	NTA	ABHYAS NEE	T MOCK TEST -	- 30		
		PHY	ISICS			
1.	If alpha, beta and	gamma rays carry the sar	ne momentum, which has t	he longest wavelength?		
	1) Alpha rays	2) Beta rays	3) Gamma rays			
	4) None all have the	ne same wavelength				
2.	The voltage applie	ed to the Coolidge X-ray t	tube is increased by 25%. As	a result the short wave		
	limit of continuou	s X-ray spectrum shifts b	y∆λ. The initial voltage app	lied to the tube is		
	1) $\frac{hc}{4e\Delta\lambda}$	2) $\frac{hc}{5e\Delta\lambda}$	3) $\frac{4hc}{5e\Delta\lambda}$	4) $\frac{5hc}{4e\Delta\lambda}$		
3.	A non-uniform th	in rod of length L is place	ed along the x-axis such that	one of its ends is at the		
	origin. The linear	mass density of the rod is	$s \lambda = \lambda_0 x$ . Find the distance of	f the centre of mass of		
	the rod from the origin.					
	1) <u>L</u>	2) $\frac{2L}{2}$	3) <u>L</u>	4) <u>L</u>		
	2	-/ 3	4	5		
4.	The distance of the	e centre of mass of a hem	ispherical shell of radius R f	from its centre is		
	1) $\frac{R}{2}$	2) $\frac{R}{3}$	3) $\frac{2R}{2}$	4) $\frac{2R}{3}$		
5.	A stone of mass 0.	3kg attached to a 1.5m lo	ng string is whirled around	in a horizontal circle on		
	a frictionless table	at a speed of 6ms <sup>-1</sup> . The t	ension in the string is			
	1) 10 N	2) 20 N	3) 7.2 N	4) None of these		
6.	Ferromagnetic sub	ostances show their prope	erties due to			
	1) filled inner subs	shells	2) vacant inner subshells	S		
	3) partially filled i	nner subshells	4) all the subshells are e	qually filled		
7.	For a cell, the term	ninal potential difference	is 2.2V when the circuit is o	pen and is reduce to		
	1.8V when the cell	is connected to a resistar	nce $R = 5\Omega$ . Determine the ir	nternal resistance of the		
	cell					
	1) $\frac{10}{9}$ Ω	2) <del>9</del> 10	3) <del>11</del> <u>9</u> Ω	4) $\frac{5}{9}\Omega$		
8.	If the length of the	e potentiometer wire is in	creased, then the accuracy i	n the determination of		
	the null point					
	1) decreases	2) increases	3) remain unaffected	4) none of these		



15.	. Two rods P and Q of the same length and same diameter having thermal conductivity in the					
	ratio 2 : 3 are joined end to end. If the temperature at one end of P is $100^{\circ}C$ and at one end of Q					
	is 0°C , then the tem	perature of the interface i	S			
	1) 40° <i>C</i>	2) 50° <i>C</i>	3) 60° <i>C</i>	4) 70° <i>C</i>		
16.	One mole of a mone	patomic gas behaving as p	per PV=nRT at 27°C is subje	cted to reversible		
	adiabatic compressi	ion until the final tempera	ature reaches $327^{\circ}C$ . If the in	nitial pressure was 1.0		
	atm then the value	of $\ln(P_{final})$ is (given In 2=0	).7)			
	1) 1.75	2) 0.176	3) 1.0395	4) 2.0		
17.	A Carnot engine ha	s the same efficiency betv	veen (i) 100 K and 500 K, (ii)	) T K and 900 K. The		
	value of T is					
	1) 90 K	2) 270 K	3) 360 K	4) 180 K		
18.	The temperature of	5 moles of a gas at consta	nt volume is charged from	100° <i>C</i> to 120° <i>C</i> . The		
	charge in internal e	nergy is 80J. The total hea	t capacity of the gas at cons	tant volume (in <i>JK</i> <sup>-1</sup> )		
	is					
	1) 8	2) 4	3) 0.8	4) 0.4		
19.	A thin plastic ring o	of radius R carries a chare	q uniformly spread over th	e entire ring. The ring		
	is rotating with ang	ular velocity $\omega$ about its a	xis. The magnetic induction	at the centre of the		
	ring is					
	1) $\frac{\mu_0 q\omega}{2\pi R}$	2) $\frac{\mu_0 q\omega}{\pi P}$	3) $\frac{\mu_0 q\omega}{4\pi P}$	4) Zero		
20	A closed-loop POR	۳ م S carrying a current is pla	eed in a uniform magnetic f	field. If the magnetic		
201	forces on segments	PS. SR and RO are $E_{\rm s}$ $E_{\rm s}$ ar	rad E respectively and are in	the plane of the paper		
	and along the direct	tions shown the force on t	the segment $OP$ is			
		Р	7			
		F1	$\rightarrow$ F <sub>3</sub>			
			R			
		5	F <sub>2</sub>			
	1) $\sqrt{(\Gamma - \Gamma)^2 - \Gamma^2}$			$\sqrt{(\Gamma - \Gamma)^2 - \Gamma^2}$		
	1) $\sqrt{(F_3 - F_1) - F_2^2}$	2) $F_3 - F_1 + F_2$	3) $F_3 - F_1 - F_2$	4) $\sqrt{(r_3 - r_1) + r_2^2}$		

21. A body moves with speed  $V_1$  for distance L and then with speed  $V_2$  for distance 2L. The average speed for the motion is

1) 
$$\frac{V_1 + V_2}{2}$$
 2)  $\frac{3V_1V_2}{V_1 + 2V_2}$  3)  $\frac{3V_1V_2}{2V_1 + V_2}$  4)  $\frac{3V_1V_2}{V_1 + V_2}$ 

- 22. A ball is suspended by a thread from the ceiling of a tram car. The breaks are applied and the speed of the car changes uniformly from  $36 \text{ Kmh}^{-1}$  to zero is 5s. The angle by which the ball deviates from the vertical is  $(g = 10 \text{ ms}^{-2})$ 
  - 1)  $\tan^{-1}\left(\frac{1}{3}\right)$  2)  $\sin^{-1}\left(\frac{1}{5}\right)$  3)  $\tan^{-1}\left(\frac{1}{5}\right)$  4)  $\cot^{-1}\left(\frac{1}{3}\right)$
- 23. A mass M is suspended by a rope from rigid support at A as shown in the figure. Another rope is tied at the end B and it is pulled horizontally with a force F. If the rope AB makes an angle  $\theta$  with the vertical, then the tension in the string AB is



26. Two bodies A and B of equal mass are suspended from two separate massless springs of constant  $k_1$  and  $k_2$  respectively. If the bodies oscillate vertically such that their maximum velocities are equal, the ratio of the amplitude of A to that of B is

1) 
$$\sqrt{\frac{k_1}{k_2}}$$
 2)  $\sqrt{\frac{k_2}{k_1}}$  3)  $\frac{k_1}{k_2}$  4)  $\frac{k_2}{k_1}$ 

27. Two simple harmonic motions are represented by the equations  $y_1 = 0.1 \sin\left(100\pi t + \frac{\pi}{3}\right)$  and  $y_2 = 0.1 \cos(100\pi t)$ . The phase difference of the velocity of particle 1 with respect to the velocity of particle 2 is

1) 
$$\frac{-\pi}{3}$$
 2)  $\frac{\pi}{6}$  3)  $\frac{-\pi}{6}$  4)  $\frac{\pi}{3}$ 

28. When a metallic surface is illuminated with monochromatic light of wavelength  $\lambda$ , the stopping potential is  $5V_0$ . When the same surface is illuminated with light of wavelength  $3\lambda$ , the stopping potential is  $V_0$ . The work function of the metallic surface is

1) 
$$\frac{hc}{6\lambda}$$
 2)  $\frac{hc}{5\lambda}$  3)  $\frac{hc}{3\lambda}$  4)  $\frac{hc}{4\lambda}$ 

29. The work function of a surface of a photosensitive material is 6.2eV. The wavelength of incident radiation for which the stopping potential is 5V lies in the
1) ultraviolet region 2) visible region 3) infrared region 4) X-rays region

- 30. Water rises in a vertical capillary tube up to a height of 2.0 cm. If the tube is inclined at an angle of  $60^{\circ}$  with the vertical, then up to what length the water will rise in the tube? 1) 2.0 cm 2) 4.0 cm 3) 6.0 cm 4) 8.0 cm
- 31. Terminal speed of 2 cm radius ball in a viscous liquid is 20 *cms*<sup>-1</sup>. Then the speed of 1 cm radius ball in the same liquid is

1) 
$$5 cms^{-1}$$
2)  $10 cms^{-1}$ 3)  $40 cms^{-1}$ 4)  $80 cms^{-1}$ 

32. Two plane mirrors are placed at some angle. There are five images formed, when an object is placed symmetrically between them. Find the angle between the mirrors.

 1) 60°
 2) 45°
 3) 30°
 4) 90°



39.	The molecules of a given mass of gas have an rms velocity of $200 ms^{-1}$ at $27^{\circ}C$ and pressure 1				
	atm. When the temp	perature is 127°C and pres	sure is 2 atm, the rms veloc	ity in <i>ms</i> <sup>-1</sup> will be	
	1) $\frac{100\sqrt{2}}{3}$	2) 100√2	3) $\frac{400}{\sqrt{3}}$	4) None of these	
40.	Water falls from a h	neight 500 m. The rise in te	emperature of water at the b	pottom if the whole of	
	energy remains in t	he water, will be (specific	heat of water is $C = 4.2 KJ K$	$(g^{-1})$	
	1) 0.23° <i>C</i>	2) 1.16° <i>C</i>	3) 0.96° <i>C</i>	4) 1.02° <i>C</i>	
41.	The frequency f of v	vibration of mass m suspe	nded from a spring of sprir	ng constant k is given	
	by $f = cm^{x}k^{y}$ . Where	e c is a dimensionless cons	stant. The values of x and y	are respectively	
	1) $\frac{1}{2}$ , $-\frac{1}{2}$	2) $-\frac{1}{2}, \frac{1}{2}$	3) $\frac{1}{2}, \frac{1}{2}$	4) $-\frac{1}{2}$ , $-\frac{1}{2}$	
42.	The first diffraction	minimum due to single s	lit diffraction is at an angle	heta for a light of	
	wavelength 5000 $\mathring{A}$	. If the width of the slit is <sup>2</sup>	$1 \times 10^{-4}$ cm, then the value of	θis	
	1) 30°	2) 45°	3) 60°	4) 15°	
43.	A clear sheet of pol	aroid is placed on the top	of similar sheet so that thei	r axes make an angle	
	$\sin^{-1}\left(\frac{3}{5}\right)$ with each	other. The ratio of intensi	ty of the emergent light to t	hat of unpolarised	
	incident light is				
	1) 16 : 25	2) 9 : 25	3) 4 : 5	4) 8 : 25	
44.	If velocity of a galax	xy relative to earth is 1.2 $\times$	$10^6  ms^{-2}$ then % increase in v	wavelength of light	
	from galaxy as com	pared to the similar sourc	e on earth will be		
	1) 0.3%	2) 0.4%	3) 0.5%	4) 0.6%	
45.	The displacement x	of a body of mass 1 kg or	n a horizontal smooth surfa	ce as a function of time	
	t is given by $x = \frac{t^4}{4}$ .	The work done in the first	second is		
	1) $\frac{1}{4}J$	2) $\frac{1}{2}J$	3) $\frac{3}{4}J$	4) $\frac{5}{4}$ J	

		СН	EMISTRY	
46.	When an electron	of a hydrogen atom ju	mps from n=4 to n	=1 state, the number of spectral
	lines emitted are			
	1) 9	2) 3	3)6	4) 15
47.	The reaction that	does not define calcina	tion is	
	1) $ZnCO_3 \xrightarrow{\Delta} Zn$	$nO + CO_2$	2) Fe <sub>2</sub> O <sub>3</sub> .XH	$I_2O \xrightarrow{\Delta} Fe_2o_3 + XH_2O$
	3) <i>CaCO</i> <sub>3</sub> . <i>MgCO</i> <sub>3</sub>	$\xrightarrow{\Delta} CaO + MgO + 2CO$	$D_2$ 4) $2Cu_2S+3$	$O_2 \xrightarrow{\Delta} 2Cu_2O + 2SO_2$
48.	The logarithm of	the equilibrium constar	nt of the cell reaction	on corresponding to the cell
	$X(s) + X^{2+}(aq) \  Y^{+}$	(aq) Y(s) with standar	d cell potential, $E_{ce}^{o}$	$_{\rm II}$ = 1.2V is given by
	1) 40.2	2) 47.2	3) 12.5	4) 21.5
49.	If the half-cell read	ctions are given as		
	i) $Fe^{2+} + 2e^- \rightarrow Fe($	$(s); E^o = -0.44V$		
	ii) $2H^+(aq)+O_2(g$	$g)$ + 2 $e \rightarrow H_2O(I)$ ; $E^o = +$	-1.23V	
	The $E^{\circ}$ for the read	tion $Fe(s) + 2H^+ + O_2(g)$	$g) \rightarrow Fe^{2+}(aq) + H_2$	O(1)
	1) -0.79 V	2) -1.67 V	3) 1.67 V	4) 0.79 V
50.	Among the follow	ving, the surfactant that	t will form micelle	s in aqueous solution at the lowest
	molar concentrati	on at ambient condition	n is	
	1) $CH_{3}(CH_{2})_{15}N^{+}$	$(CH_3)_3 Br^-$	2) CH <sub>3</sub> (CH <sub>2</sub>	$)_{11} OSO_{3}^{-}Na^{+}$
	$_{3)} CH_{3} (CH_{2})_{6} CO_{6}$	O⁻Na⁺	4) CH <sub>3</sub> (CH <sub>2</sub>	$(D_{11} N^+ (CH_3)_3 Br^-)$
51.	Identify the correc	ct statements regarding	g the structure of A	$I(BH_4)_3$ .
	1. Alis $sp^3d^2$ and E	3 is <i>sp</i> <sup>3</sup> hybridized		
	2. It has 6 3 <i>c</i> −2 <i>e</i> <sup>-</sup>	bonds		
	3. It has 6 AI–H-	- Bbonds		
	4. It has 6 2 <i>c</i> −2 <i>e</i> <sup>-</sup>	bonds		
	1) Only 1, 3, 4	2) Only 1, 2, 3	3) Only 1, 2, 4	4) All of 1, 2, 3, and 4

