01/04/2026

Code-B Phase-1

Aakash
Medical | IIT-JEE | Foundations

Corporate Office : AESL, 3rd Floor, Incuspaze Campus-2, Plot No. 13, Sector-18,
Udyog Vihar, Gurugram, Haryana - 122015, ***Ph.***+91-1244168300

MM : 720 Final Test Series(P1)_NEET2026_Test-05B **Time : 180 Min.**

PHYSICS

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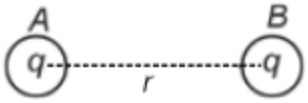
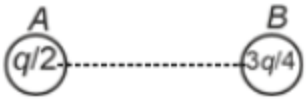
Hints and Solutions

PHYSICS

(1) **Answer :** (1)
Solution:
Initial condition



$F = \frac{K q q}{r^2}$
Final condition



$F' = \frac{\frac{K q}{2}\frac{3q}{4}}{r^2}$
$F' = \frac{3F}{8}$

(2) **Answer :** (3)
Solution:
• In a charge-free region, electrostatic field lines can be taken to be continuous curves without any breaks.
• Electrostatic field lines do not form any closed loops.
Hence, Both statement(s) are correct

(3) **Answer :** (4)
Solution:

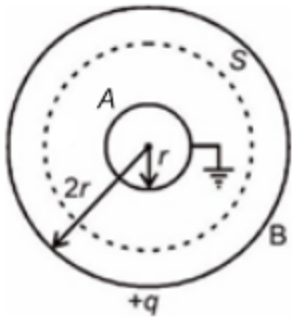
$F = \frac{kq^2}{r^2} \quad \left[K = \frac{1}{4\pi\varepsilon_0}\right]$

$\Rightarrow \frac{kq^2}{r^2} = \frac{mv^2}{R_C} \Rightarrow R_C = \frac{mv^2r^2}{kq^2}$;

$R_C = \frac{4\pi\varepsilon_0 v^2 r^2 m}{q^2}$

(4) **Answer :** (3)
Hint:
$\oint \vec{E} . \vec{dA} = \phi_{total}$
Solution:
$\phi_{total} = 0$

(5) **Answer :** (2)
Solution:



Let charge on inner sphere is q'
Potential of inner sphere is zero

$\Rightarrow \frac{q'}{r}+\frac{q}{2r}=0 \Rightarrow q'=-\frac{q}{2}$

Hence flux through surface

$\varphi_1=\frac{q_{en}}{\varepsilon_0}=\frac{-q}{2\varepsilon_0}$

(6) **Answer :** (3)
Solution:
Here forces on pith balls are equal and opposite. So angles made by strings are equal but greater from initial case.

(7) **Answer :** (4)
Solution: Answer (4)
Hint & Sol.: Electric field lines originate from positive charge and terminate at negative charge.

(8) **Answer :** (2)
Solution:

$\frac{Q}{4\pi\varepsilon_0 r^2}=3\times10^6 \Rightarrow Q\times9\times10^9=\left(\frac{5}{2}\right)^2\times3\times10^6$

$Q=\frac{25\times3}{36}\times10^{-3}$

Q ≈ 2 × 10^{-3} C

(9) **Answer :** (4)
Solution:

$\phi=\vec{E}\cdot\vec{A}=\left(10\hat{i}+58\hat{j}+10\hat{k}\right)\cdot5\hat{i}=50\frac{\text{Nm}^2}{\text{C}}$

(10) **Answer :** (2)
Solution:
The total charge upto distance '*r*'

$dq=\rho\cdot dv=4\pi r^2dr$

$=4\pi r^2.dr.\rho_0\left[\frac{5}{4}-\frac{r}{R}\right]$

$q=\int dq=4\pi\rho_0\int_0^r\left(\frac{5}{4}r^2dr-\frac{r^3}{R}dr\right)$

$q=4\pi\rho_0\left[\frac{5}{4}\frac{r^3}{3}-\frac{r^4}{4R}\right]$

$\therefore\ E=\frac{Kq}{r^2}=\frac{1}{4\pi\varepsilon_0}\frac{1}{r^2}4\pi\rho_0\left[\frac{5}{4}\frac{r^3}{3}-\frac{r^4}{4R}\right]=\frac{\rho_0 r}{4\varepsilon_0}\left[\frac{5}{3}-\frac{r}{R}\right]$

(11) **Answer :** (3)
Solution:

τ = *pE* sinθ and *W* = *pE* [cosθ$_1$ – cosθ$_2$]

τ = *pE* sinθ

$\therefore\ pE=\frac{\tau}{\sin\theta}=\frac{\tau}{\sin45^\circ}=\sqrt{2}\tau$

W = *pE*[cosθ$_1$ – cosθ$_2$]

$W=\sqrt{2\tau}\left[\cos45^\circ-\cos90^\circ\right]=\sqrt{2\tau}\left[\frac{1}{\sqrt{2}}-0\right]=\tau$

(12) **Answer :** (2)
Solution:

• Any charge system/charged body behaves like point charge if produced field follows inverse square law $\left(E\propto\frac{1}{r^2}\right)$

• If distance between two charged bodies is very large in comparison to their dimension then they can be treated as point charges.

(13) **Answer :** (3)
Solution:
Potential of smaller drop $V=\frac{1}{4\pi\varepsilon_0}\frac{q}{r}$

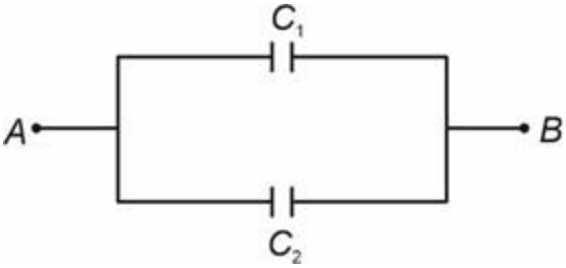
$\frac{4}{3}\pi R^3=64\times\frac{4}{3}\pi r^3$

R = 4*r*

Potential of bigger drop = $V^\beta=\frac{1}{4\pi\varepsilon_0}\frac{64q}{4r}=16V$

$\Rightarrow \frac{V^\beta}{V}=16$

(14) Answer : (2)
Hint:
Potential difference in both dielectrics are equal, hence they are in parallel combination.
Solution:



$C_1 = \frac{K\varepsilon_0 A}{2d}$

$C_2 = \frac{2K\varepsilon_0 A}{2d}$

$C_{eq} = C_1 + C_2$

$C_{eq} = \frac{3K\varepsilon_0 A}{2d}$

(15) Answer : (2)
Solution:
Answer (2)
Hint:

$$V = \frac{kq}{R}$$

Sol.:

$$V = \frac{9\times10^{9}\times1\times10^{-6}}{10\times10^{-2}}$$

$V = 9 \times 10^4$
$= 90$ kV

(16) Answer : (2)
Solution:

Potential energy of system of 2 charges, $U_{sys} = \frac{kq_1q_2}{r}$

$= \frac{9\times10^9\times(2)\times10^{-6}\times(-6)\times10^{-6}}{3}$

$= -36\times10^{-3}\ \text{J}$

(17) Answer : (1)
Solution:

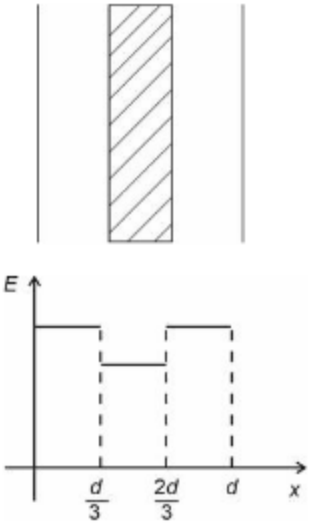
$E = -\frac{\Delta V}{\Delta x} = -\left(\frac{-30-10}{2\times10^{-2}}\right)$ = 2000 V/m

(18) Answer : (4)
Hint:
Over an equipotential surface, potential remains constant.
Solution:
$W = U_f - U_i$
$W = q\,(V_f - V_i)$
as $V_f = V_i = V$
$W = 0$

(19) Answer : (4)
Solution:
• Electric field inside a cavity of any conductor in electrostatics is zero.
• Grounded or earthed conductor is considered to have zero electric potential because it is connected to the earth, which acts as a stable reference with a conventionally defined zero potential.

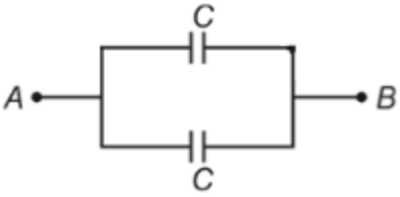
• Isolated conductor neither gains or lose any charge but redistribution of charge may take place.

