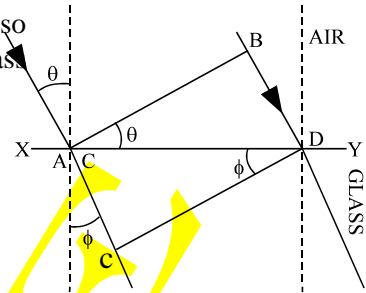


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Physics

1. In figure a wave front AB moving in air is incident on a plane glass surface XY. Its position CD after refraction through a glass slab is shown also along with the normal drawn at A and D. The refractive index of the glass with respect to air will be equal to



- (1)  $BD/AC$
- (2)  $AB/CD$
- (3)  $BD/AD$
- (4)  $AC/AD$

2. Laser light is considered to be coherent because it consists of

- (1) many wavelengths
- (2) uncoordinated wavelengths
- (3) coordinated waves of exactly the same wavelength
- (4) divergent beam

3. In Young's double slit experiment, the interference pattern is found to have an intensity ratio between bright and dark fringes, as 9. This implies that

- (1) the intensities at the screen due to the two slits are 5 units and 4 units respectively.
- (2) the intensities at the screen due to the two slits are 4 units and 1 unit respectively.
- (3) the amplitude ratio is 3.
- (4) none of these

4. In Young's double slit experiment, the separation between the slits is halved and the distance between the slits and screen is doubled. The fringe width is

- (1) unchanged
- (2) halved
- (3) double
- (4) quadrupled

5. In Young's experiment the wavelength of red light is  $7.8 \times 10^{-5}$  cm and that of blue light  $5.2 \times 10^{-5}$  cm. The value of n for which (n + 1)th blue bright band coincides with n<sup>th</sup> red band is

- (1) 4
- (2) 3
- (3) 2
- (4) 1

6. We shift Young's double slit experiment from air to water. Assuming that water is still and clear, it can be predicted that the fringe pattern will

- (1) remain unchanged
- (2) disappear
- (3) shrink
- (4) be enlarged

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7. In Young's double slit interference experiment, the distance between two sources is 0.1 mm. The distance of the screen from the sources is 20 cm. Wavelength of light used is  $5460 \text{ \AA}$ . Then the angular position of the first dark fringe is
- (1)  $0.08^\circ$  (2)  $0.16^\circ$   
(3)  $0.20^\circ$  (4)  $0.32^\circ$
8. If one of the two slits of a Young's double slit experiment is painted over so that it transmits half the light intensity of the other then
- (1) the fringe system would disappear  
(2) the bright fringes will be more bright and dark fringes will be more dark  
(3) the dark fringes would be bright and bright fringes would be darker  
(4) bright as well as dark fringes would be darker
9. In Young's double slit experiment if two slightly different wavelengths are present in the light used then
- (1) the sharpness of fringes will increase every where (compared to the case when monochromatic light is used )  
(2) there will be no fringes at all  
(3) the sharpness of fringes will decrease as we move away from central fringe.  
(4) the central fringe will be white.
10. In Young's double slit experiment, illuminated by yellow light, one slit is covered with plane transparent thin glass plate and the other slit by blue filter. Then
- (1) there will be yellow and blue interference fringes formed on the screen.  
(2) there will be uniform illumination on the screen.  
(3) the maximum intensity fringes will be double coloured.  
(4) the minimum intensity fringes will be dark.
11. In the Young's double slit experiment, the two equally bright slits are coherent, but of phase difference  $\pi/3$ . If the maximum intensity on the screen is  $I_0$ , the intensity at the point on the screen equidistant from the slits is
- (1)  $I_0$  (2)  $I_0/2$   
(3)  $I_0/4$  (4)  $3I_0/4$

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12. In an interference pattern produced by two identical slits, the intensity at the site of the central maximum is  $I$ . The intensity at the same spot when either of the two slits is closed is  $I_0$ . therefore
- (1)  $I = I_0$  (2)  $I = 2I_0$   
(3)  $I = 4I_0$  (4)  $I = I_0$  are not related to each other
13. White light is used to illuminate the two slits in a Young's double slit experiment. The separation between slits is  $b$  and the screen is at a distance  $d$  ( $\gg b$ ) from the slits. At a point on the screen directly in front of one of the slits, certain wavelengths are missing. Some of these missing wavelengths are
- (1)  $\lambda = b^2/d$  (2)  $\lambda = 2b^2/d$   
(3)  $\lambda = b^2/2d$  (4)  $\lambda = 2b^2/3d$
14. In a Young's double slits experiment, the source  $S$  and two slits  $A$  and  $B$  are horizontal, with slit  $A$  above slit  $B$ . The fringes are observed on a vertical screen  $K$ . The optical path length from  $S$  to  $B$  is increased very slightly (by introducing a transparent material of higher refractive index) and optical path length from  $S$  to  $A$  is not changed. As a result the fringe system on  $K$  moves
- (1) vertically downwards slightly (2) vertically upwards slightly  
(3) horizontally, slightly to the left (4) horizontally, slightly to the right
15. Oil floating on water shows coloured fringes due to interference of light. The order of magnitude of thickness of oil for such effect to be visible is
- (1)  $100 \text{ \AA}$  (2)  $10000 \text{ \AA}$   
(3)  $1 \text{ mm}$  (4)  $1 \text{ cm}$
16. Two waves originating from source  $S_1$  and  $S_2$  having zero phase difference and common wavelength  $\lambda$  will show completely destructive interference at a point  $P$  if  $(S_1P - S_2P)$  is
- (1)  $5\lambda$  (2)  $3\lambda / 4$   
(3)  $2\lambda$  (4)  $11\lambda / 2$
17. When light wave suffers reflection at the interface between air and glass, the change of phase of the reflected wave is equal to
- (1) zero (2)  $\pi/2$   
(3)  $\pi$  (4)  $2\pi$
18. Four independent waves are expressed as  $y_1 = a_1 \sin \omega t$ ,  $y_2 = a_2 \sin 2\omega t$ ,  $y_3 = a_3 \cos \omega t$  and  $y_4 = a_4 \sin (\omega t + \pi/3)$ . The interference is possible between
- (1) (i) and (iii) (2) (i) and (iv)  
(3) (iii) and (iv) (4) not possible at all.

