30/07/2023

Code-A Phase-1

Corporate Office : Aakash Tower, 8, Pusa Road, New Delhi-110005,
Ph.011-47623456

MM : 720 Fortnightly Test 2023-24_RM(P1)-Test-03A **Time : 200 Min.**

PHYSICS

SECTION-A

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SECTION-B

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CHEMISTRY

SECTION-A

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SECTION-B

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BOTANY

SECTION-A

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SECTION-B

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ZOOLOGY

SECTION-A

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SECTION-B

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199. (4)

200. (1)

Hints and Solutions

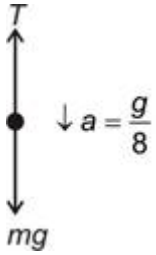
PHYSICS

SECTION-A

(1) **Answer :** (3)
Solution:
Work done = Area under force – displacement graph.
$= \frac{1}{2} \times 10 \times 5$
= 25 J

(2) **Answer :** (2)
Solution:
$T = mg$
= 25 × 9.8
W = T.S
= 25 × 9.8 × 2
= 50 × 9.8
= 490 J

(3) **Answer :** (4)
Hint:
Work done = $\vec{F} \cdot \vec{d}$
Solution:



$T = mg - \frac{mg}{8} = \frac{7mg}{8}$
Work done by the cord $W = T \times d\cos 180°$
$= -\frac{7mg}{8} \cdot d = -\frac{7mgd}{8}$

(4) **Answer :** (4)
Hint:
In self explosion, linear momentum of system remains constant.
Solution:
$0 = m \times 50 - 2m \times 25 + 2mv_3$
$2mv_3 = 0$
$v_3 = 0$
Kinetic energy of third part = 0

(5) **Answer :** (4)
Hint:
Power $= \vec{F} \cdot \vec{v}$
Solution:
$6 = \left(2\hat{i} + 4\hat{j} + \alpha\hat{k}\right) \cdot \left(\hat{i} + \hat{j} + 2\hat{k}\right)$
6 = 2 + 4 + 2α ⇒ α = 0

(6) **Answer :** (3)
Solution:
$W = \Delta KE$
$KE = \frac{1}{2}mv^2 = \frac{1}{2} \times 4 \times \left(\frac{d(t^2/2)}{dt}\right)^2$
$KE = 2 \times t^2$
At t = 2, KE = 2×2^2 = 8 J
W = 8 J

(7) **Answer :** (1)
Solution:
$\cos\theta = \frac{\vec{A}.\vec{B}}{\left|\vec{A}\right|\left|\vec{B}\right|}$
$= \frac{3}{6}$
$\cos\theta = \frac{1}{2}$
θ = 60°

(8) **Answer :** (3)
Solution:
Hint : e = $\frac{\text{|Relative velocity of separation|}}{\text{|Relative velocity of approach|}}$
Sol. : By conservation of linear momentum
$2mV = 3mV_1$
$\Rightarrow V_1 = \frac{2}{3}V$
Now, $e = \frac{V_1}{V}$
$\Rightarrow e = \frac{2}{3}$

(9) **Answer :** (3)
Hint:
Energy stored in stretched spring $U = \frac{1}{2}kx^2 = \frac{F^2}{2k}$
Solution:
Given $K_A = 3K_B$
$\frac{U_A}{U_B} = \frac{K_B}{K_A}$
$\frac{E}{E_B} = \frac{K_B}{3K_B}$
$E_B = 3E$

(10) **Answer :** (4)
Solution:
P.E = mgx
$= 1 \times 10 \times 40 \times 10^{-2}$
= 4 J

(11) **Answer :** (1)
Solution:
Potential energy is defined only corresponding a conservative field.

(12) **Answer :** (2)
Solution:
$U = \frac{1}{2}kx^2$

(13) **Answer :** (3)
Solution:
By conservation of energy
$\frac{1}{2}mv_0^2 = \frac{1}{2}k\ x_0^2$
$k = \frac{mv_0^2}{x_0^2}$

(14) **Answer :** (4)
Solution:
At the highest point $\vec{F} \perp \vec{v}$
So $P = \vec{F} \cdot \vec{v} = 0$

(15) **Answer :** (4)
Solution:
$\Delta k = w_{\text{total}}$
$0 - \frac{1}{2}\left(1\right)(20)^2 = -g\left(18\right) + \omega_R$
$\Rightarrow \quad W_R = -200 + 180$
= – 20 J

(16) **Answer :** (4)
Solution:

Potential energy is defined only for conservative forces. During elastic collision, kinetic energy is converted to potential energy.

(17) **Answer :** (3)
Solution:
$P_{\text{avg}} = \frac{\vec{F} \cdot \vec{r}}{t}$
$= \frac{6+12+10}{4}$ = 7 W

(18) **Answer :** (3)
Solution:
$\frac{1}{2}kx^2 = \frac{1}{2}k(1)^2 = 50$
$\frac{1}{2}k(2)^2 = 4 \times 50 = 200\ \text{J}$
$\frac{1}{2}\text{k}(2)^2 - \frac{1}{2}\text{k}(1)^2 = 150\ \text{J}$

(19) **Answer :** (4)
Solution:
W = area under (*f* – *x*) graph
= (20) × 1 + (–10) × 1 + (–20 × 1) + (10) × 1
= Zero

(20) **Answer :** (4)
Solution:
Mechanical energy will be conserved. It means potential energy decrease, kinetic energy increases.