(20) **Answer :** (1)
Hint:
Electric field inside dielectric is given by = $\frac{E_{air}}{K}$
Solution:



(21) **Answer :** (2)
Solution: Answer (2)
Hint & Sol.: $Q = CV$
= 5 × 5 = 25 μC

(22) **Answer :** (2)
Hint:
In parallel combination $C_P = C_1 + C_2$
Solution:
On redrawing the circuit

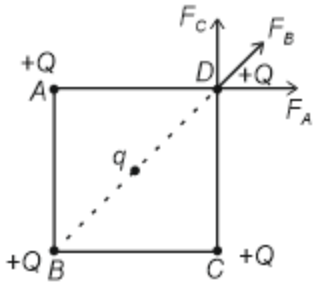


$C_{AB} = 2C = \frac{2\varepsilon_0 A}{d}$

(23) **Answer :** (2)
Solution:
Total charge on ring
$Q = \lambda\pi R$
$F = QE = \pi R\lambda E$

(24) **Answer :** (2)
Solution:
$E_x = -\frac{\delta v}{\delta x} = -2$
$E_y = -\frac{\delta v}{\delta y} = -3$
and $E_y = -\frac{\delta v}{\delta z} = 4$
$\therefore \quad \vec{E} = -2\hat{i} - 3\hat{j} + 4\hat{k}$

(25) **Answer :** (1)
Solution:
For equilibrium net force on any charge (Let D) must be zero.



i.e., $0 = \frac{KQ^2\cos 45^\circ}{a^2} + \frac{KQ^2\cos 45^\circ}{a^2} + \frac{KQ^2}{2a^2} + \frac{KQq}{\left(\frac{a}{\sqrt{2}}\right)^2}$

$0 = \frac{2KQ^2}{a^2} \times \frac{1}{\sqrt{2}} + \frac{KQ^2}{2a^2} + \frac{KQq\times 2}{a^2}$

$\Rightarrow \quad \frac{KQq\times 2}{a^2} = -\left[\frac{2KQ^2}{\sqrt{2}a^2} + \frac{KQ^2}{2a^2}\right]$

$q = -\left(\frac{1+2\sqrt{2}}{4}\right)Q$

(26) Answer : (4)
Solution:
Here $F_E \le \mu mg$:

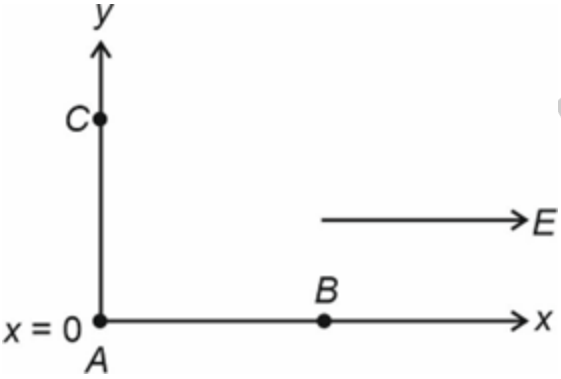
$\Rightarrow \quad \frac{9\times 10^9\times 10^{-6}\times 10^{-6}}{(0.5)2} \le \mu \times 10 \times 10^{-3} \times 10$

$\Rightarrow \quad \frac{9\times 10^{-3}}{0.25} \le \mu \times 10^{-1}$

$\Rightarrow \quad \frac{9\times 10^{-2}}{0.25} \le \mu$

$\Rightarrow \quad \mu \ge \frac{9}{25}$

(27) Answer : (3)
Solution:



Potential decreases on moving in the direction of electric field.
Hence, $V_A = V_C > V_B$

(28) Answer : (2)
Solution:
Using super position, principle
$E_{\text{inside}} = E_{\text{removed piece}} + E_{\text{remaining}}$
$O = E_{\text{due to removed piece}} + E_{\text{due to remaining shell}}$
$\Rightarrow E_{\text{due to remaining shell}} = -E_{\text{due to removed piece}}$ (1)
$E_{\text{out side}} = \frac{\sigma}{\varepsilon_0} = E_{\text{small piece}} + E_{\text{due to remaining shell}}$ (II)
$\Rightarrow E_{\text{due to remaining shell}} = \frac{\sigma}{2\varepsilon_0}$

(29) Answer : (3)
Solution:
Total electric potential energy of the system will be equal to addition of self potential energy of charges and their interaction potential energy in the external electric field.

(30) Answer : (1)

Solution:

Work done = $\Delta U = U_f - U_i = 0 - U_i$

$= (-)\left[\frac{kq^2}{2b} + \frac{kq^2}{2a} + \frac{kq^2}{b} - \frac{kq^2}{a}\frac{-kq^2}{b}\right]$

$= (-)\left[\frac{kq^2}{2b} - \frac{kq^2}{2a}\right]$

$= \frac{kq^2}{2a} - \frac{kq^2}{2b}$

$= \frac{q^2}{8\pi\varepsilon_0}\left[\frac{1}{a} - \frac{1}{b}\right]$

(31) Answer : (2)

Solution:

Using super position principle

Required potential at O = potential at O due to complete sphere – potential at O due to charged portion taken out

[Q' → charge of taken out part]

$= \frac{3}{2} \times \frac{1}{4\pi\varepsilon_0} \times \frac{\rho \times \frac{4}{3}\pi R^3}{R} - \frac{1}{4\pi\varepsilon_0} \times \frac{\frac{4}{3}\pi\left(\frac{R}{2}\right)^3 \rho}{\left(\frac{R}{2}\right)} = \frac{\rho R^2}{2\varepsilon_0} - \frac{\rho R^2}{12\varepsilon_0}$

$= \frac{5\rho R^2}{12\varepsilon_0}$

(32) Answer : (2)

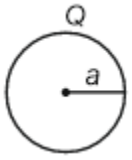
Solution:

$\vec{E}$ must be perpendicular to equipotential line hence $\vec{E}$ any vector in equipotential = 0

Option (2) satisfies the condition.

(33) Answer : (2)

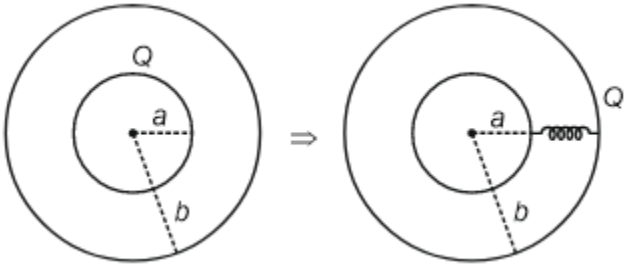
Solution:



$V = \frac{KQ}{a}$

$\Rightarrow \quad Q = \frac{Va}{K}$

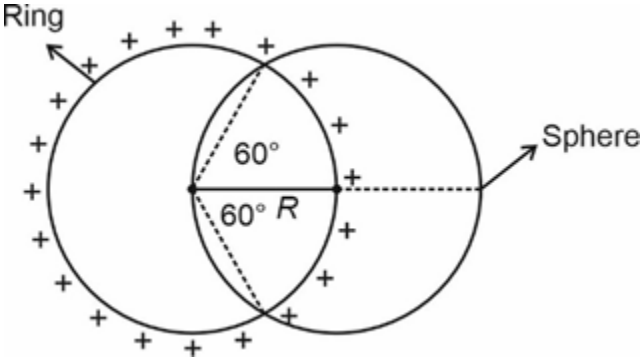
Now



Potential of sphere $= \frac{KQ}{b}$

$= \frac{K}{b} \times \frac{Va}{K} = \frac{a}{b}V$

(34) Answer : (4)
Hint:



charged enclosed by the sphere $= \frac{Q}{3}$

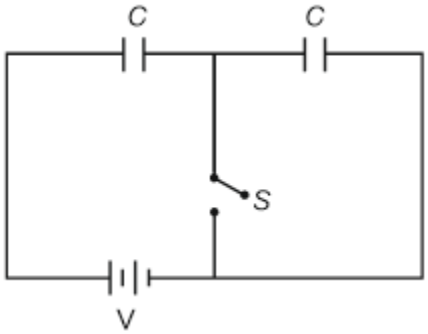
$\therefore \quad \phi_{\text{flux}} = \frac{Q}{3\varepsilon_0} = \frac{10}{3\varepsilon_0}$

(35) Answer : (3)
Solution:

$E' = \frac{Q^2}{2C'} = \frac{(nQ)^2}{2(n^{1/3}C)} = n^{2-1/3}\left(\frac{Q^2}{2C}\right)$