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19. In a two slit experiment with monochromatic light fringes are obtained on a screen placed at some distance from the slits. If the screen is moved by  $5 \times 10^{-2}$  m towards the slits, the change in fringe width is  $3 \times 10^{-5}$  m. If separation between the slits is  $10^{-3}$  m, the wavelength of light used is
- (1) 6000 Å (2) 5000 Å  
(3) 3000 Å (4) 4500 Å
20. Light travels faster in air than in glass according to
- (1) Wave theory of light (2) Corpuscular theory of light  
(3) Both 1 and 2 (4) Neither 1 or 2
21. Microwaves from a transmitter are directed normally towards a plane reflector. A detector moves along the normal to the reflector. Between positions of 14 successive maxima the detector travels a distance of 0.14 m. The frequency of transmitter is ( $c = 3 \times 10^8$  m/s)
- (1)  $1.5 \times 10^{10}$  Hz (2)  $10^{10}$  Hz  
(3)  $3 \times 10^{10}$  Hz (4)  $6 \times 10^{10}$  Hz
22. Bob of a simple pendulum of length  $l$  is made of iron. the pendulum is oscillating over a horizontal coil carrying direct current. If the timeperiod of the pendulum is  $T$ , then
- (1)  $T < 2f \sqrt{\frac{l}{g}}$  and damping is smaller than in air alone  
(2)  $T = 2f \sqrt{\frac{l}{g}}$  and damping is larger than in air alone  
(3)  $T > 2 \sqrt{\frac{l}{g}}$  and damping is smaller than in air alone  
(4)  $T < 2f \sqrt{\frac{l}{g}}$  and damping is larger than in air alone
23. If the time period  $t$  of the oscillating of a drop of liquid of density  $d$ , radius  $r$ , vibrating undersurface tension  $s$  is given by formula  $t = \sqrt{r^{2b} \cdot s^c \cdot d^{a/2}}$ . It is observed that the time period is directly proportional to  $\sqrt{\frac{d}{s}}$ . the value of  $b$  should therefore be
- (A)  $\frac{3}{4}$  (B)  $\sqrt{3}$  (C)  $\frac{3}{2}$  (D)  $\frac{2}{3}$
24. Two simple pendulum of length 1 m and 4 m respectively are both given small displacement in the same direction at shorter pendulum has completed number of oscillations equal to
- (1) 2 (2) 7 (3) 5 (4) 3

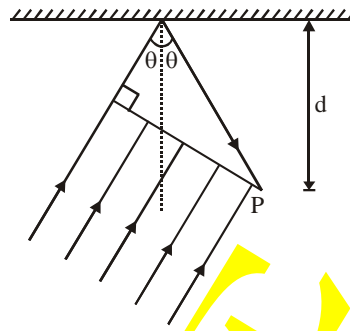
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25. The amplitude of a damped oscillator decreases to 0.9 times its original magnitude in 5 s. In another 10 s it will decrease to  $r$  times its original magnitude, where  $r$  equals  
(1) 0.7 (2) 0.81 (3) 0.729 (4) 0.6
26. If a simple pendulum has significant amplitude (up to a factor of  $1/e$  of original) only in the period between  $t = 0$  s to  $t = \tau$  s. Then  $\tau$  may be called the average life of the pendulum. When the spherical bob of the pendulum suffers a retardation (due to viscous drag) proportional to its velocity with  $b$  as the constant of proportionality, the average life time of the pendulum is (assuming damping is small) in seconds  
(1)  $\frac{0.693}{b}$  (2)  $b$  (3)  $\frac{1}{b}$  (4)  $\frac{2}{b}$
27. An engine approaches a hill with a constant speed. When it is at a distance of 0.9 km, it blows a whistle whose echo is heard by the driver after 5 s. If the speed of sound in air is 330 m/s, then the speed of the engine is  
(1) 32 m/s (2) 27.5 m/s (3) 60 m/s (4) 30 m/s
28. When two sound waves travel in the same direction in a medium the displacement of a particle located at  $X$  at time  $t$  is given by  
 $y_1 = 0.05 \cos(0.50\pi x - 100\pi t)$  and  $y_2 = 0.05 \cos(0.46\pi x - 92\pi t)$   
Where  $y_1, y_2$  and  $x$  are in meters and  $t$  in seconds. The speed of sound in the medium is  
(1) 92 m/s (2) 200 m/s (3) 100 m/s (4) 332 m/s
29. To demonstrate the phenomenon of interference we require two sources which emit radiation  
(1) of the same frequency and having a definite phase relationship  
(2) of nearly the same frequency  
(3) of the same frequency  
(4) of different wavelengths
30. The maximum number of possible interference maxima for slit-separation equal to twice the wavelength in Young's double-slit experiment is  
(1) infinite (2) five (3) three (4) zero
31. For most distinct interference patterns to be observed the necessary condition is that the ratio of intensities of light waves from the two coherent sources should be :  
(1) 1 : 1 (2) 1 : 2  
(3) 1 : 3 (4) 1 : 4
32. In double slit experiment, the phase difference between the two waves reaching at the location of the third dark fringe is :  
(1)  $\pi$  (2)  $6\pi$   
(3)  $5\pi$  (4)  $7\pi$

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33. A plane wave front of light is incident on a plane mirror as shown in the figure. Intensity is maximum at P when :

- (1)  $\cos \theta = \frac{\lambda}{2d}$
- (2)  $\cos \theta = \frac{3\lambda}{4d}$
- (3)  $\sec \theta - \cos \theta = \frac{3\lambda}{4d}$
- (4)  $\sec \theta - \cos \theta = \frac{\lambda}{2d}$

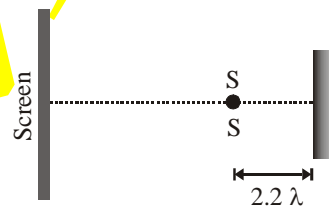


34. In the ideal double-slit experiment, when a glass-plate (refractive index 1.5) of thickness  $t$  is introduced in the path of one of the interfering beams (wave-length  $\lambda$ ), the intensity at the position where the central maximum occurred previously remains unchanged. The minimum thickness of the glass-plate is:

- (1)  $2\lambda$
- (2)  $2\lambda/3$
- (3)  $\lambda/3$
- (4)  $\lambda$

35. Considering interference of direct and reflected light in situation as shown in fig. Find the number of minima that will be formed on the screen.