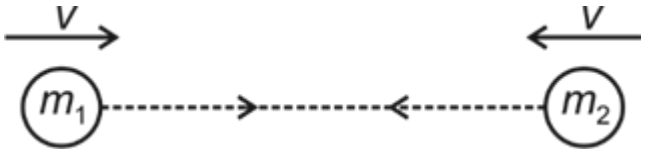
(21) **Answer :** (4)
Solution:
Work energy theorem is valid in presence of all types of forces.

(22) **Answer :** (2)
Solution:
$P = \frac{dk}{dt}$ $\quad \therefore dk = Pdt$
$\Delta k = \int Pdt = \int_2^4 \left(3t^2 - 2t + 1\right) dt$
$= 3\left[\frac{t^3}{3}\right]_2^4 - 2\left[\frac{t^2}{2}\right]_2^4 + [t]_2^4$
= $[4^3 - 2^3] - [4^2 - 2^2] + [4 - 2]$
= [64 – 8] – [16 – 4] + 2
= 56 – 12 + 2 = 46 J

(23) **Answer :** (4)
Solution:
$w = \int Fdx = \int_0^a bxdx = b\left[\frac{x^2}{2}\right]_{-0}^a = \frac{b}{2}\left[a^2 - 0^2\right] = \frac{ba^2}{2}$

(24) **Answer :** (1)
Solution:
$2mv\hat{i} + m\vec{v} = 6mv\hat{j}$
$\vec{v} = -2v\hat{i} + 6v\hat{j}$

(25) **Answer :** (1)
Solution:
In elastic collision, linear momentum of system is conserved and *e* = 1.



$\Rightarrow \quad v_1 = \frac{(m_1 - m_2)v}{(m_1 + m_2)} - \frac{2m_2 v}{m_1 + m_2} = 0$
$\Rightarrow m_1 = 3m_2$
$\Rightarrow m_1$ = 3 kg then m_2 = 1 kg

(26) **Answer :** (2)
Solution:
$\frac{1}{2}mv^2 = mgl$

$v = \sqrt{2gl}$

$7 = \sqrt{2 \times 9.8 \times l}$

$l = \frac{7^2}{2 \times 9.8} = \frac{7 \times 7}{2 \times 9.8} = \frac{5}{2} = 2.5\,\text{m}$

(27) **Answer :** (3)
Solution:
$\Delta W = \Delta K \qquad \frac{1}{2}mv^2 = FS$ and $F = \frac{mv}{t}$

$\frac{mvs}{t} = \frac{1}{2}mv^2 \quad \therefore \frac{s}{t} \propto v \quad \therefore \frac{v_1}{v_2} = \frac{s_1}{s_2} \times \frac{t_2}{t_1}$

Also $s_2 = 3s_1$ and $t_1 = 2t_2$

$\frac{v_1}{v_2} = \frac{1}{3} \times \frac{1}{2} = \frac{1}{6}$

(28) **Answer :** (4)
Solution:
$v_{\min} \geq \sqrt{5gr}$ to complete circle

$\sqrt{2gh} \geq \sqrt{5gr}$

$\boxed{h \geq \frac{5r}{2}}$

(29) **Answer :** (4)
Solution:
$W = \int_0^2 f dx = \int_0^2 \left(4x^2 - 3x\right) dx$

$= \left[\frac{4x^3}{3} - \frac{3x^2}{2}\right]_0^2$

$= \frac{32}{3} - \frac{12}{2} = \frac{14}{3}\,\text{J}$

(30) **Answer :** (3)
Solution:
$h = e^{2n} h_0$

$h_0 = \frac{h}{e^{2n}} = \frac{h}{e^{2\times 2}} = \frac{4}{e^4}$

(31) **Answer :** (3)
Solution:
$h_{\text{rebound}} = \frac{h}{2}$

as $\frac{1}{2}mu^2 = mgh$

$\frac{1}{2}mv^2 = \frac{mgh}{2}$

$\frac{\Delta k}{k} = \frac{\frac{1}{2}mu^2 - \frac{1}{2}mv^2}{\frac{1}{2}mu^2} = \frac{\frac{h}{2}}{h} = \frac{1}{2}$

$\therefore$ Loss in KE is 50%

(32) **Answer :** (2)
Solution:
$\Delta U = mg(h + x) + \frac{1}{2}mv^2$

$= (0.005 \times 10 \times 10) + \frac{1}{2} \times (0.005 \times 100)$

= 0.5 + 0.25 = 0.75 J

(33) **Answer :** (4)
Solution:
In equilibrium, potential energy is either minimum or maximum.

(34) **Answer :** (4)
Solution:
For perfectly inelastic collision velocity of separation is zero.

