

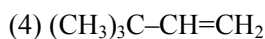
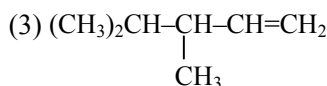
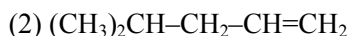
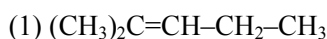


AIPMT Exam 2015 (Paper & Solution)

Code – A

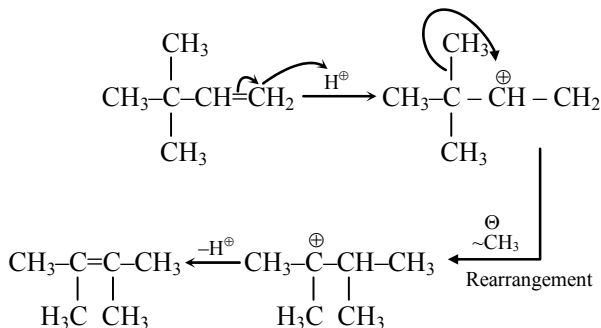
Date : 25-07-2015

Q.1 2,3-Dimethyl-2-butene can be prepared by heating which of the following compounds with a strong acid?



Ans. [4]

Sol. Students may find similar question in CP
Class notes: [Chapter : GOC-II]



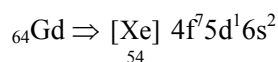
(2,3-Dimethyl-2-butene)

Q.2 Gadolinium belongs to 4f series. It's atomic number is 64. Which of the following is the **correct** electronic configuration of gadolinium?



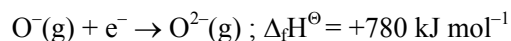
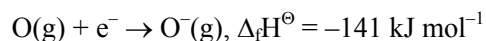
Ans. [1]

Sol. Students may find same question in CP
Exercise Sheet: [Chapter : Periodic Table,
Ex.3A, Q.No.15, Page no. 187]



Half filled 'f' subshell is more stable

Q.3 The formation of the oxide ion, $\text{O}^{2-}(\text{g})$, from oxygen atom requires first an exothermic and then an endothermic step as shown below :



Thus process of formation of O^{2-} in gas phase is unfavourable even though O^{2-} is isoelectronic with neon. It is due to the fact that :

- (1) oxygen is more electronegative
- (2) addition of electron in oxygen results in larger size of the ion
- (3) electron repulsion outweighs the stability gained by achieving noble gas configuration
- (4) O^- ion has comparatively smaller size than oxygen atom

Ans. [3]



Sol. Students may find same question in CP Exercise Sheet: [Chapter : Periodic Table, Ex.3B, Q.No.76, Page no. 194]

Second electron gain enthalpy is positive (energy absorbed) because incoming electron realise more repulsion when enter in uninegative anion

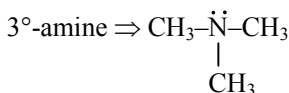
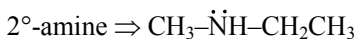
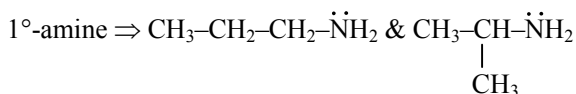
Q.4 The number of structural isomers possible from the molecular formula C_3H_9N is :

- (1) 2 (2) 3 (3) 4 (4) 5

Ans. [3]

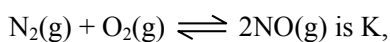
Sol. Students may find similar question in CP Exercise Sheet: [Chapter : GOC-I (Isomerism), Ex.(7B), Q.No.23, Page no. 79]

Given molecular formula = C_3H_9N

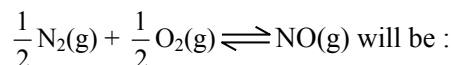


Total 4 structural isomers are possible.

Q.5 If the equilibrium constant for



the equilibrium constant for

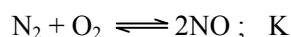


- (1) K (2) K^2 (3) $K^{1/2}$ (4) $\frac{1}{2}K$

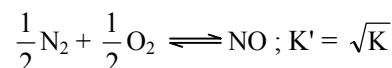
Ans. [3]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Chemical equilibrium, Ex.3(A), Q.No.1, Page no. 120]

If equilibrium constant for following reaction is



then



Q.6 Which one of the following pairs of solution is **not** an acidic buffer?

- (1) H_2CO_3 and Na_2CO_3
 (2) H_3PO_4 and Na_3PO_4
 (3) $HClO_4$ and $NaClO_4$
 (4) CH_3COOH and CH_3COONa

Ans. [3]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Ionic equilibrium, Ex.3A, Q.No.30, Page no. 156]

Weak acid and its conjugate salt with strong base is an acidic buffer but according to option Ans is (3), $HClO_4$ is a strong acid

$\therefore HClO_4 + NaClO_4$ is not an acidic buffer



Q.7 Aqueous solution of which of the following compounds is the best conductor of electric current ?

- (1) Ammonia, NH_3
- (2) Fructose, $\text{C}_6\text{H}_{12}\text{O}_6$
- (3) Acetic acid, $\text{C}_2\text{H}_4\text{O}_2$
- (4) Hydrochloric acid, HCl

Ans. [4]

Sol. **Students may find similar question in CP Exercise Sheet: [Chapter : Electro Chemistry, Ex.1, Q.No.4, Page no. 14]**

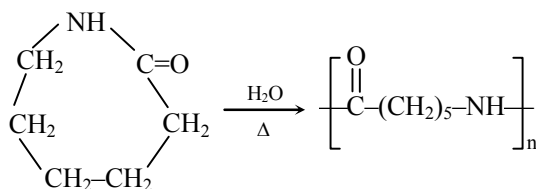
Anhydrous HCl is non conducting but in aqueous medium conducting as it provide ions $\text{HCl} + \text{H}_2\text{O} \longrightarrow \text{H}_3\text{O}^+ + \text{Cl}^-$

Q.8 Caprolactam is used for the manufacture of:

- (1) Terylene
- (2) Nylon-6, 6
- (3) Nylon - 6
- (4) Teflon

Ans. [3]

Sol. **Students may find similar question in CP Exercise Sheet: [Chapter : Polymers, Page no. 194]**



Caprolactam

Nylon-6

Q.9 On heating which of the following releases CO_2 most easily ?

- (1) MgCO_3
- (2) CaCO_3
- (3) K_2CO_3
- (4) Na_2CO_3

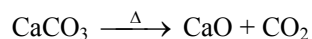
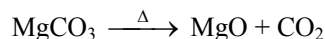
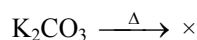
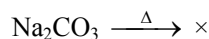
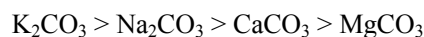
Ans. [1]

Sol. **Students may find similar question in CP Exercise Sheet: [Chapter : s-block, Q.No.117, Page no. 28]**

$$\text{Thermal stability} \propto \frac{1}{\text{Ionic potential}(\phi)}$$

$$\phi = \frac{\text{Charge}}{\text{Size}}$$

Thermal stability :



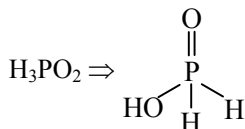
Q.10 Strong reducing behaviour of H_3PO_2 is due to :

- (1) High oxidation state of phosphorus
- (2) Presence of two $-\text{OH}$ groups and one $\text{P}-\text{H}$ bond
- (3) Presence of one $-\text{OH}$ group and two $\text{P}-\text{H}$ bonds
- (4) High electron gain enthalpy of phosphorus

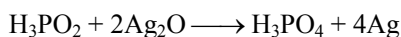
Ans. [3]



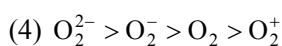
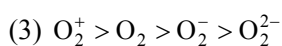
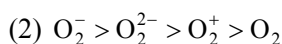
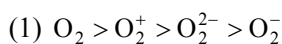
Sol. Students may find same question in CP Exercise Sheet: [Chapter : p-block (Pnicogen family), Ex.1, Q.No.28, Page no. 4]



H_3PO_2 is monobasic acid and act reducing agent due to presence of two P–H bond



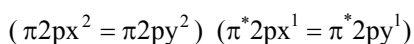
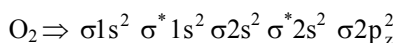
Q.11 Decreasing order of stability of O_2 , O_2^- , O_2^+ and O_2^{2-} is :



Ans. [3]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Chemical Bonding, Ex.1, Q.No.114, Page no. 219]

Stability \propto bond order



$$\text{Bond order} = \frac{N_b - N_a}{2}$$

$$\text{Bond order} = \frac{6 - 4}{2} = 2$$

Stability	O_2^+	O_2	O_2^-	O_2^{2-}
Bond order	2.5	2	1.5	1.0

Bond order \uparrow
Bond dissociation energy \uparrow
Stability \uparrow

Q.12 The number of water molecules is maximum in :

- (1) 18 gram of water
- (2) 18 moles of water
- (3) 18 molecules of water
- (4) 1.8 gram of water

Ans. [2]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Atom, molecules and Chemical Arithmetic, Ex.1, Q.No.61, Page no. 67]

18 g H_2O is 1 mol H_2O

\therefore no. of H_2O molecules are 6.02×10^{23}

18 mol H_2O has $18 \times 6.02 \times 10^{23}$ molecules of H_2O

1.8 g H_2O has 0.1 mol H_2O

\therefore no. of molecules = $0.1 \times 6.02 \times 10^{23}$
= 6.02×10^{22}

Q.13 In which of the following pairs, both the species are not isostructural?

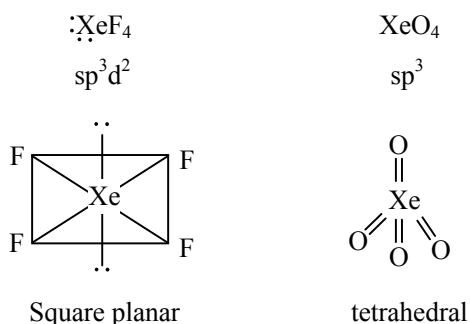
- (1) NH_3 , PH_3
- (2) XeF_4 , XeO_4
- (3) SiCl_4 , PCl_4^+
- (4) diamond, silicon carbide

Ans. [2]

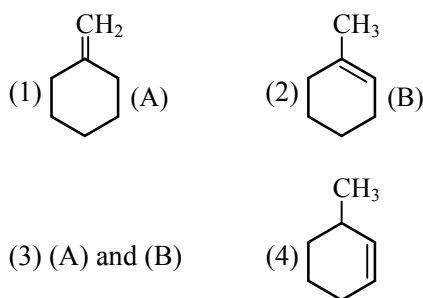


Sol. Students may find same question in Class

notes: [Chapter : Chemical Bonding]



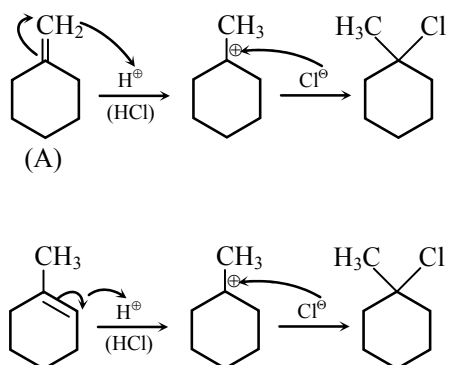
Q.14 In the reaction with HCl, an alkene reacts in accordance with the Markovnikov's rule, to give a product 1-chloro-1-methylcyclohexane. The possible alkene is :



Ans. [3]

Sol. Students may find similar question in CP

Class notes: [Chapter : GOC-II]

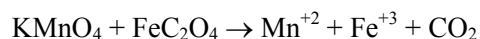


Q.15 Assuming complete ionization, same moles of which of the following compounds will require the least amount of acidified KMnO_4 for complete oxidation?

- (1) FeC_2O_4 (2) $\text{Fe}(\text{NO}_2)_2$
 (3) FeSO_4 (4) FeSO_3

Ans. [3]

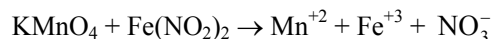
Sol. Students may find similar question in CP
Exercise Sheet: [Chapter : Oxidation Reduction, Ex.2, Q.No.25, Page no. 93]



$$v.f = 5 \quad v.f = 3$$

let number of reacting moles of $\text{FeC}_2\text{O}_4 = x$

$$\therefore n_{\text{KMnO}_4} = \frac{3x}{5}$$



$$v.f = 5 \quad v.f = 5$$

similarity if moles of $\text{Fe}(\text{NO}_2)_2$ is x

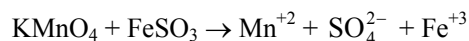
$$n_{\text{KMnO}_4} = \frac{5x}{5} = x$$



$$v.f = 5 \quad v.f = 1$$

and also the moles of FeSO_4 is x

$$n_{\text{KMnO}_4} = \frac{x}{5}$$



$$v.f = 5 \quad v.f = 3$$

and also the moles of FeSO_4 is x

$$n_{\text{KMnO}_4} = \frac{3x}{5}$$

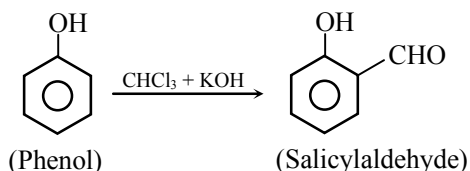


Q.16 Reaction of phenol with chloroform in presence of dilute sodium hydroxide finally introduces which one of the following functional group ?

- (1) $-\text{CHCl}_2$ (2) $-\text{CHO}$
 (3) $-\text{CH}_2\text{Cl}$ (4) $-\text{COOH}$

Ans. [2]

Sol. **Students may find similar question in CP Exercise Sheet: [Chapter : Oxygen Compounds, Ex.6, Q.No.31]**



Q.17 The vacant space in bcc lattice unit cell is :
 (1) 23% (2) 32% (3) 26% (4) 48%

Ans. [2]

Sol. **Students may find similar question in CP Exercise Sheet: [Chapter : Solid state, Ex.1, Q.No.28, Page no. 116]**

Packing efficiency of bcc unit cell = 68%
 vacant space = $100 - 68 = 32\%$

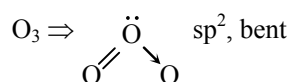
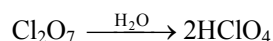
Q.18 Which of the statements given below is **incorrect** ?
 (1) ONF is isoelectronic with O_2N^-
 (2) OF_2 is an oxide of fluorine

- (3) Cl_2O_7 is an anhydride of perchloric acid
 (4) O_3 molecule is bent

Ans. [2]

Sol. **Students may find similar question in Class notes]**

OF_2 is fluoride of oxygen because F is more electronegative than oxygen



ONF and O_2N^- are isoelectronic because both contain 24 electron.

Q.19 The name of complex ion, $[\text{Fe}(\text{CN})_6]^{3-}$ is :

- (1) Tricyanoferrate (III) ion
 (2) Hexacyanidoferrate (III) ion
 (3) Hexacyanoiron (III) ion
 (4) Hexacyanitoferrate (III) ion

Ans. [2]

Sol. **Students may find same question in CP Exercise Sheet: [Chapter : Coordination Chemistry, Ex.11(A), Page no. 65]**



$$x - 6 = -3$$

$$x = +6 - 3$$

$$x = +3$$

Hexa cyanido ferrate (III) ion.