$= n^{5/3} E$

(36) Answer : (4)
Solution:
Initial circuit

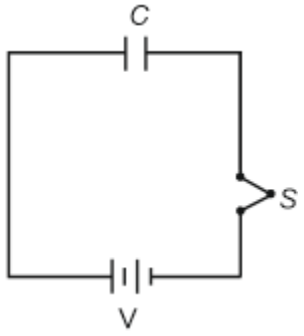


Initially stored energy in capacitors

$= \frac{1}{2}\left(\frac{C}{2}\right)V^2 = \frac{1}{4}CV^2$

initial charge on each capacitor $= \frac{CV}{2}$

After switch *S* is closed
final circuit



Energy stored $= \frac{1}{2}CV^2$

charge on capacitor = *CV*

$\therefore$ Charged supplied by battery = $= CV - \frac{CV}{2} = \frac{CV}{2}$

Using workdone by battery = Heat loss + change in stored energy

$\Rightarrow \quad \frac{CV}{2}V = H + \left(\frac{1}{2}CV^2 - \frac{1}{4}CV^2\right)$

$= H + \frac{1}{4}CV^2$

$H = \frac{CV^2}{4}$

(37) Answer : (3)

Solution:

Capacitors *C* and 2*C* are in parallel so potential across them is always same hence they can have maximum voltage V.
Charge on this *C* and 2*C* combination is 3*CV*. Now 6*C* is in series with link of C and 2*C*, hence must have same charge 3*CV*

$\therefore$ voltage across 6*C* is $\frac{3CV}{6C} \Rightarrow \frac{V}{2}$

hence total maximum voltage that can be applied

$= V + \frac{V}{2} = \frac{3V}{2} = 1.5$ V

(38) Answer : (1)

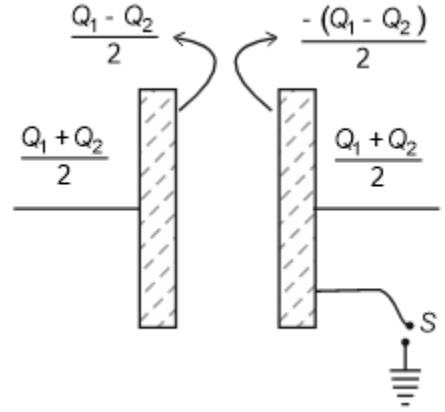
Solution:

• Effective capacitance of a series combination of capacitors is always smaller than the smallest capacitance of the capacitor in the combination.
• Increasing of area of capacitor plate or decreasing of thickness of dielectric is an alternate method to increase the capacitance.
• For a point charge, concentric spherical shells centered at the location of the charge are equipotential surfaces.

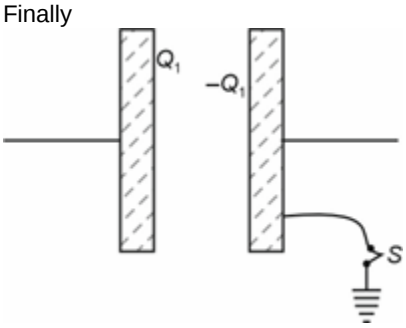
(39) Answer : (4)

Solution:

Charges on plates are initially as shown in diagram.



Finally

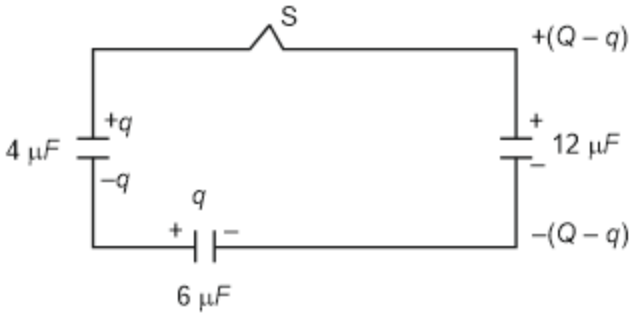


• Charge on capacitor → Q_1
• Potential difference across capacitor $= \frac{Q_1}{C}$
• Charge flown through switch is $Q_1 + Q_2$

(40) Answer : (3)

Solution:

Initial charge on 12μF
Q = 12 × 16 μC
= 192μ*C*
After switch *S* is closed
Let charge *q* flows through circuit
Using *KVL*



$\frac{-q}{4} - \frac{q}{6} + \frac{Q-q}{12} = 0$

$\Rightarrow \quad \frac{-q}{4} - \frac{q}{6} - \frac{q}{12} = \frac{-Q}{12}$

$= \frac{(3+2+1)q}{12} = \frac{Q}{12}$

$6q = Q$

$q = \frac{Q}{8} = \frac{192}{6} = 32\mu\text{C}$

Final charge on 4μF and 6μF = 32μC

final charge on 12μF = 192 – 32 = 160μC

$V_4 = \frac{32}{4} = 8V,$

$V_6 = \frac{32}{6} = \frac{16}{3}V$

$V_{12} = \frac{160}{12} = \frac{40}{3}V$

(41) Answer : (1)

Solution:

For an isolated system charge is conserved and inside a polarised dielectric net charge is zero.

(42) Answer : (4)

Solution:

$\tau = PE\sin\theta \ = q \times l \times \left(\frac{V}{d}\right)\sin 30^\circ$

$= 1 \times 10^{-6} \times 2 \times 10^{-6} \times \frac{10}{10^{-2}} \times \frac{1}{2}$

$= 1 \times 10^{-9}$ N m

(43) Answer : (3)

Solution:

Electric field due to a charged plane sheet will be numerically same at all near by points.

There force only Q and distance of observing point from Q will decide the strength of magnitude of E.

$\therefore \quad \left|\vec{E}_B\right| > \left|\vec{E}_C\right|$

and $\left|\vec{E}_D\right| \neq \left|\vec{E}_A\right|$

(44) Answer : (2)

Solution:

Let $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$

then $\vec{E} = \frac{\pi a\left(x\hat{i}+y\hat{j}+z\hat{k}\right)}{\left(x^2+y^2+z^2\right)^{3/2}} = \frac{\pi a\vec{r}}{r^3}$

This expression of $\vec{E}$ is similar to $\vec{E} = \frac{KQ}{r^3}\vec{r}$ (i.e., field lines are radial and starting from centre of sphere)

hence $KQ = \pi a$

$Q = \frac{\pi a}{k} = \pi a \times 4\pi\varepsilon_0$

$\Rightarrow Q = 4\pi^2 a\varepsilon_0$, can be assumed to be placed at origin.

Now $(\phi_D)_{\text{closed}} = \frac{Q}{\varepsilon_0}$

$= 4\pi^2 a$

(45) Answer : (1)

Solution:

$\phi_c = \frac{Q}{\varepsilon_0}$

$\left(\phi_{\text{net}}\right)_{\text{cube}} = 0$

$\Rightarrow 3\left(\phi_{\text{each face met A}}\right) + \frac{Q}{8\varepsilon_0} = 0$

$\Rightarrow \ 3\left(\phi_{\text{each face of cube met at } A}\right) = \frac{-Q}{8\varepsilon_0}$

CHEMISTRY

(46) Answer : (3)

Hint:

188 g of AgBr contains 80 g of bromine.

Solution:

188 g AgBr contains = 80 g Bromine

0.08 g AgBr contains = $\frac{80}{188} \times 0.08$ g Bromine

% of Bromine = $\frac{\frac{80\times0.08}{188}\times100}{0.1}$

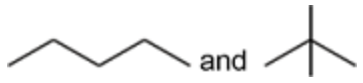
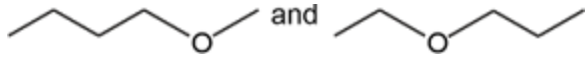
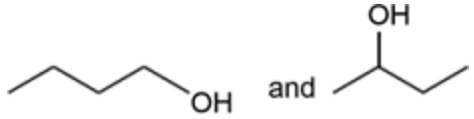
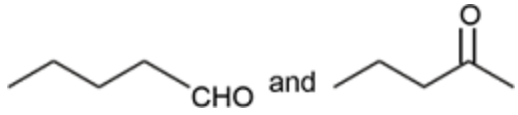
% of Bromine = 34.04%

(47) Answer : (4)

Hint:

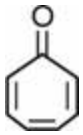
Two or more compounds having same molecular formula but different functional groups are called functional isomers.