(35) **Answer :** (3)
Solution:
$\frac{1}{2}m\left[v_1^2 - v_2^2\right] = \frac{1}{2}kx^2$

$\frac{1}{2} \times 1[16 - 4] = \frac{1}{2}K(0.1)^2$

$K = \frac{12}{0.01} = 1200\,\text{N/m}$

SECTION-B

(36) **Answer :** (3)
Solution:
Work done by frictional force can be positive, negative or zero

(37) **Answer :** (2)
Solution:
$x = t^2 + 2t \Rightarrow v = 2t + 2,$
At t=0, $v_0 = 2\ ms^{-1}$, At t=2 s, $v_2 = 6\ ms^{-1}$,
$W = \frac{1}{2}m\left(v_2^2 - v_0^2\right) = \frac{1}{2} \times 1\left(6^2 - 2^2\right) \Rightarrow W = 16\ J$.

(38) **Answer :** (2)
Solution:
Maximum potential energy of deformation is equal to loss in K.E., when both are moving with same velocity during collision.

$\Rightarrow \sqrt{2m \times 4} + 0 = mv + 2mv$
$\Rightarrow v = \sqrt{\frac{8}{9m}}$
$\Rightarrow K_i = 4\ J \quad \text{and} \quad K_f = \frac{1}{2}mv^2 + \frac{1}{2}2mv^2$
$\Rightarrow K_f = \frac{1}{2}m \times \frac{8}{9m} + \frac{1}{2} \times 2\,m \times \frac{8}{9m}$
$K_f = \frac{12}{9} = \frac{4}{3}\ J$
$\Rightarrow \Delta K = 4 - \frac{4}{3} = \frac{8}{3}\ J$

(39) **Answer :** (4)
Solution:
In head on elastic collision of two equal masses velocity will exchange.

(40) **Answer :** (3)
Solution:
KE = 4 × *p*
$\frac{1}{2}mv^2 = 4mv$
v = 8 m/s

(41) **Answer :** (3)
Solution:
Mg = *Kx*
$3Mgx_1 = \frac{1}{2}K \cdot x_1^2$
$6Mg = Kx_1$
$x_1 = 6x$

(42) **Answer :** (4)
Solution:
Velocity at highest point (before explosion) = 10 cos (37°)
Applying momentum conservation = 8 m/s
80 = 5*v* + 5 (0)
v = 16 m/s
$\Delta KE = \frac{1}{2} \times (5)(16)^2 - \frac{1}{2} \times (10) \times 8^2$
= 640 – 320 = 320 J

(43) **Answer :** (2)
Solution:
Fv = *P*
$m\frac{dv}{dt}v = P$
$\frac{mv^2}{2} = Pt$
$\Rightarrow v \propto t^{1/2}$

(44) **Answer :** (4)
Solution:

$\Delta k = \frac{1}{2}\left(\frac{m_1 m_2}{m_1+m_2}\right)(V_1 - V_2)^2$

$= \frac{1}{2} \times \left[\frac{40\times60}{40+60}\right]\left[4-2\right]^2 = 48 \text{ J}$

(45) **Answer :** (2)
Solution:

$KE = \frac{1}{2} \times \left(\frac{100}{1000}\right) \times \left(5\right)^2 = \frac{2.5}{2} = 1.25 \text{ J}$

$w_g = \Delta k = 0 - 1.25 = -1.25$ J

(46) **Answer :** (4)
Solution:

$a \propto x$

$\Rightarrow v\frac{dv}{dx} = kx$

$\Rightarrow \int_{v_1}^{v_2} V dx = k\int_0^x x dx$

$\Rightarrow \frac{\left(v_2^2 - v_1^2\right)}{2} = \frac{kx^2}{2} \Rightarrow \Delta K \propto x^2$

(47) **Answer :** (1)
Solution:

Hint : $W = \vec{F} \cdot \vec{d} = Fd\cos\theta$

Sol.: $W = 20 \times 10 \times \cos60°$

$= 20 \times 10 \times \frac{1}{2} = 100$ J

(48) **Answer :** (1)
Solution:

$U = x^2 - 2x$

$F = -\frac{dU}{dx} = -\frac{d}{dx}\left(x^2 - 2x\right) = -2x + 2$

For equilibrium $F = 0$

$\therefore -2x + 2 = 0$

$\therefore 2x = 2$

$x = 1$ m

(49) **Answer :** (2)
Solution:
Hint and Sol. : If body is moving upwards then displacement is opposite to gravitational force, hence work done by gravity will be negative.

(50) **Answer :** (3)
Solution:
Hint and Sol. : During collision, $F_{ext} = 0$, hence linear momentum of system remains conserved but kinetic and potential energy of system may vary.

CHEMISTRY

SECTION-A

(51) **Answer :** (3)
Solution:
Axial bonds suffer more repulsion than equatorial bond, making axial bonds slightly longer. Hence, axial bonds are slightly weaker than the equatorial bonds.

(52) **Answer :** (2)
Solution:

O_2^+ contain 15 electrons.

$\therefore \quad \text{BO} = \frac{N_b - N_a}{2} = \frac{10-5}{2} = 2.5$

(53) **Answer :** (1)
Solution:

F_2, O_2^{2-} & N_2 are diamagnetic in nature and have no unpaired electron.