Q.20 If Avogadro number N_A , is changed from $6.022 \times 10^{23} \text{ mol}^{-1}$ to $6.022 \times 10^{20} \text{ mol}^{-1}$, this would change :

- (1) the ratio of chemical species to each other in a balanced equation
- (2) the ratio of elements to each other in a compound
- (3) the definition of mass in units of grams
- (4) the mass of one mole of carbon

Ans. [3]

Sol. **Students may find similar question in CP Exercise Sheet: [Chapter Atom, molecules and Chemical Arithmetic, Ex.1, Q.No.65, Page no. 68]**

$$1 \text{ amu} = \frac{1}{12} \times \text{mass of 1 atom of C - 12 isotope}$$

$$1 \text{ amu} = \frac{1}{6.023} \text{ gm} = 1.66 \times 10^{-24} \text{ gm}$$

If Avogadro number is change then the definition of mass in unit of gm is changed

Q.21 Which of the following statements is **not** correct for a nucleophile?

- (1) Nucleophiles attack low e^- density sites
- (2) Nucleophiles are not electron seeking
- (3) Nucleophile is a Lewis acid
- (4) Ammonia is a nucleophile

Ans. [3]

Sol. **Students may find similar question in CP Exercise Sheet: [Chapter : GOC-II, Page no. 99]**

Nucleophile are e^- rich species

\therefore It is Lewis Base.

Q.22 A gas such as carbon monoxide would be most likely to obey the ideal gas law at :

- (1) high temperatures and high pressures
- (2) low temperatures and low pressures
- (3) high temperatures and low pressures
- (4) low temperatures and high pressures

Ans. [3]

Sol. **Students may find similar question in CP Exercise Sheet: [Chapter : Gaseous state, Q.No.42, Page no. 111]**

For real gases

$$\left(P + \frac{an^2}{V^2} \right) (V - nb) = nRT \quad \dots(1)$$

At high temperature intramolecular attractive forces are neglected i.e. $\frac{an^2}{V^2}$ term is neglected. At low pressure volume is high So nb term is neglected.

Hence from equation (1) $PV = nRT$



Q.23 Hybridization involved in complex the $[\text{Ni}(\text{CN})_4]^{2-}$ is : (At. No. Ni = 28)

- (1) d^2sp^2 (2) d^2sp^3
 (3) dsp^2 (4) sp^3

Ans. [3]

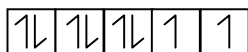
Sol. **Students may find similar question in CP Exercise Sheet: 11A [Chapter : Coordination chemistry, Q.No.41, Page no.63]**



$$x - 4 = -2$$

$$x = +4 - 2$$

$$x = +2$$



3d

CN^- is strong ligand so pairing possible



3d

4s

4p

dsp^2 complex

Q.24 The heat of combustion of carbon to CO_2 is -393.5 kJ/mol . The heat released upon formation of 35.2g of CO_2 from carbon and oxygen gas is -

- (1) -630 kJ (2) -3.15 kJ
 (3) -315 kJ (4) $+ 315 \text{ kJ}$

Ans. [3]

Sol. **Students may find similar question in CP Exercise Sheet: 1 [Chapter : Chemical thermodynamics, Q.No.112, Page no. 144]**



44 g CO_2 then heat evolved is 393.5 kJ when

$$35.2 \text{ g then heat evolved is } \frac{393.5}{44} \times 35.2$$

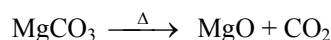
$$= -315 \text{ kJ}$$

Q.25 20.0 g of magnesium carbonate sample decomposes on heating to give carbon dioxide and 8.0 g magnesium oxide. What will be the percentage purity of magnesium carbonate in the sample ?

- (1) 60 (2) 84
 (3) 75 (4) 96

Ans. [2]

Sol. **Students may find similar question in CP Exercise Sheet: 2 [Chapter : Atom molecule, Q.No. 29, Page no. 73]**



40g MgO obtained from 84 g MgCO_3

$$\text{Then 8g obtained from } \frac{84}{40} \times 8$$

$$= 16.8 \text{ g MgCO}_3$$

$$\therefore \% \text{ purity} = \frac{16.8}{20} \times 100 = 84\%$$

Q.26 What is the mole fraction of the solute in a 1.00 m aqueous solution ?

- (1) 0.0354 (2) 0.0177
 (3) 0.177 (4) 1.770

Ans. [2]

Sol. **Students may find similar question in CP Exercise Sheet: 3A [Chapter : Solution Volumetric Analysis, Q.No.10, Page no. 51]**



$$m = \frac{X_A}{X_B} \times \frac{1000}{M_B}$$

$$1 = \frac{X_A}{(1 - X_A)} \times \frac{1000}{18}$$

$$1 - X_A = 55.5 X_A$$

$$56.5 X_A = 1$$

$$X_A = \frac{1}{56.5}$$

$$\therefore X_A = 0.0177$$

Q.27 The correct statement regarding defects in crystalline solids is

- (1) Frenkel defect is a dislocation defect
- (2) Frenkel defect is found in the halides of alkaline metals
- (3) Schottky defects have no effect on the density of crystalline solids
- (4) Frenkel defects decrease the density of crystalline solids

Ans. [1]

Sol. Students may find similar question in CP Exercise Sheet: 1 [Chapter : Solid State, Q.No. 63, 64, Page no. 118]

Frenkel defect it is a dislocation defect

Q.28 The stability of +1 oxidation state among Al, Ga, In and Tl in creases in the sequence -

- (1) Tl < In < Ga < Al
- (2) In < Tl < Ga < Al
- (3) Ga < In < Al < Tl
- (4) Al < Ga < In < Tl

Ans. [3]

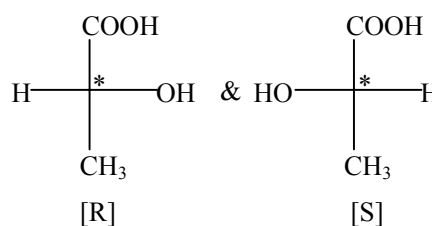
Sol. Students may find similar question in CP Exercise Sheet: Class Notes]

Q.29 Two possible stereo-structuers of $\text{CH}_3\text{CHOH.COOH}$, which are optically active, are called :

- (1) Enantiomers
- (2) Mesomers
- (3) Diastereomers
- (4) Atropisomers

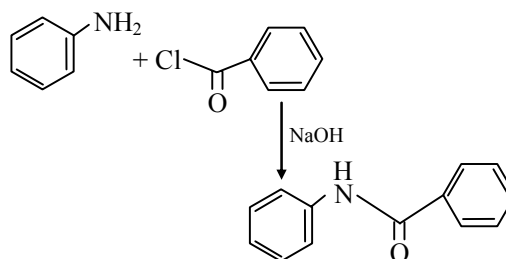
Ans. [1]

Sol.



Both are optically active and Enantiomers.

Q.30 The following reaction



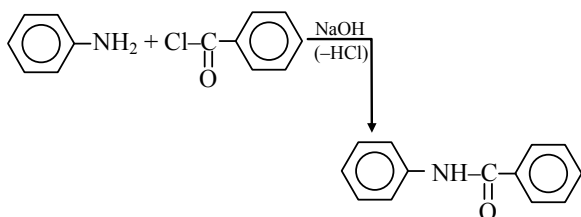
is known by the name -

- (1) Acetylation reaction
- (2) Schotten-Baumen reaction
- (3) Friedel-Craft's reaction
- (4) Perkin's reaction

Ans. [2]



Sol. Benzoylation of aniline is called Schotten-Baumann's reaction.



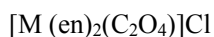
Q.31 The sum of coordination number and oxidation number of the metal M in the complex $[M(en)_2(C_2O_4)]Cl$ (where en is ethylenediamine) is -

(1) 7 (2) 8

(3) 9 (4) 6

Ans. [3]

Sol. Students may find similar question in CP Exercise Sheet: 11B [Chapter : Coordination chemistry, Q.No.116, Page no. 77]

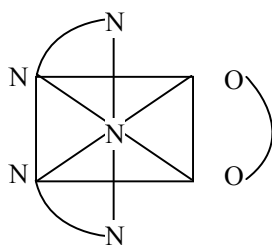
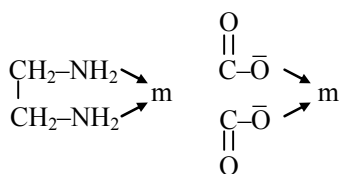


$$x + 0 - 2 - 2 - 1 = 0$$

$$x = +2 + 1$$

$$x = +3$$

en, and $C_2O_4^{2-}$ are bidentate ligand.



Coordination No = 6

sum of coordination no and oxidation no.

$$6 + 3 = 9$$

Q.32 Reaction of a carbonyl compound with one of the following reagents involves nucleophilic addition followed by elimination of water. The reagent is -

(1) hydrocyanic acid

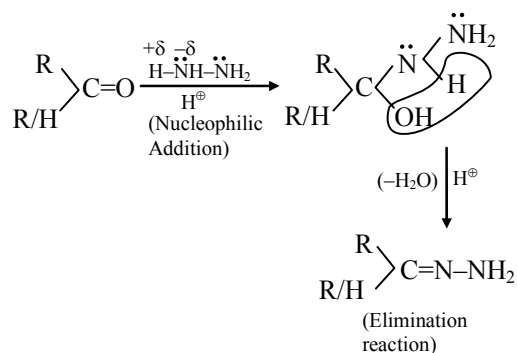
(2) sodium hydrogen sulphite

(3) a Grignard reagent

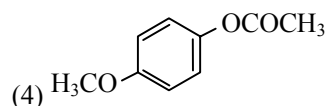
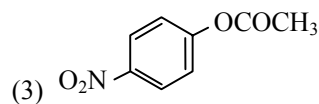
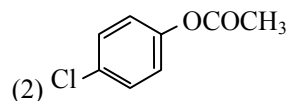
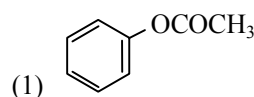
(4) hydrazine in presence of feebly acidic solution

Ans. [4]

Sol.




Q.33 Which one of the following esters gets hydrolysed most easily under alkaline conditions -



Ans. [3]



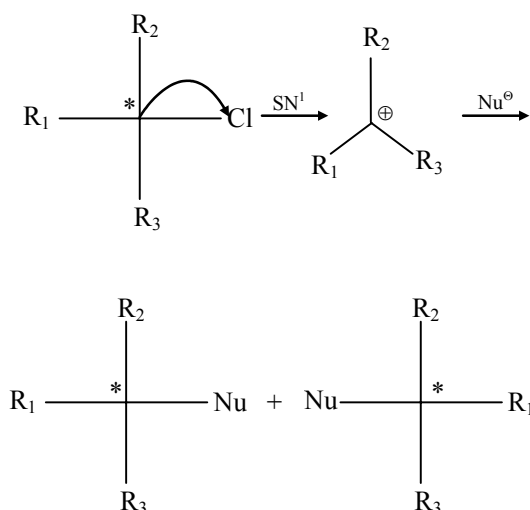
Sol. $\text{CH}_3\text{-}\overset{\text{O}}{\parallel}\text{C-O-}$  NO_2 is having best leaving group (due to $-M$ effect of nitro group) so it is most reactive towards alkaline hydrolysis.

Q.34 In an $\text{S}_{\text{N}}1$ reaction on chiral centres, there is -

- (1) 100% retention
- (2) 100% inversion
- (3) 100% racemization
- (4) inversion more than retention leading to partial racemization

Ans. [4]

Sol. Not 100% racemisation



Q.35 The rate constant of the reaction $\text{A} \rightarrow \text{B}$ is 0.6×10^{-3} mole per second. If the concentration of A is 5 M, then concentration of B after 20 minutes is -

- (1) 0.36 M
- (2) 0.72 M
- (3) 1.08 M
- (4) 3.60 M

Ans. [2]

Sol. **Students may find similar question in CP Exercise Sheet: 2 [Chapter : Chemical Kinetics, Q.No. 29, Page no. 194]**

Zero order reaction

$$x = kt$$

$$x = 0.6 \times 10^{-3} \times 20 \times 60$$

$$= 72 \times 10^{-2}$$

$$x = 0.72 \text{ M}$$

	A	→	B
Initial case	5		0
After 20 min.	$5 - x$		x
So	$[\text{B}] = x = 0.72 \text{ M}$		

Q.36 What is the pH of the resulting solution when equal volumes of 0.1 M NaOH and 0.01 M HCl are mixed ?

- (1) 7.0
- (2) 1.04
- (3) 12.65
- (4) 2.0

Ans. [3]

Sol. **Students may find similar question in CP Exercise Sheet: 1B [Chapter : Ionic equilibrium, Q.No. 22, Page no. 145]**

Let volume of each solution is V.

Acid

Base

$$\text{Eq. of HCl} = 0.01 \times V \quad \text{Equivalent of NaOH} = 0.1 \times V$$

$$\begin{aligned} \text{Net Equivalent} &= 0.1V - 0.01V \\ &= V [0.1 - 0.01] \\ &= 0.09V \end{aligned}$$

$$\therefore N \times 2V = 0.09V \quad (\text{Basic})$$

$$[\text{OH}]^{\ominus} N = \frac{0.09}{2} = 4.5 \times 10^{-2}$$

$$\begin{aligned} \text{pOH} &= 2 - \log 4.5 \\ &= 2 - 0.65 \\ &= 1.35 \end{aligned}$$

$$\therefore \text{pH} = 14 - 1.35 = 12.65$$

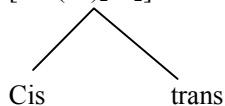
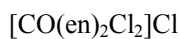
Q.37 Number of possible isomers for the complex $[\text{Co}(\text{en})_2\text{Cl}_2]\text{Cl}$ will be : (en = ethylene diamine)

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

Ans. [1]

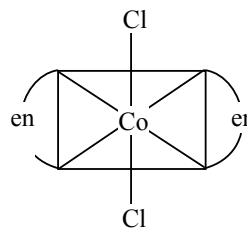
Sol. **Students may find similar question in CP Exercise Sheet: 5 [Chapter : Coordination chemistry, Q.No.30, Page no. 54]**

(i) total isomer = 3

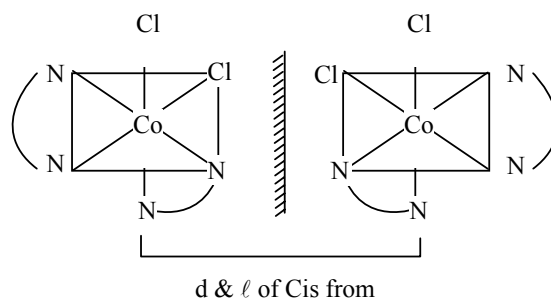


d & l

trans form is optically inactive due to plane of symmetry



Trans

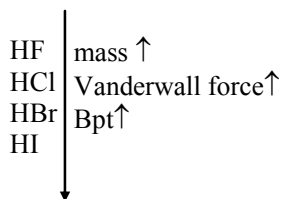


Q.38 The variation of the boiling points of the hydrogen halides is in the order $\text{HF} > \text{HI} > \text{HBr} > \text{HCl}$. What explains the higher boiling point of hydrogen fluoride ?

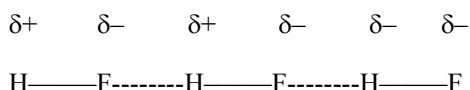
- (1) The bond energy of HF molecules is greater than in other hydrogen halides
- (2) The effect of nuclear shielding is much reduced in fluorine which polarizes the HF molecule
- (3) The electro negativity of fluorine is much higher than for other elements in the group
- (4) there is strong hydrogen bonding between HF molecules

Ans. [4]

Sol. **Students may find similar question in CP Exercise Sheet: Class Notes [Chapter : Chemical Bonding]**



Boiling point of HF is maximum because HF molecules associated by hydrogen bond



Bpt. HF > HI > HBr > HCl

Q.39 What is the mass of the precipitate formed when 50 mL of 16.9% solution of AgNO₃ is mixed with 50 mL of 5.8% NaCl solution ?