52	0.1 M NaCl and $0.05$ M BaCl <sub>2</sub> solutions are separated by a semi-permeable membrane in					
021	container. For this system, choose the correct answer					
	1) Water flows form BaCl <sub>2</sub> soltion towards NaCl solution					
	2) There is no move	ment of any solution	across the membrane			
	<ul><li>3) Osmotic pressure</li></ul>	$\sim of 0.1 M NaCl is low$	ver than the osmotic press	ure of BaCl <sub>2</sub> (Assume		
	complete dissociatio	on)				
	4) Water flows from NaCl solution towards BaCle solution					
53	The increasing orde	$r$ of $pK_2$ of the follow	ving amino acids in aqueo	us solution is Gly. Asp. Lys		
00.	Ara					
	1) Asp < Gly < Arg	< Lys	2) Arg < Lys < Gly < Asp			
	3) Gly < Asp < Arg	< Lys	4) Asp < Gly < Lys < Arg			
54.	Four solutions of $K_2$	.SO₄ with the followi	ng concentration 0.1 m, 0.0	01 m, 0.001 m and 0.0001 m		
	are available. The maximum value of van't Hoff factor, i, corresponds to					
	1) 0.001 m solution		2) 0.0001 m solution			
	) 0.1 m solution		4) 0.01 m solution			
55.	The pH of a solutio	n prepared by mixing	, 2.0 ml of HCI solution of	f pH 3.0 and 3.0 ml NaoH of		
	рН 10.0 is		-			
	1) 3.5	2) 2.5	3) 6.5	4) 5.5		
56.	A photon of hard g	amma radiation knoc	ks a proton out of $\frac{24}{12}$ Mg nu	ucleus to form		
	1) The isotope of pa	irent nucleus	2) The isobar of parent nucleus			
	3) The nuclide $^{23}_{11}Na$		4) The isobar of $\frac{23}{11}Na$			
57.	The number of mol	ecules in 100 ml of 0.4	D2 N $H_2SO_4$ is			
	1) 6.02×10 <sup>20</sup>	2) 6.02×10 <sup>16</sup>	3) 6.02×10 <sup>22</sup>	4) 6.02×10 <sup>21</sup>		
58.	A KMnO₄ solution of	an be standardized b	by titration against $As_2O_3$ (	s). A 0.1156 g sample of		
	As <sub>2</sub> O <sub>2</sub> requires 27.0	8 mL of the KMnO, (a	g) for its titration. What is	s the molarity of the KMnO,		
	(aq) [As=75]	4 、	v	<b>y</b> 4		
	1) 0 0172 M	2) 1 0172 M	3) 0 172 M	4) 0 9172 M		
	.,	_,	0, 0, 1, 2 W	,		



64. A solid is formed by two elements P and Q. The element Q forms cubic close packing and atoms of P occupy one third of tetrahedral voids. The formula of the compound is 1)  $P_3Q$ 2)  $P_2 Q_3$ 4) PQ<sub>3</sub> 3)  $P_{3}Q_{2}$ Le-blanc process is employed in the manufacturing of 65. 2) Caustic soda 1) Baking soda 3) Soda ash and potash 4) Plaster of Paris 66. Which of the following have been arranged in decreasing order of oxidation number of Sulphur? 1)  $H_2SO_4 > SO_2 > H_2S > H_2S_2O_8$ 2)  $Na_2S_4O_6 > H_2S_2O_7 > Na_2S_2O_3 > S_8$ 4)  $SO_2^{2+} > SO_4^{2-} > SO_3^{2-} > HSO_4^{-}$ 3)  $H_2SO_5 > H_2SO_3 > SCI_2 > H_2$ 67. The degree of hardness of water is usually expressed in terms of 1) g/L of CaCO<sub>3</sub> and MgCO<sub>3</sub> present 2) ppm by weight of  $MqSO_{4}$ 3) ppm of CaCO<sub>3</sub> actually present in water 4) ppm by weight of CaCO<sub>3</sub> irrespective of whether it is actually present AgCl is dissolved in excess of each of  $NH_3$ , KCN and  $Na_2S_2O_3$ . The complex ions produced in 68. each case are 1)  $\left[ Ag(NH_3)_2 \right]^{2+} \left[ Ag(CN)_2 \right]^{3-}$  and  $\left[ Ag(S_2O_3)_2 \right]^{2-}$ 2)  $\left[ Ag(NH_3)_2 \right]^+$ ,  $\left[ Ag(CN_2) \right]^{3-}$  and  $\left[ Ag(S_2O_3)_2 \right]^{2-}$ 3)  $\left[ Ag(NH_3)_2 \right]^+$ ,  $\left[ Ag(CN)_2 \right]^-$  and  $\left[ Ag(S_2O_3)_2 \right]^{3-}$ 4)  $\left[ Ag(NH_3)_2 \right]^+$ ,  $\left[ Ag(CN)_2 \right]^-$  and  $\left[ Ag_2(S_2O_3)_2 \right]^{2-}$ 69. The maximum number of reducing hydrogens are contained in which of the following molecule/s? 1)  $H_3 PO_3$ 2)  $H_2PO_2$ 3)  $H_{4}P_{2}O_{7}$ 4)  $H_{3}PO_{4}$ 70. The bond order of the N-O bonds in NO<sub>3</sub><sup>-</sup> ion is 1) 1.33 2) 1.50 3) 1.00 4) 0.33 71. Which of the following fluoride of xenon has zero dipole moment? 1) XeF<sub>3</sub> 2) XeF<sub>4</sub> 3) XeF 4) XeF<sub>2</sub>







		510					
		BIO	LOGY				
91.	The sweet potato f	family is included in the	order				
	1) Polymoniales	2) Sapindales	3) Poales	4) Asparagales			
92.	The following are	some statements about le	eucocytes. Which of	these is incorrect?			
	I) The most abund	lant leucocyte is a granul	ocyte, whereas the l	east abundant leucocyte is an			
	agranulocyte						
	II) The Largent leucocyte is a granulocyte, whereas the smallest leucocyte is an agranulocyte						
	III) Phagocytic leucocytes may be agranulocyte or granulocyte						
	IV) Polymorphonuclear leucocytes are the largest granulocyte, whereas the largest						
	granulocyte, whereas the largest agranulocyte has kidney shaped nucleus						
	1) I, II and III	2) II and IV	3) III and IV	4) I and II			
93.	A doctor has orde	red a test for serum biliru	ubin. The patient go	es to a pathologist who collects			
	his blood. The pathologist should collect this blood in a test tube containing						
	1) Anti-coagulant sodium citrate       2) Anti-coagulant double oxalate						
	3) Anti-coagulant	fluorides	4) No anti-coag	ulant			
94.	The renin-angiote	nsin mechanism to increa	ase blood pressure i	nvolves organs in the following			
	order						
	1) Kidney-Liver-L 2) Kidnev-Lunas-I	ungs-Adrenal gland-Kid Liver-Adrenal gland-Kid	ney nev				
	3) Kidney-Liver-A	drenal gland-Lungs-Kid	ney				
95.	4) Kidney-Lungs- Internal fertilization	Adrenal gland-Liver-Kid	ney				
	1) Algae	2) Amphibians	3) Fungi	4) Bony fishes			
96.	What floral reward	d does Amorphophallus pa	articularly provide t	o its pollinator?			
	1) Floral oils	2) Pollen grains	3) Nectar	4) Safe place to lay eggs			
97.	My nucellar cells s	surrounding the embryo	sac start dividing, p	protrude into the embryo sac and			
	develop into the e	mbryos. Each of may ovu	ule contains many e	mbryos. Who am I?			
	1) Apple	2) Litchi	3) Lemon	4) Strawberry			
98.	Which lupine was	excavated from the tunc	Ira that germinated	and flowered after a record			
	10,000 years?		5				
	1) Lupinus polyph	vllus	2) Lupinus Lepi	idus			
	3) Lupinus littoral	is	4) Lupinus arcti	icus			
	.,	-	., <u></u>				

99.	Choose the correct group of plants that use entomophily as their preferred method of					
	pollination					
	1) Zostera, Vallisne	ria	2) Zea mays, Sorghum vu	Igare		
	3) Bougainvillea, Sa	Ivia	4) Butea, Bauhinia			
100.	In the development	of Angiosperms, general	ly			
	1) The development of endosperm starts before the development of embryo					
	2) The developmen	t of endosperm starts afte	r the development of an em	bryo		
	3) The developmen	t of endosperm starts alor	g with the development of	embryo		
	4) The endosperm o	lisappears before the deve	elopment of embryo starts			
101.	The height of plant	is controlled by three gen	es. The maximum height in	the species is 24		
	inches, whereas the	minimum height in the s	pecies is 6 inches. What wo	uld be the height of a		
	plant of the same sp	becies whose genotype is a	AaBBcc?			
	1) 12 inches	2) 15 inches	3) 18 inches	4) 21 inches		
102.	With respect to bloc	od groups, the person hav	ing blood group is def	finitely heterozygous		
	1) A	2) B	3) AB	4) O		
103.	Which of the follow	ving genotypes represents	a pea plant with yellow po	ds and wrinkled		
	seeds?					
	1) ggrr	2) Yyrr	3) yyrr	4) GGrr		
104.	Which of the follow	ring examples of intrageni	c inheritance was discovered	ed by Mendel?		
	1) Co-dominance	2) Incomplete dominance	ce3) Complete dominance	4) None		
105.	Which of the follow	ving statement/s about tes	st cross is/are correct?			
	I) Every test cross is	s a back cross but not ever	y back cross is a test cross			
	II) Every back cross	is a test cross but not eve	ry test cross is a back cross			
	III) The ratio of a te	st cross is always 1 : 1				
	IV) A test cross can	be considered as a type of	f reciprocal cross			
	1) I and III	2) I, III and IV	3) II and IV	4) I		
106.	In Andalusian fowl	s, the mating of black and	white fowls will produce			
	1) Black fowls	2) White fowls	3) Blue fowls	4) Grey fowls		
107.	Which of the follow	ving does not belong to the	e Palaeozoic era?			
	1) Silurian	2) Cretaceous	3) Devonian	4) Carboniferous		

108.	Choose the pairs o	f organs that are a result	of convergent evolution			
	i) Wings of butterflies and winds of birds					
	ii) Flippers of penguins and flippers of dolphins					
	iii) Eves of octopus	s and eves of mammals				
	iv) Thorns of Boug	ainvillea and tendrils of	Cucurbita			
	v) Sweet potato an	d potato				
	vi) Vertebrate hear	ts and vertebrate brains				
	1) i. ii. v and vi	2) i, ii, iii and iv	3) i. ii and vi	4) i. ii. iii and v		
109	The first cellular fo	orms of life appeared on	earth about	ly ly lity in and t		
	1) 500 mva	2) 2000 mva	3) 2500 mya	4) 350 mva		
110.	An out-cross will h	nave parents	-,,	,,,		
	1) From different b	preeds				
	2) From same bree	ds but with common and	cestors only from one side			
	<ul><li>3) From same bree</li></ul>	d but with common ance	estors from both sides			
	<ul><li>4) From same bree</li></ul>	d but with no common a	ncestors			
111.	Competitive releas	se refers to				
	) Inability of two	species to co-exist indefi	nitely and eventual eliminat	tion of the competitively		
	inferior species		,	. ,		
	2) Avoidance of co	mpetition between speci	es competing for same reso	urce by figuring a		
	compromise					
	3) Expansion of dis	stribution of a species res	stricted to a small area due t	o a competitively		
	superior species be	eing experimentally elim	inated			
	4) Evolutionary su	ccess in devising a mech	anism to counter and neutra	alize competition		
112.	The intrinsic rate c	of natural increase for Inc	lian human population acco	ording to the 2011 census		
	was					
	1) 0.0205	2) 0.0147	3) 0.0652	4) 0.0351		
113.	The highest factor	contributing to the dry v	veight of organisms is			
	1) Water	2) Carbon	3) Hydrogen	4) Nitrogen		

114.	Arrange the following is descending order of their percentage of the total cost of various
	ecosystem services

1)	Soil formation >	nutrient	cvclina	> climate	regulation
·/	50111011111111011 >	nutritin	cycning		regulation

2) Soil formation > climate regulation > nutrient cycling

3)	Climate regulation	>	nutrient	cycling	>	soil	formation
----	--------------------	---	----------	---------	---	------	-----------

4) Climate regulation > soil formation > nutrient cycling

### 115. Choose the incorrect statement from the following

- 1) Sun is the only source of energy for every single ecosystem on earth
- 2) Plants capture 2-10% of PAR
- 3) Ecosystems follow the 2<sup>nd</sup> law of thermodynamics
- 4) In a terrestrial eystem major producers are herbaceous and woody plants
- 116. Which of eh following comparisons is correct
  - 1) Number of recorded animals < number of recorded plants
  - 2) Number of national parks in India < number of biodiversity hotspots in the world
  - 3) Number of varieties of mango in India < number of varieties of rice in India
  - 4) The percentage of mammals facing the threat of extinction < the percentage of amphibians acing the threat of extinction
- 117. Bali, Javan and Caspian are the subspecies of which of the following?