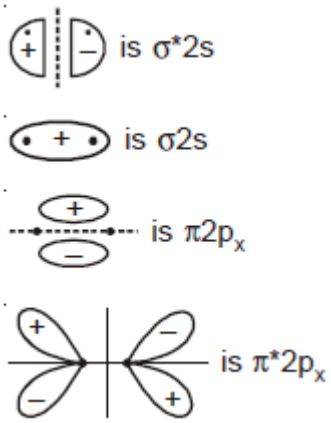
(54) **Answer :** (1)
Solution:

HF has the highest dipole moment as fluorine is the most electronegative element.

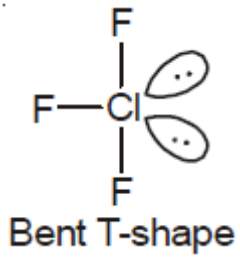
(55) **Answer :** (1)
Solution:
In SF_6, S has 12 electrons around it.

(56) **Answer :** (3)
Solution:
Ne_2 : $\sigma 1s^2, \sigma^* 1s^2, \sigma 2s^2, \sigma^* 2s^2, \sigma 2p_z^2, \pi 2p_x^2 = \pi^* 2p_x^2, \pi^* 2p_y^2 = \pi^* 2p_y^2, \sigma^* 2p_z^2$
Bond order $= \frac{1}{2}[N_b - N_a] = \frac{1}{2}[10 - 10] = 0$
As, bond order of Ne_2 is 0, $\therefore$ Ne_2 molecules does not exist.

(57) **Answer :** (1)
Solution:

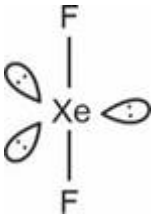


(58) **Answer :** (2)
Solution:



Bent T-shape

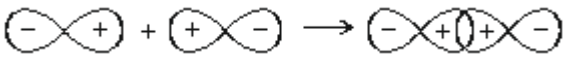
(59) **Answer :** (3)
Solution:



Number of lone pairs = 3
Number of bond pairs = 2

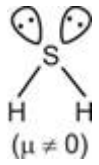
(60) **Answer :** (1)
Solution:
SF_6 (octahedral Geometry) having total twelve 90° bond angles

(61) **Answer :** (4)
Solution:



(62) **Answer :** (1)
Solution:
Lesser is the polarising power of cation greater is the ionic character.

(63) **Answer :** (1)
Solution:



(64) **Answer :** (1)
Solution:

$$\underset{sp^2}{CH_2} = \underset{sp^2}{CH} - \underset{sp^2}{CH} = \underset{sp}{C} = \underset{sp}{C} - \underset{sp^2}{CH} - \underset{sp^3}{CH_3}$$

sp^2 carbon atoms = 4
sp^3 carbon atoms = 1
sp carbon atoms = 2

(65) **Answer :** (1)
Solution:
Dipole moment, μ = q × d
= 1.6×10^{-19} C × 10^{-10} m
= 1.6×10^{-29} Cm

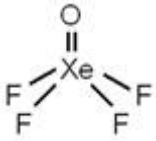
$\%$ ionic character = $\frac{\text{Observed dipole moment}}{\text{Theoretical dipole moment}} \times 100$

$= \frac{1.6\times10^{-30}}{1.6\times10^{-29}} \times 100$

= 10%

(66) **Answer :** (2)
Solution:
The shape of NH_4^+ is regular tetrahedral as no lone pair is present so bond angle is 109.5° while other species have lone pair so bond angles are less than 109.5°.

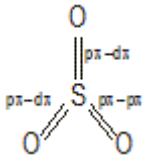
(67) **Answer :** (3)
Solution:



(68) **Answer :** (4)
Solution:
Number of hybrid orbitals in sp^3d^2 is 6

(69) **Answer :** (1)
Solution:
More the electronegativity of an atom attached to H-atom, stronger will be H-bonding.
Strength of H-bond : HF > H_2O > NH_3

(70) **Answer :** (2)
Solution:
SO_3 contains pπ – pπ and pπ – dπ bonds



(71) **Answer :** (3)
Solution:
2*p* – 2*p* has maximum overlapping due to high directional nature.

(72) **Answer :** (2)
Solution:

SO_2 = sp^2, angular shape $NH_2^{\ominus}$

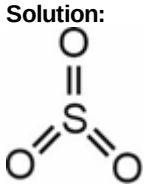
(73) **Answer :** (1)
Solution:
$N_2 : \sigma 1s^2, \sigma * 1s^2, \sigma 2s^2, \sigma * 2s^2, \pi 2\,px^2 \equiv \pi^2 p_y^2, \sigma 2p_z^2$

(74) **Answer :** (4)
Solution:
Bond order of H_2^+ is 0.5.

(75) **Answer :** (1)
Solution:
PCl_5
sp^3d hybridisation
% *d*-character = 20%

(76) **Answer :** (3)
Solution:
Bond type Bond length (pm)
C – H 107
C – C 154
C – N 143

(77) **Answer :** (1)
Solution:

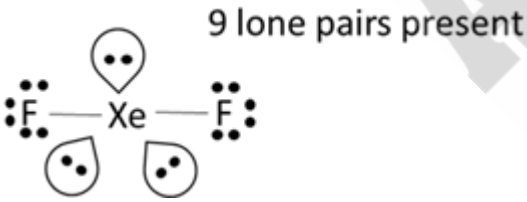


SO_3 is sp^2 hybridised and planar molecule.