- (1) 10
- (2) 11
- (3) 12
- (4) None of the above



36. A plane wave of monochromatic light falls normally on a uniformly thin film or oil which covers a glass plate. The wavelength of source can be varied continuously. Complete destructive interference is observed for  $\lambda = 5000 \text{ \AA}$  and  $\lambda = 1000 \text{ \AA}$  and for no other wavelength in between. If  $\mu$  of oil is 1.3 and that of glass is 1.5 the thickness of film will be :

- (1)  $6.738 \times 10^{-5} \text{ cm}$
- (2)  $5.7 \times 10^{-5} \text{ cm}$
- (3)  $4 \times 10^{-5} \text{ cm}$
- (4)  $2.8 \times 10^{-5} \text{ cm}$

37. White light is incident normally on a glass plate of thickness  $5000 \text{ \AA}$  and refractive index 1.5. The wavelength in the visible region ( $4000 \text{ \AA}$  to  $7000 \text{ \AA}$ ) that are strongly reflected by the plate is :

- (1)  $6000 \text{ \AA}$
- (2)  $4000 \text{ \AA}$
- (3)  $5000 \text{ \AA}$
- (4) None of these

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38. Two identical coherent sources placed on a diameter of a circle of radius  $R$  at separation  $x$  ( $x \ll R$ ) symmetrically about the centre of the circle. The sources emit identical wavelength  $\lambda$  each. The number of points on the circle with maximum intensity is ( $x = 5\lambda$ ) :
- (1) 20 (2) 22  
(3) 24 (4) 26
39. Young's double slit experiment is made in a liquid. The 10<sup>th</sup> bright fringe in liquid lies where 6<sup>th</sup> dark fringe lies on vacuum. The refractive index of the liquid is approximately :
- (1) 1.8 (2) 1.54  
(3) 1.67 (4) 1.2
40. A sonometer wire of length 114 cm is fixed at both the ends. Where should the two bridges be placed so as to divide the wire into three segments whose fundamental frequencies are in the ratio 1 : 3 : 4?
- (1) At 36 cm and 84 cm from one end (2) At 24 cm and 72 cm from one end  
(3) At 48 cm and 96 cm from one end (4) At 72 cm and 96 cm from one end
41. Two monochromatic coherent point source  $S_1$  and  $S_2$  are separated by a distance  $L$ . Each source emits light of wavelength  $\lambda$ ; where  $L \gg \lambda$ . The line  $S_1S_2$  when extended meets a screen perpendicular to it at a point  $A$  :
- (1) the interference fringes on the screen are rectangular in shape  
(2) the interference fringes on the screen are straight lines perpendicular to the line  $S_1S_2A$ .  
(3) the point  $A$  is an intensity maximum if  $L = n\lambda$ .  
(4) the point  $A$  is always an intensity maxima for any separation  $L$ .
42. For constructive interference to take place between two monochromatic light waves of wavelength  $\lambda$ , the path difference should be :
- (1)  $(2n-1)\frac{\lambda}{4}$  (2)  $(2n-1)\frac{\lambda}{2}$   
(3)  $n\lambda$  (4)  $(2n+1)\frac{\lambda}{2}$
43. In Young's double slit experiment, the 8<sup>th</sup> maximum with wavelength  $\lambda_1$  is at a distance  $d_1$  from central maximum, and 6<sup>th</sup> maximum with wavelength  $\lambda_2$  is at a distance  $d_2$ . The  $d_1/d_2$  is :
- (1)  $\frac{4}{3}\left(\frac{\lambda_2}{\lambda_1}\right)$  (2)  $\frac{4}{3}\left(\frac{\lambda_1}{\lambda_2}\right)$

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(3)  $\frac{3}{4} \left( \frac{\lambda_2}{\lambda_1} \right)$

(4)  $\frac{3}{4} \left( \frac{\lambda_1}{\lambda_2} \right)$

44. A cylindrical tube, open at both ends, has a fundamental frequency  $f$ , in air. The tube is dipped vertically in water so that half of it is in water. The fundamental frequency of the air column is now

(1)  $f$

(2)  $\frac{f}{2}$

(3)  $\frac{3f}{4}$

(4)  $2f$

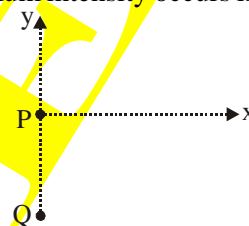
45. Two identical sources P and Q emit waves in same phase and of same wavelength. Spacing between P and Q is  $3\lambda$ . The maximum distance from P along the x-axis at which a minimum intensity occurs is given by:

(1)  $6.58\lambda$

$2.25\lambda$

(3)  $8.75\lambda$

(4)  $0.55\lambda$



**Chemistry**

46. The basic character of the oxides MgO, SrO, K<sub>2</sub>O, NiO, Cs<sub>2</sub>O increases in the order

a) MgO > SrO > K<sub>2</sub>O > NiO > Cs<sub>2</sub>O    b) Cs<sub>2</sub>O > K<sub>2</sub>O > MgO > SrO > NiO

c) NiO > MgO > SrO > K<sub>2</sub>O > Cs<sub>2</sub>O    d) K<sub>2</sub>O > NiO > MgO > SrO > Cs<sub>2</sub>O