1) Lion	2) Tiger	3) Panther
	2) 11901	

118. Which part of the biosphere reserve is an area of active cooperation between reserve

management and the local people, where in activities like settlements, cropping, forestry and

4) Cheetah

recreation and other economic uses continue in harmony with conservation goals?

1) Core area2) Buffer area3) Transition area

4) Anywhere in the biosphere reserve

119. Arrange the following efforts to control pollution in chronological order

A) In India, the Air (Prevention and Control and Pollution) Act was amended to include noise as an air pollutant

B) The government of India passed the Water (Prevention and Control of Pollution) Act to safeguard our water resources

C) Recognizing the deleterious effects of ozone depletion, the Montreal Protocol became effective

D) The Notional Forest Policy of India recommended 33% forest cover for the plains and 67% for the hills

1) A-B-D-C	2) B-A-D-C	3) B-A-C-D	4) A-B-C-D

120. Choose the correct representation of effect of sewage discharge on important characteristics of



- 121. Identify the tissue which has been incorrectly matched with its function
  - 1) Columnar Epithelium- Secretion
  - 2) Cuboidal Epithelium Absorption
  - 3) Squamous Epithelium Both secretion and absorption
  - 4) Ciliated Epithelium Move particles or mucous in a certain direction
- 122. Select the correct statements from the following
  - I) Bones support and protect softer tissues and organs
  - II) Blood is a fluid connective tissue
  - III) Cartilage is a type of specialized muscle tissue
  - IV) The bone marrow found in some bones is the site of production of leucocytes
  - 1) I and II
     2) I, II and III
     3) I, II, III, and IV
     4) I, II and IV

123	Radioactively-labelled d-nucleotides are introduced into a cell
120.	Radioactivery labelled a flactorides are fill oddeed filled een



127. The diagram shows part of a carbohydrate molecule formed by glucose monomer. What is the name of the molecule?

1) Amylose 2) Cellulose 3) Starch

4) Glycogen

- 128. What is the effect of an enzyme in an enzyme-catalysed reaction?
  - 1) decreases the activation energy and decreases the energy yield
  - 2) decreases the activation energy and has no effect on the energy yield
  - 3) increases the activation energy and increases the energy yield
  - 4) increases the energy yield and decreases the activation energy
- 129. How many copies of each different DNA molecule will be found in a cell at the beginning of each of these stages of the mitotic cell cycle?

	G2 of Interphase	Prophase	Cytokinesis
А	1	1	2
В	1	2	1
С	2	1	2
D	2	2	2
1) A	2)	B	3) C

4) D

- 130. For successful cell replacement during tissue repair, the chromosome content of each daughter cell must be identical to that of the mother cell. Which stages of mitosis make sure that each daughter cell receives one chromatid from each chromatid pair?
  - 1) Prophase and metaphase 2) Metaphase and anaphase
  - 3) Anaphase and telophase 4) Telophase and interphase
- 131. The process of exchange of <u>A</u> from the atmosphere with CO<sub>2</sub> produced by the cells is called <u>B</u> commonly known as <u>C</u>. Choose alternative that will correctly replace A, B and C in the above statement and make it meaningful
  - 1)  $A N_2$ , B ventilation, C-respiration 2) A -
    - 2)  $A NO_2$ , B breathing, C-combustion
    - 3)  $A O_2$ , B breathing, C-respiration
- 4) A-water vapour, B-ventilation, C-combustion

132. Observe the given diagram. Identify the labels A, B and C



1) A- Air goes inside the lungs, B- Ribs and sternum returned to original position, C-Diaphragm relaxed and arched upward

2) A- Air goes inside the lungs, B- Ribs and sternum raised, C-Diaphragm contracted

3) A- Air expelled from lungs, B- Ribs and sternum returned to original position, C-

Diaphragm contracted

4) A- Air expelled from lungs, B-Ribs and sternum raised, C- Diaphragm relaxed and arched upward

133. Identify the correct DNA triplet on the original DNA template that will code for the amino acid histidine based on the following table.

Amino acid	Anti-codon
Ala	CGU
His	GUA
Ser	UCA
1) CAU	2) CGT

3) GTA

4) GUA

134. From the following, identify the statements that are correct regarding tRNA.

I) Hydrogen bonds between bases temporarily hold tRNA against mRNA.

II) The base sequences in the tRNA molecules are the same as the base sequences in the mRNA that is being translated

III) The specificity of the tRNA molecule for glycine and the specificity of the enzyme that loads glycine are both necessary for correct loading

1) I, II and III	2) I and II only	3) I and III only	4) II and III only

135.	DNA polymerase catalyses conde	ensation reactions between molecules during semi-
	conservative replication of DNA.	Which two molecules are joined by DNA polymerase?
	1) Base and base	2) Base and nucleotide

3) Nucleotide and nucleotide 4) Phosphate and deoxyribose

136.	The diagram shows	the structure of a bacteria	ıl cell.	
	The presence of stru	icture X in the bacterial ce	II is one reason why bacteri	a are used in genetic
	engineering. In the	cloning vector pBR322, wl	nich gene is responsible for	the replication of
	structure X?			
	1) Cla I	2) BamH I	3) ori	4) rop
137.	Which of the follow	ing statements/s is/are a	n example of genetic engine	eering?
	I) Inserting a gene f	or human insulin product	ion into bacteria	
	II) Selective breedin	g to produce cattle with h	igh milk yields	
	III) Using methods	like crop rotation with leg	uminous plants to increase	the fertility of the soil
	IV) Vegetative prop	agation and grafting are p	practiced to ensure higher y	ield
	1) I, II and IV	2) II and III	3) I and III	4) Only I
138.	Ligase enzymes are	used in genetic engineeri	ng to	
	1) Cut open plasmic	DNA	2) Insert plasmids into bac	cteria
	3) Isolate the DNA	making up a human gene	4) Join human DNA to pla	asmid DNA
139.	To produce insulin	via a non-human cell, whi	ch of the following would I	pe required to be
	inserted in the vector	pr's plasmid?		
	1) a segment of DN	A from a human	2) a segment of DNA from	n another bacterium
	3) a molecule of ins	ulin	4) an enzyme	
140.	In some areas, farm	ers who grow genetically	modified (GM) corn have to	o make sure there is a
	gap between GM ar	nd non-GM crops. What is	the reaction for leaving a g	ap between the crops?
	1) so they can get la	rge machinery into the fie	lds	
	2) to prevent cross-	pollination between GM a	nd non-GM crops	
	3) to prevent diseas	e spreading between crop	S	
	4) to prevent pests a	attacking crops		
141.	Which of the follow	ing organisms is an odd o	ne out with respect to mod	e of nutrition?
	1) Gonyaulax	2) Chlamydomonas	3) Trypanosmona	4) Nostoc
142.	Dikaryophase is cor	nmonly seen in members	of	
	1) Ascomycetes and	Phycomycetes	2) Ascomycetes and Basid	iomycetes
	3) Phycomycetes an	d Basidiomycetes	4) Basidiomycetes and De	uteromycetes

- 143. Which of these statement/s about lichens is/are true?
  - I) Lichens are mutually beneficial symbiotic associations
  - II) They grow extensively in areas with high pollution, hence called as pollution indicators

III) The phycobiont member, algae, is an autotroph and the mycobiont member, fungi, is a heterotroph

IV) Fungi help the algae harvest sunlight for photosynthesis

 1) II and III
 2) I and III
 3) I, II and III
 4) III and IV

144. Fill in the blanks A, B, C and D with the correct chose of words

Viruses are (A), protected by a protein coat called (B). The protein coat is made up of the

assembly of small units called the (C). It protects the internal (D) of the viruses

- 1) A-glycolipids, B-capsule, C-chains, D-sugars
- 2) A-lipoproteins, B-cover, C-helices, D-genetic material
- 3) A-glycoproteins, B-cell wall, C-fatty acids, C-cytoplasm
- 4) A- nucleoproteins, B-capsid, C-capsomeres, D-genetic material
- 145. Observe the below diagram. Identify the option suggesting the correct functions of A, B and C



1) A-Helps in attachment to the substratum, B-Stalk for supporting the body of brown algae,

C-Leaf like Photosynthetic organ for producing food

2) A-Stalk for supporting the body of brown algae, B-Leaf like Photosynthetic organ for producing food, C-Helps in attachment to the substratum

3) A-Leaf like Photosynthetic organ for producing food, B-Stalk for supporting the body of brown algae, C-The holdfast helps in attachment to the substratum

4) A-Leaf like Photosynthetic organ for producing food, B-Helps is attachment to the substratum, C-Stalk for supporting the body of brown algae

146. Roots of which of the following plants are involved in nitrogen fixation?

1) Cycas2) Pinus3) Banyan4) Peepal

147. Identify the correct match between the types of aestivation and their examples

Types of	Examples
Aestivation	
I. Valvate	A. Cotton
II. Twisted	B. Bean
III. Imbricate	C. Calotropis
IV. Vexillary	D. Gulmohar

1) I-A, II-D, III-B, IV-C

3) I-A, II-B, III-C, IV-D

2) I-D, II-C, III-B, IV-A
 4) I-C, II-A, III-D, IV-B

148. A plant with racemose inflorescence, zygomorphic flowers, five sepals and petals showing vexillary aestivation, monocarpellary and unilocular superior ovary, androecium consisting of ten stamens.

The above-listed conditions are characteristics of which family of plants?

1) Solan	aceae 2) Fabaceae	3) Liliaceae	4) Brassicaceae
,			•

149. In some plants, the leaves are short lived and small. The petioles of such plants expand and become green. One such plant is

1) Cactus2) Venus fly-trap3) Australian acacia4) Peas

150. The edible part of coconut fruit is

1) perisperm2) endosperm3) endocarp4) mesocarp

151. Read the following statements about monocot root. Which amongst them are correct?

I) It shows a polyarch condition of xylem

II) Central pith is less or absent

III) The monocot root dos not undergo secondary growth

 1) Only I
 2) I, II and III
 3) I and III
 4) I and II

152. Arrange the below four layers in proper order starting from the outermost to the innermost layer after secondary growth has already occurred in a dicot stem

I) Phellem	II) Wood	III) Phelloderm	IV) Vascular cambium
1) $  \rightarrow     \rightarrow       \rightarrow   V$	2) $  \rightarrow       \rightarrow     \rightarrow   \vee$	3) $ V \rightarrow     \rightarrow    \rightarrow  $	4) $    \rightarrow    \rightarrow   \rightarrow   \lor$