(78) **Answer :** (2)
Solution:
M.O. configuration of C_2 is
$\sigma 1s^2,\ \sigma * 1s^2,\ \sigma 2s^2, \sigma * 2s^2,\ \pi 2p_x{}^2 = \pi 2p_y{}^2$

(79) **Answer :** (4)
Solution:
BeH_2 does not follow octet rule.
H : Be : H

(80) **Answer :** (1)
Solution:



(81) **Answer :** (3)
Solution:

Bond	C – C	F – F	O – O	Cl – Cl
$BE\ \left(\frac{kJ}{mol}\right)$	347	159	138	243

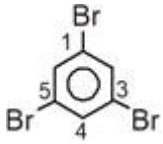
(82) **Answer :** (1)
Solution:
ClO_4^- , SO_3 and NO_3^- have π-bonds.

(83) **Answer :** (1)
Solution:
Acetone is soluble in water due to intermolecular H-bonding.

(84) **Answer :** (2)
Solution:

Intramolecular Hydrogen bonding in o-Nitro phenol

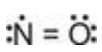
(85) **Answer :** (1)
Solution:



1, 3, 5 bromoposition will give zero dipole moment.

SECTION-B

(86) **Answer :** (1)
Solution:



(87) **Answer :** (1)
Solution:
BF_3 are sp^2 while NH_2^-, NH_3 and CH_4 are sp^3 hybridised.

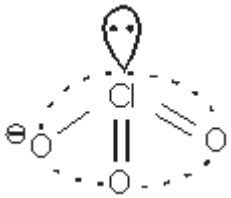
(88) **Answer :** (1)
Solution:
Lesser the bond order, longer is the bond length.

Species	Bond order
O_2	2
O_2^-	1. 5
O_2^+	2. 5

(89) **Answer :** (2)
Solution:
The hybridisation of N is sp^3 in both NH_3 and NH_4^+.

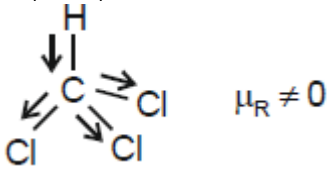
(90) **Answer :** (1)
Solution:
NaF > NaCl > NaBr > NaI: (Melting point order)

(91) **Answer :** (2)
Solution:
$C\ell O_3^-$: sp^3 hybridisation



(92) **Answer :** (1)
Solution:
$N_2 \Rightarrow \sigma 1s^2\ \sigma^* 1s^2\ \sigma 2s^2\ \sigma^* 2s^2 \pi 2p_x^2 = \pi 2p_y^2\ \sigma 2p_z^2$
To form N_2^+, e^- will be removed from $\sigma 2p_z$ orbital.

(93) **Answer :** (2)
Solution:
CH_4, CCl_4 ⇒ Regular geometry so dipole moment is zero but $CHCl_3$ is not regular geometry



(94) **Answer :** (3)
Solution:
KO_2 is paramagnetic because it contains superoxide ion, O_2^-.

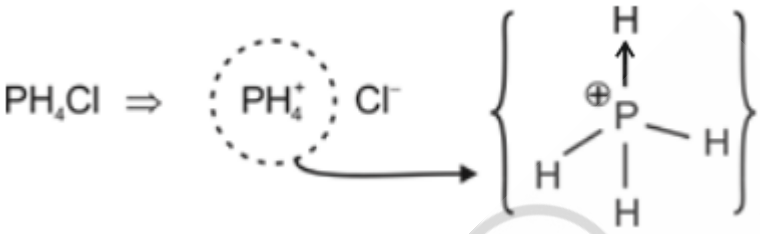
(95) **Answer :** (3)
Solution:
PO_4^{3-} has 4 resonating structures hence bond order $=\frac{5}{4}=1.25$

(96) **Answer :** (2)
Solution:
$\pi 2p_x$ has only one nodal plane.

(97) **Answer :** (4)
Solution:
BO of O_2 = 2 and that of O_2^+ is 2.5.

(98) **Answer :** (4)
Solution:
CH_3O^- has cannot show conjugation.

(99) **Answer :** (4)
Solution:
In PH_3, phosphorous can donate lone pair to H^+ and can form coordinate bond



(100) **Answer :** (3)
Solution:
- Covalent character increases with increase in charge and decrease in size of cation.
- Covalent character increases with increase in charge and increase in size of anion.

BOTANY

SECTION-A

(101) **Answer :** (2)
Solution:
As they are eukaryotes, they have well defined nucleus, membrane bounded cell organelles and 80S ribosomes in the cytoplasm.

(102) **Answer :** (3)
Solution:
Cellulosic cell wall is found in plants.
Cell wall in monerans (except Archaebacteria and *Mycoplasma*) is made up of peptidoglycan and cell wall in fungi is made up of chitin.

