refractive index of A w.r.t B =  $\frac{\mu_A}{\mu_B} = \frac{V_B}{V_A} = \frac{5}{4}$ 

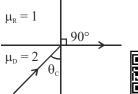
$$\Longrightarrow\! \mu_{_{B}}\!=\!\left(\frac{4}{5}\right)\!\mu_{_{A}}$$





Q.40

Critical angle is the angle of incidence for which angle of refraction is 90° when light goes from denser to rarer medium





Applying snell's law

- $\begin{array}{l} \mu_{_{D}}\sin\theta_{_{c}}=\mu_{_{R}}\times\sin90^{\circ}\\ \Rightarrow 2\times\sin\theta_{_{c}}=1\times1 \end{array}$
- $\Rightarrow \sin\theta_{c} = \frac{1}{2}$
- $\Rightarrow \theta_c$  (critical angle) = 30°
- Q.41

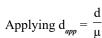
Magnifying power of astronomical telescope when the final image is formed at infinity is expressed as:



So,  $M = \frac{f_0}{f}$ , here  $f_0$  is the focal length of objective

and  $f_{\alpha}$  is the focal length of the eyepiece.

Q.42





$$d = (\mu) d$$

$$d = (\mu) d_{app}$$
  
 $\therefore d_1 = (1.5)(4) = 6 cm$ 

$$d_2 = (1.5)(6) = 9 \text{ cm}$$

Therefore actual thickness of the glass slab is  $d_1 + d_2 = 15 \text{ cm}$ 

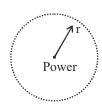
$$\begin{aligned} &n_{1}\beta_{1} = n_{2} \beta_{2} \\ &\Rightarrow 6 \times \frac{\lambda_{1}D}{d} = 7 \times \frac{\lambda_{2}D}{d} \end{aligned}$$

$$\Rightarrow 6 \times 700 \text{ nm} = 7 \lambda_2$$

$$\Rightarrow 6 \times 700 \text{ nm} = 7 \lambda_2$$
  
$$\Rightarrow \lambda_2 = 600 \text{ nm} = 6000 \text{Å}$$



**Q.44** (2)





Point source has spherical wavefront

Intensity, 
$$I = \frac{p}{4\pi r^2}$$

$$\Rightarrow I \propto \frac{1}{r^2}$$

Q.45 (3)



When two waves of same frequency superimpose, then redistribution of energy takes place which remains constant with time.

When two waves of different frequency superimpose, then redistribution of energy takes place which carries with time.

Q.46 (2)



From Brewsters's law,

$$\tan \theta_p = \mu$$

where  $\theta_{p}$  = polarising angle or angle of polarisation or Brewsters's angle

$$As \mu \ge 1 \Rightarrow tan\theta_p \ge 1$$
$$\Rightarrow \theta_p \ge 45^{\circ}$$

Q.47 (3)



Shift of fringes =  $(\mu - 1)t$  $\Rightarrow (\mu-1)t = n\lambda$  $\Rightarrow$   $(\mu-1) \times 12 \times 10^{-7} = 600 \times 10^{-9}$ 

$$\Rightarrow \mu - 1 = \frac{1}{2}$$

$$\Rightarrow \mu = 1.5$$



Q.48 (2)



$$\sin \theta_{\rm C} = \frac{1}{\mu} \text{ and } \tan \theta_{\rm p} = \mu$$

where  $\theta_c$  = critical angle

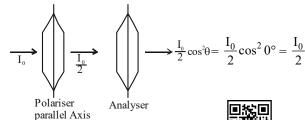
$$\theta_p = \text{polarising angle}$$

$$\Rightarrow \sin\theta_{\rm C} = \frac{1}{\tan\theta_{\rm p}}$$

 $\Rightarrow \tan \theta_{\rm p} = \frac{1}{\sin \theta_{\rm C}} = \frac{5}{3}$ 

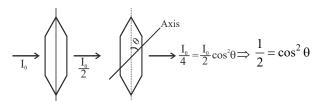
$$\Rightarrow \theta_{\rm p} = \tan^{-1} \left( \frac{5}{3} \right)$$