47. The K<sub>sp</sub> values for sulphates of alkaline earth metals vary in the order

a) BeSO<sub>4</sub> > MgSO<sub>4</sub> > CaSO<sub>4</sub> > SrSO<sub>4</sub> > BaSO<sub>4</sub>

b) BaSO<sub>4</sub> > SrSO<sub>4</sub> > CaSO<sub>4</sub> > MgSO<sub>4</sub> > BeSO<sub>4</sub>

c) MgSO<sub>4</sub> > CaSO<sub>4</sub> > SrSO<sub>4</sub> > BaSO<sub>4</sub> > BeSO<sub>4</sub>

d) BeSO<sub>4</sub> > BaSO<sub>4</sub> > SrSO<sub>4</sub> > CaSO<sub>4</sub> > MgSO<sub>4</sub>

48. Setting of plaster of paris involves :

a) Combination with atmospheric CO<sub>2</sub>

b) Oxidation with atmospheric oxygen

c) Hydration to yield another hydrate

d) Dehydration

49. Gypsum CaSO<sub>4</sub>·2H<sub>2</sub>O on heating to about 120°C forms a compound which has the chemical composition represented by :

a) CaSO<sub>4</sub>·H<sub>2</sub>O

b) 2CaSO<sub>4</sub>·3H<sub>2</sub>O

c) 2CaSO<sub>4</sub>·H<sub>2</sub>O

d) CaSO<sub>4</sub>

50. Which of the following statements is not true regarding beryllium chloride ?

a) In solid state, beryllium chloride exists in the form of chain structure

b) It readily dissolves in water and gets hydrolysed to form basic solution

c) In vapour state. It exists as dimer with bridged structure

d) Above 1200K, it has linear structure.

51. Which of the following compounds is (are) not soluble in water ?

a) Li<sub>2</sub>CO<sub>3</sub>

b) LiF

c) Li<sub>3</sub>PO<sub>4</sub>

d) All of the above

52. Which of the following is not true ?

a) The alkaline earth metals always form dipositive ions

b) The compounds of alkaline earth metals are less soluble in water than the corresponding alkali metals

c) The hydrides of alkaline earth metals are reducing agents

d) In the solid state, BeCl<sub>2</sub> exists as linear molecule



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53. Which of the following does not illustrate the anomalous properties of lithium ?
- Li is much softer than the other group I metals
  - The m.p. and b.p of Li are comparatively high
  - Li forms a nitride  $\text{Li}_3\text{N}$  unlike group I metals
  - The ion of Li and its compounds are more heavily hydrated than those of the rest of the group.
54. Beryllium shows diagonal relationship with aluminium. Which of the following similarity is incorrect :
- Be forms beryllates and Al forms aluminates
  - $\text{Be}(\text{OH})_2$  like  $\text{Al}(\text{OH})_3$  is basic
  - Be like Al is rendered passively by  $\text{HNO}_3$
  - $\text{Be}_2\text{C}$  like  $\text{Al}_4\text{C}_3$  yields methane on hydrolysis
55. Which of the following is the strongest base ?
- $\text{Mg}(\text{OH})_2$
  - $\text{NaOH}$
  - $\text{Ca}(\text{OH})_2$
  - $\text{KOH}$
56. Of the following acids
- Hypophosphorous acid
  - Orthophosphorous acid
  - Caro's acid
  - Glycine
- I, II monobasic, III dibasic acid and IV amphoteric
  - II monobasic, I, III dibasic acid and IV amphoteric
  - I monobasic, II III dibasic acid and IV amphoteric
  - I, II, III dibasic acid and IV amphoteric
57.  $\text{NH}_4\text{ClO}_4 + \text{HNO}_3(\text{dilute}) \rightarrow \text{HClO}_4 + \text{X}$   
 $\text{X} \xrightarrow{\text{Heat}} \text{Y}(\text{g})$   
'X' and 'Y' are respectively
- $\text{NH}_4\text{NO}_3$  and  $\text{N}_2\text{O}$
  - $\text{NH}_4\text{NO}_2$  and  $\text{N}_2$
  - $\text{HNO}_4$  and  $\text{O}_2$
  - $\text{HNO}_4$  and  $\text{NO}_2$
58. (I)  $\text{Al} \xrightarrow{\text{N}_2} \text{y}$ , (II)  $\text{Al} \xrightarrow{\text{C}} \text{z}$  product y and z on hydrolysis yields, respectively
- ammonia and acetylene
  - ammonia and methane
  - nitric oxide and acetylene
  - nitric acid and methane
59. A blue coloured liquid z gives dark brown vapours upon heating. Liquid z is
- $\text{N}_2\text{O}_4$
  - $\text{N}_2\text{O}_5$
  - $\text{N}_2\text{O}_3$
  - NO
60. The oxide which is the anhydride of ortho-phosphoric acid is :
- $\text{P}_4\text{O}_{10}$
  - $\text{P}_2\text{O}_5$
  - $\text{P}_4\text{O}_6$
  - $\text{P}_2\text{O}_3$
61. The correct decreasing order of basic strength is :
- $\text{AsH}_3 > \text{SbH}_3 > \text{PH}_3 > \text{NH}_3$
  - $\text{SbH}_3 > \text{AsH}_3 > \text{PH}_3 > \text{NH}_3$
  - $\text{NH}_3 > \text{PH}_3 > \text{AsH}_3 > \text{SbH}_3$
  - $\text{PH}_3 > \text{AsH}_3 > \text{SbH}_3 > \text{NH}_3$
62. The number of S-S bonds in sulphur trioxide trimer ( $\text{S}_3\text{O}_9$ ) is
- three
  - two
  - one
  - zero
63. Which of the following is the correct order of decreasing oxidising power of perhalates ?
- $\text{ClO}_4^- > \text{BrO}_4^- > \text{IO}_4^-$
  - $\text{BrO}_4^- > \text{ClO}_4^- > \text{IO}_4^-$
  - $\text{IO}_4^- > \text{BrO}_4^- > \text{ClO}_4^-$
  - $\text{BrO}_4^- > \text{IO}_4^- > \text{ClO}_4^-$
64. The correct order of boiling points of noble gases is
- $\text{He} < \text{Ne} < \text{Ar} < \text{Kr} < \text{Xe}$
  - $\text{He} > \text{Ne} > \text{Ar} > \text{Kr} > \text{Xe}$
  - $\text{He} < \text{Ne} < \text{Kr} < \text{Ar} < \text{Xe}$
  - $\text{He} < \text{Ne} < \text{Ar} < \text{Xe} < \text{Kr}$