(Ag = 107.3, N = 14, O = 16, Na = 23, Cl = 35.5)

- (1) 7g (2) 14g
 (3) 28g (4) 3.5 g

Ans. [1]

Sol. Students may find similar question in CP Exercise Sheet: 1 [Chapter : Atom Molecule, Q.No.76, Page no. 65]

$$\text{Molarity (M) of AgNO}_3 = \frac{16.9 \times 10}{169.3} = 1.0 \text{ M}$$

$$\text{Molarity (M) of NaCl} = \frac{5.8}{58.5} \times 10 = 0.9914 \text{ M}$$



$$\text{Moles } n = \frac{0.99 \text{ M} \times 50}{1000} \quad \frac{0.99 \times 50}{1000}$$

$$\approx 0.05 \quad \approx 0.05$$

∴ moles of AgCl formed = 0.05

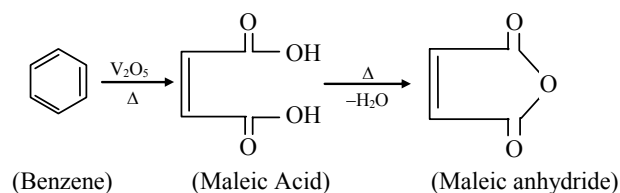
$$\text{Mass of AgCl} = 0.05 \times 142.5 = 7 \text{ g}$$

Q.40 The oxidation of benzene by V₂O₅ in the presence of air produces -

- (1) benzoic acid
 (2) benzaldehyde
 (3) benzoic anhydride
 (4) maleic anhydride

Ans. [4]

Sol.



Q.41 Which of the following is not the product of

dehydration of ?

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

Ans. [4]

Sol. stable carbocation

No rearrangement occur.

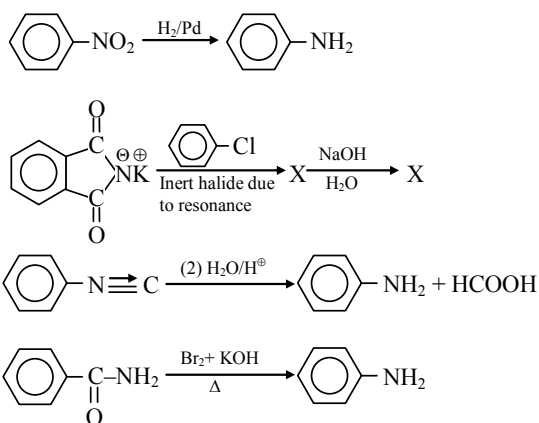


Q.42 Method by which Aniline cannot be prepared is -

- (1) reduction of nitrobenzene with H_2/Pd in ethanol
- (2) potassium salt of phthalimide treated with chlorobenzene followed by hydrolysis with aqueous NaOH solution
- (3) hydrolysis of phenylisocyanide with acidic solution
- (4) degradation of benzamide with bromine in alkaline solution

Ans. [2]

Sol.



Q.43 Which of the following reaction(s) can be used for the preparation of alkyl halides ?

- (I) $CH_3CH_2OH + HCl \xrightarrow{anh. ZnCl_2}$
 - (II) $CH_3CH_2OH + HCl \rightarrow$
 - (III) $(CH_3)_3COH + HCl \rightarrow$
 - (IV) $(CH_3)_2CHOH + HCl \xrightarrow{anh. ZnCl_2}$
- (1) (IV) only
 - (2) (III) and (IV) only
 - (3) (I), (III) and (IV) only
 - (4) (I) and (II) only

Ans. [3]

Sol. Luca's reagent can be used for $[HCl + ZnCl_2]$ $1^\circ/2^\circ/3^\circ$ -alcohol. But if $ZnCl_2$ is absent then only 3° alcohol can be used because it is most reactive due to 3° carbocation.

Q.44 Which is the correct order of increasing energy of the listed orbitals in the atom of titanium ?

(At. no. $Z = 22$)

- (1) $3s \ 3p \ 3d \ 4s$
- (2) $3s \ 3p \ 4s \ 3d$
- (3) $3s \ 4s \ 3p \ 3d$
- (4) $4s \ 3s \ 3p \ 3d$

Ans. [1]

Sol. Students may find similar question in CP Exercise Sheet: 3B [Chapter : Atomic Structure, Q.No. 163, Page no. 43]

Ti [22], $[Ar] 3d^2 4s^2$

When electron will fill in 3d then its energy will become less than 4s. So electron will emit from 4s not from 3d. So energy of 3d will be less than 4s.

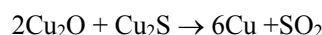
Q.45 In the extraction of copper from its sulphide ore, the metal is finally obtained by the reduction of cuprous oxide with -

- (1) copper (I) sulphide
- (2) sulphur dioxide
- (3) iron(II) sulphide
- (4) carbon monoxide

Ans. [1]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Metallurgy, Q.No.60, Page no. 98]

Copper is extracted by self reduction process





Q.46 Root pressure develops due to -

- (1) Increase in transpiration
- (2) Active absorption
- (3) Low osmotic potential in soil
- (4) Passive absorption

Ans. [2]

Sol. Students may find similar question in CP Exercise Sheet: Plant physiology [Chapter: Plant water relation, Q.No 258, Ex. # 1]

Root pressure is developed in herbaceous plants due to osmotic active water absorption.

Q.47 Which one is a **wrong** statement?

- (1) Brown algae have chlorophyll a and c, and fucoxanthin
- (2) Archegonia are found in Bryophyta, Pteridophyta and Gymnosperms
- (3) *Mucor* has biflagellate zoospores
- (4) Haploid endosperm is typical feature of gymnosperms

Ans. [3]

Sol. Students may find this in CP Sheet: [Chapter : Plant diversity, Page no. 81]

Mucor is member of zygomycetes and form aplanospores (Aflagellate spores).

Q.48 Which of the following structures is **not** found in a prokaryotic cell?

- (1) Plasma membrane
- (2) Nuclear envelope
- (3) Ribosome
- (4) Mesosome

Ans. [2]

Sol. Students may find it in CP Sheet: [Chapter: Cell biology, Page no. 3]

Nuclear membrane is absent in prokaryotes.

Q.49 Which one of the following animals has two separate circulatory pathways?

- (1) Shark
- (2) Frog
- (3) Lizard
- (4) Whale

Ans. [4]

Sol. Students may find it in CP Sheet: Animal diversity, Page no. 132

Whale have double circulation which consist of

- (a) Pulmonary circulation
- (b) Systemic circulation

Q.50 Most animals that live in deep oceanic waters are -

- (1) detritivores
- (2) primary consumers
- (3) secondary consumers
- (4) tertiary consumers



Ans. [1]

Sol. In deep oceanic water generally detritivores are found.

Q.51 An association of individuals of different species living in the same habitat and having functional interactions is -

- (1) Population
- (2) Ecological niche
- (3) Biotic community
- (4) Ecosystem

Ans. [3]

Sol. **Students may find similar question in CP Sheet: Ecology [Chapter : Population and community, Page no. 52]**

Community is group of interacting populations of different species occupying same habitat.

Q.52 The oxygen evolved during photosynthesis comes from water molecules. Which one of the following pairs of elements is involved in this reaction?

- (1) Magnesium and Chlorine
- (2) Manganese and Chlorine
- (3) Manganese and Potassium
- (4) Magnesium and Molybdenum

Ans. [2]

Sol. **Students may find similar question in CP Exercise Sheet: Plant physiology [Chapter : Photosynthesis, Q.No.158, Ex. # 1]**

Photolysis of water helped by minerals of oxygen evolving complex (OEC) which involves Manganese and Chlorine.

Q.53 Axile placentation is present in -

- (1) *Argemone* (2) *Dianthus*
- (3) Lemon (4) Pea

Ans. [3]

Sol. **Students may find it in CP Sheet: [Chapter: Structural organization in plant, Page no. 104]**

- Argemone : Parietal
- Dianthus : Free central
- Lemon : Axile
- Pea : Marginal

Q.54 In which of the following both pairs have **correct** combination?

(1)	Gaseous nutrient cycle	Sulphur and Phosphorus
	Sedimentary nutrient cycle	Carbon and Nitrogen
(2)	Gaseous nutrient cycle	Carbon and Nitrogen
	Sedimentary nutrient cycle	Sulphur and Phosphorus
(3)	Gaseous nutrient cycle	Carbon and Sulphur
	Sedimentary nutrient cycle	Nitrogen and Phosphorus
(4)	Gaseous nutrient cycle	Nitrogen and Sulphur
	Sedimentary nutrient cycle	Carbon and Phosphorus

Ans. [2]

Sol. **Students may find similar question in CP Exercise Sheet: Ecology [Chapter : Ecosystem, Q.No.78, Ex.# 2]**



Carbon and nitrogen cycles are gaseous cycles as their reservoir lies in hydrosphere and atmosphere respectively while sulphur and phosphorus cycles are sedimentary cycles as their reservoir lies in rocks or sediment.

Q.55 In mammalian eye, the 'fovea' is the center of the visual field, where -

- (1) more rods than cones are found
- (2) high density of cones occur, but has no rods
- (3) the optic nerve leaves the eye
- (4) only rods are present

Ans. [2]

Sol. **Students may find it in CP Sheet: Animal physiology-II, Page no. 271**

Fovea centralis have only cone cell so act as centre of visual field.

Q.56 Choose the **wrong** statement -

- (1) Yeast is unicellular and useful in fermentation
- (2) *Penicillium* is multicellular and produces antibiotics
- (3) *Neurospora* is used in the study of biochemical genetics
- (4) Morels and truffles are poisonous mushrooms

Ans. [4]

Sol. **Students may find this in CP Sheet: [Chapter : Plant diversity, Page no. 83]**

Morels and truffles are edible member of ascomycetes.

Q.57 Which of the following are **not** membrane-bound?

- (1) Mesosomes
- (2) Vacuoles
- (3) Ribosomes
- (4) Lysosomes

Ans. [3]

Sol. **Students may find it in CP Sheet: [Chapter: Cell biology, Page no. 28]**

Ribosomes are membrane less cell organelle.

Q.58 In which of the following interactions both partners are adversely affected?

- (1) Mutualism
- (2) Competition
- (3) Predation
- (4) Parasitism

Ans. [2]

Sol. **Students may find theory in CP Sheet: Ecology [Chapter : Community & population theory, Page no. 64]**

Competition is the interaction where fitness of both interacting species decrease (–/–)



Q.59 A colour blind man marries a woman with normal sight who has no history of colour blindness in her family. What is the probability of their grandson being colour blind?

- (1) 0.25 (2) 0.5
- (3) 1 (4) Nil

Ans. [4]

Sol. **Students may find similar question in CP Exercise Sheet: Genetic, Page no. 20**

Nil

	X ^c	Y
X	X ^c X	XY
X	X ^c X	XY

Son is not affected so grand son will also not affected.

Q.60 Ectopic pregnancies are referred to as-

- (1) Pregnancies terminated due to hormonal imbalance
- (2) pregnancies with genetic abnormality
- (3) Implantation of embryo at site other than uterus
- (4) Implantation of defective embryo in the uterus

Ans. [3]

Sol. **Students may find this in class notes [Chapter : Reproductive system]**

Implantation of embryo of site other than uterus is called Ectopic pregnancy or Tubal pregnancy

Q.61 Cellular organelles with membranes are -

- (1) lysosomes, Golgi apparatus and mitochondria
- (2) nuclei, ribosomes and mitochondria
- (3) chromosomes, ribosomes and endoplasmic reticulum
- (4) endoplasmic reticulum, ribosomes and nuclei

Ans. [1]

Sol. **Students may find it in CP Sheet: [Chapter: Cell biology]**

Lysosome : single membrane bound,

Golgi body and endoplasmic reticulum : Membranous, **mitochondria and nucleus** double membrane, **ribosome** membrane less.

Q.62 Cell wall is absent in -

- (1) *Nostoc* (2) *Aspergillus*
- (3) *Funaria* (4) Mycoplasma

Ans. [4]

Sol. **Students may find this in CP Sheet: [Chapter : Plant diversity, Page no. 44]**

Cell wall is not present in mycoplasma.



- Q.63** The term "linkage" was coined by -
- (1) W. Sutton (2) T.H. Morgan
- (3) T. Boveri (4) G. Mendel

Ans. [2]

Sol. **Students may find similar question in CP Exercise Sheet: Genetic, Page no. 15**

T.H. Morgan

- Q.64** Which of the following biomolecules does have a phosphodiester bond?
- (1) Nucleic acids in a nucleotide
- (2) Fatty acids in a diglyceride
- (3) Monosaccharides in a polysaccharide
- (4) Amino acids in a polypeptide

Ans. [1]

Sol. **Students may find it in CP Sheet: [Chapter: Protoplasm, Page no. 18]**

Phosphodiester bond is present between two nucleotide of a nucleic acid.

- Q.65** The primary dentition in human differs from permanent dentition in **not** having one of the following type of teeth -
- (1) Incisors (2) Canine
- (3) Premolars (4) Molars

Ans. [3]

Sol. **Students may find it in CP Sheet: Animal physiology-I, Page no. 133**

Premolar teeth are absent in human childhood (milk teeth dentition). Pre molar teeth are monophyodont.

- Q.66** A protoplast is a cell -
- (1) without cell wall
- (2) without plasma membrane
- (3) without nucleus
- (4) undergoing division

Ans. [1]

Sol. **Students may find it in CP Sheet: [Chapter : Cell biology, Page no. 6]**

Protoplasm = cell wall less cell
= cell – cell wall

- Q.67** In which group of organisms the cell walls form two thin overlapping shells which fit together?
- (1) Slime moulds (2) Chrysophytes
- (3) Euglenoids (4) Dinoflagellates

Ans. [2]

Sol. **Students may find this in CP Sheet: [Chapter : Plant diversity, Page no. 64]**

Overlapping shells are present in Diatoms member of Chrysophytes.



Q.68 The DNA molecule to which the gene of interest is integrated for cloning is called -

- (1) Carrier (2) Transformer
- (3) Vector (4) Template

Ans. [3]

Sol. **Students may find similar question in CP Exercise Sheet: Genetic Page no. 44**

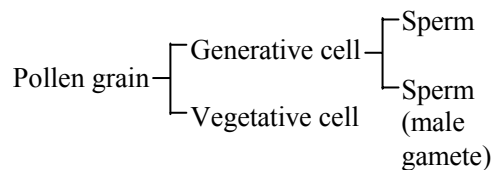
Vector.

Q.69 Male gametophyte in angiosperms produces

- (1) Three sperms
- (2) Two sperms and a vegetative cell
- (3) Single sperm and a vegetative cell
- (4) Single sperm and two vegetative cell

Ans. [2]

Sol. **Students may find this in CP Sheet: [Chapter : Reproduction in flowering plants, Page no. 13]**



Q.70 Coconut water from a tender coconut is -

- (1) Degenerated nucellus
- (2) Immature embryo
- (3) Free nuclear endosperm
- (4) Innermost layers of the seed coat

Ans. [3]

Sol. **Students may find this in CP Sheet: [Chapter : Reproduction in flowering plants, Page no. 32]**

Coconut water consist of free nuclear endosperm with each nucleus been triploid in nature.