Q.49 (4)



Now.





$$\Rightarrow \cos\theta = \pm \frac{1}{\sqrt{2}}$$

if 
$$\cos \theta = +\frac{1}{\sqrt{2}} \implies \theta = 45^\circ = \frac{\pi}{4}$$

if 
$$\cos \theta = -\frac{1}{\sqrt{2}} \implies \theta = 135^\circ = \frac{3\pi}{4}$$

Q.50 (3)





 $\tan \theta_{p} = \mu = \frac{C}{V}$  where  $\theta_{p} = \text{polarising angle}$ 

$$\Rightarrow \tan \theta_{p} = \frac{3 \times 10^{8}}{2.25 \times 10^{8}} = \frac{12}{9} = \frac{4}{3}$$
$$\Rightarrow \theta_{p} = 53^{\circ}$$

# **CHEMISTRY SECTION-A**

Q.51 (3)



Primary amine can give isocyanide test.

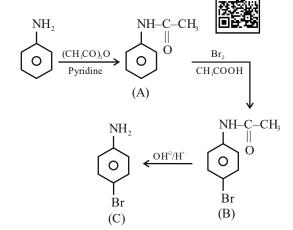
Q.52 Only 1° amide can give Hofmann bromamide reaction.

$$CH_3 - C - NH - CH_3 \rightarrow 2^{\circ}$$
 Amide

[N-Methyl acetamide]



**Q.53** (3)



Q.54 (1)
Only aliphatic primary amine can be prepared by gabriel phthalimide reaction.



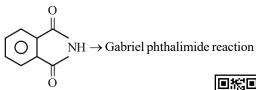
Q.55 (2)
Lucas test is given by alcohols not amines.



Q.56 (3)  $R - NC \xrightarrow{Reduction} R - NH - CH_3$ 

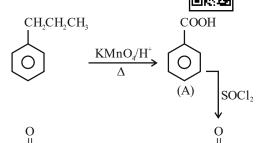


Q.57 (3)  $Br_2 + NaOH \rightarrow Hofmann's bromamide reaction$ 



O  $CHCl_3 + Alc. KOH \rightarrow carbylamine test$   $O \rightarrow SO_2Cl \rightarrow Hinsberg's test$ 





Aniline

(B)

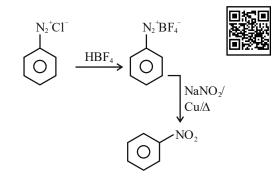
N-phenyl benzamide

**Q.59** (3)



Facts

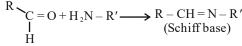
**Q.60** (1)



Q.61 (1)  $R-NH_2+CHCl_3 \xrightarrow{KOH} R-NC$ 



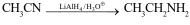
**Q.62** (1)





Q.63 (3)

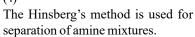
$$CH_3CONH_2 \xrightarrow{Br_2/KOH} CH_3NH_2$$



$$CH_{3}NC \xrightarrow{\quad LiAlH_{4}/\quad } CH_{3}NHCH_{3}$$

$$CH_3CONH_2 \xrightarrow{LiAlH_4} CH_3CH_2NH_2$$







**Q.65** (1)

$$R-C \equiv N \xrightarrow{AlH(iBu)_2} R-CHO$$

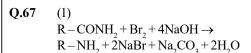


**Q.66** (3)

Ethylamine is more water soluble than ethylamine  $pK_b$  of methylamine is less than that of aniline.



Boiling point order of isomeric amines is RNH,>R,NH>R,N





**Q.68** (1)



$$\begin{array}{c}
NH_2 \\
NaNO_2 + \\
HCl
\end{array}$$

$$\begin{array}{c}
N_2^+C\Gamma \\
CuBr \\
HBr
\end{array}$$

$$\begin{array}{c}
O\\
(Y)
\end{array}$$

Q.69 (4)
In Hoffmann bromamide reaction nitrene is formed as intermediate of the reaction.