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65. Which of the following ions does not have S-S linkage ?  
a)  $\text{S}_2\text{O}_8^{2-}$       b)  $\text{S}_2\text{O}_6^{2-}$   
c)  $\text{S}_2\text{O}_4^{2-}$       d)  $\text{S}_2\text{O}_3^{2-}$
66. The correct order of electron affinities of N, O, S and Cl are  
a)  $\text{O} < \text{N} < \text{Cl} < \text{S}$       b)  $\text{O} < \text{S} < \text{Cl} < \text{N}$   
c)  $\text{O} = \text{Cl} < \text{N} = \text{S}$       d)  $\text{N} < \text{O} < \text{S} < \text{Cl}$
67. Identify the incorrect statement with respect to ozone.  
a) ozone is formed in the upper atmosphere by a photochemical reaction involving dioxygen  
b) Ozone is more reactive than oxygen  
c) Ozone is diamagnetic whereas oxygen is paramagnetic  
d) None
68. Chlorine acts as a bleaching agent only in presence of :  
a) dry air      b) moisture      c) sunlight      d) pure oxygen
69.  $\text{XeF}_6$  on complete hydrolysis gives  
a) Xe      b)  $\text{XeO}_2$       c)  $\text{XeO}_3$       d)  $\text{XeO}_4$
70. What are the products formed in the reaction of xenon hexafluoride with silicon dioxide ?  
a)  $\text{XeSiO}_4 + \text{HF}$       b)  $\text{XeF}_2 + \text{SiF}_4$       c)  $\text{XeOF}_4 + \text{SiF}_4$       d)  $\text{XeO}_3\text{F}_2 + \text{SiF}_2$
71. Iodine oxidises the  $\text{S}_2\text{O}_3^{2-}$  ion to  
a)  $\text{S}^{2-}$       b)  $\text{SO}_4^{2-}$       c)  $\text{S}_4\text{O}_6^{2-}$       d)  $\text{S}_2\text{O}_3^{2-}$
72. Which compound of Xe is stable in solution but explosive, when dry, like T.N.T.  
a)  $\text{XeF}_6$       b)  $\text{XeF}_4$       c)  $\text{XeO}_3$       d)  $\text{XeOF}_4$
73. Which of the noble gas has highest polarizability ?  
a) He      b) Ar      c) Kr      d) Xe
74. Which of the following is anhydride of  $\text{HClO}_4$  ?  
a)  $\text{Cl}_2\text{O}$       b)  $\text{ClO}_2$       c)  $\text{Cl}_2\text{O}_7$       d)  $\text{Cl}_2\text{O}_6$
75. Which compound is prepared by the following reaction ?  
$$\text{Xe} + 2\text{F}_2 \xrightarrow[673\text{K}, 5-6\text{atm}]{\text{Ni vessel}} \text{---}$$
  
(1 : 5 volume ratio)  
a)  $\text{XeF}_2$       b)  $\text{XeF}_6$       c)  $\text{XeF}_4$       d)  $\text{XeOF}_2$
76. Cerium (z = 58) is an important member of the lanthanides. Which of the following statements about cerium is incorrect ?  
a) The common oxidation states of cerium are +3 and +4  
b) Cerium (IV) acts as an oxidising agent  
c) The +4 oxidation state of cerium is not known in solutions  
d) The +3 oxidation state of cerium is more stable than the +4 oxidation state.
77. Which of the following is not correct about transition metals ?  
a) Their melting and boiling points are high  
b) Their compounds are generally coloured  
c) They can form ionic (or) covalent compounds  
d) They do not exhibit variable valency
78. Of the ions  $\text{Zn}^{2+}$ ,  $\text{Ni}^{2+}$  and  $\text{Cr}^{3+}$  (At. Nos Zn = 30, Ni = 28, Cr = 24)  
a) Only  $\text{Zn}^{2+}$  is colourless and  $\text{Ni}^{2+}$  and  $\text{Cr}^{3+}$  are coloured      b) All three are colourless  
c) All three are coloured      d) Only  $\text{Ni}^{2+}$  is coloured and  $\text{Zn}^{2+}$  and  $\text{Cr}^{3+}$  are colourless

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79. Which of the following factors may be regarded as the main cause of lanthanide contraction ?
- Effective shielding of one of 4f-electrons by another in subshell
  - Poor shielding of one of 4f-electrons by another in the subshell
  - Greater shielding of 5d-electrons by 4f-electrons
  - Poorer shielding of 5d-electrons by 4f-electrons
80. For which one of the following ions, the colour is not due to d-d transition ?
- $\text{CrO}_4^{2-}$
  - $\text{Cu}(\text{NH}_3)_4^{2+}$
  - $\text{Ti}(\text{H}_2\text{O})_6^{3+}$
  - $\text{CF}_6^{3-}$
81. In which of the properties listed below hydrogen does not show resemblance with halogen.
- Electro positive character
  - Electro negative character
  - Neutral nature of  $\text{H}_2\text{O}$
  - Atomicity
- I and III
  - I only
  - II and III
  - III and IV
82. Which combination cannot be used for the preparation of hydrogen gas in the laboratory ?
- Zn/conc.  $\text{H}_2\text{SO}_4$
  - Zn/dil  $\text{HNO}_3$
  - pure Zn/dil.  $\text{H}_2\text{SO}_4$
- I and II
  - I, II, III
  - III only
  - I and III
83. Which of the following explanations justifies for not placing hydrogen in either the group of alkali metals or halogens ?
- The ionization enthalpy of hydrogen is too high for group of alkali metals and too low for halogen group
  - Hydrogen atom does not contain any neutron
  - Hydrogen is much lighter than alkali metals or halogens
  - Hydrogen can form compounds with almost all other elements
84. In the laboratory preparation of hydrogen, pure zinc is not used because
- pure zinc becomes passive due to the formation of oxide layer
  - pure zinc becomes passive due to the formation of sulphate layer
  - pure zinc reacts slowly with the acid
  - pure zinc reacts with acid vigorously and violently
85. Which of the following statements is not correct ?
- The ratio of ortho to para hydrogen varies with temperature
  - The ratio of ortho and para hydrogen at 300K and above is 3 : 1
  - pure para hydrogen can be obtained by cooling ordinary hydrogen to about 20 K
  - Pure ortho hydrogen can be obtained by heating ordinary hydrogen above 300K
86. When electric current is passed through an ionic hydride in the molten state :
- hydrogen is liberated at the cathode
  - hydrogen is liberated at the anode
  - no reaction takes place
  - hydride ion migrates towards cathode
87. Which dissolved salts of calcium and magnesium cause temporary hardness in water
- Sulphates of calcium and magnesium
  - $\text{CaCO}_3$  and  $\text{MgCO}_3$
  - $\text{Ca}(\text{HCO}_3)_2$  and  $\text{Mg}(\text{HCO}_3)_2$
  - $\text{CaC}_2\text{O}_4$  and  $\text{MgC}_2\text{O}_4$