Q.71 The species confined to a particular region and not found elsewhere is termed as -

- (1) Rate (2) Keystone
- (3) Alien (4) Endemic

Ans. [4]

Sol. **Students may find similar question in CP Sheet: Ecology [Chapter : Biodiversity, Theory, Page no. 134]**

Species finds only in a particular region are called as endemic species.

Q.72 Metagenesis refers to -

- (1) Presence of a segmented body and parthenogenetic mode of reproduction
- (2) Presence of different morphic forms
- (3) Alternation of generation between asexual and sexual phases of an organism
- (4) Occurrence of a drastic change in form during post-embryonic development



Ans. [3]

Sol. **Students may find it in CP Sheet: Animal diversity, Page no. 19**

Metagenesis is alternation of generation between asexual polyp form and sexual medusa form of some coelentrates like obelia.

Q.73 The enzyme that is **not** present in succus entericus is -

- (1) lipase (2) maltase
- (3) nucleases (4) nucleosidase

Ans. [3]

Sol. **Students may find it in CP Sheet: Animal physiology-I, Page no. 150**

Lipase, maltase, nucleosidase enzymes are found in succus entericus (intestinal juice) while Nuclease enzyme in found in pancreatic juice.

Q.74 Eutrophication of water bodies leading to killing of fishes is mainly due to non-availability of -

- (1) oxygen (2) food
- (3) light (4) essential minerals

Ans. [1]

Sol. **Students may find similar question in CP Exercise Sheet: Ecology [Chapter : Environmental issue, Q.No.28, Ex. # 2]**

Eutrophication cause increase in Biochemical Oxygen Demand (BOD) and decrease Dissolve Oxygen (D.O.), leads to death of fishes.

Q.75 The function of the gap junction is to -

- (1) stop substance from leaking across a tissue
- (2) performing cementing to keep neighbouring cells together
- (3) facilitate communication between adjoining cells by connecting the cytoplasm for rapid transfer of ions, small molecules and some large molecules.
- (4) separate two cells from ach other

Ans. [3]

Sol. **Students may find it in CP Sheet: Animal physiology-I, Page no. 5, (NCERT-XI (Eng.) Page No. 102)**

Function of gap junction is to facilitate communication between adjoining cell by connecting the cytoplasm for rapid transfer of ions, small molecule and some large molecules.



Q.76 Match the following list of microbes and their importance -

(1)	<i>Sacharomyces cerevisiae</i>	(i)	Production of immunosuppressive agents
(2)	<i>Monascus purpureus</i>	(ii)	Ripening of Swiss cheese
(3)	<i>Trichoderma polysporum</i>	(iii)	Commercial production of ethanol
(4)	<i>Propionibacterium shermanii</i>	(iv)	Production of blood cholesterol lowering agents

(a) (b) (c) (d)

(1) (iii) (i) (iv) (ii)

(2) (iii) (iv) (i) (ii)

(3) (iv) (iii) (ii) (i)

(4) (iv) (ii) (i) (iii)

Ans. [2]

Sol. **Students may find this in CP Sheet: [Chapter : Economic zoology, Page no. 113 & 117]**

- (a) *Sacharomyces cerevisiae* → Fermentation → Ethanol production
- (b) *Monascus purpureus* → statins → blood cholesterol lowering agents
- (c) *Trichoderma polysporum* → cyclosporin A → Production of immuno suppressive agent
- (d) *Propionibacterium shormanii* → Ripening of swiss cheese

Q.77 Arrange the following events of meiosis in correct sequence -

- (a) Crossing over
- (b) Synapsis
- (c) Terminalisation of chiasmata
- (d) Disappearance of nucleolus

(1) (b), (c), (d), (a) (2) (b), (a), (d), (c)

(3) (b), (a), (c), (d) (4) (a), (b), (c), (d)

Ans. [3]

Sol. **Students may it in CP Sheet: [Chapter : Cell division, Page no. 54]**

- (a) Crossing over : Pachytene
- (b) Synapsis : Zygotene
- (c) Terminalization of chiasma : Diakinesis
- (d) Disappearance of nucleolus : end of Diakinesis

They are different events of prophase-I of Meiosis.

Q.78 The cutting of DNA at specific locations became possible with the discovery of -

- (1) Ligases
- (2) Restriction enzymes
- (3) Probes
- (4) Selectable markers

Ans. [2]



Sol. Students may find similar question in CP Exercise Sheet: Genetic Page no. 42

Q.79 During biological nitrogen fixation, inactivation of nitrogenase by oxygen poisoning is prevented by -

- (1) Cytochrome
- (2) Leghaemoglobin
- (3) Xanthophyll
- (4) Carotene

Ans. [2]

Sol. Students may find similar question in CP Exercise Sheet: Plant Physiology [Chapter : Plant water relation, Q.No. 345, Ex. # 1]

Leghaemoglobin acts as O₂ scavenger as it combined with O₂ to form oxyleghaemoglobin and regulates O₂ concentration in root nodules of leguminous plants.

Q.80 Grafted kidney may be rejected in a patient due to -

- (1) Innate immune response
- (2) Humoral immune response
- (3) Cell-mediated immune response
- (4) Passive immune response

Ans. [3]

Sol. Students may find similar question in CP Exercise Sheet: Immunity and disease Page no. 124

Cell mediated immune response.

Q.81 The body cell in cockroach discharge their nitrogenous waste in the haemolymph mainly in the form of -

- (1) Calcium carbonate
- (2) Ammonia
- (3) Potassium urate
- (4) Urea

Ans. [3]

Sol. Students may find it in CP Sheet: Lower animal, Page no. 89-90

Body cells in cockroach discharges their nitrogenous waste in form potassium urate in the haemolymph from where it comes into malpighian tubule.

Q.82 Filiform apparatus is characteristic feature of -

- (1) Synergids
- (2) Generative cell
- (3) Nucellar embryo
- (4) Aleurone cell

Ans. [1]

Sol. Students may find this in CP Sheet: [Chapter : Reproduction in flowering plants, Page no. 21]

Synergid of embryo sac consist of filiform apparatus.



Q.83 Acid rain is caused by increase in the atmospheric concentration of -

- (1) O₃ and dust (2) SO₂ and NO₂
 (3) SO₃ and CO (4) CO₂ and CO

Ans. [2]

Sol. **Students may find similar question in CP Exercise Sheet: Ecology [Chapter : Environmental issue]**

Acid rain have H₂SO₄ and HNO₃ in the ratio of 7 : 3 due to high concentration of oxides of sulphur & nitrogen.

Q.84 The wheat grain has an embryo with one large, shield-shaped cotyledon known as -

- (1) Coleoptile (2) Epiblast
 (3) Coleorrhiza (4) Scutellum

Ans. [4]

Sol. **Students may find this in CP Sheet: [Chapter : Reproduction in flowering plants, Page no. 36]**

Scutellum is the single cotyledon present in monocot.

Q.85 Among china rose, mustard, brinjal, potato, guava, cucumber, onion and tulip, how many plants have superior ovary?

- (1) Four (2) Five
 (3) Six (4) Three

Ans. [3]

Sol. **Students may find it in CP Sheet: [Chapter: Structural organization of plant, Page no. 98]**

Superior ovary or hypogynous flower is present in china rose, mustard, brinjal, potato, onion and tulip.

Q.86 Which of the following is **not** a function of the skeletal system?

- (1) Locomotion
 (2) Production of erythrocytes
 (3) Storage of minerals
 (4) Production of body heat

Ans. [4]

Sol. **Students may find this in class notes [Chapter : Skeletal system]**

Function of skeletal system are – Locomotion, production of erythrocyte (By bone marrow) and storage of minerals.

Q.87 Golden rice is a genetically modified crop plant where the incorporated gene is meant for biosynthesis of -

- (1) Vitamin A (2) Vitamin B
 (3) Vitamin C (4) Omega 3

Ans. [1]



Sol. Students may find similar question in CP
Exercise Sheet: Genetics, Page no. 50

Vitamin-A

Q.88 Chromatophores take part in -

- (1) Respiration (2) Photosynthesis
(3) Growth (4) Movement

Ans. [2]

Sol. Students may find it in CP Sheet:
[Chapter: Cell biology, Page no. 19]

Chromatophore are membranous structure and have photosynthetic pigments. These pigments are involved in photosynthesis.

Q.89 Select the **wrong** statement -

- (1) Mosaic disease in tobacco and AIDS in human being are caused by viruses
(2) The viroids were discovered by D.J. Ivanowski
(3) W.M. Stanley showed that viruses could be crystallized
(4) The term 'contagium vivum fluidum' was coined by M.W. Beijerinck

Ans. [2]

Sol. Students may find this in CP Sheet:
[Chapter : Plant diversity – Virus, Page no. 189]

Viroids were discovered by T.O. Diener.

Q.90 A pleiotropic gene -

- (1) Controls multiple traits in an individual
(2) is expressed only in primitive plants
(3) is a gene evolved during Pliocene
(4) controls a trait only in combination with another gene

Ans. [1]

Sol. Students may find similar question in CP
Exercise Sheet: Genetics Page no. 23

Control multiple trait in a individual.

Q.91 Human urine is usually acidic because -

- (1) hydrogen ions are actively secreted into the filtrate
(2) the sodium transporter exchanges one hydrogen ion for each sodium ion, in peritubular capillaries
(3) excreted plasma proteins are acidic
(4) Potassium and sodium exchange generates acidity

Ans. [1]

Sol. Students may it in CP Sheet: Animal
physiology-II, Page no. 19

Hydrogen ion are actively secreted into the filtrate so urine become acidic in nature.



- Q.92** Auxin can be bioassayed by -
- (1) Lettuce hypocotyl elongation
 - (2) Avena coleoptile curvature
 - (3) Hydroponics
 - (4) Potometer

Ans. [2]

Sol. Students may find similar question in CP Exercise Sheet: Plant physiology [Chapter: Plant growth, Q.No.3, Ex. # 1]

Avena coleoptile curvature test is the bioassay of auxin.

- Q.93** Which of the following events is not associated with ovulation in human female?
- (1) LH surge
 - (2) Decrease in estradiol
 - (3) Full development of Graafian follicle
 - (4) Release of secondary oocyte

Ans. [2]

Sol. Students may find it in CP Sheet: Animal physiology-II, Page no. 149, (NCERT-XI (Eng.) Page No. 332)

Decrease in levels of estradiol is not associated with ovulation in human female, where as LH surge, full development of Graafian follicle and release of secondary oocyte is associated with ovulation.

- Q.94** Body having meshwork of cells, internal cavities lined with food filtering flagellated cells and indirect development are the characteristics of phylum :
- (1) Protozoa
 - (2) Coelenterata
 - (3) Porifera
 - (4) Mollusca

Ans. [3]

Sol. Students may find it in CP Sheet: Animal diversity, Page no. 15

In porifera body having meshwork of cells internal cavities lined with food filtering flagellated cells 'Choanocyte' indirect development with larva like parenchymata and amphiblastula.

- Q.95** Which one of the following hormones is not involved in sugar metabolism?
- (1) Glucagon
 - (2) Cortisone
 - (3) Aldosterone
 - (4) Insulin

Ans. [3]

Sol. Students may find it in CP Sheet: Animal physiology-II, Page no. 163, (NCERT-XI (Eng.) Page No. 335-336)

Aldosterone produced by adrenal cortex is involved in regulating the amount of minerals in our body fluid, while glucagon, cortisone & insulin are involved in sugar metabolism.



Q.96 Which of the following diseases is caused by a protozoan?

- (1) Blastomycosis (2) Syphilis
(3) Influenza (4) Babesiosis

Ans. [4]

Sol. **Students may find it in Class notes**
[Chapter : Animal diversity

Babesiosis also called Red fever caused by Babesia sp member of class sporozoa of phylum protozoa.

Q.97 Outbreeding is an important strategy of animal husbandry because it :

- (1) exposes harmful recessive genes that are eliminated by selection.
(2) helps in accumulation of superior genes.
(3) is useful in producing purelines of animals.
(4) is useful in overcoming inbreeding depression.

Ans. [4]

Sol. **Students may find this in class notes**
[Chapter : Economic zoology], (NCERT-XI, Page No. 167)

Outbreeding is cross between different breeds & useful in overcoming inbreeding depression.

Q.98 A childless couple can be assisted to have a child through a technique called GIFT. The full form of this technique is :

- (1) Germ cell internal fallopian transfer
(2) Gamete inseminated fallopian transfer
(3) Gamete intra fallopian transfer
(4) Gamete internal fertilization and transfer

Ans. [3]

Sol. **Students may find it in CP Sheet: Reproductive system, Page no. 92**

GIFT = Gamete Intra Falopian Transfer

Q.99 A jawless fish, which lays eggs in fresh water and whose ammocoetes larvae after metamorphosis return to the ocean is :

- (1) *Petromyzon* (2) *Eptatretus*
(3) *Myxine* (4) *Neomyxine*

Ans. [1]

Sol. **Students may find it in CP Sheet: Animal diversity, Page no. 105**

Petromyzon is jawless marine fish which lays egg in fresh water and whose ammocoetes larva after metamorphosis return to the ocean.

Q.100 The structures that help some bacteria to attach to rocks and / or host tissues are :

- (1) Holdfast (2) Rhizoids
(3) Fimbriae (4) Mesosomes



Ans. [3]

Sol. **Students may find this in CP Sheet:**
[Chapter : Plant diversity, Page no. 29]

Bacterial surface consist of fimbriae that help in attachment of substratum.

Q.101 If you suspect major deficiency of antibodies in a person, to which of the following would you look for confirmatory evidence ?

- (1) Serum globulins
- (2) Fibrinogen in plasma
- (3) Serum albumins
- (4) Haemocytes

Ans. [1]

Sol. **Students may find similar question in CP Exercise Sheet: Immunity and disease, Page no. 125**

Serum globulins.

Q.102 In human females, meiosis-II is not completed until?

- (1) birth
- (2) puberty
- (3) fertilization
- (4) uterine implantation

Ans. [3]

Sol. **Students may find it in CP Sheet:**
Reproductive system, Page no. 51

In human female meiosis-II completed after fertilization.

Q.103 Which of the following layers in an antral follicle is acellular ?

- (1) Zona pellucida
- (2) Granulosa
- (3) Theca interna
- (4) Stroma

Ans. [1]

Sol. **Students may find it in CP Sheet:**
Reproductive system, Page no. 16

Zona pellucida = Acellular layer between follicular cell and oocyte.

Q.104 In his classic experiments on pea plants, Mendel did not use :

- (1) Flower position (2) Seed colour
- (3) Pod length (4) Seed shape

Ans. [3]

Sol. **Students may find similar question in CP Exercise Sheet: Genetics, Page no. 5**

Pod length.



Q.105 Which one of the following fruits is parthenocarpic?

- (1) Banana (2) Brinjal
- (3) Apple (4) Jackfruit

Ans. [1]

Sol. Students may find it in CP Sheet:
 [Chapter: Structural organization of plant,
 Page no. 105]

Parthenocarpy : Formation of fruit without fertilization e.g. Banana.

Q.106 In angiosperms, microsporogenesis and megasporogenesis :

- (1) occur in ovule
- (2) occur in anther
- (3) form gametes without further divisions
- (4) Involve meiosis

Ans. [4]

Sol. Students may find this in CP Sheet:
 [Chapter : Reproduction in flowering
 plants, Page no. 4]

Microspore and megaspore are formed by meiosis .