**Q.70** (3)



$$\begin{array}{c}
NH_2 \\
NaNO_2 + HCl \\
\hline
0-5°C
\end{array}
\xrightarrow{N_2^+C\Gamma} \xrightarrow{F} \xrightarrow{HBF_4} \xrightarrow{\Delta} \xrightarrow{(B)}$$

Q.71 (4) 3° amine do not react with PhSO<sub>2</sub>Cl (Hinsberg reagent)



**Q.72** (4)



Vitamin B<sub>12</sub> can be stored in our body.

**Q.73** (4)



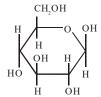
Sucrose is non-reducing sugar.

**Q.74** (3)



Maltose  $\xrightarrow{\text{Maltase}}$  glucose

**Q.75** (1)





(β-D glucose has five chiral carbons)

**Q.76** (3)



Proteins are polymers of amino acids.

Ascorbic acid

Q.77 (1) Vitamin 'C' name is



Q.78 (4)



Facts

Q.79 (2)
Lactose can shows mutarotation.
DNA and RNA do not have all the same nitrogen base.



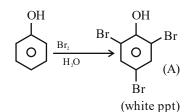
Amino acid connected with peptide linkage and form protein.



Q.80 (1)
Isoleucine → Protein
Oxidoreductase → Enzymes
Pyridoxine → vitamin
DNA → Nucleic acid



Q.81 (4)





 $\begin{array}{c|c}
NH_2 & & NH_2 \\
\hline
O & & Br_2 \\
\hline
H_2O & & Br
\end{array}$   $\begin{array}{c}
NH_2 \\
Br \\
O & Br$ (white ppt)

**Q.82** (1)



Alanine is non-essential amino acid.

**Q.83** (3)



 $\alpha\text{-D-glucose}$  and  $\beta\text{-D-glucose}$  are diastereomers of each other.

Q.84 (1)



Insulin is a hormone.

Q.85  $Vitamin B_2 \rightarrow Riboflavin$ 

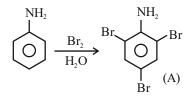


**SECTION-B** 

Q.86 (4)



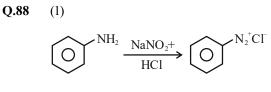
Q.87 (2)





$$\begin{array}{c}
NH_2 \\
\hline
O \\
\hline
Br_2/CH_3COOH
\end{array}$$

$$\begin{array}{c}
NH_2 \\
\hline
O \\
Br
\end{array}$$



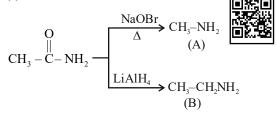






[Diazonium salt]

Q.91



(A) and (B) are homologous of each other.

Q.92 (2)



$$C_{6}H_{5}N_{2}C1 \xrightarrow{CuCN} C_{6}H_{5} - CN$$

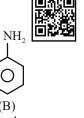
$$(A) \qquad \downarrow H_{3}O^{\oplus}$$

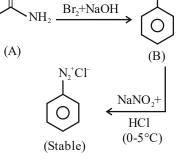
$$C_{6}H_{5} - C - NH_{2} \xleftarrow{NH_{3}} C_{6}H_{5}COOH$$

$$O \qquad (B)$$

$$(C)$$

Q.93 (2)





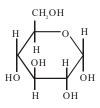
Q.94



Pentaacetate of glucose does not react with NH<sub>2</sub>OH because its cyclic structure do not have free -CHO group.







α-D-glucose

Q.96 (2)



Glucose  $\xrightarrow{NH_2OH}$  oxime

**Q.97** (1)

Amylopective have 1  $\rightarrow$  4  $\alpha$ -linkage Amylopective have 1  $\rightarrow$  4  $\alpha$ -linkage and 1  $\rightarrow$  6  $\alpha$ -linkage



**Q.98** (3)

Sucrose  $\rightarrow \alpha$ -D-glucose +  $\beta$ -D-fructose Lactose  $\rightarrow \beta$ -D-galactose +  $\beta$ -D-glucose Maltose  $\rightarrow \alpha$ -D-glucose



**Q.99** (1)

Maltose  $\rightarrow$  2  $\alpha$ -D-glucose



**Q.100** (4)

Glucose does not perform NaHSO<sub>3</sub> test due to absence of free Aldehyde group. Here, Aldehyde group is involved in Hemiacetal formation so it is not free.