153.	Which of the follow	ing is correct with respect	t to uphill transport using c	hannel pumps?
	1) Lower concentra	tion to higher concentration	on utilizing ATP	
	2) Higher concentra	ition to lower concentration	on utilizing ATP	
	3) Higher concentra	ition to lower concentration	on without utilizing ATP	
	4) Hypertonic solut	ion to hypotonic solution		
154.	The process of nitro	ogen cycling by microbes i	nvolves multiple steps of o	xidation and
	simultaneous reduc	tion. The following reacti	on occurring during one su	ch step is brought
	about by which bac	teria?		
	$2NO_2^- + O_2 \longrightarrow 2NO_2^- + O_2^- + O_2 \longrightarrow 2NO_2^- + O_2^- + O_$	$\mathcal{O}_3^-$		
	1) Pseudomonas	2) Nitrosomonas	3) Nitrobacter	4) Thiobacillus
155.	According to Black	man's law of limiting facto	or, which of the following is	s the most important
	limiting factor in th	e process of photosynthes	is?	
	1) Water	2) CO <sub>2</sub>	3) Light	4) Temperature
156.	How many cycles o	f cyclic and non-cyclic ph	otophosphorylation would	be required in order
	to generate enough	energy for the productior	n of one glucose molecule?	
157.	<ol> <li>1) 10 cyclic and 4 no</li> <li>2) 6 cyclic and 6 nor</li> <li>3) 2 cyclic and 4 nor</li> <li>4) 8 cyclic and 1 nor</li> <li>How many of the formation</li> </ol>	on-cyclic photophosphory n-cyclic photophosphoryla n-cyclic photophosphoryla n-cyclic photophosphoryla ollowing are the substrates	lation ation ation ation s involved in the Kreb's cyc	le?
	Citric acid, succinic	acid, hydrochloric acid, $\alpha$	e–ketoglutaric acid, fumario	c acid, malic acid,
	pyruvic acid, phosp	hoglyceric acid, acetic aci	d	
	1) Six	2) Four	3) Five	4) Three
158.	In which of the follo	owing form, glycerol can e	enter the cell as a cellular su	Ibstrate?
	1) PGA	2) Pyruvate	3) PGAL	4) PEP
159.	Read the given state	ements about auxins and s	state whether they are true	or false.
	a. Auxin promotes a	apical dominance		
	b. Auxins have a ne	gative impact on cytokini	n levels	
	c. F.W. Went isolate	ed auxins from the coleopt	tiles of the oat plant	
	d. Auxin promotes	flowering in the pineapple	e plants	
	1) a-false, b-false, c-	true, d-false	2) a-true, b-false, c-true, d	-true
	3) a-true, b-false, c-1	rue, d-false	4) a-false, b-true, c-true, d	-true

160. Growth of vascular cambium is an example of

1) Senescence2) Geometric growth3) Arithmetic growth4) Plasticity

161. Which of the following statements is incorrect regarding organisms of phylum Chordata?1) The organisms are characterized by the presence of a notochord and a ventral hollow nerve cord

2) They are triploblastic and bilaterally symmetrical

3) They have a ventral heart

4) They are further divided into three subphyla

162. How many of the following organisms belong to the second largest phylum? Apple snail, Pearl oyster, Anopheles, Culex, Aedes, Starfish, Sea urchin, Cuttlefish, Sea cucumber, Squid, Devil fish

1) 9 2) 8 3) 10 4) 5

163. A 2 years old child shows stunted growth and slow brain development. He has thin limbs and also shows wasting of muscles. There is great oedema and swelling present over his body parts. He has very less amount of fat present beneath his skin. Which of the following could be a reason for the development of this condition in him?

1) Replacement of mother's milk by foods less in total proteins as well as calories at an early age

2) Replacement of mother's milk by foods less in total proteins, but having high calories at an early age

3) Replacement of mother's milk by food less in total fats, but having high calories at an early age

4) Replacement of mother's milk by foods less in vitamins and minerals, but having high calories at an early age

164. Select the correct statements regarding the human skeletal system from the statements given below

I) There are a total of 12 ribs in the human skeletal system

II) Each limb is made up of 30 bones

III) The axial skeleton consists of 80 bones

IV) The wrist bones are 8 in number

1) I and II 2) I and III

3) I, III and IV

4) II, III and IV

165. Which of the following joint permits only limited movements?

1) Joint present between flat skull bones

2) Joint present between adjacent vertebrae

3) Joint present between humerus and pectoral girdle

4) Knee joint

166. Column-I lists the parts of the human brain and column-II lists the functions. Match the two columns and identify the correct choice from those given

	Column-I		Column-II	
Α.	Cerebrum	p.	Seat of intelligence	
В.	Cerebellum	q.	Receive visual and	
			auditory inputs	
C.	Hypothalamus	r.	Controls the rate of	
			heartbeat	
D.	Midbrain	S.	Controls the pituitary	
		t.	Maintains body posture	
1) A			2) A=s, B=t, C=q,	, D=p

A=t, B=r, C=q, D=p
 A=t, B=s, C=p, D=r

4) A=p, B=t, C=s, D=q

167. Which of the following statement regarding forebrain is correct?

1) Forebrain consists of hypothalamus, thalamus and cerebellum

2) The layer of cells covering the cerebral hemispheres is referred to as white matter

3) The lobe involved in regulation of sexual behaviour and expression of emotional reaction is also a part of the forebrain

4) Association areas of the forebrain are sensory in function

168. Which of the following hormone helps in maintaining body temperature, metabolism, pigmentation and defense capabilities?

1) Melatonin	2) Melanin	3) Thymosin	4) Calcitonin

169. The hormones A and B secreted by Islet of Langerhans cause hyperglycemia and hypoglycemia, respectively

1) A: insulin, B: glucagon 2) A

- 3) A: glucagon, B: insulin
- 2) A: somtatostatin, B: insulin
- 4) A: insulin, B:somatostatin

- 170. Read the following statements about eh parathyroid gland and identify the true and false ones.Select the correct option after referring to the given table
  - I) Human beings have a pair of parathyroid glands, situated in each lobe of the thyroid gland
  - II) The secretion of PTH is regulated by the levels of circulating calcium ions
  - III) PTH is a hypocalcemic hormone
  - IV) PTH plays a major role in maintaining calcium balance in the body along with TCT
  - 1) I-True, II-False, III-True, IV-False 2) I-True, II-True, III-False, IV-True
  - 3) I-False, II-False, III-True, IV-False 4) I-False, II-True, III-False, IV-True
- 171. Identify the functions/characteristic of parts labelled as A, B, C, D and E in the given diagram. Select the correct option after referring to the given table



1) A: Part having a narrow lumen, B: Part where zygote formation occurs, C: Part closest to the ovary, D: Part responsible for transportation of ovum, E: Part responsible for production of ovum

2) A: Part having a narrow lumen, B: Part closest to the ovary, C: Part responsible for transportation of ovum, D: Part where zygote formation occurs, E: Part responsible for production of ovum

3) A: Part responsible for production of ovum, B: Part responsible for transportation of ovum,C: Part where zygote formation occurs, D: Part closest to the ovary, E: Part having a narrowlumen

4) A: Part where zygote formation occurs, B: Part responsible for transportation of ovum, C: Part responsible for production of ovum, D: Part having a narrow lumen, E: Part closest to the ovary

- 172. Which of the following cells are responsible for the secretion of the hormone that stimulates muscular growth, growth of facial and axillary hair, aggressiveness, low pitch of voice, etc. In males?
  - 1) Cells which form the lining of seminiferous tubules
  - 2) Cells which provide nutrition to the growing spermatozoa
  - 3) Cells situated in the interstitial space of testis
  - 4) Germ cells
- 173. Which of the following parts of the sperm provides energy for its motility?
  - 1) The head 2) The neck 3) The tail

4) The middle piece

- 174. Choose the right one among the statements given below
  - 1) IUDs are generally inserted by the user herself
  - 2) IUDs increase phagocytosis reaction in the uterus
  - 3) IUDs suppress gametogenesis
  - 4) IUDs once inserted need not be replaced
- 175. Which of the following processes is involved in the assisted reproductive technology known as 'GIFT'?
  - 1) Transfer of zygote into the fallopian tube
  - 2) Transfer of zygote into the uterus
  - 3) Transfer of ovum collected from donor to the fallopian tube
  - 4) Transfer of ovum collected from donor to the uterus
- 176. Identify the organism which causes dry, scaly lesions on the skin, nails and scalp of humans is
  - 1) A fungi belonging to genus Neurospora
  - 2) A fungi belonging to genus Microsporum
  - 3) A bacteria belonging to genus Streptococcus
  - 4) A bacteria belonging to genus Mycobacterium
- 177. Which of the following is an example of a disease caused by the attack of the body on its own cells?
  - 1) Diabetes inscipidus 2) Malaria
  - 3) Rheumatoid arthritis 4) Tuberculosis

- 178. Which of the following drugs is capable of producing a state of euphoria or increased energy?
  - 1) Coke obtained from *Erythroxylum coca*
  - 2) Heroin obtained from *Cannabis sativa*
  - 3) Charas obtained from *Calviceps purpurea*
  - 4) Morphine obtained from Papaver somniferum
- 179. Match the microbes given in column I with the major role played by them given in column II and select the correct option form the codes given below

	Column I		Column II
I	Propionibacterium	А	Produces an
	sharmanii		immunosuppressive
			agent
11	Sterptococcus	В	Nitrogen fixation in
			soil
	Trichoderma	С	Produce large holes
	polysporum		in Swiss cheese
IV	Rhizobium	D	Produces enzyme
			used as clot-buster
1) I-	C, II-A, III-D, IV-B	•	2) I-C, II

1) I-C, II-A, III-D, IV-B

3) I-B, II-A, III-D, IV-C

4) I-A, II-C, III-B, IV-D

180. Given below are the steps involved in sewage treatment. Arrange them in proper sequence and select the correct option

A. Passage of primary effluent into large aeration tanks for mechanical agitation and pumping of air

- B. Passage of secondary effluent and formation of activated sludge
- C. Physical removal of particles through filtration and sedimentation
- D. Release of effluent from the secondary treatment plant into natural water bodies.
- E. Growth of useful aerobic microbes into flocs which significantly reduces the BOD.

1) A, C, B, E, D 2) A, B, C, D, E 3) C, A, E, B, D 4) C, E, A, B, D

# NTA ABHYAS NEET MOCK TEST – 30

## Answers and Solutions PHYSICS KEY

1) 4	2) 2	3) 2	4) 1	5) 3	6) 3	7) 1	8) 2	9) 1	10) 1
11) 2	12) 1	13) 1	14) 2	15) 1	16) 1	17) 4	18) 2	19) 3	20) 4
21) 3	22) 3	23) 2	24) 3	25) 1	26) 2	27) 3	28) 1	29) 1	30) 2
31) 1	32) 1	33) 3	34) 1	35) 2	36) 3	37) 3	38) 1	39) 3	40) 2
41) 2	42) 1	43) 4	44) 2	45) 2	46)	47)	48)	49)	50)
CHEMISTRY KEY									

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

#### **BIOLOGY KEY**

101) 1	102) 4	103) 4	104) 1	105) 3	106) 4	107) 3	108) 4	109) 3	110) 1
111) 2	112) 3	113) 1	114) 4	115) 4	116) 3	117) 2	118) 4	119) 2	120) 4
121) 3	122) 2	123) 2	124) 1	125) 1	126) 4	127) 2	128) 3	129) 2	130) 1
131) 3	132) 4	133) 3	134) 4	135) 4	136) 3	137) 4	138) 2	139) 4	140) 2
141) 3	142) 2	143) 3	144) 3	145) 3	146) 4	147) 4	148) 4	149) 1	150) 2
151) 3	152) 2	153) 2	154) 4	155) 3	156) 1	157) 4	158) 2	159) 3	160) 2
161) 3	162) 2	163) 1	164) 3	165) 2	166) 2	167) 3	168) 3	169) 2	170) 3
171) 1	172) 4	173) 2	174) 4	175) 2	176) 4	177) 3	178) 1	179) 3	180) 4
181) 1	182) 3	183) 4	184) 2	185) 3	186) 2	187) 3	188) 1	189) 2	190) 3

#### **PHYSICS SOLUTIONS**

1. On the basis of dual nature of light, de-Broglie suggested that the dual nature is not only of light, but each moving material particle has the dual nature. He assumed a wave to be associated which is called the matter-wave. The wavelength of this wave is determined by the momentum of the particle. If p is the momentum of the particle, the wavelength of the wave

associated with it is  $\lambda = \frac{h}{p}$ , where h is Plank's constant.

Since, it is given that, alpha, beat and gamma rays carry the same momentum, so they will have the same wavelength.

2. 
$$\frac{1}{2}mv_{\max}^{2} = eV = \frac{hc}{\lambda} \Longrightarrow \lambda = \frac{hc}{eV}$$
$$\Longrightarrow \lambda_{1} = \frac{hc}{eV_{1}}, \lambda_{2} = \frac{hc}{eV_{2}}$$
$$\Longrightarrow \lambda_{1} - \lambda_{2} = \frac{hc}{eV_{1}} - \frac{hc}{eV_{2}}$$
$$\Longrightarrow \Delta \lambda = \frac{hc}{e} \left[ \frac{1}{V_{1}} - \frac{4}{5V_{1}} \right] = \frac{hc}{eV_{1}} \times \frac{1}{5}$$
$$\therefore V = \frac{hc}{5e\Delta\lambda}$$

3. The mass of considered element is  $dm = \lambda dx = \lambda_0 x dx$ 



4. Acceleration of cylinder down the plane is

$$a = \left(g\sin 30^\circ\right) \left(\sin 30^\circ\right) = 10 \left(\frac{1}{2}\right) \left(\frac{1}{2}\right) = 2.5 \text{ m/s}^2$$
  
Time taken :  $t = \sqrt{\frac{2s}{a}} = \sqrt{\frac{2 \times 5}{2.5}} = 2s$ 

5. Given 
$$I_1 = I_2 \Rightarrow \frac{1}{2}MR^2 = \frac{mL^2}{12} + \frac{mR^2}{4}$$

Solve to get  $L = \sqrt{3}R$ 

- 6. Partially filled inner subshells are responsible for ferromagnetic behaviour of such substances.
- 7. When the circuit is open, potential difference E=2.2V

$$i = \frac{2.2}{r+5}$$

5Ω

Potential difference across cell =E-ir

$$1.8 = 2.2 - \frac{2.2}{r+5} \times r \Rightarrow \frac{2.2r}{r+5} = 0.4$$
$$\Rightarrow r = \frac{2}{1.8} = \frac{10}{9}\Omega$$

8. Voltage  $across 2\Omega$  is the same as voltage  $across arm containing 1\Omega$  and  $5\Omega$  resistances. Voltage  $across 2\Omega$  resistance.