Q.107 A gene showing codominance has :

- (1) both alleles independently expressed in the heterozygote

- (2) one allele dominant on the other
- (3) alleles tightly linked on the same chromosome
- (4) alleles that are recessive to each other

Ans. [1]

Sol. Students may find similar question in CP
 Exercise Sheet: Genetics, Page no. 14

Q.108 The chitinous exoskeleton of arthropods is formed by the polymerization of :

- (1) lipoglycans
- (2) keratin sulphate and chondroitin sulphate
- (3) D – glucosamine
- (4) N – acetyl glucosamine

Ans. [4]

Sol. Students may find it in CP Sheet:
 [Chapter: Protoplasm, Page no. 106]

Chitin is a polymer of N-acteyl glucosamine.

Q.109 The imperfect fungi which are decomposers of litter and help in mineral cycling belong to :

- (1) Ascomycetes (2) Deuteromycetes
- (3) Basidiomycetes (4) Phycomycetes

Ans. [2]



Sol. Students may find this in CP Sheet:
[Chapter : Plant diversity, Page no. 92]

Deuteromycetes lack sexual reproduction and so are termed fungi imperfecti.

Q.110 The wings of a bird and the wings of an insect are :

- (1) homologous structures and represent convergent evolution
- (2) homologous structures and represent divergent evolution
- (3) analogous structures and represent convergent evolution
- (4) phylogenetic structures and represent divergent evolution

Ans. [3]

Sol. Students may find it in CP Sheet: Origin and Evolution of life, Page no. 16

Wings of birds and the wings of an insect are similar in function but differ in origin so they are analogous structure & analogy shows convergent evolution.

Q.111 Flowers are unisexual in :

- | | |
|--------------|----------------|
| (1) Onion | (2) Pea |
| (3) Cucumber | (4) China rose |

Ans. [3]

Sol. Students may find it in CP Sheet:
[Chapter: Structural organization of plant, Page no. 156]

Unisexual flower either have androecium or gynoecium only.

Unisexual flowers are present in cucumber.

Q.112 Increase in concentration of the toxicant at successive trophic levels is known as :

- (1) Biogeochemical cycling
- (2) Biomagnification
- (3) Biodeterioration
- (4) Biotransformation

Ans. [2]

Sol. Students may find similar question in CP Exercise Sheet: Ecology [Chapter : Environmental issues, Ex. 2, Q.No. 6]

Increased concentration of non biodegradable pollutants at successive trophic levels of food chain is known of Biomagnification.

Q.113 Destruction of the anterior horn cells of the spinal cord would result in loss of :

- (1) integrating impulses
- (2) sensory impulses
- (3) voluntary motor impulses
- (4) commissural impulses

Ans. [2]



Sol. Students may find it in CP Sheet: Animal physiology-II, Page no. 229

Nerves arises from dorsal or anterior root ganglia of spinal cord are sensory in nature.

Q.114 Roots play insignificant role in absorption of water in :

- (1) Wheat (2) Sunflower
- (3) Pistia (4) Pea

Ans. [3]

Sol. Pistia is an aquatic plant and root is generally not involved in water absorption in aquatic plant.

Q.115 Match the columns and identify the correct option.

Column I	Column II
(a) Thylakoids	(i) Disc-shaped sacs in Golgi apparatus
(b) Cristae	(ii) Condensed structure of DNA
(c) Cisternae	(iii) Flat membranous sacs in stroma
(d) Chromatin	(iv) Infoldings in mitochondria

- | (a) | (b) | (c) | (d) |
|-----------|-------|------|------|
| (1) (iii) | (iv) | (ii) | (i) |
| (2) (iv) | (iii) | (i) | (ii) |
| (3) (iii) | (iv) | (i) | (ii) |
| (4) (iii) | (i) | (iv) | (ii) |

Ans. [3]

Sol. Students may find it in CP Sheet: [Chapter: Cell biology]

Q.116 Identify the correct order of organisation of genetic material from largest to smallest :

- (1) Chromosome, genome, nucleotide, gene
- (2) Chromosome, gene, genome, nucleotide
- (3) Genome, chromosome, nucleotide, gene
- (4) Genome, chromosome, gene, nucleotide

Ans. [4]

Sol. Students may find it in class notes Protoplasm.

Genome > Chromosome > Gene > Nucleotide

Q.117 Which one of the following hormones though synthesised elsewhere, is stored and released by the master gland ?

- (1) Melanocyte stimulating hormone
- (2) Antidiuretic hormone
- (3) Luteinizing hormone
- (4) Prolactin

Ans. [2]



Sol. Students may find it in CP Sheet: Animal physiology-II, Page no. 152, (NCERT-XI (Eng.) Page No. 332)

Antidiuretic hormone (Vasopressin) is synthesized by hypothalamic nuclei. It is stored and released by neurohypophysis (posterior lobe of pituitary gland).

Q.118 Read the different components from (a) to (d) in the list given below and tell the correct order of the components with reference to their arrangement from outer side to inner side in a woody dicot stem :

- (1) Secondary cortex
- (2) Wood
- (3) Secondary phloem
- (4) Pith

The correct order is :

- (1) (d), (c), (a), (b)
- (2) (c), (d), (b), (a)
- (3) (a), (b), (d), (c)
- (4) (d), (a), (c), (b)

Ans. [4]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Structural organization of plant, Q.No. 137, Page no. 66]

Q.119 Which of the following joints would allow no movement?

- (1) Ball and Socket joint
- (2) Fibrous joint
- (3) Cartilaginous joint
- (4) Synovial joint

Ans. [2]

Sol. Students may find it in CP Sheet: Animal physiology-I, Page no. 112

Fibrous joint do not allow movement.

Q.120 Which one of the following is not applicable to RNA?

- (1) Chargaff's rule
- (2) Complementary base pairing
- (3) 5' phosphoryl and 3' hydroxyl ends
- (4) Heterocyclic nitrogenous bases

Ans. [1]

Sol. Students may find it in class notes [Chapter : Protoplasm]

Chargaff's principle is not applicable for RNA as purine is not equal to pyrimidine.

Q.121 Doctors use stethoscope to hear the sounds produced during each cardiac cycle. The second sound is heard when :

- (1) AV node receives signal from SA node
- (2) AV valves open up
- (3) Ventricular walls vibrate due to gushing in of blood from atria
- (4) Semilunar valves close down after the blood flows into vessels from ventricles

Ans. [4]

Sol. **Students may find it in CP Sheet: Animal physiology-II, Page no. 104**

Closure of Bicuspid & tricuspid valve produces first heart sound (lubb) while of semilunar valve produces second heart sound (Dup).

Q.122 During ecological succession :

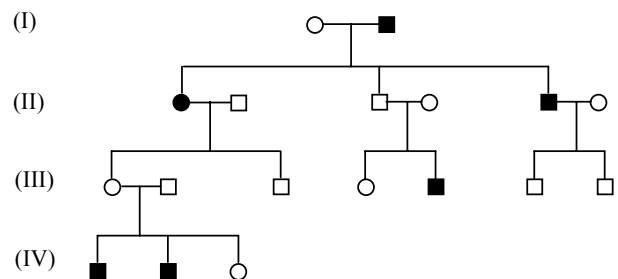
- (1) the changes lead to a community that is in near equilibrium with the environment and is called pioneer community
- (2) the gradual and predictable change in species composition occurs in a given area
- (3) the establishment of a new biotic community is very fast in its primary phase.
- (4) the numbers and types of animals remain constant.

Ans. [2]

Sol. **Students may find similar question in CP Exercise Sheet: Ecology [Chapter : Population & Community, Ex. 1, Q.No. 78]**

Succession is gradual & Predictable change in species composition occurs in a area.

Q.123 In the following human pedigree, the filled symbols represent the affected individuals. Identify the type of given pedigree.



- (1) X-linked dominant
- (2) Autosomal dominant
- (3) X-linked recessive
- (4) Autosomal recessive

Ans. [4]

Sol. **Students may find similar question in CP Exercise Sheet: Genetics, Page no. 63]**

Autosomal recessive. Offspring is affected but parent are not affected is characteristic of autosomal recessive.

Q.124 Balbiani rings are sites of :

- (1) RNA and protein synthesis
- (2) Lipid synthesis
- (3) Nucleotide synthesis
- (4) Polysaccharide synthesis

Ans. [1]

Sol. **Students may find it in CP Sheet: [Chapter : Cell biology, Page no. 43]**

Balbiani ring are present in polytene chromosome & it is the site of RNA & protein synthesis.

Q.125 Name the pulmonary disease in which alveolar surface area involved in gas exchange is drastically reduced due to damage in the alveolar walls.

- (1) Asthma
- (2) Pleurisy
- (3) Emphysema
- (4) Pneumonia

Ans. [3]

Sol. **Students may find it in CP Sheet: Animal physiology-II, Page no. 66**

Emphysema is pulmonary disease caused by air pollutant causes break down of alveolar wall so reduces surface area of gaseous exchange.

Q.126 Which of the following are most suitable indicators of SO₂ pollution in the environment?

- (1) Fungi
- (2) Lichens
- (3) Conifers
- (4) Algae

Ans. [2]

Sol. **Students may find similar question in CP Exercise Sheet: Ecology [Chapter : Environmental issues, Ex. 1, Q.No. 19]**

Lichens are SO₂ Pollution indicators or they do not grow in SO₂ Polluted habitat.

Q.127 Satellite DNA is important because it :

- (1) codes for enzymes needed for DNA replication.
- (2) codes for proteins needed in cell cycle.
- (3) Shows high degree of polymorphism in population and also the same degree of polymorphism in an individual, which is heritable from parents to children.
- (4) does not code for proteins and is same in all members of the population.

Ans. [3]

Sol. **Students may find similar question in CP Exercise Sheet: Genetics, Page no. 51**

V.N.T.R. or satellite DNA show high degree of polymorphism is basis of DNA test.

Q.128 Industrial melanism is an example of -

- (1) Neo Lamarckism
- (2) Neo Darwinism
- (3) Natural selection
- (4) Mutation

Ans. [3]

Sol. **Students may find it in CP Sheet: Origin & Evolution of life, Page no. 32**

Industrial melanism shows natural selection.

Q.129 A column of water within xylem vessels of tall trees does not break under its weight because of -

- (1) Positive root pressure
- (2) Dissolved sugars in water
- (3) Tensile strength of water
- (4) Lignification of xylem vessels

Ans. [3]

Sol. **Students may find similar question in CP Exercise Sheet: Plant Physiology [Chapter : Plant water relation theory, Page no. 196]**

High Tensile strength of water, helps in prevention of breakage of water column within xylem vessels of high tree.

Q.130 The introduction of t-DNA into plants involves -

- (1) Allowing the plant roots to stand in water
- (2) Infection of the plant by *Agrobacterium tumefaciens*
- (3) Altering the pH of the soil, then heat-shocking the plants
- (4) Exposing the plants to cold for a brief period

Ans. [2]

Sol. **Students may find similar question in CP Sheet: Genetics, Page no. 47**

Agrobacterium tumefaciens bacteria contain t-DNA (transfer DNA)

In its Ti plasmid (Tumor inducing plasmid)

This bacterium transfers this t-DNA fragment into host plant nuclear genome during infection.

Q.131 Pick up the wrong statement :

- (1) Nuclear membrane is present in Monera
- (2) Cell wall is absent in Animalia
- (3) Protista have photosynthetic and heterophic modes of nutrition
- (4) Some fungi are edible

Ans. [1]



Sol. Students may find this in CP Sheet:
[Chapter : Plant diversity, Page no. 23]

Monera (Prokaryotes) do not have well defined nucleus as they lack nuclear membrane and nucleolus.

Q.132 In photosynthesis, the light-independent reactions take place at :

- (1) Stromal matrix (2) Thylakoid lumen
(3) Photosystem I (4) Photosystem II

Ans. [1]

Sol. Students may find similar question in CP Exercise Sheet: Plant Physiology [Chapter : Photosynthesis theory, Page no. 16]

The light independent reaction or dark reaction occurs in stromal matrix of chloroplast.

Q.133 Which of the following immunoglobulins does constitute the largest percentage in human milk?

- (1) IgG (2) IgD
(3) IgM (4) IgA

Ans. [4]

Sol. Students may find similar question in CP Exercise Sheet: Immunity and disease, Page no. 125

IgA.

Q.134 Which of the following pairs is not correctly matched?

Mode of reproduction	Example
(1) Conidia	<i>Penicillium</i>
(2) Offset	Water hyacinth
(3) Rhizome	Banana
(4) Binary fission	<i>Sargassum</i>

Ans. [4]

Sol. Students may find this in CP Sheet:
[Chapter : Plant diversity, Page no. 102]

Binary fission occurs in unicellular organisms whereas sargassum is multicellular brown algae.

Q.135 The UN conference of Parties on climate change in the year 2012 was held at :

- (1) Warsaw
(2) Durban
(3) Doha
(4) Lima

Ans. [3]

Sol. UN Conference of Parties (COP) 2012 was held at Qatar, Doha.

Q.136 In the spectrum of hydrogen, the ratio of the longest wavelength in the Lyman series to the longest wavelength in the Balmer series is :

- (1) $\frac{5}{27}$ (2) $\frac{4}{9}$
 (3) $\frac{9}{4}$ (4) $\frac{27}{5}$

Ans. [1]

Sol. **Students may find similar question in : [Chapter : Atomic structure, similar question in CP minor test paper]**

$$\frac{1}{\lambda} = RZ^2 \left(\frac{1}{n_1^2} - \frac{1}{n_2^2} \right)$$

Lyman series : $n_1 = 1, n_2 = 2$

$$\frac{1}{\lambda_1} = RZ^2 \left(\frac{1}{1^2} - \frac{1}{2^2} \right) \quad \dots(1)$$

Balmer series :

$n_1 = 2, n_2 = 3$

$$\frac{1}{\lambda_2} = RZ^2 \left(\frac{1}{2^2} - \frac{1}{3^2} \right) \quad \dots(2)$$

$$\frac{\text{eq}^n(2)}{\text{eq}^n(1)} \Rightarrow \frac{\lambda_1}{\lambda_2} = \frac{RZ^2 \left(\frac{1}{4} - \frac{1}{9} \right)}{RZ^2 \left(1 - \frac{1}{4} \right)} = \frac{\frac{5}{36}}{\frac{3}{4}}$$

$$= \frac{5}{36} \times \frac{4}{3} = \frac{5}{27}$$

Q.137 The energy of the em waves is of the order of 15 keV. To which part of the spectrum does it belong ?

- (1) γ -rays (2) X-rays
 (3) Infra - red rays (4) Ultraviolet rays

Ans. [2]

Sol. **Students may find similar question in CP Exercise Sheet: [Chapter : Photo electric effect, Ex-2, Q.No. 28, Page no. 78]**

$$E = 15 \text{ keV} = 15 \times 10^3 \text{ eV}$$

$$\therefore E = \frac{12400}{\lambda} \text{ eV}\text{\AA}$$

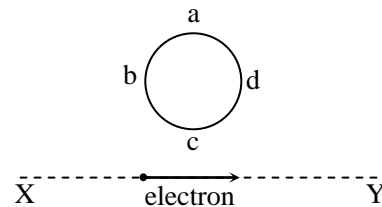
$$\lambda = \frac{12400}{E} \text{ eV}\text{\AA}$$

$$\lambda = \frac{12400}{15 \times 10^3 \text{ eV}} \text{ eV}\text{\AA}$$

$$\lambda = .826 \text{\AA} (\lambda < 0.01 \text{\AA})$$

It is part of X-rays

Q.138 An electron moves on a straight line path XY as shown. The abcd is a coil adjacent to the path of electron. What will be the direction of current, if any, induced in the coil ?