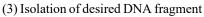
# BIOLOGY-I SECTION-A

#### Q.101 (3)

# New NCERT Pg. No. 171

Recombinant DNA technology involves following steps in order:

- (1) Isolation of DNA
- (2) Fragmentation of DNA



- (4) Transferring the DNA in host
- (5) Culturing the host cells in a medium

### Q.102 (3)

### New NCERT Pg. No. 164

The construction of the first rDNA emerged from the possibility of linking a gene encoding antibiotic resistance with a native plasmid of *Salmonella typhimurium*.



# Q.103 (2)

# New NCERT Pg. No. 171

Fungal cell wall is made up of chitin for extraction of genetic material (DNA) frm a fungal cell, chitanase, RNAsse and protease can be used.



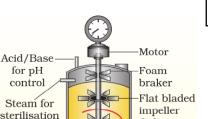
# Q.104 (3)

### New NCERT Pg. No. 175

Quality control testing is a process involved in downstream processing.



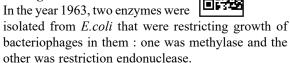
# Q.105 (3) New NCERT Pg. No. 174





Q.106 (3)

### New NCERT Pg. No. 165



Culture broth

Sterile Air

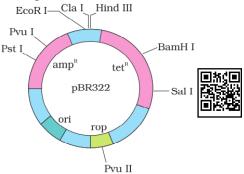
### Q.107 (3)

#### New NCERT Pg. No. 165

More than 900 restriction enzymes are isolated from over 230 strains of bacteria which recognise different recognition sequence.

#### **O.108** (1)

# New NCERT Pg. No. 169



Pvu II is present at roop site which codes for proteins required for replication of plasmid.

# Q.109 (3)

# New NCERT Pg. No. 166

Palindrome in DNA is a sequence of base pairs that reads same on the two strands when orientation of reading is kept the same.

### **Q.110** (1)

# New NCERT Pg. No. 167,168, 169

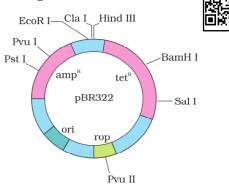
Similar sticky ends facilitates the action of enzyme DNA ligase and helps in formation of recombinant molecules.

Selectable marker helps in distinguishing between transformants and non-transformants.



#### Q.111 (1)

### New NCERT Pg. No. 169



### **Q.112** (2)

#### New NCERT Pg. No. 171

Heat shock is given at 42°C in transformation process.



# **Q.113** (2)

### New NCERT Pg. No. 164

Plasmid confers antibiotic resistance to bacteria.



### **Q.114** (4)

# New NCERT Pg. No. 171

Purified DNA is precipitated by addition of chilled ethanol.



### **Q.115** (2)

# New NCERT Pg. No. 168

The separated bands of DNA are cut out from the and extracted from the gel piece. This step is known as elution.



### **Q.116** (3)

# New NCERT Pg. No. 169

*E.coli* can be modified to carry resistance against antibiotics such aas; tetracycline or ampicillin.



### **Q.117** (3)

### New NCERT Pg. No. 171

Recombinant DNA technology

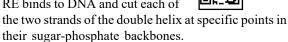


involves several steps in specific sequence such as isolation of DNA, fragmentation of DNA by restriction endonucleases, isolation of a desired DNA fragment, ligation of the DNA fragment into a vector, transferring the recombinant DNA into the host, culturing the host cells in a medium at large scale and extraction of the desired product.

# **O.118** (3)

# New NCERT Pg. No. 166

RE binds to DNA and cut each of



### Q.119 (1)

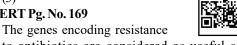
### New NCERT Pg. No. 165

The first RE isolated was Hind II.