 $V = 2 \times 3 = 6V$ 

So, voltage across lowest arm,  $V_1 = 6V$ 

Current across  $5\Omega$ ,  $I = \frac{6}{1+5} = 1A$ 

Thus, power across  $5\Omega$ ,

$$P = I^2 R = (1)^2 \times 5 = 5 W$$

9. 
$$P = \frac{1}{2} V_o i_o \cos \phi \Longrightarrow P = P_{Peak} - \cos \phi$$

$$\Rightarrow \frac{1}{2} (P_{peak}) = P_{peak} \cos \phi$$
$$\Rightarrow \cos \phi = \frac{1}{2} \Rightarrow \phi = \frac{\pi}{2}$$

$$\varphi \cos \varphi = \frac{1}{2}$$

10.  $e = Bvl = 0.1(2 \times 10^{-2}) \times 6 = 12 \times 10^{-3} = 12mV$ 

3

11. The charge A experiences three forces  $F_1$ ,  $F_2$  and  $F_3$  as shown in the figure

$$F_{2} = \frac{1}{4\pi\varepsilon_{0}} \frac{q_{1}q_{2}}{a^{2}}$$
 (along AD)  

$$F_{3} = \frac{1}{4\pi\varepsilon_{0}} \frac{q_{1}q_{2}}{a^{2}}$$

The resultant of  $F_1$  and  $F_2$  should be equal and opposite to  $F_3$  to keep the system is equilibrium. Resultant of  $F_1$  and  $F_2$ 

$$=F_{3}=\sqrt{F_{1}^{2}+F_{2}^{2}}=\frac{1}{4\pi}\frac{q_{1}q_{2}}{\varepsilon_{0}a^{2}}\sqrt{2}$$

For equilibrium,  $\frac{1}{4\pi} \frac{q_1 q_2}{a^2} \sqrt{2} = \frac{1}{4\pi \varepsilon_0} \frac{q_1^2}{a^2}; \frac{q_1}{q_2} = \sqrt{2}$ 

12. 
$$B = \frac{\mu_0 I}{2\pi r} = \frac{4\pi \times 10^{-7} \times 18}{2\pi \times 0.2} T = 18\mu T$$
Now,  $T = 2\pi \sqrt{\frac{I}{MB_H}}$  and  $T^{\dagger} = 2\pi \sqrt{\frac{I}{M(B_H - B)}}$ 
Dividing  $\frac{T^{\dagger}}{T} = \sqrt{\frac{B_H}{B_H - B}}$  or  $\frac{T^{\dagger}}{T} = \sqrt{\frac{24}{24 - 18}} = 2$ 
 $T^{\dagger} = 2 \times 0.1s = 0.2 s$ 
13.  $g = \frac{4}{3}\pi G\rho R \Rightarrow g \propto \rho R \Rightarrow \frac{g_e}{g_m} = \frac{\rho_e}{\rho_m} \times \frac{R_e}{R_m}$ 
 $\Rightarrow \frac{6}{1} = \frac{5}{3} \times \frac{R_e}{R_m} \Rightarrow R_m = \frac{5}{18} R_e$ 
14.  $\frac{(v_e)_{p_1}}{(v_e)_{p_2}} = \frac{\sqrt{2g_1R_1}}{\sqrt{2g_2R_2}} = \sqrt{\frac{g_1}{g_2} \times \frac{R_1}{R_2}} = \sqrt{ab}$ 
15. Rate of cooling  $\left(-\frac{dT}{dt}\right) \propto$  emissivity (e)
From graph,  $\left(-\frac{dT}{dt}\right)_x > \left(-\frac{dT}{dt}\right)_y \Rightarrow e_x > e_y$ 
Further emissivity (e)  $\propto$  Absorptive power (a)  $\Rightarrow a_x > a_y$ 

(: . good absorbers are good emitters)

16. Isentropic process is an adiabatic process. So,

2

$$\left(\frac{T_1}{T_2}\right)^{\gamma} = \left(\frac{P_1}{P_2}\right)^{\gamma-1} \Rightarrow \left(\frac{300}{600}\right)^{\frac{5}{3}} = \left(\frac{P_i}{P_f}\right)^{\frac{5}{3}}$$
$$\Rightarrow \left(\frac{1}{2}\right)^{\frac{5}{3}} = \left(\frac{1}{P_f}\right)^{\frac{2}{3}} \Rightarrow \frac{5}{3}\ln 2 = \frac{2}{3}\ln P_f$$
$$\Rightarrow \ln P_f = \frac{5}{2}\ln 2 = 1.75$$
$$17. \quad \eta = 1 - \frac{T_2}{T_1} = 1 - \frac{100}{500} = 1 - \frac{T}{900}$$
$$\therefore \frac{T}{900} = \frac{1}{5} \text{ or } T = 180K$$
$$18. \quad \text{Number of moles } n = 5 \text{ mol}, \ T_1 = 100^{\circ}C, \ T_2 = 120^{\circ}C \ \Delta U = 80J$$
Rise is temperature  $\Delta T = 120 - 100 = 20^{\circ}C$ 
$$\Delta U = ns\Delta T \Rightarrow \frac{80}{5} = 1 \times s \times 20 \ ; \ s = 0.8J$$

:. For 5 mol,  $s = 0.8 \times 5JK^{-1} = 4JK^{-1}$ 

19. Due to charge q moving on circular path u I = u a f

$$B_{centre} = \frac{\mu_0 I}{2R} = \frac{\mu_0 q f}{2R} = \frac{\mu_0 q \omega}{4\pi R}$$

20. : Net force on current carrying closed loop is zero

: 
$$F_{PQ} = \sqrt{(F_3 - F_1)^2 + F_2^2}$$

21. Average speed =  $\frac{Total \ dis \tan ce}{Total \ time}$ 

$$=\frac{3L}{\frac{L}{V_1}+\frac{2L}{V_2}}=\frac{3V_1V_2}{V_2+2V_1}$$

22.  $u = 36 \, kmh^{-1} = 10 \, ms^{-1}$ 

$$v = u + at, \tan \theta = \frac{a}{g}$$

$$v = 10 - a \times 5 \quad \text{(given, v=0)}$$

$$a = 2; \quad \tan \theta = \frac{2}{10}$$
23. 
$$\frac{T}{\sin 90^{\circ}} = \frac{F}{\sin(\pi - \theta)} = \frac{Mg}{\sin\left(\frac{\pi}{2} + \theta\right)}$$

T  

$$r = \frac{F}{\sin \theta} = \frac{Mg}{\cos \theta}$$
  
24. Energy is released when stability increases. This will happen when binding energy per  
nucleon increases Reactant  
Reaction (a) 60×8.5MeV=510MeV  
Reaction (b) 120×7.5=900 MeV  
Reaction (c) 120 × 7.5 = 900 MeV  
Reaction (c) 120 × 7.5 = 900 MeV  
Reaction (c) 90×8=72090×8=720  
Product  
2×30×5= 300 MeV  
(90×8+30×5)=870 MeV  
2×60×8.5=1020 MeV  
(60×85+30×5)=600 MeV  
25. Particle will strike the point B if velocity of particle with respect to platform is along AB or  
component of its relative velocity along AD is zero.  
So,  $u\cos \theta = v$  or  $\theta = \cos^{-1}\left(\frac{v}{u}\right)$   
26.  $v_{max} = \omega A_i \ \omega_A A_i = \omega_B A_B \Rightarrow \frac{A_A}{A_B} = \frac{\omega_B}{\omega_A}$   
 $\frac{\omega_B}{\omega_A} = \sqrt{\frac{k_D}{m}} \div \sqrt{\frac{k_D}{m}} = \sqrt{\frac{k_D}{k_1}} \Rightarrow \sqrt{\frac{k_D}{k_1}}$  is correct  
27.  $v_1 = \frac{d}{d_1}(y_1) = (0.1 \times 100\pi) \cos\left(100\pi t + \frac{\pi}{2}\right)$ 

$$v_{2} = \frac{d}{dt}(y_{2}) = (-0.1 \times \pi) \sin \pi t$$
$$= (0.1 \times \pi) \cos\left(\pi t + \frac{\pi}{2}\right)$$
$$\therefore \Delta \phi = \frac{\pi}{3} - \frac{\pi}{2} = -\frac{\pi}{6}$$
$$28. \qquad e(5V_{0}) = \frac{hc}{\lambda} - \phi \text{ and } eV_{0} = \frac{hc}{3\lambda} - \phi \Rightarrow \phi = \frac{hc}{6\lambda}$$
$$29. \qquad E = \frac{\sigma 2\pi}{4\pi\varepsilon_{0}} \left[1 - \frac{x}{\sqrt{R^{2} + x^{2}}}\right]$$
$$E = 9 \times 10^{9} \times 10 \times 10^{-9} \times 6.28 \left[1 - \frac{2}{\sqrt{4 + 9}}\right]$$

$$E = 90 \times 6.28 \left[ 1 - \frac{2}{\sqrt{13}} \right]$$

$$E = 251.2 \text{ N/C}$$
30. The height up to which water will rise  $l = \frac{h}{\cos \alpha} = \frac{2cm}{\cos 60^{\circ}} = 4cm$   
(h= vertical height,  $\alpha = \text{angle with vertical}$ )  
31. Terminal velocity,  $v = \frac{2r^{2}(\rho - \rho_{0})g}{9\eta}$  i.e.,  $v \propto r^{2}$   
 $\therefore \frac{v}{v} = \frac{r^{2}}{r^{2}}$  or  $v_{1} = v\left(\frac{r}{r}\right)^{2} = 20\left(\frac{1}{2}\right)^{2} = 5cms^{-1}$   
32. Number of images  $= \frac{360^{\circ}}{0} - 1$   
 $5 = \frac{360^{\circ}}{0} - 1 \Rightarrow 0 = 60^{\circ}$   
33.  $\frac{1}{v} - \frac{1}{u} = \frac{1}{f} \Rightarrow \frac{u}{v} - 1 = \frac{u}{f}$   
 $\frac{u}{v} = \frac{u}{f} + 1 \Rightarrow \frac{1}{m} = \frac{u}{f} + 1$   
Slope  $= \frac{1}{f} \Rightarrow \frac{1}{f} = \frac{b}{c} \Rightarrow f = \frac{c}{b}$   
34. A bullet of mass m,  
Since we know that  $mv = mv_{1} + mv_{2}$   
Where, v is the initial velocity and v\_{2} is the velocity when strikes the block.  
So, initial  $KE = \frac{1}{2}mv^{2} - \dots (1)$   
Therefore.  
The maximum transfer of KE of the bullet in the block where  $v^{2=0}$   
So,  $\frac{1}{2}mv^{2} = \frac{1}{mv^{2}} + \dots (2)$   
Form equation 1 and 2 we get,  
Since  $mv = mv_{1} : m^{2}v^{2} = m^{2}v_{1}^{2}$   
Thus,  $\frac{m^{2}v^{2}}{mv^{2}} = \frac{m^{2}v_{1}^{2}}{mv^{2}} \Rightarrow M = m$   
35. Using conservation of angular momentum  $\left(\frac{1}{2}mR^{2}\right)\omega = \left\{\frac{1}{2}mR^{2} + \frac{1}{2}\left(\frac{m}{4}\right)R^{2}\right\}\omega^{1}$   
 $\left(\frac{1}{2}mR^{2}\right)\omega = \frac{5}{8}mR^{2}\omega \Rightarrow \omega^{1} = \frac{4}{5}\omega$   
36. The peak value of rectified output voltage = peak value of input voltage- barrier voltage =  $2 - 0 - 1 = .3V$ 

37. Voltage gain of the given operational amplifier is defined in ratio of output voltage to input voltage.  $A_v = \frac{V_0}{V_i}$ 

From Ohm's law V = iR, where I is current, R is resistance

$$\therefore A_V = \frac{R_f}{R_i} = \frac{100 \, k\Omega}{1 \, k\Omega} = 100$$

38. Diodes  $D_1$  and  $D_3$  are forward biased and  $D_2$  is reverse biased so the circuit can be redrawn as



40.