- (1) No current induced
 (2) abcd
 (3) adcb
 (4) The current will reverse its direction as the electron goes past the coil

Ans. [4]

Sol. **Students may find similar question in CP Exercise Sheet: [Chapter : EMI, Ex-3B, Q.No. 47, Page no. 183]**



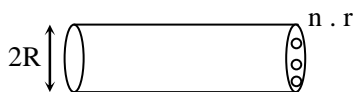
When e^- is coming towards the loop magnetic flux of one type increased and when going away same magnetic flux decreased so induced current opposite to each other.

Q.139 The cylindrical tube of a spray pump has radius R , one end of which has n fine holes, each of radius r . If the speed of the liquid in the tube is V , the speed of the ejection of the liquid through the holes is :

- (1) $\frac{V^2 R}{nr}$ (2) $\frac{VR^2}{n^2 r^2}$
 (3) $\frac{VR^2}{nr^2}$ (4) $\frac{VR^2}{n^3 r^2}$

Ans. [3]

Sol. **Students may find similar question in CP :**
[Class room notes]



$$A_1 V_1 = A_2 V_2$$

$$\Rightarrow V_2 = \frac{A_1 V_1}{A_2} = \frac{\pi R^2 \times V}{n(\pi r^2)}$$

$$= \frac{R^2}{nr^2} V$$

Q.140 The Young's modulus of steel is twice that of brass. Two wires of same length and of same area of cross section, one of steel and another of brass are suspended from the same roof. If we want the lower ends of the wires to be at

the same level, then the weights added to the steel and brass wires must be in the ratio of :

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

Ans. [3]

Sol. **Students may find similar question in CP**
Exercise Sheet: [Chapter : Elasticity,
Ex-1B, Q.No. 42, Page no. 180]

$$Y_{\text{steel}} = 2 Y_{\text{brass}}$$

$$L_s = L_b$$

$$A_s = A_b$$

$$\Delta L_s = \Delta L_b$$

$$Y = \frac{\text{stress}}{\text{strain}} = \frac{\frac{F}{A}}{\frac{\Delta L}{L}} = \frac{WL}{A\Delta L}$$

$$W = \frac{YA\Delta L}{L} \propto Y$$

$$\frac{W_s}{W_b} = \frac{Y_s}{Y_b} = 2 : 1$$

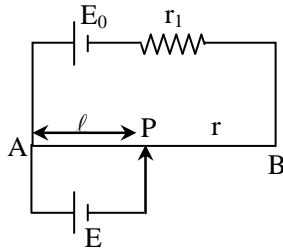
Q.141 A potentiometer wire of length L and a resistance r are connected in series with a battery of e.m.f. E_0 and a resistance r_1 . An unknown e.m.f. E is balanced at a length ℓ of the potentiometer wire. The e.m.f. E will be given by :

- (1) $\frac{LE_0 r}{(r + r_1)\ell}$ (2) $\frac{LE_0 r}{r_1}$
 (3) $\frac{E_0 r}{(r + r_1)} \frac{\ell}{L}$ (4) $\frac{E_0 \ell}{L}$



Ans. [3]

Sol. **Students may find similar question in CP Exercise Sheet: [Chapter : Current electricity, Ex.-3B, Q.No. 113, Page no. 219]**



$$\text{Current in wire AB} = \frac{E_0}{r_1 + r}$$

$$\text{Potential gradient} = \left(\frac{E_0}{r_1 + r} \right) \cdot \frac{r}{L}$$

$$\therefore E = \left(\frac{E_0}{r_1 + r} \right) \frac{r}{L} \times \ell$$

Q.142 A particle is executing a simple harmonic motion. Its maximum acceleration is α and maximum velocity is β . Then, its time period of vibration will be:

(1) $\frac{2\pi\beta}{\alpha}$ (2) $\frac{\beta^2}{\alpha^2}$

(3) $\frac{\alpha}{\beta}$ (4) $\frac{\beta^2}{\alpha}$

Ans. [1]

Sol. **Students may find similar question in CP Exercise Sheet: [Chapter : SHM, Ex-1, Q.No. 25, Page no. 242]**

Maximum acceleration

$$\alpha = A\omega^2 \quad \dots(1)$$

Maximum velocity

$$\beta = A\omega \quad \dots(2)$$

$$\frac{\text{Eq}^n(1)}{\text{Eq}^n(2)} \Rightarrow \frac{\alpha}{\beta} = \omega \Rightarrow \frac{\alpha}{\beta} = \frac{2\pi}{T}$$

$$T = 2\pi \frac{\beta}{\alpha}$$

Q.143 If vectors $\vec{A} = \cos \omega t \hat{i} + \sin \omega t \hat{j}$ and $\vec{B} = \cos \frac{\omega t}{2} \hat{i} + \sin \frac{\omega t}{2} \hat{j}$ are functions of time, then the value of t at which they are orthogonal to each other is :

(1) $t = 0$ (2) $t = \frac{\pi}{4\omega}$

(3) $t = \frac{\pi}{2\omega}$ (4) $t = \frac{\pi}{\omega}$

Ans. [4]

Sol. **Students may find similar question in CP [CP Minor test paper]**

For perpendicular vectors

$$\vec{A} \cdot \vec{B} = 0$$

$$\Rightarrow [\cos \omega t \hat{i} + \sin \omega t \hat{j}] \cdot \left[\cos \frac{\omega t}{2} \hat{i} + \sin \frac{\omega t}{2} \hat{j} \right] = 0$$

$$\cos \omega t \cos \frac{\omega t}{2} + \sin \omega t \sin \frac{\omega t}{2} = 0$$

$$\{ \because \cos A \cos B + \sin A \sin B = \cos (A - B) \}$$

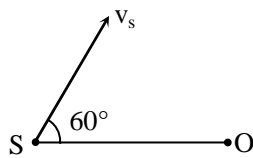
$$\therefore \cos \left(\omega t - \frac{\omega t}{2} \right) = 0$$

$$\Rightarrow \cos \frac{\omega t}{2} = 0$$

$$\Rightarrow \frac{\omega t}{2} = \frac{\pi}{2}$$

$$\Rightarrow t = \frac{\pi}{\omega}$$

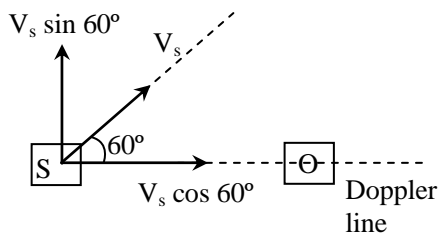
Q.144 A source of sound S emitting waves of frequency 100 Hz and an observer O are located at some distance from each other. The source is moving with a speed of 19.4 ms^{-1} at an angle of 60° with the source observer line as shown in the figure. The observer is at rest. The apparent frequency observed by the observer (velocity of sound in air 330 ms^{-1}), is :



- (1) 97 Hz (2) 100 Hz
 (3) 103 Hz (4) 106 Hz

Ans. [3]

Sol. Students may find similar question in CP [Chapter : Doppler Effect, CP Classroom notes]



$$n' = n \left(\frac{v}{v - v_s \cos 60^\circ} \right)$$

$$= 100 \left(\frac{330}{330 - 19.4 \times \frac{1}{2}} \right)$$

$$= 100 \left(\frac{330}{330 - 9.7} \right)$$

$$= 100 \left(\frac{330}{320.3} \right)$$

$$= 103.02 \text{ Hz}$$

Q.145 An automobile moves on a road with a speed of 54 km h^{-1} . The radius of its wheels is 0.45 m and the moment of inertia of the wheel about its axis of rotation is 3 kg m^2 . If the vehicle is brought to rest in 15 s , the magnitude of average torque transmitted by its brakes to the wheel is :

- (1) $2.86 \text{ kg m}^2 \text{ s}^{-2}$ (2) $6.66 \text{ kg m}^2 \text{ s}^{-2}$
 (3) $8.58 \text{ kg m}^2 \text{ s}^{-2}$ (4) $10.86 \text{ kg m}^2 \text{ s}^{-2}$

Ans. [2]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Rotation , Ex- 1, Q.No. 41, Page no. 141]

$$V = 54 \frac{\text{km}}{\text{h}} = 15 \text{ m/s}$$

$$\omega_0 = \frac{v}{r} = \frac{15}{.45} \frac{\text{rad}}{\text{s}}, \quad \omega = 0$$

$$\omega = \omega_0 + \alpha t$$

$$0 = \frac{15}{.45} + \alpha 15$$

$$\alpha = - \frac{15}{.45 \times 15} = - \frac{1}{.45} \frac{\text{rad}}{\text{s}^2}$$

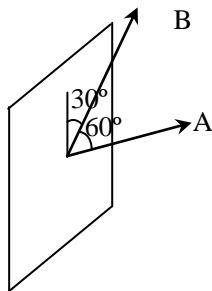
$$\tau = I\alpha = - \frac{3}{.45} = - \frac{300}{45} = -6.66 \text{ kgm}^2/\text{s}^2$$

Q.146 A rectangular coil of length 0.12 m and width 0.1 m having 50 turns of wire is suspended vertically in a uniform magnetic field of strength 0.2 Weber/m². The coil carries a current of 2A. If the plane of the coil is inclined at an angle of 30° with the direction of the field, the torque required to keep the coil in stable equilibrium will be :

- (1) 0.12 Nm (2) 0.15 Nm
 (3) 0.20 Nm (4) 0.24 Nm

Ans. [3]

Sol. **Students may find similar question in CP Exercise Sheet: [Chapter : Magnetic field, Ex. -1, Q.No. 117, Page no. 70]**



$$\begin{aligned} \tau &= NAIB \sin \theta \\ &= 50 \times .012 \times 2 \times 0.2 \times \sin 60^\circ \\ &= 0.20 \text{ Nm} \end{aligned}$$

Q.147 A parallel plate air capacitor has capacity ‘C’, distance of separation between plates is ‘d’ and potential difference ‘V’ is applied between the plates. Force of attraction between the plates of the parallel plate air capacitor is :

- (1) $\frac{C^2V^2}{2d^2}$ (2) $\frac{C^2V^2}{2d}$
 (3) $\frac{CV^2}{2d}$ (4) $\frac{CV^2}{d}$

Ans. [3]

Sol. **Students may find similar question in CP: [Chapter : Capacitance, Classroom notes]**

Force between plates of capacitor

$$F = qE$$

$$= q \left(\frac{q}{2A \epsilon_0} \right)$$

$$F = \frac{q^2}{2A \epsilon_0}$$

$$\therefore q = CV$$

$$F = \frac{C^2V^2}{2A \epsilon_0}$$

$$F = \frac{\left(\frac{A \epsilon_0}{d} \right) CV^2}{2A \epsilon_0}$$

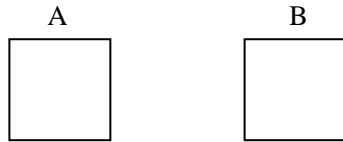
$$F = \frac{CV^2}{2d}$$

Q.148 Two vessels separately contain two ideal gases A and B at the same temperature, the pressure of A being twice that of B. Under such conditions, the density of A is found to be 1.5 times the density of B. The ratio of molecular weight of A and B is :

- (1) $\frac{1}{2}$ (2) $\frac{2}{3}$
 (3) $\frac{3}{4}$ (4) 2

Ans. [3]

Sol. Students may find similar question in CP
[Chapter : KTG, Classroom notes]



$$\begin{aligned}
 P_A &= 2P_B \\
 \rho_A &= 1.5 \rho_B \\
 \frac{M_A}{M_B} &= ? \\
 \therefore \frac{P}{\rho} &= \frac{RT}{M_0} \Rightarrow M_0 = \frac{\rho RT}{P} \\
 &\quad R, T = \text{const.}
 \end{aligned}$$

$$\begin{aligned}
 M_0 &\propto \frac{\rho}{P} \\
 \Rightarrow \frac{M_A}{M_B} &= \frac{\rho_A}{\rho_B} \times \frac{P_B}{P_A} \\
 &= 1.5 \times \frac{1}{2} \\
 &= 0.75 = 3/4
 \end{aligned}$$

Q.149 A satellite S is moving in an elliptical orbit around the earth. The mass of the satellite is very small compared to the mass of the earth. Then,

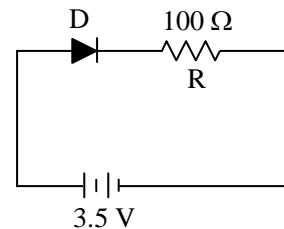
- (1) the acceleration of S is always directed towards the centre of the earth.
- (2) the angular momentum of S about the centre of the earth changes in direction, but its magnitude remains constant.
- (3) the total mechanical energy of S varies periodically with time
- (4) the linear momentum of S remains constant in magnitude.

Ans. [1]

Sol. Students may find similar question in CP
Exercise Sheet: [Chapter : Gravitation, CP
Minor Test]

Force on satellite is only gravitational force, which will always be towards the centre of earth

Q.150 In the given figure, a diode D is connected to an external resistance $R = 100 \Omega$ and an e.m.f. of 3.5 V. If the barrier potential developed across the diode is 0.5V, the current in the circuit will be:



- (1) 35 mA
- (2) 30 mA
- (3) 40 mA
- (4) 20 mA

Ans. [2]

Sol. Students may find similar question in CP
Exercise Sheet: [Chapter : Electronics,
Solved Example, Page no. 179]

$$\begin{aligned}
 i &= \frac{V_{\text{net}}}{R_{\text{net}}} = \frac{3.5 - 0.5}{100} \\
 &= \frac{3}{100} \text{ Amp.} \\
 &= 30 \text{ mA}
 \end{aligned}$$



Q.151 A remote – sensing satellite of earth revolves in a circular orbit at a height of 0.25×10^6 m above the surface of earth. If earth’s radius is 6.38×10^6 m and $g = 9.8 \text{ ms}^{-2}$, then the orbital speed of the satellite is :

- (1) 6.67 km s^{-1} (2) 7.76 km s^{-1}
- (3) 8.56 km s^{-1} (4) 9.13 km s^{-1}

Ans. [2]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Gravitation , Ex-2, Q.No. 6, Page no. 208]

$$\frac{GMm}{r^2} = \frac{mv^2}{r} \quad r = R + h$$

$$v = \sqrt{\frac{GM}{r}} = \sqrt{\frac{GMR^2}{R^2r}} = \sqrt{\frac{g}{r}} R$$

$$v = \left(\sqrt{\frac{9.8}{.25 \times 10^6 + 6.38 \times 10^6}} \right) \times 6.38 \times 10^6$$

$$= \sqrt{\frac{1.47}{10^6}} \times 6.38 \times 10^6$$

$$= 7.76 \times 10^3 \text{ m/s} = 7.76 \text{ km/s}$$

Q.152 The position vector of a particle \vec{R} as a function of time is given by :

$$\vec{R} = 4 \sin(2\pi t) \hat{i} + 4\cos(2\pi t) \hat{j}$$

Where R is in meters, t is in seconds and \hat{i} and \hat{j} denote unit vectors along x-and y- directions, respectively. Which one of the following statements is wrong for the motion of particle ?