### Q.120 (3)

### New NCERT Pg. No. 169



to antibiotics are considered as useful selectable

For example, you can ligate a foreign DNA at the BamH I site of tetracycline resistance gene in the vector pBR322

### Q.121 (2)

# New NCERT Pg. No. 170

In order to force bacteria to take up the rDNA, the host cell is made competent by treating them with a specific concentration of a divalent cation.



### Q.122 (2)

# New NCERT Pg. No. 180

Agrobacterium tumificiens is known as natural genetic engineer of plants and is used to introduce nematode specific genes in plants.

### Q.123 (3)

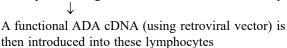
# New NCERT Pg. No. 180

RNAi is a method of cellular defence, it involves post-transcriptional gene silencing in eukaryotes.

# Q.124 (3)

# New NCERT Pg. No. 182

The lymphocytes from the blood of the patient are grown in a culture outside the body



The lymphocytes with ADA cDNA are returned to the patient.

# Q.125 (3)

# New NCERT Pg. No. 180

 $CryIAc \rightarrow Cotton bollworms$  $CryIAb \rightarrow Corn borer$ 

Meloidegyne incognitia → Nematode parasite Bacillus thuringiensis → Insecticidal protein



### New NCERT Pg. No. 184

In 1997, the first transgenic cow,



Rosie, produced human protein-enriched milk (2.4 grams per litre)

The milk contained the human alpha-lactalbumin protein.



#### **Q.127** (3)

### New NCERT Pg. No. 178

Imagine a situation when a protoplast of tomato is fused with that of potato, and then they are grown - to form new hybrid plants combining tomato and potato characteristics. Well, this has been achieved – resulting in formation of pomato;

# **Q.128** (1)

# New NCERT Pg. No. 178

The capacity to generate a whole plnat from any cell/explant is called totipotency.



### New NCERT Pg. No. 184

Transgenic mice are being used to test the safety of the polio caccine.

Toxicity testing in transgenic animals allow us to obtain results in less time.



### New NCERT Pg. No. 181

Insulin that is used to treat diabetes

was earlier extracted from pancreas of slaughtered cattle and pigs.

Because that insulin was from an animal source, some patients develop unwanted immune response to it.

### Q.131 (3)

#### New NCERT Pg. No. 181

At present, about 30 recombinat

therapeutics have been approved for human-use the world over.

In India, 12 of these are presently being marketed.

**Q.132** (2)

### New NCERT Pg. No. 182

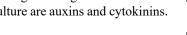
In enzyme replacement therapy,

functional ADA is given to the patient by injection.



# New NCERT Pg. No. 178

Main growth regulators used in tissue culture are auxins and cytokinins.



# Q.134 (3)

### New NCERT Pg. No. 178

Explants are any part of a plant taken out and grown in a test tube, under sterile conditions in special nutrient media.

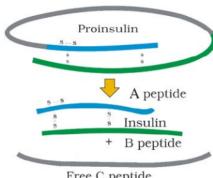


### New NCERT Pg. No. 182

2 polypeptide chains A and B of

human insulin are joined together via disulphide bridges.





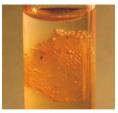
Free C peptide

#### **SECTION-B**

# **Q.136** (1)

### New NCERT Pg. No. 171

DNA that gets separated out after addition of chilled ethanol can be removed by spooling.







DNA that separates out can be removed by spooling

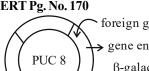
# Q.137 (1)

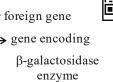
### New NCERT Pg. No. 169

Selectable marker helps in identifying and eliminating non-transformants and selectively

permitting the growth of the transformants. Transformation is a procedure through which a piece of DNA is introduced in a host bacterium (you will study the process in subsequent section).

0.138(4)





chromogenic substrate = No/white

Recombinants yield no colour due to insertional inactivation.



0.139 (2)

### New NCERT Pg. No. 167, 169

DNA ligase is used to join same kind of sticky-ends together.