(103) **Answer :** (3)
Solution:
Amoeboid protozoan-*Entamoeba*
Ciliated protozoan-*Paramoecium*
Sporozoan- *Plasmodium*
Flagellated protozoan-*Trypanosoma*

(104) **Answer :** (2)
Solution:
Slime moulds form the plasmodium under the suitable conditions. During unfavourable conditions, the plasmodium differentiates and forms fruiting bodies bearing spores.

(105) **Answer :** (3)
Solution:
Chrysophytes are photosynthetic.

(106) **Answer :** (2)
Solution:

Mycoplasma lacks any cell wall.

(107) Answer : (3)
Solution:
Archaebacteria have different cell wall composition as compared to eubacteria which have peptidoglycan in their cell wall.

(108) Answer : (1)
Solution:
Cyanobacteria often form blooms in polluted water

(109) Answer : (3)
Solution:
Cholera, typhoid, tetanus and citrus canker are well known diseases caused by different bacteria. They are helpful in making curd from milk, production of antibiotics, fixing nitrogen in legume roots, etc.

(110) Answer : (4)
Solution:
Mesosome is formed by the extension of plasma membrane into the cell and helps in various functions, like cell wall formation, DNA replication and distribution to daughter cells.

(111) Answer : (4)
Solution:
Mode of nutrition in kingdom Monera can be autotrophic or heterotrophic.
Autotrophic mode of nutrition includes chemoautotrophic and photoautotrophic, and heterotrophic mode of nutrition includes saprophytic and parasitic.

(112) Answer : (2)
Solution:
Kingdom monera includes prokaryotes.
Other four kingdoms Protista, Fungi, Plantae and Animalia include eukaryotes.

(113) Answer : (4)
Solution:
First scientific attempt of classification of living organisms (plants and animals) was performed by Aristotle
Aristotle classified animals into Anaima and Enaima, on the basis of absence and presence of red blood respectively.

(114) Answer : (3)
Solution:
Viruses are not included in any group as per five kingdom classification.

(115) Answer : (3)
Solution:
Due to presence of cell wall, Linnaeus grouped bacteria and fungi with plants.

(116) Answer : (4)
Solution:
Bacteria are sole members of kingdom Monera.

(117) Answer : (1)
Solution:
Vibrio are comma-shaped bacteria

(118) Answer : (4)
Solution:
Some of the bacteria are autotrophic but vast majority are heterotrophic.

(119) Answer : (3)
Solution:
Bacteria are prokaryotes.

(120) Answer : (4)
Solution:
Monerans have simple structure but complex behaviour and metabolism.

(121) Answer : (2)
Solution:
Bacteria mainly reproduce by binary fission under favourable condition and form spores during unfavourable conditions.

(122) Answer : (2)
Solution:
Bacteria reproduce mainly by fission.

(123) Answer : (2)

Solution:
Trypansoma (Protozoans) causes sleeping sickness.

(124) Answer : (3)
Solution:
Methanogens are responsible for the production of methane from the cattle dung.

(125) Answer : (4)
Solution:
Mycoplasma completely lack cell wall.
Paramoecium and *Euglena* have pellicle instead of cell wall.

(126) Answer : (3)
Solution:
Nostoc has heterocyst and chlorophyll a. It lacks flagella throughout the life cycle.

(127) Answer : (2)
Solution:
Protist having stiff cellulosic plates on cell wall are dinoflagellates e.g. *Gonyaulax*.

(128) Answer : (4)
Solution:
Chemoautotrophs are found in monera kingdom.

(129) Answer : (1)
Solution:
Kingdom Protista forms a link with members of plants ,animals and fungi

(130) Answer : (4)
Solution:
Diatoms are the chief producers in the oceans.

(131) Answer : (4)
Solution:
Dinoflagellates such as *Gonyaulax* are responsible for red tides or red coloration of oceans. They also produce toxins which are dangerous for marine life.

(132) Answer : (3)
Solution:
Pellicle is a protein rich layer in *Euglena* which makes their body flexible.

(133) Answer : (3)
Solution:
Euglena shows both autotrophic and heterotrophic nutrition.

(134) Answer : (2)
Solution:
Plasmodium is the somatic body of slime moulds which is naked *i.e.*, not covered by cell wall.

(135) Answer : (2)
Solution:
Chemosynthetic autotrophic bacteria oxidise various inorganic substances such as nitrates, nitrites and ammonia and use the released energy for their ATP production.

SECTION-B

(136) Answer : (4)
Solution:
In five kingdom classification, unicellular eukaryotes are placed in kingdom Protista.

(137) Answer : (2)
Solution:
Aristotle divided animals into two groups, those which had red blood and those that did not.

(138) Answer : (2)
Solution:
Herbs are non-woody plants.
Shrubs are taller than herbs and their stems are not harder but thicker. Trees are woody plants taller than herb and shrub.

(139) Answer : (2)
Solution:
Rod-shaped bacteria are called bacilli.

(140) Answer : (4)
Solution:

Obligate anaerobes show anaerobic mode of respiration only.

(141) Answer : (2)
Solution:
Halophiles are archaebacteria.

(142) Answer : (2)
Solution:
Diatoms are microscopic and float passively in water currents (plankton). Most of them are photosynthetic. In diatoms the cell walls form two thin overlapping shells, which fit together as in a soap box.