- (1) Path of the particle is a circle of radius 4 meter
- (2) Acceleration vector is along $-\vec{R}$.
- (3) Magnitude of acceleration vector is $\frac{v^2}{R}$, where v is the velocity of particle
- (4) Magnitude of the velocity of particle is 8 meter/ second

Ans. [4]

Sol. Students may find similar question in CP [Chapter : Motion in plane, Class room notes]

$$\vec{R} = 4 \sin(2\pi t)\hat{i} + 4 \cos(2\pi t)\hat{j}$$

$$x = 4 \sin 2\pi t \quad \dots(1)$$

$$y = 4 \cos 2\pi t \quad \dots(2)$$

$$(1) \quad x^2 + y^2 = 4^2 (\sin^2 2\pi t + \cos^2 2\pi t)$$

$$\boxed{x^2 + y^2 = 4^2} \text{ equation of circle and radius 4m}$$

$$(2) \quad \vec{a} = \frac{V^2}{R} (-\hat{R})$$

$$(3) \quad a = \frac{V^2}{R}$$

$$(4) \quad V_x = + 4(\cos 2\pi t) (2\pi)$$

and $V_y = - 4(\sin 2\pi t) (2\pi)$

$$V = \sqrt{V_x^2 + V_y^2}$$

$$= \sqrt{(8\pi)^2 (\cos^2 2\pi t + \sin^2 2\pi t)}$$

$$V = 8\pi$$

so 4th option is incorrect.

Q.153 A string is stretched between fixed points separated by 75.0 cm. It is observed to have resonant frequencies of 420 Hz and 315 Hz. There are no other resonant frequencies between these two. The lowest resonant frequency for this string is :

- (1) 105 Hz (2) 155 Hz
 (3) 205 Hz (4) 10.5 Hz

Ans. [1]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Wave theory, Ex-1, Q.No. 98, Page no. 41]

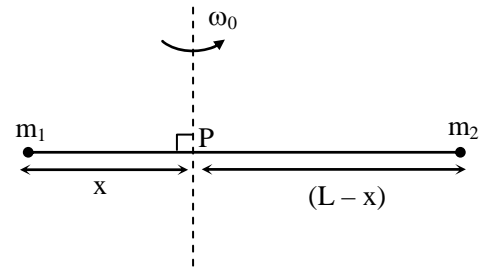
$$315 : 420 = 3 : 4$$

315 Hz is a 3rd harmonic of wire and 420 Hz is a 4th harmonic.

If 315 is a 3rd harmonic then $3n_{\text{fundamental}} = 315$

$$n_{\text{fundamental}} = \frac{315}{3} = 105\text{Hz}$$

Q.154 Point masses m_1 and m_2 are placed at the opposite ends of a rigid rod of length L and negligible mass. The rod is to be set rotating about an axis perpendicular to it. The position of point P on this rod through which the axis should pass so that the work required to set the rod rotating with angular velocity ω_0 is minimum, is given by :



(1) $x = \frac{m_2 L}{m_1 + m_2}$ (2) $x = \frac{m_1 L}{m_1 + m_2}$

(3) $x = \frac{m_1}{m_2} L$ (4) $x = \frac{m_2}{m_1} L$

Ans. [1]

Sol. Students may find similar question in CP [Chapter : Rotation, classroom notes]

$$I = m_1 x^2 + m_2 (L - x)^2$$

$$I = m_1 x^2 + m_2 L^2 + m_2 x^2 - 2m_2 Lx$$

$$\frac{dI}{dx} = 2m_1 x + 0 + 2xm_2 - 2m_2 L = 0$$

$$x(2m_1 + 2m_2) = 2m_2 L$$

$$x = \frac{m_2 L}{m_1 + m_2}$$

When I is minimum, work done $W = \frac{1}{2} I \omega_0^2$ will also be minimum.

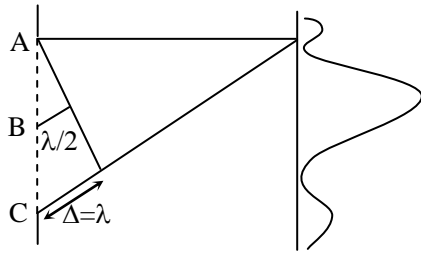
Q.155 At the first minimum adjacent to the central maximum of a single-slit diffraction pattern, the phase difference between the Huygen's wavelet from the edge of the slit and the wavelet from the midpoint of the slit is :

(1) $\frac{\pi}{8}$ radian (2) $\frac{\pi}{4}$ radian

(3) $\frac{\pi}{2}$ radian (4) π radian

Ans. [4]

Sol. Students may find similar question in CP
[Chapter : Wave optics, Classroom notes]



For first minima path difference between A and C is λ so path difference between A and B should be $\lambda/2$ and phase difference π

Q.156 A force $\vec{F} = \alpha\hat{i} + 3\hat{j} + 6\hat{k}$ is acting at a point $\vec{r} = 2\hat{i} - 6\hat{j} - 12\hat{k}$. The value of α for which angular momentum about origin is conserved is :

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

Ans. [2]

Sol. Students may find similar question in CP
Exercise Sheet: [Chapter : Rotation,
Solved Example 13, Page no. 134]

Angular momentum

$$\vec{L} = \text{constant}$$

$$\Rightarrow \text{Torque } \vec{\tau} = 0$$

$$\Rightarrow \vec{r} \times \vec{F} = 0$$

$$\begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 2 & -6 & -12 \\ \alpha & 3 & 6 \end{vmatrix} = 0$$

$$\Rightarrow (-36 + 36)\hat{i} - (12 + 12\alpha)\hat{j} + (6 + 6\alpha)\hat{k} = 0$$

$$\Rightarrow 0\hat{i} - 12(1 + \alpha)\hat{j} + 6(1 + \alpha)\hat{k} = 0$$

$$-12(1 + \alpha) = 0$$

$$\alpha = -1$$

Q.157 Two particles A and B, move with constant velocities \vec{v}_1 and \vec{v}_2 . At the initial moment their position vectors are \vec{r}_1 and \vec{r}_2 respectively. The condition for particles A and B for their collision is :

$$(1) \vec{r}_1 - \vec{r}_2 = \vec{v}_1 - \vec{v}_2$$

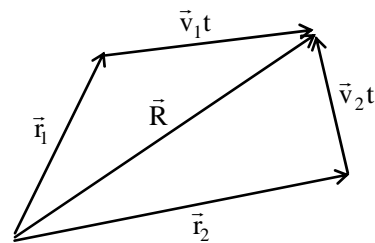
$$(2) \frac{\vec{r}_1 - \vec{r}_2}{|\vec{r}_1 - \vec{r}_2|} = \frac{\vec{v}_2 - \vec{v}_1}{|\vec{v}_2 - \vec{v}_1|}$$

$$(3) \vec{r}_1 \cdot \vec{v}_1 = \vec{r}_2 \cdot \vec{v}_2$$

$$(4) \vec{r}_1 \times \vec{v}_1 = \vec{r}_2 \times \vec{v}_2$$

Ans. [2]

Sol. Students may find similar question in CP
[Chapter : Vector, Classroom notes]



$$\vec{R} = \vec{r}_1 + \vec{v}_1 t = \vec{r}_2 + \vec{v}_2 t$$

$$\vec{r}_1 - \vec{r}_2 = (\vec{v}_2 - \vec{v}_1)t$$

$$\frac{\vec{r}_1 - \vec{r}_2}{|\vec{r}_1 - \vec{r}_2|} = \frac{(\vec{v}_2 - \vec{v}_1)t}{|\vec{v}_2 - \vec{v}_1|t}$$

$$\frac{\vec{r}_1 - \vec{r}_2}{|\vec{r}_1 - \vec{r}_2|} = \frac{\vec{v}_2 - \vec{v}_1}{|\vec{v}_2 - \vec{v}_1|}$$

Q.158 A nucleus of uranium decays at rest into nuclei of thorium and helium. Then :

- (1) The helium nucleus has less kinetic energy than the thorium nucleus
- (2) The helium nucleus has more kinetic energy than the thorium nucleus
- (3) The helium nucleus has less momentum than the thorium nucleus
- (4) The helium nucleus has more momentum than the thorium nucleus.

Ans. [2]

Sol. **Students may find similar question in CP Exercise Sheet: [Chapter : Nuclear Physics, Ex-2, Q.No. 158, Page no. 17]**



Momentum conservation

$$\Rightarrow |\vec{p}_{\text{Th}}| = |\vec{p}_{\text{He}}| = p$$

$$\text{Kinetic energy } K = \frac{p^2}{2m}$$

$$K \propto \frac{1}{m}$$

$$m_{\text{He}} < m_{\text{Th}}$$

$$\Rightarrow K_{\text{He}} > K_{\text{Th}}$$

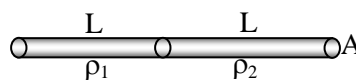
Q.159 Two metal wires of identical dimensions are connected in series. If σ_1 and σ_2 are the conductivities of the metal wires respectively, the effective conductivity of the combination is :

$$(1) \frac{\sigma_1 \sigma_2}{\sigma_1 + \sigma_2} \quad (2) \frac{2 \sigma_1 \sigma_2}{\sigma_1 + \sigma_2}$$

$$(3) \frac{\sigma_1 + \sigma_2}{2 \sigma_1 \sigma_2} \quad (4) \frac{\sigma_1 + \sigma_2}{\sigma_1 \sigma_2}$$

Ans. [2]

Sol. **Students may find similar question in CP [Chapter : Current Electricity, Classroom notes]**



$$R_{\text{eq}} = R_1 + R_2$$

$$\rho \frac{2L}{A} = \rho_1 \frac{L}{A} + \rho_2 \frac{L}{A}$$

$$2\rho = \rho_1 + \rho_2$$

$$\frac{2}{\sigma} = \frac{1}{\sigma_1} + \frac{1}{\sigma_2}$$

$$\frac{2}{\sigma} = \frac{\sigma_1 + \sigma_2}{\sigma_1 \sigma_2}$$

$$\sigma = \frac{2\sigma_1 \sigma_2}{\sigma_1 + \sigma_2}$$

Q.160 Light of wavelength 500 nm is incident on a metal with work function 2.28 eV. The de Broglie wavelength of the emitted electron is :

$$(1) \leq 2.8 \times 10^{-12} \text{ m}$$

$$(2) < 2.8 \times 10^{-10} \text{ m}$$

$$(3) < 2.8 \times 10^{-9} \text{ m}$$

$$(4) \geq 2.8 \times 10^{-9} \text{ m}$$

Ans. [4]

Sol. Students may find similar question in CP
[Chapter : P.E.E., Classroom notes]

$$E_{ph} = \frac{1240}{500} \text{ eV} = 2.48 \text{ eV}$$

$$\begin{aligned} K.E_{max} &= E_{ph} - W \\ &= 2.48 - 2.28 \\ &= 0.2 \text{ eV} \end{aligned}$$

$$\begin{aligned} * \lambda_{e \text{ min}} &= \frac{12.27}{\sqrt{K.E_{max} \text{ (eV)}}} \text{ \AA} \\ &= \frac{12.27}{\sqrt{0.2}} \text{ \AA} \\ &= 27.436 \text{ \AA} \\ &= 27.436 \times 10^{-10} \text{ m} \\ \lambda_{min.} &= 2.7436 \times 10^{-9} \text{ m} \\ \lambda &\geq \lambda_{min} \end{aligned}$$

Q.161 4.0 g of a gas occupies 22.4 liters at NTP. The specific heat capacity of the gas at constant volume is $5.0 \text{ JK}^{-1} \text{ mol}^{-1}$. If the speed of sound in this gas at NTP is 952 ms^{-1} , then the heat capacity at constant pressure is (Take gas constant $R = 8.3 \text{ JK}^{-1} \text{ mol}^{-1}$)

- (1) $8.5 \text{ JK}^{-1} \text{ mol}^{-1}$
- (2) $8.0 \text{ JK}^{-1} \text{ mol}^{-1}$
- (3) $7.5 \text{ JK}^{-1} \text{ mol}^{-1}$
- (4) $7.0 \text{ JK}^{-1} \text{ mol}^{-1}$

Ans. [1]

Sol. Students may find similar question in CP
Exercise Sheet: [Chapter : KTG, Solved Example 9, Page no. 123]

$$M = 4 \text{ gm}$$

$$V = 22.4 \text{ litre}$$

$$C_V = 5 \frac{\text{J}}{\text{mole K}}$$

$$v_{\text{sound}} = 952 \text{ m/sec}$$

$$C_P = ?$$

$$v_{\text{sound}} = \sqrt{\frac{\gamma PV}{M}}$$

$$\gamma = \frac{M}{PV} v_{\text{sound}}^2 = \frac{C_P}{C_V}$$

$$C_P = C_V \left(\frac{M}{PV} \right) v_{\text{sound}}^2$$

$$= 5 \left[\frac{4 \times 10^{-3}}{10^{-5} \times 22.4 \times 10^{-3}} \right] (952)^2$$

$$= \frac{20}{22.4} \times (952)^2 \times 10^{-5}$$

$$= 809,200 \times 10^{-5} = 8.09 \text{ J/moles k}$$

Q.162 A series R-C circuit is connected to an alternating voltage source. Consider two situations:

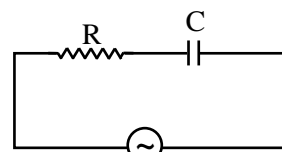
- (a) When capacitor is air filled.
- (b) When capacitor is mica filled.

Current through resistor is i and voltage across capacitor is V then :

- (1) $V_a = V_b$
- (2) $V_a < V_b$
- (3) $V_a > V_b$
- (4) $i_a > i_b$

Ans. [3]

Sol. Students may find similar question in CP
[Chapter : AC, Classroom notes]



$$V = V_0 \sin \omega t$$

$$X_C = \frac{1}{2\pi fC}$$

current in circuit

$$I = \frac{V}{Z} = \frac{V}{\sqrt{R^2 + \left(\frac{1}{2\pi fC}\right)^2}}$$

$$\text{or } I = \frac{2\pi fC}{\sqrt{4\pi^2 f^2 C^2 R^2 + 1}} \times V$$

Voltage drop across capacitor

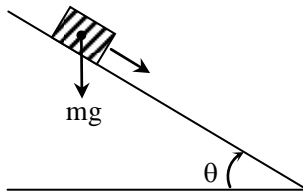
$$V_C = I \times X_C$$

$$= \frac{2\pi fC \times V}{\sqrt{4\pi^2 f^2 C^2 R^2 + 1}} \times \frac{1}{2\pi fC}$$

$$V_C = \frac{V}{\sqrt{4\pi^2 f^2 C^2 R^2 + 1}}$$

When mica is introduced capacitance will increase, hence voltage across capacitor gets decrease.