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88. In the Lane's process for the manufacture of hydrogen, the reagents used in the oxidation and reduction periods are respectively.
- a)  $\text{Fe}_3\text{O}_4$  and  $\text{H}_2$                       b)  $\text{Fe}_3\text{O}_4$  and  $\text{H}_2$   
c)  $\text{O}_2$  and  $\text{H}_2$                               d)  $\text{Fe}/\text{H}_2\text{O}$  and  $\text{Fe}_3\text{O}_4$
89. Nascent hydrogen is prepared by
- a) Na and  $\text{C}_2\text{H}_5\text{OH}$                       b) Al and NaOH  
c) Zn and dil.  $\text{H}_2\text{SO}_4$                       d) All of these
90. Permanent hardness of water can remove by adding
- a) sodium chloride                      b) sodium carbonate  
c) washing soda                          d) soda lime

## Biology

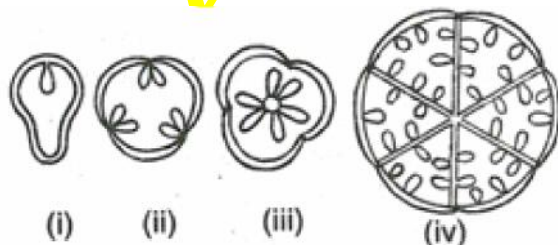
91. Who discovered recombinant DNA (rDNA) technology?  
(A) James D. Watson                      (B) Hargobind Khorana  
(A) Walter Sutton and Oswald Avery                      (D) Stanley Cohen and Herbert Boyer
92. Which one of the following technique is not used for early molecular diagnosis?  
(A) Polymerase chain reaction                      (B) Recombinant DNA technology  
(C) Polyacrylamide gel electrophoresis                      (D) Enzyme linked immunosorbent assay
93. Manipulation of DNA in genetic engineering became possible due to discovery of  
(A) primase                      (B) DNA ligase                      (C) transcriptase                      (D) restriction endonuclease
94. Bacteria protect themselves from viruses by fragmenting viral DNA upon entry with:  
(A) ligase                      (B) gyrase                      (C) exnuclease                      (D) endonuclease
95. EcoRI is an example of  
(A) Exonuclease                      (B) Endonuclease  
(D) RNA polymerase                      (D) Specific sirv of restriction endonuclease
96. Which of the following techniques is used to separate proteins?  
(A) Gel electrophoresis                      (B) Isoelectric focusing  
(C) Polymerase chain reaction                      (D) Ion exchange chromatography
97. A mixture containing DNA fragments, A, B, C and D with molecular weights  $A + B = C$ ,  $A > B$  and  $D > C$ , was subjected to agarose gel electrophoresis. The position of these fragments from cathode to anode sides, of gel should be by?  
(A) D, C, A, B                      (B) A, B, C, D                      (C) C, B, A, D                      (D) B, A, D, C
98. Agarose extracted from sea weeds finds use in :  
(A) Tissue culture                      (B) PCR                      (C) Gel electrophoresis                      (D) Spectrophotometry
99. The autonomously independent, self replicating extra nuclear DNA imparting certain factors to some bacterium is called :  
(A) cosmid                      (B) Plastid                      (C) plasmid                      (D) phagemid
100. What are true of plasmids?  
(A) They are found in viruses                      (B) They are main part of chromosomes  
(C) They are widely used in gene transfer                      (D) They contain gene for vital activities
101. Identify the plasmid:  
(A) *AIU I*                      (B) *Hind III*                      (C) *Eco RI*                      (D) pBR 322
102. Insect tolerant gene *Bacillus thuringiensis* is introduced using Ti plasmid of  
(A) *Escherichia coli*                      (B) *Arabidopsis thaliana*                      (C) *Haemophilus*                      (D) *Agrobacterium*
103. Crown gall disease in plants is caused by  
(A) Ti-plasmid                      (B) Pi-pasmid                      (C) bacteria                      (D) virus
104. Gene amplification using primers can be done by  
(A) ELISA                      (B) Gene gun                      (C) Microinjection                      (D) Polymerase chain reaction
105. The thermostable enzymes, "*Taq*" and "*Pfu*" is isolated from thermophilic bacteria are  
(A) DNA ligase                      (B) RNA polymerases                      (C) DNA polymerase                      (D) Restriction endonucleases
106. Biolistic technique is used in  
(A) Tissue culture process                      (B) Gene transfer process  
(C) Hybridisation process                      (D) Gramplasm conservation process