41.

39. Work done by gas in all four process is positive and in order  $W_A > W_B > W_C > W_D \Rightarrow$  (3) is false The change in initial energy U is same for all process.

$$\therefore Q_A = U + W_A - \dots (1)$$

$$Q_B = U + W_B - \dots (2)$$

$$Q_C = U + W_C - \dots (3)$$

$$Q_D = U + W_D - \dots (4)$$
Hence  $Q_A > Q_B > Q_C > Q_D \Rightarrow (4)$  is false  
From equations (1) and (4)  

$$Q_A - Q_D = W_A - W_D \Rightarrow (1)$$
 is true  
From equations (1) and (2)  

$$Q_B - Q_C = W_B - W_C \Rightarrow (2)$$
 is false  
When water falls from a height. It has potential energy (mgh)  
This is used in heating up the water  $(mc\Delta\theta)$   
Hence we have  $mgh = mc\Delta\theta \Rightarrow \Delta\theta = \frac{gh}{c}$   

$$= \frac{9.8 \times 500}{4.2 \times 10^3} = 1.16^{\circ} C$$
Frequency  $\left[M^0 L^0 T^{-1}\right] = \left[M\right]^x \left[ML^0 T^{-2}\right]^y$   
Comparing the powers on M, L and T  $-2y = -1 \Rightarrow y = \frac{1}{2}$   
And  $x + y = 0; \therefore x = -y = -\frac{1}{2}$ 

42. The distance of first diffraction minimum from the central principal maximum.

$$x = \frac{D\lambda}{d} \cdot \operatorname{Since} \frac{x}{D} = \frac{\lambda}{d} \text{ or } d = \frac{\lambda}{\sin\theta}$$
sin  $\theta = \frac{\lambda}{d} = \frac{500(\times 10^{-5})}{1\times 10^{-5}} = 0.5 = \sin 30^{\circ} \Rightarrow \theta = 30^{\circ}$ 
43. If 1 is the intensity of the incident unpolarized light, the intensity transmitted by the first is 1/2. This is the intensity of incident light on the second polaroid. Intensity transmitted by the second polaroid is  $\left(\frac{1}{2}\right)\cos^2\theta$ , where  $\theta$  is the angle between the axes. Here  $\sin\theta = \frac{3}{5}$ ,  $\cos\theta$  is therefore  $\frac{4}{5}$ .  
 $\frac{1}{2}\cos^2\theta = \frac{1}{2}\times\left(\frac{4}{5}\right)^2 = \frac{8}{25}I:\frac{8}{25}$  is the required ratio
44. Since  $\frac{v}{c} = \frac{A\lambda}{\lambda}: : ... \lambda = \frac{v}{c} \times \lambda$ 
or  $\frac{A\lambda}{\lambda} = \frac{12\times10^6}{1\times10^6} = \frac{12}{2}\times\frac{10^5}{10^8} = 4\times10^{-3}$ 
 $\frac{A\lambda}{\lambda} \times 100 = 0.41.c., 0.4\%$ 
45.  $v = \frac{dx}{dt} = \frac{1}{4}\times4t^2 = t^2 = 108t^{-1}$ 
Work done = Change in K.E
 $= \frac{1}{2}\times1\times1-\frac{1}{2}\times1\times0=\frac{1}{2}J$ 
Here,  $n_2 = 4, n_i = 1$ . So  $(N) = \frac{(4-1)(4-1+1)}{2} = \frac{3\times4}{2} = 6$ 
47. Calcination is a process in which ore is heated mainly in the absence of air whereas roasting is a process in which ore is heated mainly in the absence of air whereas roasting is a process in which ore is heated mainly in the absence of air whereas roasting is a process in which ore is heated mainly in the absence of air whereas roasting is a process in which ore is heated mainly in the absence of air whereas roasting is a process in which ore is heated mainly in the absence of air whereas roasting is a process in which ore is heated mainly in the absence of air whereas roasting is a process in which ore is heated mainly in the absence of air whereas roasting is a process in which ore is heated mainly in the absence of air whereas roasting is a process in which ore is heated mainly in the absence of air whereas roasting is a process in which ore is heated mainly in the absence of air whereas roasting is a process in which ore is heated mainly in the absence of air whereas roasting is a process in which ore is heated mainly in the absence of air whereas roasting is a process in which ore is heated in the presence of air.

50. Larger the hydrophobic fragment of surfactant molecule easier will be micellisation, smaller the CMC value i.e.,  $CH_3(CH_2)_{15}N^+(CH_3)_3Br^-$  will have lowest CMC due to longest hydrophobic chain Al is  $sp^3d^2$  hybridized. B is  $sp^3$  hybridized. 51.  $63c - 2e^{-}$ ,  $62c - 2e^{-}$  bonds and 6 AI-H-B bonds 52. Using  $\pi V = iCRT$ i= 2 for NaCl i = 3 for BaCl<sub>2</sub>  $\pi V_{\scriptscriptstyle NaCl} = 2 \times 0.1 RT = 0.2 RT$  $\pi V_{BaCl_2} = 3 \times 0.05 RT = 0.15 RT$ As  $\pi V_{NaCl} > \pi V_{BaCl_2}$  towards NaCl solution. Order of acidic strength 53.  $K_a \propto \text{number of } -COOH \text{ groups} \propto \frac{1}{no.of - NH_2 \text{ groups}}$ So,  $pK_a \propto \frac{1}{K_a}$ Asp < Gly < Lys < Arg 54. As electrolytes can have maximum degree of dissociation in most diluted solution. Here 0.0001 m solution is most diluted so due to maximum dissociation i is maximum Given, for HCl, pH=3;  $[H^+] = 10^{-3} = M_1, V_1 = 2ml$ 55. For NaOH, pH=10,  $[H^+] = 10^{-10} = M_2$ ,  $V_2 = 3ml$  $M_1V_1 - M_2V_2 = M_R(V_1 + V_2)$  $10^{-3} \times 2 - 10^{-10} \times 3 = M_R (2+3)$  $2 \times 10^{-3} = 5 \times M_{P}$  $M_R = 4 \times 10^{-4} = \left[ H^+ \right]$  $pH = \log(4 \times 10^{-4}) = 4 - 0.6020 = 3.39 \approx 3.5$  $^{24}_{12}Mg + \gamma \rightarrow Na^{23} + ^{1}_{1}P$ 56. 57. Normality = Molarity × valency factor (n)  $0.02 = M \times 2$ Molarity =  $\frac{No.of moles}{Volumeinlitre}$  $0.01 = \frac{n}{0.1} = n = 0.001$ 1 mole of  $H_2SO_4$  contains  $6.023 \times 10^{23}$  molecules. SO, 0.001 mole contains 6.023×10<sup>20</sup> molecules Meq. Of  $As_2O_3 = Meq$  of 58.

$$KMnO_{4}\left(As_{2}^{3*} \rightarrow 2As^{3*} + 4e^{-}\right)$$

$$\frac{0.1156}{198/4} \times 1000 = M \times 5 \times 27.08 \left(Mn^{7*} + 5e^{-} \rightarrow Mn^{3*}\right)$$

$$\therefore M = 0.0172$$

$$\therefore M_{met_{1}} = 0.0172M$$
59. (1) Norethindrone - Antifertility drung  
(2) Ofloxacin - Anti - Biotic  
(3) Equanil - Hypertension (tranquilizer)  
60. The reaction occurs as follows  

$$\int H + \int e^{-Ch_{1}} - Ch_{2} - Ch_{3}$$
61. 
$$\left[Mg^{2*}\right]\left[OH^{-}\right]^{2} = 10^{-12}$$

$$O.01 \times \left[OH^{-}\right]^{2} = 10^{-12}$$

$$\left[OH^{-}\right] = 10^{-3}M$$

$$\therefore \left[H^{+}\right] = 10^{-9}M \text{ and } pH = -\log 10^{-9} = 9$$
62. 
$$p = \left(\frac{0.33}{1.33}\right)P, p_{B} = \left(\frac{0.33}{1.33}\right)P$$

$$p_{An} = \left(\frac{0.67}{1.33}\right)P : K_{P} = \frac{p_{A} \times p_{B}}{p_{AB}} \Rightarrow K_{P} = \frac{0.33 \times 0.33 \times P}{0.67 \times 1.33}$$

$$\frac{P}{K_{p}} = 8 \Rightarrow P = 8K_{p}$$
63. As smallest cation is most hydrated here  $CiO_{1}^{-}$  has smallest central atom as it has +7 charge on it and on  $CiO_{3}^{-} (+5), CiO_{2}^{-} (+3), CiO^{-1} (+1)$  so the order of hydration energy is  $CiO^{-} < CiO_{3}^{-} < CiO_{3}^{-}$ 

64. Let octahedral voids = x= no. of atoms of Q So, tetrahedral voids =2x

No. of atoms of 
$$P = \frac{1}{3} \times 2x = \frac{2}{3}x$$
  
 $P: Q = \frac{2}{3}x: x = 2:3$   
Formula  $= P_2Q_3$ 

- 65. In Le-blanc process, potassium chloride of carnallite is converted to  $K_2SO_4$  which is then heated with coal and lime stone to give  $K_2CO_3$ . (Potach or pearl ash)
- 66.

Compound	Oxidation state
$H_2SO_5$	+6
$H_2SO_3$	+4
SCl <sub>2</sub>	+2
$H_2S$	-2
$^{-2}_{O}$ +6 -1   /-1 H-O-S-O-OH    O	

- 67. The degree of harness of water is usually expressed in terms of ppm by weight of  $CaCO_3$  irrespective of whether it is actually present
- 68. Here following reasons occur as follows  $AgCl + 2NH_4OH \rightarrow \left[Ag(NH_3)_2\right]Cl + 2H_2O$

$$AgCl + 2KCN \rightarrow K \Big[ Ag(CN)_2 \Big] + KCl$$
$$AgCl + Na_2S_2O_3 \rightarrow Na_3 \Big[ Ag(S_2O_3)_2 \Big] + \text{NaCI}$$

Sodium argento thiosulphate

69. Maximum number of P-H bonds are is esent in  $H_3PO_2$ 

70. Bond order = 
$$\frac{\text{total number of bonds}}{\text{total resonating structures}} = \frac{2+1+1}{3} = 1.33$$

Bond order =  $1 + \frac{\pi}{\sigma} = 1 + \frac{1}{3} = 1.33$ 

- 71. In  $XeF_4$ , the four fluorine atoms are present at the corners of a square plane and two lone pairs are present at axial positions. All the individual bond moments in such an arrangement cancel out, as a result the molecule has zero dipole moment. Rest other are polar.
- 72. The hydrolysis of  $NCl_3$  by water produces ammonium hydroxide and hypochlorus acid  $NCl_3 + 4H_2O \rightarrow NH_4OH + 3HOCl$

73. 
$$2KO_2 + S \xrightarrow{\Delta} K_2SO_4$$

-2

 $K_2SO_4 \xrightarrow{BaCl_2} BaSO_4$ 

(White precipitate)

In  $KO_2 \rightarrow O_2^-$  due to unpaired electron in  $\pi^*$  (ABMO) is paramagnetic as per MOT.

 $KO_2 \Rightarrow \% of K is$ 

 $\frac{39}{71} \times 100 = 55\%$  w/w basis

74. Beryllium has highest third ionization energy as  $Be^{2+}$  has  $1s^2$  (he gas configuration) so removal of electron is very touch.

$$Be \xrightarrow{I_1} Be^+ \xrightarrow{I_2} Be^{2+} \xrightarrow{I_3} . I_1 < I_2 <<< I_3$$

75. Lattice energy  $= -\frac{(z^+ z^-)e^2}{r}$ . Here r is the interionic distance and it is minimum in case of MgO

so, MgO has the highest lattice energy here

76. Although aromatic halides cannot be used in Williamson either synthesis yet if storng electron withdrawing group like  $NO_2$  at ortho and para-positions are present then synthesis may occur.



77. Markownikoff's addition of water followed by tautomerization



$$CH_3 - CH = CH - CH_3 \rightarrow H_3C - CH HC - CH_3 \xrightarrow{Zn/H_2O} 2CH_3CHO + ZnO$$

79. As- I effect increases stability carbocation decreases. Stronger the electron withdrawing group, lesser the carbocation stability. So II is least stable and III is most stable

 $F_3C-CH_2^\oplus < Cl_3C-CH_2^\oplus < H_3C-CH_2^\oplus$ 

- 80. Nylon-6, 6 are fibres and these are polymers which have strong intermolecular forces such as hydrogen bonding. Buna-S is an elastomer and has weak intermolecular forces. Polyethylene are thermoplastics in which intermolecular forces of attraction are neither very strong nor very weak. Based on it the correct order is I>III>II
- 81. Isoelectric point

$$=\frac{pK_{a_1}+pK_{a_2}}{2}=\frac{2.3+9.7}{2}=6$$

- 82. It is case of free radical substitution reaction (Halogination). In which rate of reaction and product formation depend upon stability of free radical formed. In option (4) teritiary free radial is formed so product is option (4) is major.
- 83. Here final product E is ortho-bromo benzoic acid.