Solution:

-  are chain isomers
-  are metamers
-  are position isomers
-  are functional group isomers

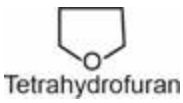
(48) Answer : (4)

Hint:

Structure of tropone is 

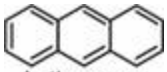
Solution:

(a)  Non-benzenoid aromatic

(b)  Heterocyclic non-aromatic

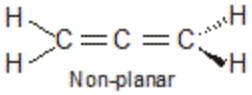
(c)  Heterocyclic aromatic

(d) Benzenoid aromatic

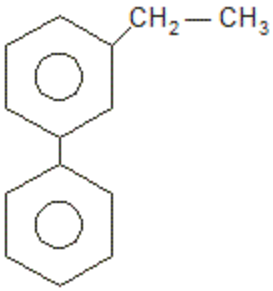

Anthracene

(49) **Answer :** (2)
Solution:
N, Cl, P and S can be detected by Lassigne's test

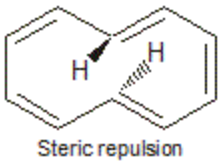
(50) **Answer :** (2)
Hint:
Allene is a non planar molecule.
Solution:
1.


Non-planar

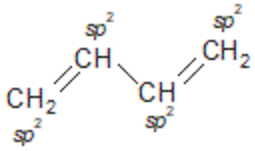
2.



3.


Steric repulsion

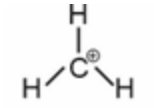
4.



(51) **Answer :** (1)
Hint:
Number of equivalents of H_2SO_4 = Number of equivalents of NH_3 + Number of equivalents of NaOH
Solution:
Total number of equivalents of H_2SO_4 = $\frac{20\times0.1\times2}{1000}$ = 4×10^{-3}
Number of equivalents of NaOH = $\frac{10\times0.1\times1}{1000} = 10^{-3}$
Equivalents of NH_3 = $4 \times 10^{-3} - 1 \times 10^{-3}$
= 3×10^{-3}
Mass of N = $14 \times 3 \times 10^{-3}$ g
% of N = $\frac{14\times3\times10^{-3}}{0.2} \times 100 = 21\%$

(52) **Answer :** (2)
Solution:
Paper chromatography is a type of partition chromatography.

(53) **Answer :** (3)
Solution:
$\overset{+}{C}H_3$ is sp^2 hybridised



Trigonal planar

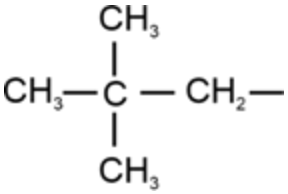
(54) **Answer :** (3)
Solution:

Order of stability $CH_2=CH-\dot{C}H_2 > Ph\dot{C}H_2 > CH_3\dot{C}HCH_3 > \dot{C}H_3$

(55) **Answer :** (2)
Hint:

$CH_3-CH_2-\underset{\underset{CH_3}{|}}{CH}-$

is sec-butyl group.
Solution:

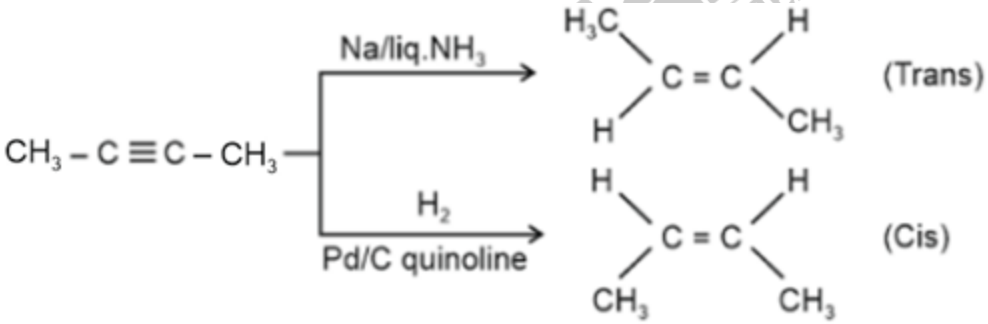


is neopentyl group.

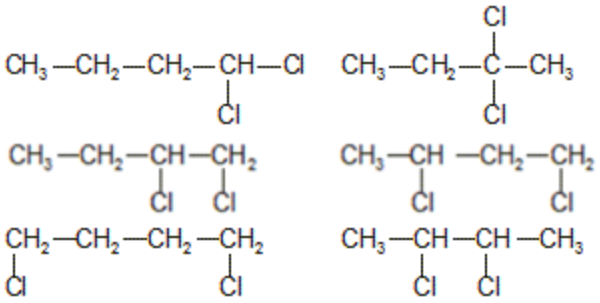
(56) **Answer :** (2)
Solution:

	Mixture	Separation Technique
a.	Aniline from aniline-water mixture	Steam distillation
b.	Glycerol from spent-lye	Distillation under reduced pressure
c.	Chloroform and Aniline	Distillation
d.	Different fractions of crude oil	Fractional distillation

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



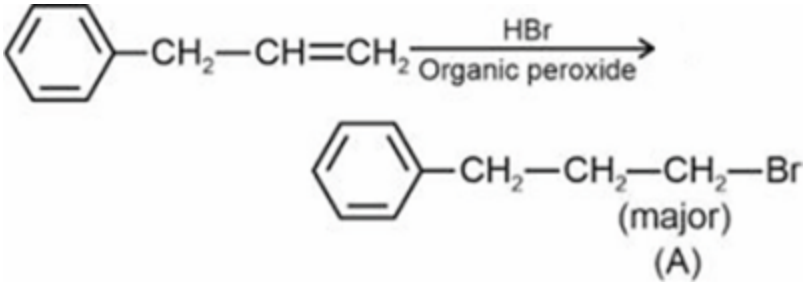
(58) **Answer :** (4)
Solution:



(59) **Answer :** (1)
Solution:
Alkynes are relatively less reactive than alkenes towards electrophilic addition due to less stable carbocation intermediate

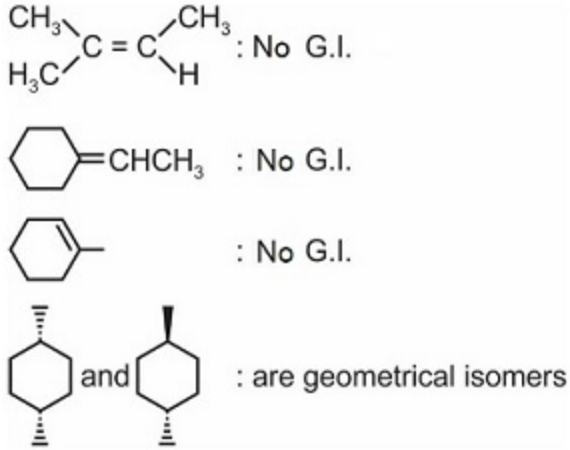
$CaC_2 + H_2O \rightarrow C_2H_2 + Ca(OH)_2$

(60) **Answer :** (3)
Hint:
In the presence of peroxide, addition of HBr to unsymmetrical alkenes follows the anti Markovnikov's rule.
Solution:

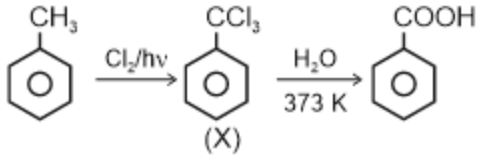


(61) **Answer :** (4)
Solution:
$-NHCOCH_3$ group is ortho and para directing group.

(62) **Answer :** (2)
Hint:
Compounds having different groups across unsaturation can show geometrical isomerism.
Solution:

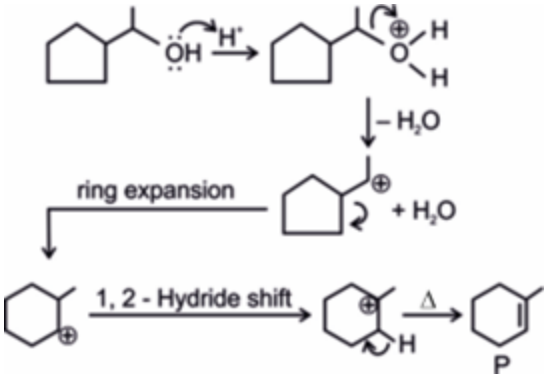


(63) **Answer :** (1)
Solution:



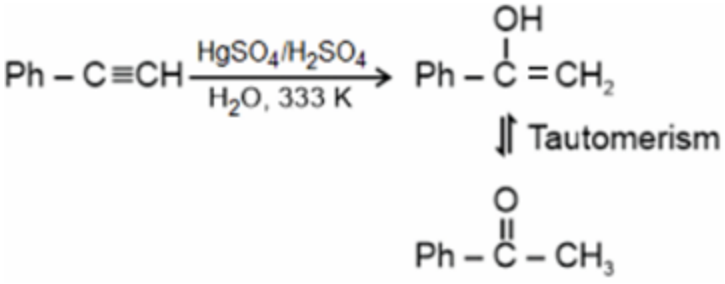
(64) **Answer :** (2)
Solution:
- Ortho/para directing groups increase electron density at ortho and para positions of benzene ring.
- Meta directing groups decrease electron density at ortho and para positions of benzene ring.