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107. Two microbes found to be very useful in genetic engineering are  
(A) Diplococcus sp. and Pseudomonas sp. (B) Vibrio cholerae and a tailed bacteriophage  
(C) Crown gall bacterium and Caenorhabditis elegans  
(D) Escherichia coli and Agrobacterium tumefaciens
108. DNA or RNA segment tagged with a radioactive molecule is called  
(A) VectroR (B) Probe (C) Clone (D) Plasmid
109. C-peptide of human insulin is  
(A) A part of mature insulin molecules (B) Responsible for formation of disulphide bridges  
(C) Removed during maturation of pro-insulin to insulin (D) Responsible for its biological activity
110. The site of production of ADA in the body is  
(A) Bone marrow (B) Lymphocytes (C) Blood plasma (D) Monocytes
111. Which of the following is obtained from genetic engineering?  
(A) Glucose (B) Golden rice (C) Haemoglobin (D) None of these
112. Golden rice is transgenic crop of the future with the following improved trait  
(A) insect resistance (B) high protein content  
(C) high vitamin-A content (D) high lysine (essential amino acid) content
113. Cultivation of Bt cotton has been much in the news. The prefix 'Bt' means  
(A) 'Barium-treated' cotton seeds (B) Carrying an endotoxin gene from Bacillus thuringiensis  
(C) 'Bigger thread' variety of cotton with better tensile strength  
(D) Produced by 'biotechnology' using restriction enzymes and ligases
114. cryII Ab and cry I Ab produce toxins that control:  
(A) cotton boll worm and corn borer respectively  
(B) corn borer and cotton boll worm respectively  
(C) tobacco budworms and nematodes respectively  
(D) nematodes and tobacco budworms respectively
115. Salt resistant transgenic has been developed for  
(A) brinjal (B) grape (C) potato (D) tomato
116. Silencing of mRNA has been used in producing transgenic plants resistant to  
(A) bollworms (B) nematodes (C) White rusts (D) bacterial blights
117. Human insulin is being commercially produced from a transgenic species of  
(A) Rhizobium (B) Escherichia (C) Saccharomyces (D) Mycobacterium
118. Abnormal gene is replaced by normal gene through:  
(A) cloning (B) radiation (C) medicines (D) gene therapy
119. Which of these is used as vector in gene therapy for SCID?  
(A) Arbovirus (B) Rotavirus (C) Retrovirus (D) Entrovirus
120. Hybridoma technology has been successfully used in  
(A) Synthesis of haemoglobin (B) production of alcohol in bulk  
(C) production of somatic hybrids (D) synthesis of monoclonal antibodies
121. Hybridoma is a biotechnique which involves fusion of  
(A) B-cell with T-cell (B) T-cell with spleen cell  
(C) Spleen cell with myeloma cell (D) Myeloma cell with B-cell
122. terminator gene:  
(A) helps in terminating seed germination (B) helps in terminating flowering  
(C) used in hybridisation (D) none of these
123. The protein  $\alpha$ -1 antitrypsin is used to treat the disease  
(A) Cancer (B) Emphysema  
(C) ADA deficiency disease in children (D) Alzheimer's disease
124. Cladodes are modified  
(A) Leaf (B) Stem (C) Roots (D) Petiole
125. Illegal and unlawful development of biomaterial without payment to inhabitants of their region is called

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- (A) biobar (B) biopiracy (C) biopatent (D) biotechnology
126. Root pockets act as balancers and found in  
 (A) hygrophytes (B) free floating hydrophytes  
 (C) fixed floating hydrophytes (D) All of these
127. Root cap is absent in  
 (A) Parassite/Cuscuta (B) Wolffia (C) epiphytes (D) All of these
128. Rootless angiosperms are  
 (A) Podostemum & Pothas (B) Ludwigia (C) Wolffia and utricularia (D) All of correct
129. Beaded (moniliform) roots are found in  
 (A) Bitterground (Momordica) (B) Asparagus (B) Both Correct (D) Dahlia
130. Velaman tissue occurs in  
 (A) epiphytic roots of Orchids (B) haustorial roots of Cuscuta  
 (C) pneumatophores of Mangrooves (D) buttress roots of Dalbergia
131. Largest as well as apical and edible bud is of  
 (A) cabbage (B) cauliflower (C) onion (D) agave
132. A structure found only in aquatic plants  
 (A) runner (B) offset (C) stolon (D) tuber
133. Divergent multicostate reticulate venation is found in leaves of  
 (A) Zizyphus (B) Luffa and castor (C) Fan palm (D) All correct
134. A pair of insectivorous plants is  
 (A) Drosera and Rafflesia (B) Nepenthes and Bladderwort  
 (C) Dionaea and Viscum (D) Rafflesia and Venus fly trap
135. In 'Tulsi' (Ocimum) of Labiatae the inflorescence is  
 (A) cyathium (B) verticillaster (C) hypanthodium (D) raceme of racemes
136. Male flowers in a cyathium are arranged  
 (A) centripetally (B) acropetally (C) centrifugally (D) basipetally
137. An edible inflorescence is  
 (A) corymb (C) catkin (C) hypanthodium (D) all of these
138. A flower with carpels, stamens, petals is said to be  
 (A) complete (B) perfect (C) monoecious (D) unisexual
139. The individual parts of the perianth are known as  
 (A) sepals (B) petals (C) tepals (D) carpels
140. A<sub>1+(9)</sub> condition found in papilionaceae (Fabaceae) stands for  
 (A) adelphous (B) synantherous (C) diadelphous (D) didynamous
141. When all carpels are free from each other, the condition is known as  
 (A) polycarpellary (B) syncarpous (C) apocarpous (D) bicarpellary
142. Colchicine is an alkaloid obtained from corm of Colchicum autumnale. It belongs to  
 (A) Gramineae (B) Areaceae (C) Liliaceae (D) Leguminosae
143. Identify the following placentation



- (A) Marginal, parietal, free central, superficial (B) marginal, axile, parietal, free central  
 (C) Marginal, parietal, parietal, superficial (D) Marginal, free central, parietal, axile
144. Coleoptile and coleorhiza are protective covering in Maize grain. Which is true?  
 (A) Coleorhiza is a covering on plumule (B) Coleoptile is a covering on radicle