(143) Answer : (4)
Solution:
Sporozoans lack any locomotory structure.
Plasmodium – Lack locomotory structure
Amoeba – Pseudopodia
Paramoecium – Cilia
Trypanosoma – Flagella

(144) Answer : (4)
Solution:
Plasmodium is considered to be most notorious protozoan causing malaria.

(145) Answer : (1)
Solution:
Marine forms of protozoans having silica shells on their surface are amoeboid protozoans

(146) Answer : (2)
Solution:
Ciliates such as *Paramoecium* have definite region of ingestion and egestion.

(147) Answer : (3)
Solution:
For locomotion, *Euglena* has flagella.

(148) Answer : (3)
Solution:
Chrysophytes, dinoflagellates and euglenoids are autotrophs whereas ciliates are protozoans which are heterotrophs.

(149) Answer : (4)
Solution:
The spores are dispersed by air currents.

(150) Answer : (3)
Solution:
Loose tissue body organisation can be represented by mycelium of fungi.

ZOOLOGY

SECTION-A

(151) Answer : (3)
Solution:
Alimentary canal starts with mouth. In stomach, muscularis consists of 3-layers in which innermost layer is oblique muscle layer. Opening of ileum into caecum is guarded by ileo-caecal valve.

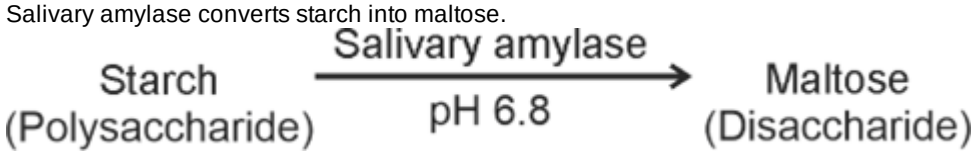
(152) Answer : (1)
Solution:
The gastro-oesophageal sphincter controls the passage of food into the stomach.

(153) Answer : (3)
Solution:
Majority of mammals including human being have diphyodont type of dentation. In adult human has 32 permanent teeth which are heterodont in nature. Arrangement of teeth in each half of upper and lower jaw in the order I, C, PM, M is represented by
$\frac{2123}{2123}$

(154) Answer : (2)
Solution:

Total number of teeth in adult human is 32. Out of these, premolars and last molar teeth appear only once *i.e*., are monophyodont and the remaining teeth are diphyodont. Therefore, monophyodont teeth are 12 in number.

(155) Answer : (2)
Hint:
70% starch is hydrolysed in small intestine
Solution:
Salivary amylase converts starch into maltose.



(156) Answer : (3)
Solution:
Gastrin stimulates the gastric gland to secrete and release gastric juice.

(157) Answer : (3)
Hint:
These are required in small quantities.
Solution:
Mineral ions such as Ca^{++}, Mg^{++} and Cl^{-} can be absorbed in original form. Bread and meat are rich sources of carbohydrates and proteins respectively. They need to be hydrolysed into simple absorbable forms. Spinach contains cellulose which can't be digested in human alimentary canal.

(158) Answer : (4)
Solution:
Liver is the site of synthesis of bile.

(159) Answer : (2)
Hint:
Largest gland of the body.
Solution:
Hepatic lobule is the structural and functional unit of liver. Glisson's capsule is a mammalian feature.

(160) Answer : (3)
Solution:
Upper surface of the tongue has small projections called papillae, some of which bears teste buds. Glottis is a opening of the wind pipe. Vermifom appendix is a vestigeal structure in humans.

(161) Answer : (2)
Solution:
Intestinal juice contains a variety of enzymes like disaccharidases, dipeptidases, lipases, nucleosidases; *etc*.

(162) Answer : (1)
Solution:
Mucus neck cells secrete mucus. Peptic or chief cells secrete pepsinogen. Parietal or oxyntic cells secrete HCl and intrinsic factor.

(163) Answer : (3)
Solution:
The wall of alimentary canal from oesophagus to rectum possesses four layers namely serosa, muscularis, sub-mucosa and mucosa.

(164) Answer : (2)
Solution:
A – Duct from gall bladder / cystic duct
B – Common bile duct
C – Common hepatic duct
D – Duct from liver

(165) Answer : (2)
Solution:
Fats are broken down by lipases with the help of bile into di- and monoglycerides.

(166) Answer : (1)
Solution:
Crypts of Lieberkuhn are present between the bases of villi which are formed by mucosa in the intestine.

(167) Answer : (3)
Solution:
Physiologic values for carbohydrates and proteins are 4.0 kcal/g respectively while that of fats are 9.0 kcal/g.

(168) Answer : (4)

Solution:
Nucleotidase works under alkaline conditions (pH 7.8) in small intestine.

(169) Answer : (1)
Solution:
Parietal cells produce intrinsic factor essential for absorption of vitamin B_{12}.

(170) Answer : (4)
Hint:
Identify the characteristic feature of kwashiorkor disease.
Solution:
Marasmus is produced by a simultaneous deficiency of proteins and calories. It is found in infants less than one year of age. In Marasmus, both growth rate and body weight decline considerably.