(65) **Answer :** (2)
Hint:
During dehydration of alcohols, carbocation is formed as intermediate
Solution:

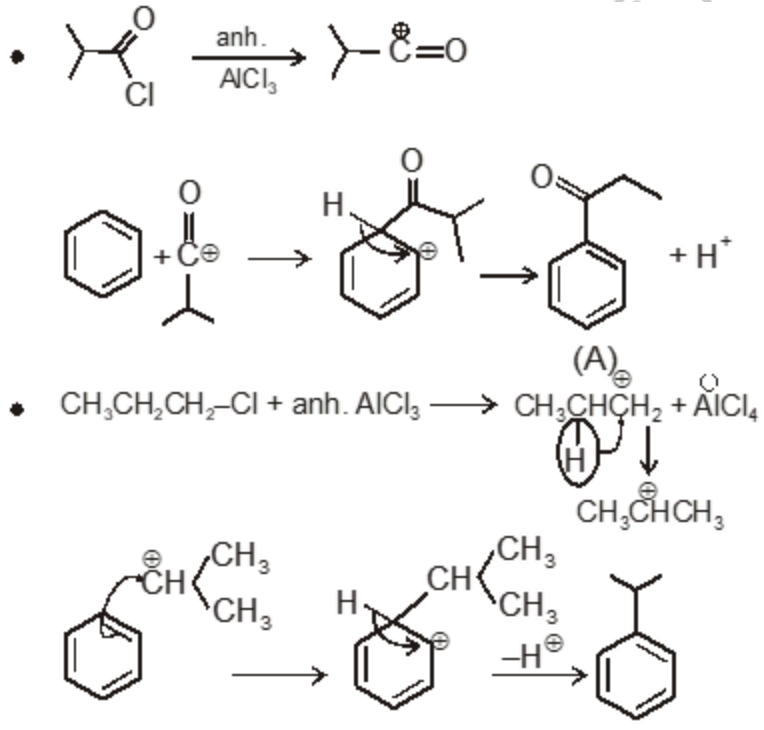


a

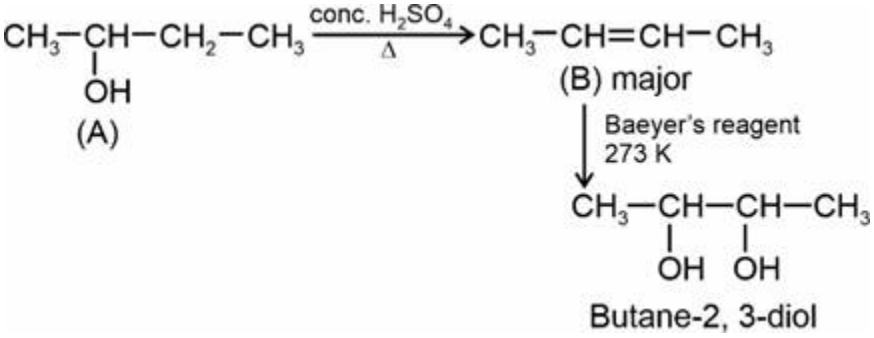
(66) **Answer :** (3)
Solution:



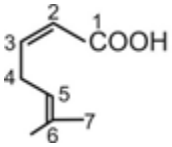
(67) **Answer :** (4)
Solution:



(68) **Answer :** (2)
Hint:
Cold, dilute, aqueous solution of potassium permanganate is known as Baeyer's reagent
Solution:



(69) **Answer :** (1)
Hint:
Longest chain of carbon atoms containing –COOH is considered.
Solution:



: 6-methylhepta-2,5-dienoic acid

(70) **Answer :** (2)
Solution:

$\mathrm{OH}\overset{6}{\mathrm{C}}-\overset{5}{\mathrm{CH}_2}-\overset{4}{\mathrm{C}}=\overset{3}{\mathrm{C}}-\overset{2}{\mathrm{CH}_2}-\overset{1}{\mathrm{C}}\,\mathrm{OOCH_3}$

$C_1 = sp^2$

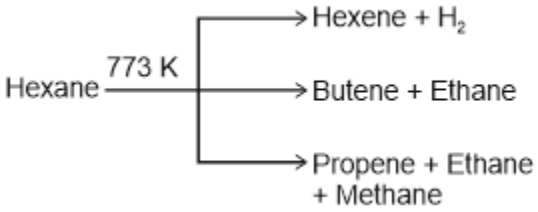
$C_2 = sp^3$

(71) **Answer :** (4)
Solution:
'Cl' = +R effect and –I effect.
Hence ortho, para directing and electron withdrawing group.
Since, $(\mathrm{CH_3})_3\mathrm{C}-\mathrm{Ph}$ has no α-hydrogen.
∴ It won't show hyperconjugation.

(72) **Answer :** (3)
Solution:
Staggered form is most stable form of ethane-1,2-diol due to intramolecular hydrogen bonding among all its conformations.

(73) **Answer :** (3)
Solution:
Vicinal dihalides on treatment with zinc metal undergo dehalogenation to form alkenes.

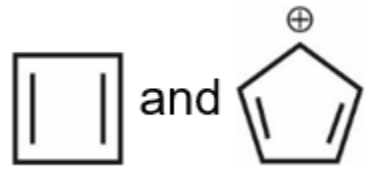
(74) **Answer :** (2)
Solution:

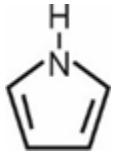


(75) **Answer :** (4)
Solution:

= Non-Aromatic

= Anti aromatic

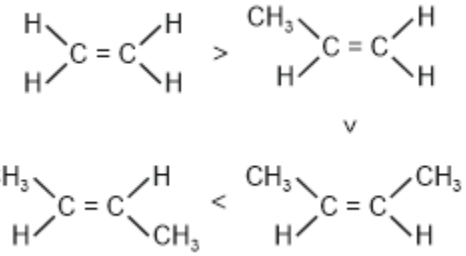

and


= Aromatic

(76) Answer : (3)
Solution:
Alkanes containing even number of carbon atoms are formed at anode in Kolbe's electrolytic method.

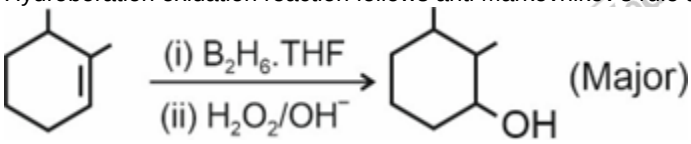
(77) Answer : (1)
Solution:
Heat of hydrogenation of alkene $\propto \frac{1}{\text{Stability of alkene}}$

Order of heat of hydrogenation

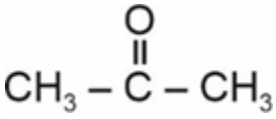
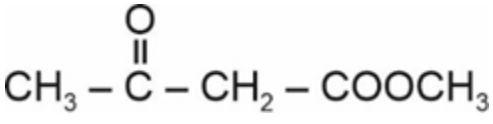
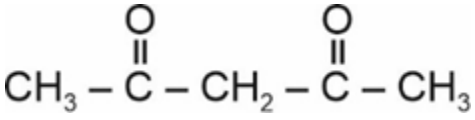


(78) Answer : (3)
Solution:
$CH_4 \xrightarrow[h\nu]{Br_2} CH_3 - Br$
(Free radical substitution reaction)

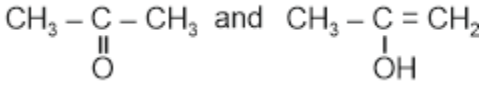
(79) Answer : (2)
Solution:
Hydroboration oxidation reaction follows anti Markovnikov's rule and no rearrangement takes place:



(80) Answer : (4)
Solution:

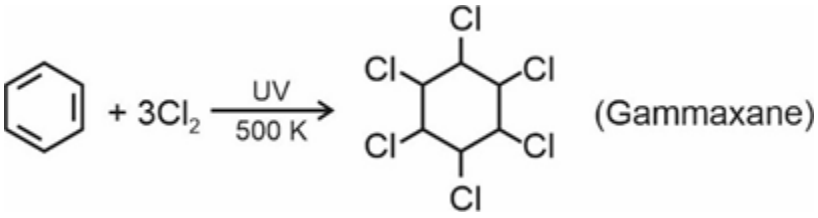
Compound	% enol
	0.00025
	4.8
	80.4

(81) Answer : (3)
Solution:



are tautomers and not resonating structures.

(82) Answer : (1)
Solution:



(83) Answer : (1)
Solution:
P_1 = 715 – 15 = 700 mm of Hg.