84. If and III have delocalized six  $\pi$  electrons and hence are aromatic 85.

$$\begin{split} \underbrace{\underbrace{\mathsf{f}}_{t}}_{t} & \underbrace{\underbrace{\mathsf{f}}_{t}}_{t} \\ & \mathsf{For a zero order reaction, A \to B}, \\ & \mathsf{Rate} = -d[A] = k \text{ or } -d[A] = k. \, dt \\ & \mathsf{dt} \\ & \mathsf{When t} = 0, [A] = [A]^0 \text{ and} \\ & \mathsf{t} = \mathsf{t}, [A] = [A] \\ & \mathsf{Hence} - \int_{[A]_0}^{[A]} d[A] = k \int_{(\mathsf{t}=0)}^{(\mathsf{t}=\mathsf{t})} dt \\ & [A]_0 - [A] = kt \\ & \mathsf{Or } [A] = [A]_0 - kt \\ & \mathsf{Thus the plot of } [A] \text{ versus t is linear} \\ & \mathsf{with negative slope and intercept } [A]_0 \end{split}$$

86. 
$$P_A = \frac{nRT}{V} = \frac{1 \times 0.0821 \times 200}{20} = 0.821$$

 $W = P.\Delta V = 0.821(20-10) = 8.21Latm$ 

- 87. Lysine can tested by ninhydrin as ninhydrin test is for testing amino acids.
   Furfural can be tested by 1-naphthol. Benzyl alcohol can be tested by Ceric ammonium nitrate which is a yellow reagent and on reaction with alcohol changes to red Styrene can be tested by *KMnO*<sub>4</sub> as styrene decolourises alk. *KMnO*<sub>4</sub>
- 88.  $CH_3 CHO + \text{Fehling solution} \rightarrow Cu_2O \downarrow$

When acetaldehyde is treated with Fehling's solution, it gives a red precipitate of  $Cu_2O$ 

89. -OH group is highly ring activating so groups like -COOH and  $-SO_3H$  present at ortho or para positions are also substituted by electrophile.



years of dormany. Date palm, Phoenix dactylifera, has a 2000 year old viable seed. It was discovered during the archeological excavation at King Herod's palace near the Dead Sea

- 99. Pollination by insects is entomophily. Entomophilous flowers have bright colours stickey polen nectar and fragrance e.g., Bougainvillea, Salvia.
  Zostera, vallisneria are hydrophilous (pollinated by water). Zea mays (maize), Sorphum vulgare (jowar) are anemophilous (pollinated by wind). Butea is ornithophilous (pollinated by birds) while Bauhinia is chiropterophilous (pollinated by bats).
- 100. After double fertilization in Angiosperms, a triploid primary endosperm nucleus and a diploid zygote is formed. First the primary endosperm nucleus undergoes cell division to form a triploid endosperm. This will be used as a nutritive tissue for the developing embryo
- 101. This is an example of polygenic or quantitative inheritance. Let the height contributed by each dominant allele be 'x' inches and that by each recessive allele be 'y' inches. AABBCC will have maximum height. Thus, 6x=24 and x=4. aabbcc will have a minimum height. Therefore, 6y=6 and y=1. The given benotype AaBBcc has 3 dominant alleles and 3 recessive alleles. Thus 3x+3y=3(4)+3(1)=15
- 102. ABO blood group system is controlled by 3 different alleles I<sup>A</sup>, I<sup>B</sup> and i. A person with blood group A may have genotypes I<sup>A</sup>I<sup>A</sup> or I<sup>A</sup>i. The person with blood group B may have genotypes I<sup>B</sup>I<sup>B</sup> or I<sup>B</sup>i. The person with blood group O has genotype ii. Person with blood group AB has genotype I<sup>A</sup>I<sup>B</sup>, so the person is definitely heterozygous
- 103. In a pea plant, Green pods are dominant over yellow pods. Thus GG would be the genotype of homozygous green pod and gg would be the genotype of homozygous yellow pod. Additionally round seeds are dominant over wrinkled seeds. RR round seeds, rr wrinkled seeds. Thus a pea plant with yellow pods with wrinkled seeds will have genotype ggrr
- 104. Thus intragenic inheritance was discovered after Mendel's depth. Intragenic or inter-allelic gene interaction occurs between alleles of the same genes, e.g., incomplete dominance, co-dominance and multiple alleles.
- 105. A back cross is a cross between hybrid and any homozygous parent. A test cross in a cross between hybrid and homozygous recessive parent. Thus every test cross is a back cross but not every back cross is a test cross. The Monohybrid test cross-ratio is 1:1, dihybrid test cross-ratio is 1:1:1:1, thrihybrid test cross-ratio is 1:1:1:1:1:1:1:1. Reciprocal crosses are a pair of crosses in which the sex of the parents are interchanged.
- 106. The colour of Andalusian fowl exhibits incomplete dominance. Black fowls are homozygous dominant with the genotype BB. White fowls are homozygous recessive with the genotype bb. When the mate all fowls are heterozygous having the genotype Bb which is expressed as blue
- 107. According to the geological time scale, the Paleozoic era is divided into 6 periods: Cambrian, Ordovician, Silurian, Devonian, Carboniferous and Permian. The Paleozoic era is followed by the Mesozoic era which is divided into 3 periods. Triassic, Jurassic and Cretaceous
- 108. Organs that are structurally different but perform the same function are called analogous organs. They are a result of convergent evolution. Examples of analogous organs are winds of bufferflies and or birds, the eye of the octopus and mammals the flippers of penguins and dolphins. Swett potato (root modification) and potato (stem modification) etc.

Organs that are structurally similar but perform different functions are called homologous organs. They are a result of divergent evolution. It indicates common ancestry. Homology is seen in vertebrate hearts or brains. It is also seen in the thorn and tendrils of Baugainvillea and Cucurbita.

- 109. About 2000 million years ago (mya), the first cellular forms of life appeared on earth. By the time of 500 mya, invertebrates were formed and jawless fish probably evolved around 350 mya. Seaweeds and few plants existed probably around 320 mya. We are told that the first organisms that invaded land were plants. They are widespread on land when animals invaded the land. Fish with stout and strong fins could move on land and go back to water. This was about 350 mya.
- 110. Outcrossing is the process of mating of animals within the same breed, but having no common ancestors on either side of their pedigree up to 4-6 generations. Outcrossing helps to overcome inbreeding depression
- 111. Sometimes a species is restricted to smaller area due to another species which is superior. If the superior species is removed, the competition of the inferior species decreases and they increases in number and covers a wider area. This is called competitive release.
- 112. The intrinsic rate of natural increase (r) is the difference between birth rate and death rate. According to the 2011 census, India has a birth rate of 21.8 per 1000 and depth rate 7.1 per 1000 individuals. Thus r=21.8-7.1=14.7 per 1000, which is 0.0147
- 113. Dry weight of the organism is the weight after water is removed. Carbon constitutes 49% of dry weight in organisms. This, it contributes maximally to dry weight of the organism
- 114. Out of the total cost of various ecosystem services, the soil formation accounts for about 50%, nutrient cycling for less than 10% and the cost of climate regulation is about 6%
- 116. More than 70% of all the species recorded are animals, whereas plants comprise no more than 22% of the total. The total number of biodiversity hotspots in the world is 36, whereas India now has 90 national parks. India has more than 50,000 genetically different strains of rice and 1,000 varieties of mango. In the world, 23% of all mammal species, 32% of all amphibian species face the threat of extinction
- 117. Recent extinctions of species includes quagga (Africa), thylacine (Australia), Steller's sea cow (Russia), the dodo (Mauritius) and three subspecies (Bali, Javan, Caspian) of tiger
- 118. India now has 14 biosphere reserves. Each biosphere reserve has 3 zones (a) Core zone: No human activity allowed (b) Buffer zone: Educational and research facilities (c) Transition zone: Tribal residence, e.g., Silent valley (Kerala), Similipal (Orissa).



- 119. The government of India has passed the Water (Prevention of Control of Pollution) Act, 1974 to safeguard our water resources. In India, the Air (Prevention and Control of Pollution) Act was amended in 1987 to include noise as an air pollutant. The National Forest Policy (1988) of India has recommended 33% forest cover for the plains and 67% for the hills. Recognizing the deleterious effects of ozone depletion, an international treaty, knows as the Montreal Protocol, was signed at Montreal (Canada) in 1987 (effective in 1989)
- 120. When sewage is discharged in the river, the dissolved oxygen decreases and the biological oxygen demand BOD increases. Microbes that cause break down of organic matter consume a lot of oxygen. This causes a deficiency of oxygen for fishes and other aquatic organisms leading to their depth
- 121. The squamous epithelium is made of a single thin layer of flattened cells with irregular boundaries. They are fond in the walls of blood vessels and air sacs of lungs and are involved in functions like forming a diffusion boundary
- 122. Cartilage is a type of connective tissue forming soft body structures of the nose tip, ear pinna. Bone marrow found in long bones are a site for the production of blood cell including white blood cell (leucocytes). Blood is one of the two tissues which is fluid other been the lymph
- 123. Here, 2 and 3 are nucleus and mitochondria which contain DNA that made of nucleotide. Rest of the labelled organelles do not contain nucleotides/DNA where 1 is rough endoplasmic reticulum and 4 is golgi complex
- 124. Goblet cell been secretory in function will have more amount of golgi bodies and vacuoles compared to other cells from the options
- 125. All the given feature are present in both plant cell and prokaryotic cell although the composition may vary. A plant cell has a cell wall (of cellulose), the cell membrane is present and also ribosome (80S) whereas prokaryotic cell mostly contains peptidoglycan as cell wall with 70S ribosome
- 126. Fructose and glucose are reducing sugar turning benedict solution from blue towards red Amino acid with glucose act as a monomer for making polypeptide and polysaccharides respectively
- 127. Glycogen is a branched polymer of glucose monomer. Glucose units are linked together linearly by  $\alpha(1 \rightarrow 4)$  glycosidic bonds from one glucose to the next whereas the branches are linked to the chains by  $\alpha(1 \rightarrow 6)$  glycosidic bonds between the first glucose of the branch and glucose on the main chain
- 128. An enzyme is a catalyst that reduces the activation energy for a reaction and helps in increasing the concentration of product without any change in energy yield

- 129. All the three stages mentioned occur after S-phase; thus, DNA is duplicated (DNA is twice in amount). Even though two nuclei have formed in the dividing cell, until the cytoplasm is completely divided, the single mother cell will have 2 copies of DNA. Once the cytokinesis has completed, each daughter cell will have a single copy of DNA. Hence, the answer is 4.
- 130. Metaphase in mitosis ensure the orientation of chromatid pair in proper alignment assisted by the centrioles and microtubules. Anaphase is the stage where as chromatids are separated at centromere to ensure each new cell that form gets equal number of chromosomes
- 131. Oxygen is taken in and carbon dioxide is given out during the breathing process for respiring that is to break down glucose for obtaining ATP
- 132. During inhalation, diaphragm contracts resulting in intake of air which raises the ribs and sternum to compensate and low volume and equalize the pressure with atmospheric pressure
- 133. Anticodon is the triplet found on tRNA which is complimentary to mRNA and the mRNA is complimentary to the template DNA strand use in transcription. Thus the sequence of tRNA will be same as the template DNA only interchanging T and U So tRNA anti-codon-GUA will have DNA triplet as GTA
- 134. The codon and anti-codon sequence are complimentary and bind to each other via H-bonds which occurs between tRNA and mRNA during translation. The base sequence of tRNA and mRNA are not same rather complimentary to each other and highly specific to ensure correct sequence of amino acid in making the desired protein
- 135. The DNA polymerases are enzymes that make new DNA molecules by assembling nucleotides, the building blocks of DNA. They are important for DNA replication process. They catalyse polymerization of deoxy-ribonucleotides by joining the dNTPs together that is joining the nucleotide monomer together to make polynucleotides
- 136. A plasmid is the extrachromosomal DNA found in bacteria which forms an important tool in easy gene manipulation and vector for carrying the gene of interest for transmission and expression. Structure X is a plasmid. In the E.coli cloning vector, rop codes for the proteins involved in the replication of the plasmid. BamHI and Clal are restriction sites on the vector while ori stands for the origin and replication site
- 137. Techniques to alter the chemistry of genetic material (DNA and RNA) to introduce these into host organisms and thus change the phenotype of the host organism come under genetic engineering. Statement I is only one where the gene is been manipulated artificially to get the desired effect. Selective breeding can be considered as gene manipulation but there is no control on the outcome but chance
- 138. Ligase is an enzyme required to join the nucleotides together similar to the process in DNA replication of joining the Okazaki fragments. It does so by catalyzing the joining of two molecules by making new chemical bond between them
- 139. The induce human insulin production in a bacterial cell, the human insulin gene (DNA) must be ligated to the bacterial (example E.coli) plasmid successfully. On successful ligation in the plasmid will enable the expression of the insulin gene and produce human insulin without any demerits