Q.140 (2)

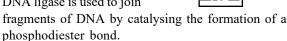
### New NCERT Pg. No. 169

The antibiotic resistance gene gets inactivated and helps in selection of recombinants and non-recombinant transformants.

**Q.141** (1)

# New NCERT Pg. No. 167

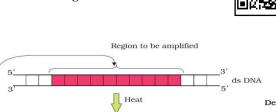
DNA ligase is used to join

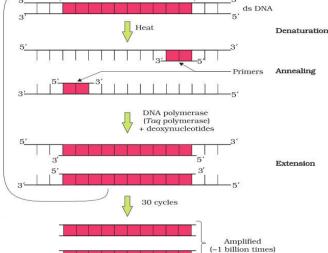


**Q.142** (4)

New NCERT Pg. No. 172







**O.143** (4)

### New NCERT Pg. No. 168

The separated DNA fragments can be visualised only after staining the DNA with ethidium bromide. DNA fragments are negatively charged molecules, they can be separated by forcing them to move towards the anode under an electric field through a medium/matrix.



# New NCERT Pg. No. 169

Rop codes for the proteins involved in the replication of the plasmid.



Q.145 (4)

### New NCERT Pg. No. 169

Ampicilin and tetracycline encoding genes are useful selectable markers.



Q.146 (3)

# New NCERT Pg. No. 183

PCR is now routinely used to detect HIV in suspected AIDS patients.



**Q.147** (1)

### New NCERT Pg. No. 180

Meloidegyne incognitia is a nematode.



O.148 (1)

# New NCERT Pg. No. 184

 $\alpha$ -1-antitrypsin is used to treat emphysema.

0.149 (1)

# New NCERT Pg. No. 184

Transgenic mice are being used to test the safety of the polio vaccine before they are used on humans.

O.150 (4)

### New NCERT Pg. No. 179

Dipterans are flies and mosquitoes. Coleopterans are beetles.

Lepidopterans are tobacco budworm, armyworm.



# **BIOLOGY-II SECTION-A**

Q.151 (4)

#### New NCERT Pg. No. 168

Plasmids and bacteriophages have the ability to replicate within bacterial cells independent of the control of chromosomal DNA.

Q.152 (3)

### New NCERT Pg. No. 177

Three critical research areas of biotechnology are:



- (i) Providing the best catalyst in the form of improved organism usually a microbe or pure enzyme.
- (ii) Creating optimal conditions through engineering for a catalyst to act.
- (iii) Downstream processing technologies to purify the protein/organic compound.

Q.153 (2)

# New NCERT Pg. No. 166

Each restriction endonuclease recognises a specific palindromic nucleotide sequences in the DNA.



(1)

### New NCERT Pg. No. 169

Presence of more than one recognition sites could generate several fragments of DNA. Presence of more than one recognition sites within the vector will generate several fragments, which will



# **New NCERT Pg. No.165, 166**

Restriction endonuclease – Cuts DNA

complicate the gene cloning.



at specific position

Restriction exonuclease – Removes nucleotides from the ends of DNA

DNA ligase Taq polymerase

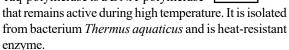
– joins the DNA fragments - extends primers on

genomic DNA template

# Q.156 (2)

# New NCERT Pg. No. 172

Taq-polymerase is a DNA-polymerase



#### Q.157 (4)

# New NCERT Pg. No. 173

If the process of replication of DNA

is repeated many times, the segment of DNA can be amplified to approximately billion times, i.e., 1 billion copies are made. Such repeated amplification is achieved by the use of a thermostable DNA polymerase (isolated from a bacterium, Thermus aquaticus), which remain active during the high temperature induced denaturation of double stranded DNA

### **O.158** (1)

# New NCERT Pg. No. 165

The convention for naming RE is the

first letter of the name comes from the genes and the second two letters come from the species of the prokaryotic cell from which they were isolated.