$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$

$V_2 = \frac{700 \times 100 \times 273}{300 \times 760}$

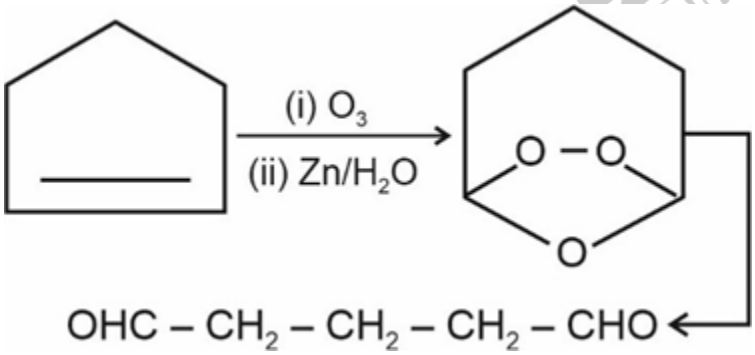
= 83.8 mL

$\%N = \frac{28 \times 83.8}{22400 \times 0.14} = \frac{2346.4}{3136} \times 100 = 74.8\%$

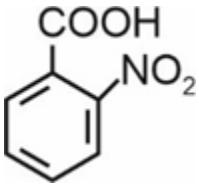
(84) Answer : (1)
Solution:
Conditions for steam distillation:
I. Substance must be steam volatile with steam non-volatile impurities.
II. Substance must be immiscible with water.
III. Should have high molecular mass.
IV. Fairly high vapour pressure at about 373 K.

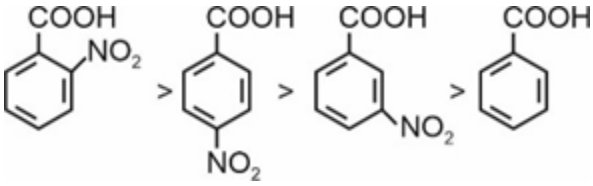
(85) Answer : (4)
Solution:
C_3H_8O; $CH_3 – CH_2 – O – CH_3$ and $C_4H_{10}O$ are of different molar mass species.

(86) Answer : (4)
Solution:



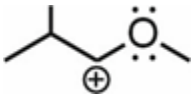
(87) Answer : (2)
Solution:

Due to ortho effect, the acidity of  is highest.

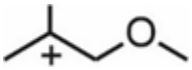


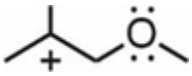
Acidity

(88) **Answer :** (2)
Solution:

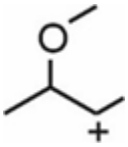


is resonance stabilized, hence more stable than





is more stable then



due to being tertiary carbocation.

(89) **Answer :** (1)
Solution:
Priority order: –COOH, –SO_3H, –COOR, COCl, –$CONH_2$, –CN, –HC = O, –OH

(90) **Answer :** (2)
Solution:

$Fe_4[Fe(CN)_6]_3 \cdot xH_2O$	–	Prussian blue
$[Fe(CN)_5NOS]^{4-}$	–	Violet
$[Fe(SCN)]^{2+}$	–	Blood red
$(NH_4)_3PO_4 \cdot 12MoO_3$	–	Yellow

BOTANY

(91) **Answer :** (1)
Solution:
Intercellular spaces are absent in bundle sheath cells. These cells are located around vascular bundles in the leaves of C_4 plant. These cells have very thick walls that are impervious to gaseous exchange.

(92) **Answer :** (3)
Hint:
In C_4 plants, the primary CO_2 acceptor is phosphoenol pyruvate.
Solution:
The primary CO_2 acceptor is a 3 carbon molecule, phosphoenol pyruvate and is present in the mesophyll cells of C_4 plants.

(93) **Answer :** (1)
Solution:
Action spectrum of photosynthesis resembles closely to the absorption spectrum of chlorophyll *a*.

(94) **Answer :** (3)
Hint:
In chemiosmosis, breakdown of proton gradient leads to the release of energy.
Solution:
Chemiosmosis process requires a proton pump, proton gradient, a membrane and ATP synthase.

(95) Answer : (3)
Hint:
Plastocyanin is located on the inner side of the thylakoid membrane and receives electrons from cytochrome b_6f complex.
Solution:
Plastocyanin is a donor of electrons to PS I or P_{700}.

(96) Answer : (4)
Solution:
Site of dark reaction is stroma. The site of light reaction is thylakoid and stroma lamellae.

(97) Answer : (3)
Solution:
Ultimate donor of electrons in non-cyclic photophosphorylation is water. $NADP^+$ is the final electron acceptor in this process.

(98) Answer : (3)
Hint:
RuBP is the primary CO_2 acceptor in the C_3 plants.
Solution:
The primary acceptor molecule during the C_3 cycle is a five-carbon ketose sugar.

(99) Answer : (2)
Solution:
Direct synthesis of ATP from metabolites is called substrate level phosphorylation.

(100) Answer : (2)
Solution:
Chromatographic separation of leaf pigments shows that the colour that we see in leaves is not due to a single pigment but due to four pigments.
PS I reaction centre is P_{700} and PS II reaction centre is P_{680}

(101) Answer : (2)
Hint:
The terminal electron acceptor in mitochondria combines with protons to form metabolic water.
Solution:
Oxygen is the terminal electron acceptor in the electron transport system of mitochondria.

(102) Answer : (3)
Solution:
Succinate dehydrogenase is found attached to the inner mitochondrial membrane.

(103) Answer : (1)
Solution:
Succinate dehydrogenase (complex II) is found attached to the inner mitochondrial membrane.

(104) Answer : (2)
Solution:
Carbohydrates are the most preferred respiratory substrates.

(105) Answer : (3)
Solution:

$$RQ = \frac{CO_2 \text{ evolved}}{O_2 \text{ consumed}}$$

RQ for protein is 0.9.
Protein is respiratory substrate in protoplasmic respiration.

(106) Answer : (3)
Solution:
Citric acid is formed in Krebs' cycle by the condensation of acetyl group with OAA and water.

(107) Answer : (3)
Hint:
The product of this reaction is lactic acid.
Solution:
In lactic acid fermentation, CO_2 is not released.

(108) Answer : (3)
Solution:

Citric acid – 6C
Acetyl CoA - 2C
Malic acid and succinic acid - 4C
α-ketoglutaric acid-5C

(109) Answer : (3)
Solution:
Pyruvate dehydrogenase complex is present in the mitochondrial matrix. It catalyzes the conversion of pyruvic acid to acetyl CoA.

(110) Answer : (1)
Solution:
During respiration, formation of pyruvate during glycolysis, occurs in the cytoplasm of cell.

(111) Answer : (1)
Solution:
The first member of citric acid cycle is oxaloacetic acid.

(112) Answer : (3)
Solution:
Tomato is a C_3 plant. It does not show Kranz anatomy.

(113) Answer : (1)
Solution:
Increase in intensity beyond A_1 is not immediately detrimental; if CO_2 concentration is increased, rate of photosynthesis will increase but can become detrimental if light intensity is increased continuously. C_3 plants get saturated beyond 450 µl L^{-1}.

(114) Answer : (2)
Solution:
Phosphofructokinase – Fructose-6-phosphate is phosphorylated by the transfer of phosphate from ATP.
Lactate dehydrogenase – Pyruvate undergoes reduction by $NADH+H^+$.

(115) Answer : (2)
Solution:
Productivity and yield of plants like sugarcane exceeds that of plants like bell pepper due to lack of photorespiration. This is because C_4 plants have a CO_2 concentrating mechanism and bundle sheath cells are adapted to maintain low oxygen concentration around RuBisCO.

(116) Answer : (1)
Solution:
CO_2 and O_2 show competitive binding on the active site of RuBisCO.
As a result, relative concentration plays an important role in determination of RuBisCO activity.

(117) Answer : (1)
Solution:
The evolution of glycolysis occurred in order to oxidise sugar without needing oxygen because early atmosphere lacked oxygen. All organisms retain the enzymatic machinery for this common pathway.

(118) Answer : (4)
Solution:
By rupture of outer membrane the intermembrane space will become exposed to cytosol and the proton concentration in inter-membrane space would become diluted. This will lead to decline in rate of ATP synthesis.

(119) Answer : (2)
Solution:
Photolysis of water occurs during the light reaction of photosynthesis.

(120) Answer : (4)
Solution:
C_4 plants show greater productivity and higher yield as compared to the C_3 plants because C_4 plants have a special type of leaf anatomy.

(121) Answer : (1)
Solution:
For a living system, all pathways of respiration occur simultaneously. Whether glycolytic $NADH+H^+$ is transferred to mitochondria, is determined by fate of pyruvic acid. Intermediates can enter and exit the respiratory pathways as and when required.