- 140. To avoid unwanted outcome and undesired effect it is advisable to not mix GMO with non-GMO. If they cross-pollinate and result in successful fertilization can produce variation which might be harmful for the farmers business and/or to the ecosystem
- 141. Trypanosoma is a flagellated protozoan which is parasitic in nature. It causes diseases like Sleeping sickness. Gonyaulax is a photosynthetic dinoflagellate. Chlamydomonas is a single celled alga. Nostoc is a photosynthetic cyanobacterium
- 142. Dikaryophase is an intervening stage in the sexual reproduction cycle of certain fungi (especially, the members of the group Basidiamycetes and Ascomycetes). When two fungal hyphae fuse together, but the nuclei do not fuse immediately, it result in the formation of a dikaryon (n+n).
- 143. Lichens are a symbiotic association of the algae (phycobiont) and fungi (mycobiont). The algal partner produces food and the fungal partner provides protection to the algae. The fungi also help in absorption of minerals and water. Lichens generally do not grow in polluted areas, hence they are good indicators of pollution.
- 144. Viruses are on borderline of living and non-living. They possess a protein coat with complex assembly of units called the capsomeres. These capsomeres are arranged in helical or polyhedral forms. Internal to the protein coat lies the genetic material of the virus which can be either DNA or RNA
- 145. The given diagram is of Laminaria which is a brown alga A-The frond is a leaf-like organ which is photosynthetic in nature. It also contains air cavities for exchange of gases. B-The stipe is a stalk which supports the frond. C-The holdfast at the base helps in attachment of the algal body to a substratum
- 146. Cycas shows presence of specialized roots called coralloid roots which are associated with the nitrogen fixing cyanobacteria.
- 147. Calotropis is an example of valvate aestivation in which the petals touch each other without overlapping. Cotton flower shows twisted aestivation in which the one margin of a petal overlaps the next petal. Imbricate aestivation shows the petals overlapping each other without any specific direction, such as that in Gulmohar. Bean belongs to the Fabaceae family in which the flowers have a unique five-petal arrangement called the vexillary arrangement

148.

 $\% \ Q^{7} K_{(5)} - A_{(9)+1} \underline{G}_{1}$ 

The given characteristics belong to the members of the family Fabaceae. These are plants with racemose inflorescence, zygomorphic flowers, five sepals and petals showing vexillary aestivation, monocarpellary and unilocular superior ovary, androecium consisting of ten stamens. The above floral formula stands corrected for plants like soybean, grams pulses and Sesbania.

- 149. In some plants such as Australian acacia, the leaves are small and short lived. The petioles in these plants expand, become green and synthesize food.
- 150. The cellular and nuclear endosperm is the edible part of the drupe fruit of coconut

- 151. The monocot root is very similar to the dicot root in many aspects with minor similarities. It shows the presence of more than six xylem bundles hence said to have a polyarch condition. The pith is large and prominent. Secondary growth in not seen in monocot root due to the absence of vascular cambium.
- 152. The meristematic tissue called cork cambium or phellogen develops, usually in the cortex region. Phellogen is a couple of layers thick. It is made of narrow, thin-walled, and nearly rectangular cells. Phellogen cuts off cells on both sides. The outer cells differentiate into cork or phellem while the inner cells differentiate into secondary cortex or phelloderm. Internal to the secondary cortex lies the xylem (wood), then the vascular cambium and then the phloem is the innermost.
- 153. The movement of molecules in an uphill transport occurs from lower concentration to higher concentration. The pumps are driven by energy (ATP) which allows the movement of molecules against the concentration gradient.
- 154. The reaction is the oxidation of nitrite into nitrate. This reaction is catalyzed by the bacteria Nitrobacter. Nitrosomonas and Nitrococcus are responsible for the Ammonia to nitrite. Thiobacillus and Pseudomonas are responsible for denitrification.
- 155. CO<sub>2</sub> is one of the most important factors affecting photosynthesis at normal field conditions. Other factors are equally important for the reaction to occur, but CO<sub>2</sub> concentration fluctuation or lesser availability can completely alter the rate of reaction, which may also lead to photorespiration. The concentration of CO<sub>2</sub> is very low in the atmosphere (between 0.03% and 0.04%)
- 156. Six cyclic photophosphorylation produce 12 ATPs, 6 non-cyclic photophosphorylation produce 6 ATP and 12 NADPH<sub>2</sub>.

To produce one molecule of glucose by the Calvin cycle, we require 18 ATP and 12 NADPH<sub>2</sub>.

- 157. The substrates of Kreb's cycle are acetyl CoA, citric acid, iso-citric acid, aconitate, oxalosuccinate, α ketoglutaric acid, succinyl CoA, succinic acid, fumaric acid, malic acid, oxaloacetic acid etc.
- 158. Fats would need to be broken down into glycerol and fatty acids first. If fatty acids were to be respired they would first be degraded to acetyl CoA and enter the pathway. Glycerol would enter the pathway after being converted to PGAL.
- 159. F.W. Went isolated the auxins from the Avena coleoptiles. Auxins promote apical dominance by inhibiting the growth of lateral buds. Auxins promote flowering in plants like pineapple as it is a growth-promoting hormone-like cytomkinin level negatively as they are not antagonistic in function.
- 160. In arithmetic growth, the cell divides giving rise to two daughter cells. From which, only ne daughter cells continues to divide while the other differentiates to divide while the other differentiates and matures to become a permanent cell. This kind of nature of growth rate is shown by meristematic cells.

Plasticity is the ability of the tissues to form different structures in response to environment conditions. Senescence is the deterioration phase with respect to the ageing of a cell or tissue or an organism.

- 161. The organisms of Phylum Chordate are not characterized by notochord only. They are characterized by the presence of
  - 1. A notochord
  - 2. A dorsal hollow nerve cord
  - 3. Paired pharyngeal gill slits
- 162. The second-largest phylum is phylum Mollusca. Apple snail, Pearl oyster, Cuttlefish, Squid, and Devil fish belong to phylum Mollusca. Anopheles, Culex, and Aedes belong to phylum Arthropoda. Starfish, Sea Urchin, and Sea cucumber belong to phylum Echinodermata
- 163. The child is suffering from 'Kwashiorkor'. Kwashiorkor is a form of protein-energy malnutrition (PEM). It occurs as a result of the replacement of mother's milk by foods having low protein, but a high caloric value, in children more than one year of age. It is characterized by growth failure, failure or brain development, thinning of limbs, wasting of muscles. There is little fat present beneath the skin. Extensive oedema and swelling over the body parts are seen.
- 164. The human skeletal system has 12 pairs of ribs, i.e., a total of 24 ribs. The first 7 pairs are called true ribs. The 8<sup>th</sup>, 9<sup>th</sup> and 10<sup>th</sup> pairs of ribs do not articulate directly with the sternum but join the seventh rib with the help of hyaline cartilage. The last 2 pairs (11<sup>th</sup> and 12<sup>th</sup>) of ribs are not connected ventrally and are, therefore, called floating ribs.
- 165. The joint present between adjacent vertebrae is known as 'cartilaginous' joint. The bones involved in this type of joint are connected together with the help of cartilage. These joints allow an only a limited range of movement
- 166.

The cerebrum is the largest part of the human brain. It is
the seat of intelligence
The cerebellum is the part of the hindbrain responsible
for maintaining body Posture.
Hypothalamus is located near the pituitary gland, helps
to control the pituitary.
Midbrain receives visual and auditory inputs
It controls the rate of heartbeat.

- 167. The lobe involved in the regulation of sexual behaviour and expression of emotional reaction is the 'limbic lobe'. It is formed by the inner part of the cerebral hemispheres and structures like the amygdala, hippocampus, etc. Hence it is a part of the forebrain.
  The forebrain consists of the hypothalamus, thalamus and cerebrum.
  The layer of cells covering cerebral hemispheres is the cerebral cortex, also called grey matter.
  Association areas of the forebrain are neither motor nor sensory in function.
- 168. The pineal gland is located on the dorsal side of forebrain. Pineal secretes a hormone called melatonin. Melatonin plays a very important role in the regulation of a 24-hour (diurnal) rhythm of our body. For example, it helps in maintaining the normal rhythms of sleep-wake cycle, body temperature. In addition, melatonin also influences metabolism, pigmentation, the menstrual cycle as well as our defense capability.

169. The  $\alpha$  – cells of the Islets of Langerhans are responsible for the secretion of glucagon. Glucagon is responsible for glycogenolysis. The  $\beta$  – cells of the Islet of Langerhans are responsible for the secretion of insulin. Insulin is responsible for glycogenesis and hence caused hypoglycemia.

# 170. I. Human beings have four parathyroid glands, two pairs each situated in each lobe of the thyroid gland.

II. PTH acts on bones and stimulates the process of bone resorption and also stimulates the absorption of calcium from the renal tubules and digested food. Hence, it is a 'hypercalcemic' hormone

171. This is a diagram of the female reproductive system:

A: Isthmus: It is terminal part of the fallopian tube which has a narrow lumen.

B: Ampulla: It is the widest part of the fallopian tube. The union of sperm and ovum i.e.,

fertilization occurs in this part which leads to the formation of zygote.

C: Infundibulum: It is the part of the fallopian tube which is closest to the ovary

D: Fimbriae: These are finger-like projections. They are responsible for the collection of ovum after ovulation and transporting it to the ampulla

E: Ovary: It is the female reproductive organ. It is responsible for the production of ovum and hormones like estrogen and progesterone.

- 172. Cells situated in the interstitial space of testis are knowns as 'leydig cells' or 'interstitial Cells'. These cells are responsible for the secretion of the androgen 'testosterone'. Testosterone is the hormone responsible for the development of male sexual characters. Adam's apple is the thickening of thyroid cartilage that causes a change in the voice of males at puberty. This happens under the effect of hormone testosterone
- 173. The middle piece of the sperm contains numerous mitochondria, the powerhouse of the cell. These mitochondria supply sperm with the energy, which it requires for its motility and fertilizing capacity
- 174. Intra-Uterine Devices (IUDs). These devices are inserted by doctors or expert nurses in the uterus thorough the vagina. These intra Uterine Devices are presently available as the non-medicated IUD's (e.g Lippes loop), copper releasing IUDs (CuT, Cu7, Multiload 375) and the hormone releasing IUDs (Progestasert, LNG-20). IUDs increase phagocytosis of sperms within the uterus and the Cu ions released suppress sperm motility and the fertilizing capacity of sperms. The hormone-releasing IUDs, in addition, make the uterus unsuitable for implantation and the cervix hostile to the sperms
- 175. 'GIFT' stands for 'gamete intra-fallopian tube transfer'. It is and assisted reproductive technology used in females who cannot produce an ovum but are capable of providing the necessary conditions for fertilization and implantation. In this technique, the ovum is collected from a donor female and is transported to the fallopian tube of the mother
- 176. The condition characterized by dry, scaly lesions on the skin, nails, and scalp of humans is known as 'ringworms'. IT is an infectious disease caused by fungi that belong to the genus Microsporum, Trichophyton, and Epidermophyton. It usually spreads through soil or by using a towel, clothes, etc. of infected individuals
- 177. Sometimes due to genetic or unknown reasons, the body is unable to differentiate between its own and foreign cells and attacks its own cells. This is known as auto-immunity and the

diseases occurring as a result of this are known as auto-immune diseases. Rheumatoid arthritis is an example of auto-immune disease in humans

- 178. Coke is the common name of coca alkaloid or cocaine obtained from the plant Erythroxylum coca. Cocaine has a great stimulating action on the CNS. It is capable of producing a state of euphoria or increased energy.
- 179. I. Propionibacterium sharmanii is a bacterium which produces large amount of CO<sub>2</sub>. This is responsible for the production of large holes which are seen in Swiss Cheese.
  II. Streptococcus produces the enzyme 'streptokinase'. Streptokinase is modified by genetic engineering and used as a 'clot buster' for removing clots from blood vessels of patients who had a myocardial infarct

III. Trichoderma polysporum produces 'cyclosporin-A', which is used as an immunosuppressive agent in organ transplant patients.

IV. Rhizobium forms nodules on the roots of leguminous plants through symbiotic associations. They are responsible for fixing atmospheric nitrogen in the soil.

180. The sequence of steps in sewage treatment is as follows:

Primary treatment: This involves the physical removal of all small and large particles from the sewage through filtration and sedimentation. The solids which settle form the primary sludge and the supernatant forms the effluent. The effluent then passes to large aeration tanks for secondary treatment.

Secondary treatment: This involves the following steps

- 1. Constant mechanical agitation of effluent in aeration tank and pumping of air.
- 2. As a result, there is the growth of useful aerobic microbes into flocs which consume the majority of the oxygen in the effluent and significantly reduce the Biological Oxygen Demand (BOD).
- 3. Passage of effluent into settling tanks where sedimentation of bacterial flocs occurs. This sediment is called the activated sludge.
- 4. The effluent from the secondary treatment plant is released into natural water bodies.