# Q.159 (3)

### New NCERT Pg. No. 170

The Ti plasmid of Agrobacterium

tumifaciens has been modified into a cloning vector which is no more pathogenic to the plants but is still able to use the mechanisms to deliver genes of our interest into a vairety of plants.

### **Q.160** (3)

### New NCERT Pg. No. 165, 166

RE are isolated from bacteria and not from viruses.





### New NCERT Pg. No. 172

Primers are short oligonucleotide sequences added at 3' end of template DNA during PCR.

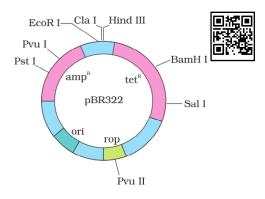
### **Q.162** (1)

#### New NCERT Pg. No. 171

In biolistics or gene gun method, cells are bombarded with high velocity micro-particles of gold or tungsten coated with DNA.

#### Q.163 (4)

# New NCERT Pg. No. 169



### **Q.164** (1)

### New NCERT Pg. No. 164

Stanley Cohen and Herbert

Boyer accomplished consteruction of first recombinant DNA in 1972.

#### Q.165 (3)

# New NCERT Pg. No. 163

The European Federation of

Biotechnology has given a definition of biotechnology that encompasses both traditional view and modern molecular biotechnology.

# **Q.166** (1)

### New NCERT Pg. No. 170

Selectable markers have been

developed which differentiate recombinants from nonrecombinants on the basis of their ability to produce colour in the presence of a chromogenic substrate. In this, a recombinant DNA is inserted within the coding sequence of an enzyme, ß-galactosidase. This results into inactivation of the gene for synthesis of this enzyme, which is referred to as insertional inactivation. The presence of a chromogenic substrate gives blue coloured colonies if the plasmid in the bacteria does not have an insert





# **O.167** (1)

# New NCERT Pg. No. 168

The DNA fragmetns separate (resolve) according to their size through sieving effect provided by the agarose gel.



### New NCERT Pg. No. 170

Retroviruses have been disarmed and are used to deliver desirable genes into animal cells.



# New NCERT Pg. No. 170

Agrobacterium tumifaciens is able to deliver a place of T-DNA using Ti plasmid.



### New NCERT Pg. No. 166

The palindrome in DNA is a sequence of base pairs that reads same on the two strands when orientation of reading is kept same.



### New NCERT Pg. No. 168

Ethidium bromide is used to see bright orange coloured bands of DNA exposed to UV light.



### New NCERT Pg. No. 180

The proteins encoded by the genes cryIAc and cryIIAb control the cotton bollworms, and that of cryIAb controls corn borer.

Q.173 (3)

# New NCERT Pg. No. 179

The activated Bt-toxin binds to the surface of midgut epithelial cells of the insects and create pores in it.

Q.174 (4)

# New NCERT Pg. No. 180

The source of complementary RNA in

RNAi could be from an infection by viruses having RNA genomes or mobile genetic elements (transposons) that replicate via an RNA intermediate.

**Q.175** (3)

# New NCERT Pg. No. 184

Genetic engineering approval

committee makes decisions regarding the validity of GM research and the safety of introducing GMO's for public services.



### New NCERT Pg. No. 179

Dipterans are flies and mosquitoes. Coleopterans are beetles

Lepidopterans are tobacco budworm, armyworm.



### New NCERT Pg. No. 179

Genetically modified plants exhibit increased efficiency of mineral usage.



# New NCERT Pg. No. 179

Golden rice is nutritionaly enhanced (vit. A enriched rice).



Q.179 (3)

# New NCERT Pg. No. 182

If the gene isolated from marrow cells producing ADA is introduced into cells at early embryonic stages, it could be a permanent were for ADA deficiency. Both bone marrow transplantation and enzyme replacement therapy are temporary cure.

Q.180

### New NCERT Pg. No. 184

In chemical safety testing, transgenic animals are made to carry genes which make them more sensitive to toxic substances than non-transgenic animals.

Q.181 (4)

# New NCERT Pg. No. 183, 184

Over 95% of all existing transgenic animals are mice.