(171) Answer : (4)
Solution:
Absorption of water, simple sugars and alcohol *etc*. takes place is stomach.

(172) Answer : (3)
Hint:
The enzyme that produces simple absorbable forms upon acting on substrate.
Solution:
Dipeptides $\xrightarrow{\text{Dipeptidase}}$ Amino acids.
Enterokinase acts on trypsinogen. Nuclease acts on polynucleotides and trypsinogen is a zymogen.

(173) Answer : (2)
Solution:
Bolus is formed in buccal cavity, which is conveyed to pharynx and then to oesophagus.

(174) Answer : (1)
Hint:
Establish enzyme, substrate, product relationship.
Solution:
Maltase will act on maltose to yield glucose. Amylopsin/pancreatic amylase and salivary amylase act on starch to produce maltose.

(175) Answer : (3)
Solution:
Skin, eye and mucus membranes turn yellow due to deposition of bile pigments.

(176) Answer : (3)
Solution:
Chymotrypsin does curdling of milk by digesting casein, at pH 7.8 in adults.

(177) Answer : (1)
Solution:
Trypsinogen is activated by enzyme enterokinase into active trypsin. It is secreted by the intestinal mucosa.

(178) Answer : (2)
Solution:
Dipeptidases are secreted by epithelial cells of small intestine which act on dipeptides and break them into amino acids.

(179) Answer : (2)
Hint:
Product of mastication that passes from oral cavity to stomach.
Solution:
In stomach, food mixes with acidic gastric juice by the churning movements producing chyme.

(180) Answer : (2)
Solution:
Gastric glands secrete pepsin and rennin (in infants) whose optimum pH is 1.8. The other given enzymes work optimally at alkaline pH.

(181) Answer : (1)
Solution:
Brunner's glands provide an alkaline medium.
Brunner's gland is a sub-mucosal gland whose secretions protects the intestinal mucosa from the acidic chyme of stomach.

(182) Answer : (3)
Solution:
Deglutition is another term used for swallowing which is partly voluntary and partly involuntary.

(183) Answer : (2)
Solution:
Insulin is released directly into blood.

(184) Answer : (2)
Hint:
Humans have four different types of teeth which are embedded in bony jaw.
Solution:
Humans have two sets of teeth in their life time *i.e*. deciduous and permanent teeth. We have four different types of teeth *i.e*. canines, incisors, premolars and molars, thus we have heterodont dentition. These teeth are embedded in the socket of jaw bone *i.e*. thecodont.

(185) Answer : (2)
Solution:
Chloride ions are absorbed by simple diffusion. Transport of water depends upon osmotic gradient.

SECTION-B

(186) Answer : (1)
Solution:
Sucrose is composed of monomer glucose and fructose.

(187) Answer : (2)
Solution:
The tongue is a freely movable muscular organ attached to the floor of the oral cavity by the frenulum.

(188) Answer : (4)
Hint:
Ampulla of Vater.
Solution:
Gastro-oesophageal sphincter regulates the opening of oesophagus into stomach. The opening of stomach into duodenum is guarded by pyloric sphincter. Ileo-caecal valve prevents backflow of undigested food from caecum to ileum.

(189) Answer : (3)
Solution:
Salivary glands are located outside buccal cavity.

(190) Answer : (2)
Solution:
Maltase and gastric lipase are not found in saliva.

(191) Answer : (3)
Hint:
Pancreatic amylase is released in this 'C' shaped structure.
Solution:
Lipase is absent in colon whereas mouth, stomach and duodenum respectively contain lingual, gastric and pancreatic lipases.

(192) Answer : (3)
Solution:
Vomiting is the ejection of stomach content through the mouth. This reflex action is controlled by vomit centre in the medulla.

(193) Answer : (2)
Solution:
Lactase enzyme required for digestion of lactose (carbohydrates) is not secreted sufficiently in aged people.

(194) Answer : (2)
Solution:
In pancreatic juice trypsinogen, chymotrypsinogen, procarboxypeptidase are present in inactive state.

(195) Answer : (2)
Solution:
Hint : This organ produces bile.
Sol.: Bile lacks mucus. Secretions of gastric glands, salivary glands and intestinal glands contain mucus.

(196) Answer : (2)
Hint:
This is produced when sucrase acts on its substrates.
Solution:
Sucrase is a brush-bordered enzyme which breaks sucrose into glucose and fructose.

(197) Answer : (1)
Hint:

Structure into which the buccal cavity opens.
Solution:
A cartilaginous flap called epiglottis prevents the entry of food into the glottis *i.e.* opening of the wind pipe, during swallowing.

(198) Answer : (2)
Solution:
Mouth-digestion of carbohydrates occurs.
Small intestine - major site of digestion
Stomach - digestion of proteins takes place.

(199) Answer : (4)
Solution:
Diarrhoea is increased liquidity of faecal matter and abnormal bowel movement.

(200) Answer : (1)
Hint:
Digested food gets absorbed in small intestine.
Solution:
Bio-macromolecules (protein, nucleic acids, polysaccharides and lipids) have to be broken down and converted into simple substances in the digestive system.