(122) Answer : (3)
Solution:
Carboxylation is the most crucial step of Calvin cycle. It is catalysed by RuBisCO.

(123) Answer : (1)
Solution:
In non-cyclic photophosphorylation, both ATP and NADPH + H^+ are synthesised.

(124) Answer : (3)
Solution:
CO_2 releases in mitochondria during photorespiration.

(125) Answer : (3)
Solution:
Pyruvate dehydrogenase requires the participation of the coenzymes such as, CoA and NAD^+ while Mg^{2+} acts as the metal activator.

(126) Answer : (4)
Solution:
Aerobic bacteria accumulated more in the region illuminated by blue and red light in T.W. Engelman experiment. They do not perform photosynthesis.

(127) Answer : (1)
Solution:
The ratio of carbon atoms present in a tripalmitin molecule to the molecules of CO_2 released upon its complete oxidation is 1 : 1.

(128) Answer : (1)
Solution:
Triose phosphate (3-PGAL) is oxidised in glycolysis in order to form BPGA, but this reaction does not directly yield ATP, hence can not be considered substrate level phosphorylation.

(129) Answer : (2)
Solution:
Least absorbed light by Chlorophyll *a* (Chief pigment) is green-yellow region (500-600 nm), most absorbed is blue region (400-500 nm), followed by far-red region (600-700 nm).

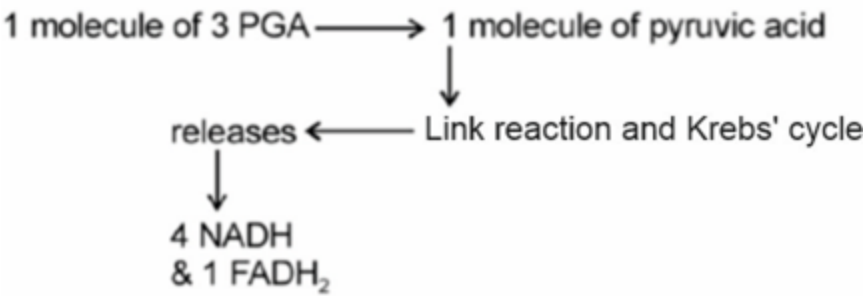
(130) Answer : (3)
Solution:

First member of TCA cycle	– Is oxaloacetic acid (4C)
Common intermediate between fatty acid and sugar breakdown	– Undergoes condensation with OAA in mitochondrial matrix
Formation of succinate in mitochondria	– Coupled with the formation of GTP
Molecular oxygen	– Responsible for vigorous rate of oxidation of $NADH+H^+$ in aerobic living system.

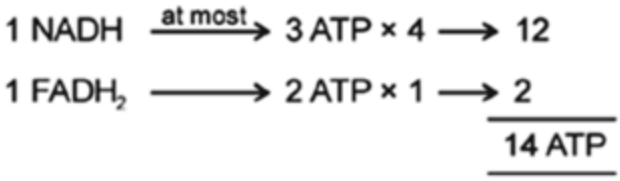
(131) Answer : (4)
Solution:
H^+ passes through F_0 from intermembrane space to matrix down the electrochemical proton gradient.
The key is to oxidise glucose, not in one step but in several steps, enabling some steps to be just large enough, such that the energy released can be coupled to ATP synthesis. This strategy is not unique to plant cells.

(132) Answer : (2)
Solution:
Since anaerobic respiration does not include ETS and oxidative phosphorylation, the $2NADH+H^+$ molecules do not yield ATP.

(133) Answer : (1)
Solution:



These molecules will enter ETS and produces ATP.
Now,



(134) Answer : (4)
Solution:
Dead mechanical tissue in stem and root plays no role is supplying oxygen to living cells.

(135) Answer : (4)
Solution:
Blackman proposed the law of limiting factors.

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(136) Answer : (2)
Solution:
Menstrual phase (~3-5 days) is followed by follicular phase also known as proliferative phase w.r.t. uterine cycle.

(137) Answer : (4)
Solution:
Mammary ampulla is a wider part which is connected to lactiferous duct. Infundibulum leads to a wider part of oviduct called ampulla. Vas deferens dilates to form ampulla which receives duct from seminal vesicle to form ejaculatory duct.

(138) Answer : (4)
Solution:
After ovulation, increase in progesterone gives negative feedback to LH that leads to degeneration of corpus luteum. Decrease in progesterone unable to maintain endometrium that results in menstruation.

(139) Answer : (3)
Solution:
Due to heterozygosity in male sex chromosomes (XY), the sex of baby is decided by the kind of sperm (having X or Y chromosome) fertilizes female ovum (which has X chromosome).

(140) Answer : (1)
Solution:
Bulbourethral glands are the part of male reproductive system. Each fallopian tube is about 10-12 cm long in adult females and shape of uterus is like an inverted pear.

(141) Answer : (3)
Solution:
Entry of sperm into secondary oocyte triggers completion of meiosis II of secondary oocyte in fallopian tube causing release of second polar body.

(142) Answer : (1)
Solution:
In human beings, after one month of pregnancy, the embryo's heart is formed.
By the end of second month of pregnancy, the foetus develops limbs and digits.
By the end of 12 weeks (first trimester), most of the major organ systems are formed. For example, the limbs and external genital organs are well developed.

The first movement of foetus and appearance of hair on head are usually observed during the fifth month.

(143) Answer : (4)
Solution:
LH and FSH are gonadotrophins.
Androgen secretion from testes is stimulated by LH. Maintenance of corpus luteum and ovulation is also under control of LH.
Secondary sexual characters are due to estrogen in females and testosterone in males.

(144) Answer : (4)
Solution:
Gonadotropins (LH and FSH) increase gradually during the follicular phase and stimulate follicular development as well as secretion of estrogens by growing follicles. LH and FSH attain peak during the ovulatory phase.
The ovulatory phase is followed by the luteal phase during which ruptured Graafian follicles convert into corpus luteum.
The corpus luteum secretes large amounts of progesterone which is essential to maintain the endometrial lining.

(145) Answer : (4)
Solution:
The opening of the vagina is often covered partially by a membrane called hymen. The hymen is often torn during the first coitus (intercourse). However, it can also be broken by a sudden fall or jolt, insertion of a vaginal tampon, active participation in some sports like horseback riding, cycling, *etc.* In some women, the hymen persists even after coitus. In fact, the presence or absence of hymen is not a reliable indicator of virginity or sexual experience.

(146) Answer : (2)
Solution:
TSH stimulates the synthesis and secretion of thyroid hormones from the thyroid gland. ACTH stimulates the synthesis and secretion of steroid hormones like glucocorticoids from the adrenal cortex. ADH is released by posterior pituitary and MSH is secreted by pituitary gland.

(147) Answer : (1)
Solution:
Decrease in the estrogen levels can lead to increased chances of fracture in old females.
Low pitch is seen in males as compared to females. Testosterone affects the male libido and maturation of epididymis.
Estrogen is secreted from growing follicles and corpus luteum in females. Glucocorticoids, particularly cortisol, produces anti-inflammatory reactions and suppresses the immune response.

(148) Answer : (3)
Solution:
Glucagon is a peptide hormone, secreted from α-cells of Islet of Langerhans of pancreas. It interacts with membrane-bound receptors.
Estradiol, aldosterone and cortisol are steroid hormones.

(149) Answer : (4)
Solution:
Receptor binding and the associated cellular cascades amplify the hormone signals allowing hormones to act at very low concentrations. Hormones are non-nutrient chemicals which act as intercellular messengers and are produced in trace amounts. Hormones which interact with intracellular receptors (*e.g.*, steroid hormones, iodothyronines, *etc.*) mostly regulate gene expression or chromosome function by the interaction of hormone-receptor complex with the genome.

(150) Answer : (4)
Solution:
Diabetes mellitus occurs due to lack of insulin from pancreatic islets. It leads to hyperglycemia and glycosuria.

(151) Answer : (2)
Solution:
Hormones which act on the endocrine system but are synthesized within neurosecretory cells are called neurogenic hormones. Hypothalamus and adrenal medulla secrete neurogenic hormones but only neurohypophysis stores and releases these hormones. Thyroid gland stores its hormones in an inactive form but they are not neurogenic.

(152) Answer : (1)
Solution:
The pineal gland is located on the dorsal side of the forebrain. Pineal gland secretes a hormone called melatonin, derived from amino acid tryptophan. Melatonin plays a very important role in the regulation of a 24-hour (diurnal) rhythm of human 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.

(153) Answer : (3)
Solution:
Thymosin secreted from thymus gland regulates the immune system of our body.