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- (C) Coleoptile is a covering on plumule (D) Coleorhiza is a covering of endosperm
145. The aleurone layer in maize grain is present in peripheral region of endosperm specially rich in  
(A) lipids (B) auxins (C) proteins (D) starch
146. At maturity the funiculus abscises leaving a scar called  
(A) micropyle (B) hilum (C) pulmule (D) chalaza
147. Angiosperms differ from Gymnosperms in having  
(A) broad leaves (B) tracheids (C) fruit (D) cotyledons
148. Go through the following matches  
(i) Jasmine - Climber (ii) Peppermint - Stolon (iii) Pistia - Offset (iv) Chrysanthemum - Sucker  
Which of these are correct  
(A) (i), (ii) & (iii) (B) (ii), (iii) and (iv) (C) (i), (iii) and (iv) (D) All are correct
149. Agave, bulbil is a modification of  
(A) Vegetative bud (B) Caulin bud (C) Terminal bud (D) Floral bud
150. Go through the following matches  
(i) Colocasia - Corn (ii) Ginger - Rhizome (iii) Turmeric - Corm  
(iv) Cana - rhizome  
Which of these are correct?  
(A) (i), (ii) & (iii) (B) (i) & (ii) (C) (ii), (iii) & (iv) (D) (i), (ii) & (iv)
151. Keel is characteristic of the flowers of  
(A) Bean (B) Gulmohar (C) Cassia (D) Calotropis
152. Capitulum inflorescence is characteristic feature of the family  
(A) Asteraceae (B) Moraceae (C) Poaceae (D) Brassicaceae]
153. Which one of the following pairs is wrongly matched while the remaining three are correct?  
(A) Penicillium - Conidia (B) Water Hyacinth - Runner  
(C) Bryophyllum - Leaf bud (D) Agave - Bulbils
154. Colocasia also known as taro, is an example of a modified  
(A) Rhizome (B) Tuber (C) Bulb (D) Corm
155. Placentation in tomato and lemon is  
(A) Free central (B) Marginal (C) Axile (D) Parietal
156. A staminode does not possess  
(A) Filament (B) Anther (C) Male gametes (D) Pollengrains
157. Among bitter gourd, mustard, brinjal, pumpkin, china rose, lupin, cucumber, sunhemp, gram, guava, bean, chilli, plum, petunia, tomato, rose, withania, potato, onion, aloe, and tulip, how many plants have hypogynous flower?  
(A) Fifteen (B) Eighteen (C) Six (D) Ten
158. Genetic engineering is possible because  
(A) the phenomenon of transduction in bacteria is well understood  
(B) restriction endonuclease purified from bacteria can be used in Vitro  
(C) we can see DNA at specific sites by endonuclease like DNAase I  
(D) we can see DNA by electron microscope
159. Artificial synthesis of DNA was done by  
(A) Wilkinson (B) Kornberg (C) Franklin (D) Watson & Krick
160. Ligase helps in  
(A) removal of few genes (B) translation  
(C) inserting few genes in DNA (D) bringing transversion in chromosomes
161. The restriction "nuclease inspects" the length of a DNA sequence special sequence in the DNA recognised by restriction endonuclease is called  
(A) nucleotide sequence (B) nucleoside sequence  
(C) palindromic nucleotide sequence (D) both (A) & (B)
162. Taq polymerase enzyme is used in  
(A) restriction mapping (B) gene cloning (C) PCR (D) all of these

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163. In recombination DNA technology, a plasmid vector must be cleaved by  
(A) four separate enzyme (B) modified DNA ligase  
(C) a heated alkaline solution (D) the same enzyme that cleaves the donor genes
164. Which of the following is restriction endonuclease?  
(A) Lipase (B) Amylase (C) Alul (D) Anhydrase
165. Ligase catalyse the formation of bonds between  
(A)  $C = O$  (B)  $C = C$  (C)  $C - H$  (D)  $H - H$
166. Recent techniques used for separating fragments of DNA is  
(A) northern blotting (B) southern blotting  
(C) eastern blotting (D) western blotting
167. Circular DNA is present in  
(A) chloroplast (B) mitochondria (C) Plasmid (D) all of these
168. ELISA is used to  
(A) separate viral RNA (B) purify proteins  
(C) isolate DNA (D) identify specific proteins
169. Blindness is prevented by use of which crop in poor countries?  
(A) Wheat (B) Flavr Savr (C) Golden rice (D) Pea
170. The bacteria used in the production of vitamin B<sub>12</sub> is  
(A) Propionibacterium freudenreichii (B) Bacillus megathenium  
(C) Streptococcus (D) all of these
171. The sheep 'dolly' was cloned by using somatic cells from donor's  
(A) Udder (B) Skin (C) Tongue (D) Ear lobe
172. The enzyme diastase was identified by  
(A) Waksman (B) Fleming (C) Christian hasen (D) Payer and Parsoz
173. Human body produced interferon after attack of  
(A) virus (B) bacteria (C) Fungi (D) mycoplasma
174. Nif genes are associated with  
(A) nitrification (B) nitrogen fixation (C) ammonification (D) deamination
175. The stem of maize and sugarcane have supporting roots coming out of the lower nodes of the stem. They are called  
(A) Stilt roots (B) prop roots (C) pneumatophores (D) adventitious
176. Most widely used bio weapon is  
(A) Bacillus subtilis (B) Pseudomonas putida  
(C) Bacillus anthracis (D) None of these
177. Biopiracy is related to which of the following?  
(A) Traditional knowledge (B) Biomolecules and regarding bioresources  
(C) Bioresources (D) All of these
178. In India, DNA fingerprinting was first started at  
(A) IARI, New Delhi (B) CCMB, Hyderabad  
(C) CPRI, Shimla (D) CDRI, Lucknow
179. The construction of the first recombinant DNA was done by using the native plasmid of  
(A) E. coli (B) Salmonella typhimurium  
(C) Bacillus thuringiensis (D) Yeast
180. DNA is acidic due to  
(A) sugars (B) phosphoric acid (C) purines (D) pyrimidines