- Animals that have had their DNA manipulated to possess and express an extra gene are known as transgenic animals.
- Transgenic rats, rabbits, pigs, sheep, cows and fishes have been produced, although over 95 per cent of all existing transgenic animals are mice.

Q.182 (3)

### New NCERT Pg. No. 179

Bt-toxins are endotoxins and are activated in insect gut due to its alkaline pH.

They are not toxic to humans because they are insect group-specific and are digested in acidic environment of stomach.

Q.183 (3)

### New NCERT Pg. No. 178

In Green Revolution, increased

yields of crops have partly been due to the use of improved crop varieties, but mainly due to the use of better management practices and use of agrochemicals. (fertilisers and pesticides).

Q.184 (2)

# New NCERT Pg. No. 182

The first clinical gene therapy was given in 1990 to a 4-year-oid girl with adenosine deaminase (ADA) deficiency.





# Q.185 (3)

# New NCERT Pg. No. 178



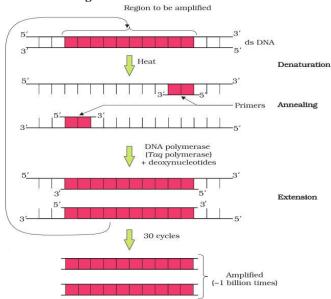
Somaclones are genetically identical to the original plant from which they were grown.

### **SECTION-B**

**Q.186** (4)



### New NCERT Pg. No. 172



### Q.187 (4)

# New NCERT Pg. No. 171



In biolistics or gene gun method, cells are bombarded with high velocity microparticles of gold or tungsten coated with DNA.

# **Q.188** (1)

### New NCERT Pg. No. 166



A recognition sequence of DNA is a palindromic sequence that reads same in both the direction if orientation of reading is kept same.

# Q.189 (2)

# New NCERT Pg. No. 163



According to EFB, the integration of natural science and organisms, cells, parts there of, and molecular analogues for products and services.

# Q.190 (3)

# New NCERT Pg. No. 168, 169



A probe is a ssDNA or ssRNA radio active tag ged molecule used in technique autoradiography.

# Q.191 (2)

# New NCERT Pg. No. 168



Agarose gel provides sieving effect during gel-electrophoresis.

### Q.192 (2)

# New NCERT Pg. No. 170



Bacterial cells are made competent to take DNA by treating them with divalent cations called calcium.

### Q.193 (2)

# New NCERT Pg. No. 165

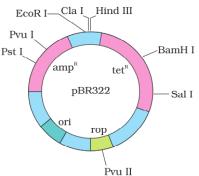


Roman numbers following the names indicate the order in which the enzymes were isolated from that strain of bacteria.

# Q.194 (2)

# New NCERT Pg. No. 169





# Q.195 (2)

### New NCERT Pg. No. 165



Recognition sequence of Hind II

 $5'-GTC \downarrow GAC-3'$ 

3'-CAG↑CTG-5'

#### Q.196 (4)

### New NCERT Pg. No. 183, 184



Toxicity testing in transgenic animals allow us to obtain results in less time.

#### Q.197 (1)

# New NCERT Pg. No. 180



Using Agrobacterium vectors,

nematode specific genes were introduced into the host plant. The introduction of DNA was such that it produced both sense and anti-sense RNA in the host cells. These two RNA's being complementary to each other formed a double stranded (dsRNA) that specific mRNA of the nematode. The consequence was that the parasite could not survive in a transgenic host expressing specific interfering RNA.

# Q.198 (3)

#### New NCERT Pg. No. 182



For effective treatment of a disease, early diagnosis and understanding its pathophysiology is very important.

**Q.199** (1)

# New NCERT Pg. No. 181

The recombinant DNA technological processes have made immense impact in the area of healthcare by enabling mass production of safe and more effective therapeutic drugs.

**Q.200** (4)

# New NCERT Pg. No. 178



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For increasing food production, following options can be throught

- (a) agro-chemical based agriculture
- (b) organic agriculture
- (c) genetically engineered crop-based agriculture.