(154) Answer : (1)

Solution:
Secretin is released in response to acid in the small intestine and stimulates pancreas to release bicarbonate ions. Gastrin stimulates gastric glands to release HCl and pepsinogen.

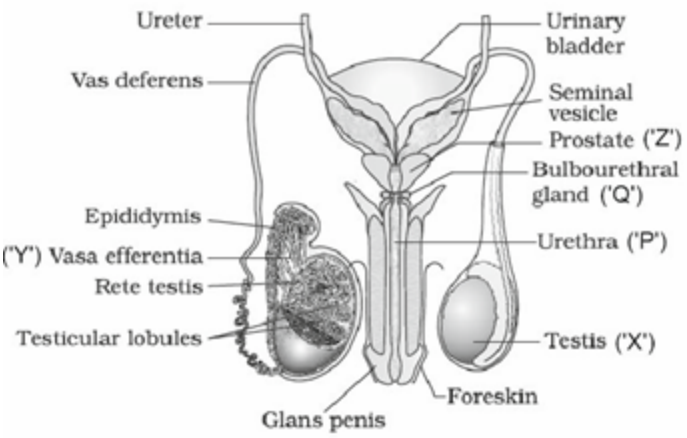
(155) Answer : (3)
Solution:
Development of tumour in the adenohypophysis can lead to hypersecretion of growth hormone that results in acromegaly in adult humans.
Over-secretion of GH stimulates abnormal growth of the body leading to gigantism and low secretion of GH results in stunted growth/pituitary dwarfism.
Adrenaline is an emergency hormone that increases the rate of heart beat, the strength of heart contraction and the rate of respiration.

(156) Answer : (4)
Solution:
Just after ovulation, the ruptured Graffian follicle transforms into the corpus luteum, which begins secreting progesterone (along with moderate estrogen). Progesterone exerts strong negative feedback on the hypothalamus, leading to decreased GnRH pulse frequency. Consequently, there is decrease in LH and FSH secretion from the anterior pituitary.

(157) Answer : (4)
Solution:
Spermatozoa leaving the testes are not fully motile. They continue their maturation and acquire motility during their passage through the epididymis. Mature spermatozoa are released from the Sertoli cells and move freely in the lumen of the seminiferous tubules.

(158) Answer : (2)
Solution:
As per the given information,
• Her reproductive span have been of
= 37 – 14 years
= 23 years
• Number of menstrual cycles per year that she must have had:
13 cycles/year (28-days cycle)
• Thus, total ovulatory cycles have been:
= 23 × 13 = 299
The first polar body is formed when a primary oocyte completes meiosis I (which occurs just before ovulation), thus, after each ovulatory cycle, a first polar body is formed.

(159) Answer : (4)
Solution:



The duct system, accessory glands and penis are secondary male sex organs.
The bulbourethral glands are pea-sized structures lying adjacent to the urethra, at the base of penis.
Seminal vesicles are situated behind the bladder.
Scrotum remains connected with the abdominal cavity by the inguinal canal.

(160) Answer : (3)
Solution:
The ovary is the primary female sex organ.
The stroma of ovaries is divided into two zones:
1. A peripheral cortex – Contains ovarian follicles
2. An inner medulla – Consists of loose connective tissue, elastic fibres and numerous blood vessels.

(161) Answer : (2)

Solution:

'P' is oxytocin, known as the milk-ejecting hormone.
'Q' is prolactin, primarily responsible for milk formation.
High levels of prolactin can lead to amenorrhea, by inhibiting the release of GnRH.
Significant peaks of oxytocin is seen during labor and birth and not at the time of first trimester of pregnancy.

(162) Answer : (4)

Solution:

Although a healthy male ejaculate has 200 to 300 million sperms, very few of them reach the site of fertilisation. Most sperms are killed by the acidic environment in the vagina of female reproductive tract. So, many sperms are needed to increase the likelihood of fertilisation. Ootid is a haploid structure.

(163) Answer : (3)

Solution:

During oogenesis, the tertiary follicle changes into the mature follice or Graafian follicle.
Graafian follicle contains the secondary oocyte, which forms the zona pellucida.
Granulosa cells lying in the close vicinity of the ovum and zona pellucida gets elongated to form the corona radiata.

(164) Answer : (2)

Solution:

The embryonic development of humans include the following steps:
Cleavage → Blastulation → Implantation → Gastrulation → Organogenesis.
Capacitation of sperms occurs in the female reproductive tract to make them viable for fertilization.

(165) Answer : (1)

Solution:

In the structure of sperm, the acrosome lies between the plasma membrane in the anterior head region and the nuclear envelope. The acrosome consists of a protein matrix core and contains numerous hydrolytic enzymes, which are important for fertilisation.

(166) Answer : (3)

Solution:

Placenta is an organ which connects the foetus with the uterine wall.
The umbilical cord connects the foetus to the placenta.
The placenta is expelled during labor, after the baby has been delivered.
Placenta can allow passage of some viruses from a pregnant mother to her foetus.
Placenta also acts as an endocrine structure.

(167) Answer : (4)

Solution:

Zona pellucida, a thick glycoproteinaceous layer surrounding the secondary oocyte during oogenesis, remains intact during early cleavage stages, prevent attachment of embryo to unusual place.

(168) Answer : (3)

Solution:

Morula is a solid ball of 8-16 blastomeres develop by cleavage of a fertilized egg.
It is formed 3-4 days after fertilization and enters the uterus.

(169) Answer : (4)

Solution:

Aldosterone increases Na^+ reabsorption and K^+ secretion in the renal tubules.
Water follows Na^+ → dehydration does not occur; instead, mild fluid retention increases BP.
Aldosterone does not regulate calcium homeostasis.

(170) Answer : (3)

Solution:

Parathyroid gland is present on the back side of the thyroid gland. The parathyroid glands produce parathyroid hormone (PTH), which is crucial for maintaining normal blood calcium levels. Following their removal, PTH levels drop sharply, leading to:

- Reduced mobilization of calcium from bones due to decreased osteoclast activity
- Decreased reabsorption of calcium in the kidneys
- Reduced production of active vitamin D, which is necessary for calcium absorption from the gut.

Tetany is caused due to the deficiency of calcium.

(171) Answer : (3)

Solution:

Stretching of atrial walls causes the release of Atrial Natriuretic Factor (ANF). ANF causes vasodilation and increased Na^+ and water excretion.

(172) Answer : (1)
Solution:
Hormones produce their effects on target tissues by binding to specific proteins called hormone receptors present on them.

(173) Answer : (2)
Solution:
Rise in blood glucose levels stimulates insulin release from β-cells. Insulin promotes cellular glucose uptake, glycogenesis and reduces blood glucose. At the same time, glucagon secretion would be suppressed.

(174) Answer : (3)
Solution:
The hormones secreted by the thyroid gland (primarily thyroxine or T_4, which is converted to the active triiodothyronine or T_3) have a significant calorigenic effect and promote tissue differentiation. Thyroxine affects intelligence and cognitive functions.

(175) Answer : (3)
Solution:
Sella tursica is a saddle-shaped depression in the unpaired sphenoid bone present at the base of skull. The pituitary gland is located in this bony cavity.
The pineal gland is located on the dorsal side of forebrain.
The thyroid gland is composed of two lobes which are located on either side of the trachea. Both the lobes are interconnected with a thin flap of connective tissue called isthmus.

(176) Answer : (1)
Solution:
The structure 'X' is the hypothalamus. Hormones regulating the anterior pituitary reach there through the hypothalamo-hypophyseal portal circulation, not by axonal transport.

(177) Answer : (2)
Solution:
The **kidneys** produce the hormone **erythropoietin (EPO),** which stimulates the red bone marrow to produce red blood cells (erythropoiesis). The kidney is primarily an excretory organ and is not considered as an organised endocrine gland, but rather a non-endocrine tissue with an endocrine function. The kidneys are located in the abdominal cavity, on either side of the spine, below the diaphragm.

(178) Answer : (4)
Solution:
Cortisol, growth hormone, and catecholamines (like adrenaline/epinephrine) are all considered hyperglycemic hormones, *i.e.,* they increase blood glucose levels.

(179) Answer : (4)
Solution:
Cushing's syndrome is characterised by high secretion of cortisol and hyperglycaemia.
Epiphyseal plates close after adolescence.
Relaxin and inhibin work together (synergistically) in the reproductive system. Relaxin relaxes tissues like pelvic ligaments and inhibin regulates FSH, both supporting reproductive processes.

(180) Answer : (3)
Solution:
Glucocorticoids stimulate gluconeogenesis, lipolysis, proteolysis, erythropoiesis, cardio-vascular system, blood pressure, and glomerular filtration rate and inhibit inflammatory reactions by suppressing the immune response.