Q.163 A plank with a box on it at one end is gradually raised about the other end. As the angle of inclination with the horizontal reaches 30° , the box starts to slip and slides 4.0 m down the plank in 4.0 s. The coefficients of static and kinetic friction between the box and the plank will be, respectively :



- (1) 0.4 and 0.3
- (2) 0.6 and 0.6
- (3) 0.6 and 0.5
- (4) 0.5 and 0.6

Ans. [3]

Sol. Students may find similar question in CP [Chapter : Friction, classroom notes]

$$\mu_s = \tan 30^\circ = \frac{1}{\sqrt{3}} = 0.57 \approx 0.6$$

$$S = ut + \frac{1}{2} at^2$$

$$4 = 0 + \frac{1}{2} (g \sin 30^\circ - \mu_k \cos 30^\circ)(4)^2$$

$$0.5 = 10 \times \frac{1}{2} - \mu_k 10 \times \frac{\sqrt{3}}{2}$$

$$5\sqrt{3}\mu_k = 4.5$$

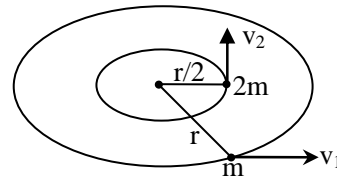
$$\mu_k = 0.51$$

Q.164 Two stones of masses m and $2m$ are whirled in horizontal circles, the heavier one in a radius $\frac{r}{2}$ and lighter one in radius r . The tangential speed of lighter stone is n times that of the value of heavier stone when they experience same centripetal forces. The value of n is :

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

Ans. [2]

Sol. Students may find similar question in CP [Chapter : Circular Motion, Minor Test]



Equal centripetal force

$$\frac{mv_1^2}{r} = \frac{(2m)v_2^2}{r/2}$$

$$\Rightarrow v_1^2 = 4v_2^2$$

$$\Rightarrow v_1 = 2v_2$$

Q.165 The coefficient of performance of a refrigerator is 5. If the temperature inside freezer is -20°C , the temperature of the surroundings to which it rejects heat is :

- (1) 21°C (2) 31°C
 (3) 41°C (4) 11°C

Ans. [2]

Sol. **Students may find similar question in CP [Chapter : Thermodynamics, Classroom notes]**

$$\alpha = 5 \quad T_2 = -20^\circ\text{C}$$

$$= -20 + 273$$

$$T_2 = 253\text{K}$$

$$T_1 = ?$$

$$\alpha = \frac{T_2}{T_1 - T_2}$$

$$\Rightarrow 5 = \frac{253}{T_1 - 253}$$

$$\Rightarrow 5T_1 - 1265 = 253$$

$$T_1 = \frac{1518}{5} = 303.6\text{K}$$

$$= 30.6^\circ\text{C} \approx 31^\circ\text{C}$$

$$T_1 = \text{temp. of surrounding}$$

$$T_2 = \text{temp. of source (inside temp.)}$$

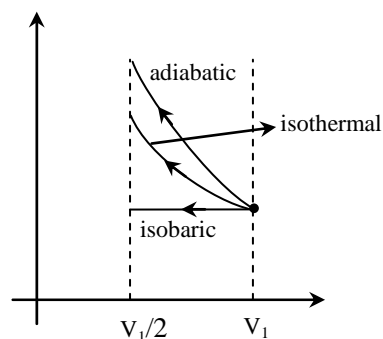
Q.166 An ideal gas is compressed to half its initial volume by means of several processes. Which of the process results in the maximum work done on the gas ?

- (1) Isothermal (2) Adiabatic
 (3) Isobaric (4) Isochoric

Ans. [2]

Sol. **Students may find similar question in CP [Chapter Thermodynamics, Classroom notes]**

$$V_1 \rightarrow V_1/2$$



Work done = area under curve

$$W_{\text{adiabatic}} > W_{\text{isothermal}} > W_{\text{isobaric}}$$

Q.167 A ball is thrown vertically downwards from a height of 20 m with an initial velocity v_0 . It collides with the ground, loses 50 percent of its energy in collision and rebounds to the same height. The initial velocity v_0 is :

(Take $g = 10 \text{ ms}^{-2}$)

- (1) 10 ms^{-1} (2) 14 ms^{-1}
 (3) 20 ms^{-1} (4) 28 ms^{-1}

Ans. [3]



Sol.

Students may find similar question in CP

[Chapter : Work, power, energy, Classroom notes]

$$0.5 \left(mgh + \frac{1}{2}mv^2 \right) = mgh$$

$$0.25mv^2 = 0.5mgh$$

$$v = \sqrt{2gh}$$

$$= \sqrt{2 \times 10 \times 20} = \sqrt{400} = 20 \text{ m/s}$$

Q.168 On a frictionless surface, a block of mass M moving at speed v collides elastically with another block of same mass M which is initially at rest. After collision the first block moves at an angle θ to its initial direction and has a speed $\frac{v}{3}$. The second block's speed after the collision is :

(1) $\frac{\sqrt{3}}{2}v$

(2) $\frac{2\sqrt{2}}{3}v$

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

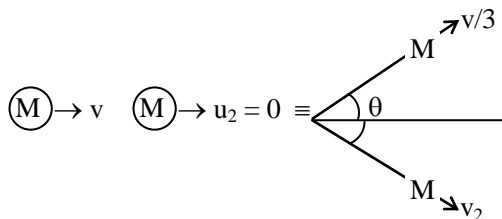
(4) $\frac{3}{\sqrt{2}}v$

Ans. [2]

Sol.

Students may find similar question in CP

Exercise Sheet: [Chapter : Work, power, energy , Ex-3B, Q.No. 9, Page no. 101]



Using conservation of K.E

$$\frac{1}{2}Mv^2 + 0 = \frac{1}{2}M\left(\frac{v}{3}\right)^2 + \frac{1}{2}Mv_2^2$$

$$v^2 = \frac{v^2}{9} + v_2^2$$

$$v_2^2 = \frac{8v^2}{9}$$

$$v_2 = \frac{2\sqrt{2}v}{3}$$

Q.169 If potential(in volts) in a region is expressed as $V(x, y, z) = 6xy - y + 2yz$, the electric field (in N/C) at point (1, 1, 0) is :

(1) $-(6\hat{i} + 9\hat{j} + \hat{k})$ (2) $-(3\hat{i} + 5\hat{j} + 3\hat{k})$

(3) $-(6\hat{i} + 5\hat{j} + 2\hat{k})$ (4) $-(2\hat{i} + 3\hat{j} + \hat{k})$

Ans. [3]

Sol.

Students may find similar question in CP

Exercise Sheet: [Chapter : Electrostatics, Ex-3A, Q.No. 26, Page no. 56]

$$V = 6xy - y + 2yz$$

$$E = -\frac{\partial V}{\partial x}\hat{i} - \frac{\partial V}{\partial y}\hat{j} - \frac{\partial V}{\partial z}\hat{k}$$

$$E = -6y\hat{i} - (6x - 1)\hat{j} - 2y\hat{k}$$

At (1, 1, 0)

$$E = -6\hat{i} - 5\hat{j} - 2\hat{k}$$

$$E = -(6\hat{i} + 5\hat{j} + 2\hat{k})$$



Q.170 Two slits in Young's experiment have widths in the ratio 1 : 25. The ratio of intensity at the maxima and minima in the interference pattern, $\frac{I_{max}}{I_{min}}$ is :

- (1) $\frac{4}{9}$
- (2) $\frac{9}{4}$
- (3) $\frac{121}{49}$
- (4) $\frac{49}{121}$

Ans. [2]

Sol. **Students may find similar question in CP Exercise Sheet: [Chapter : Wave Optics , Ex-1B , Q.No. 2, Page no.89]**

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

$$= \left(\frac{\sqrt{\frac{1}{25} + 1}}{\sqrt{\frac{1}{25} - 1}} \right)^2 = \frac{36}{16} = \frac{9}{4}$$

Q.171 The heart of a man pumps 5 liters of blood through the arteries per minute at a pressure of 150 mm of mercury. If the density of mercury be $13.6 \times 10^3 \text{ kg/m}^3$ and $g = 10 \text{ m/s}^2$, then the power of heart in watt is :

- (1) 1.50
- (2) 1.70
- (3) 2.35
- (4) 3.0

Ans. [2]

Sol. **Students may find similar question in CP Exercise Sheet: [Chapter : Fluid Mechanics, Ex-1A, Q.No. 4, Page no. 215]**

$$P = \frac{W}{t} = \frac{mgh}{t} = \frac{V}{t} \rho gh$$

$$= \frac{5 \times 10^{-3}}{60} \times 13.6 \times 10^3 \times 10 \times 150 \times 10^{-3}$$

$$= \frac{5 \times 13.6 \times 150}{6} \times 10^{-3}$$

$$= 1700 \times 10^{-3}$$

P = 1.7 Watt

Q.172 A proton and an alpha particle both enter a region of uniform magnetic field B, moving at right angles to the field B. If the radius of circular orbits for both the particles is equal and the kinetic energy acquired by proton is 1MeV, the energy acquired by alpha particle will be :

- (1) 1 MeV
- (2) 4 MeV
- (3) 0.5 MeV
- (4) 1.5 MeV

Ans. [1]

Sol. **Students may find similar question in CP Exercise Sheet: [Chapter : Magnetic field, Solved example 19 Page no. 35]**

Radius in magnetic field

$$R = \frac{mv}{qB} = \frac{\sqrt{2mE}}{qB}$$



$$E = \frac{q^2 B^2 R^2}{2m}$$

For proton

$$E_1 = \frac{e^2 \times B^2 \times R^2}{2 \times m_p}$$

for α -particle

$$E_2 = \frac{(2e)^2 \times B^2 \times R^2}{2 \times 4m_p}$$

$$\therefore E_1 = E_2$$

Q.173 The input signal given to a CE amplifier having a voltage gain of 150 is $V_i = 2 \cos \left(15t + \frac{\pi}{3} \right)$. The corresponding output signal will be :

(1) $300 \cos \left(15t + \frac{4\pi}{3} \right)$

(2) $300 \cos \left(15t + \frac{\pi}{3} \right)$

(3) $75 \cos \left(15t + \frac{2\pi}{3} \right)$

(4) $2 \cos \left(15t + \frac{5\pi}{6} \right)$

Ans. [1]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Electronics, Q.No. 30, Page no. 191]

$$V_i = 2 \cos (15t + \pi/3)$$

$$A_v = \frac{V_o}{V_i}$$

$$V_o = A_v \times V_i = 300$$

$$V_{output} = 300 \cos (15t + \pi/3 + \pi)$$

$$V_{output} = 300 \cos (15t + 4\pi/3)$$

Q.174 If dimensions of critical velocity v_c of a liquid flowing through a tube are expressed as $[\eta^x \rho^y r^z]$, where η , ρ and r are the coefficient of viscosity of liquid, density of liquid and radius of the tube respectively, then the values of x , y , and z are given by :

(1) 1, 1, 1

(2) 1, -1, -1

(3) -1, -1, 1

(4) -1, -1, -1

Ans. [2]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Unit & Dimensions, Ex-2, Q.No. 42, Page no. 24]

$$V_c = \eta^x \rho^y r^z$$

$$M^0 L^1 T^{-1} = (M^1 L^{-1} T^{-1})^x (M^1 L^{-3})^y (L^1)^z$$

$$M^0 L^1 T^{-1} = M^{x+y} L^{-x-3y+z} T^{-x}$$

$$-x = -1$$

$$x = 1 \dots (1)$$

$$x + y = 0 = 0$$

$$y = -x = -1 \dots (2)$$

$$-x - 3y + z = 1$$

$$-1 - 3(-1) + z = 1$$

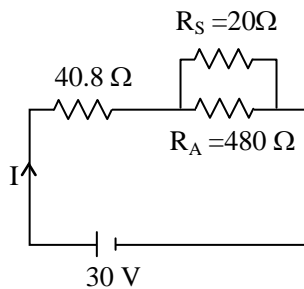
$$z = -1$$

Q.175 A circuit contains an ammeter, a battery of 30 V and a resistance 40.8 ohm all connected in series. If the ammeter has a coil of resistance 480 ohm and a shunt of 20 ohm, the reading in the ammeter will be :

- (1) 1 A
- (2) 0.5 A
- (3) 0.25 A
- (4) 2 A

Ans. [2]

Sol. Students may find similar question in CP [Chapter : Current electricity, Classroom notes]



$$R_{eq} = 40.8 + \frac{480 \times 20}{500}$$

$$= 40.8 + 19.2$$

$$= 60 \Omega$$

$$I = \frac{30}{60} = 0.5 \text{ amp}$$

So reading of ammeter = 0.5 amp

Q.176 Water rises to a height 'h' in capillary tube. If the length of capillary tube above the surface of water is made less than 'h', then :

- (1) Water does not rise at all.
- (2) water rises upto the tip of capillary tube and then starts overflowing like a fountain.
- (3) water rises upto the top of capillary tube and stays there without overflowing.
- (4) water rises upto a point a little below the top and stays there

Ans. [3]

Sol. Students may find similar question in CP [Chapter : Surface tension, Classroom notes]

Height of water column > length of tube

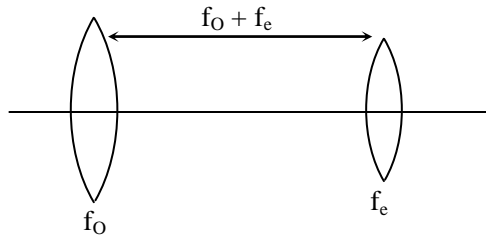
⇒ so liquid will be stay there

Q.177 In an astronomical telescope in normal adjustment a straight black line of length L is drawn on inside part of objective lens. The eye-piece forms a real image of this line. The length of the image is I. The magnification of the telescope is :

- (1) $\frac{L}{I}$
- (2) $\frac{L}{I} + 1$
- (3) $\frac{L}{I} - 1$
- (4) $\frac{L + I}{L - I}$

Ans. [1]

Sol. Students may find similar question in CP
[Chapter : Optical Instrument, Classroom notes]



For eye – piece lens

$$m = \frac{f}{f + u} = \frac{h_I}{h_O}$$

$$\Rightarrow \frac{f_e}{f_e + [-(f_o + f_e)]} = \frac{I}{L}$$

$$\Rightarrow -\frac{f_e}{f_o} = \frac{I}{L}$$

$$\Rightarrow \frac{f_o}{f_e} = -\frac{L}{\ell} = m.p.$$

(–) sign stands for inverted image

Q.178 The value of coefficient of volume expansion of glycerin is $5 \times 10^{-4} \text{ K}^{-1}$. The fractional change in the density of glycerin for a rise of 40°C in its temperature, is :

(1) 0.010 (2) 0.015

(3) 0.020 (4) 0.025

Ans. [3]

Sol. Students may find similar question in CP
[Chapter : Thermal Expansion, CP Major Paper]

$$\rho = \rho_0 (1 + Y\Delta T)$$

$$\rho - \rho_0 = \rho_0 Y \Delta T$$

fractional change

$$\begin{aligned} \frac{\rho - \rho_0}{\rho_0} &= Y\Delta T = 5 \times 10^{-4} \times 40 \\ &= 200 \times 10^{-4} = 0.020 \end{aligned}$$

Q.179 A photoelectric surface is illuminated successively by monochromatic light of wavelength λ and $\frac{\lambda}{2}$. If the maximum kinetic energy of the emitted photoelectrons in the second case is 3 times that in the first case, the work function of the surface of the material is :

(h = Planck's constant, c = speed of light)

- (1) $\frac{hc}{3\lambda}$ (2) $\frac{hc}{2\lambda}$
(3) $\frac{hc}{\lambda}$ (4) $\frac{2hc}{\lambda}$

Ans. [2]

Sol. Students may find similar question in CP
Exercise Sheet: [Chapter : P.E.E , Ex-1, Q.No. 34, Page no. 75]

$$k_{\max} = E - \phi$$

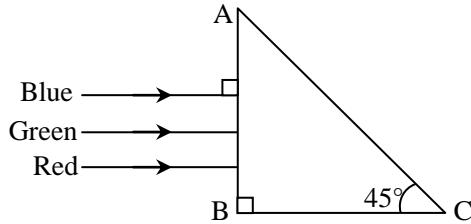
$$k = \frac{hc}{\lambda} - \phi \quad \dots (1)$$

$$3k = \frac{hc}{(\lambda/2)} - \phi \quad \dots (2)$$

On solving

$$\phi = \frac{hc}{2\lambda}$$

Q.180 A beam of light consisting of red, green and blue colours is incident on a right angled prism. The refractive index of the material of the prism for the above red, green and blue wavelengths are 1.39, 1.44 and 1.47, respectively.

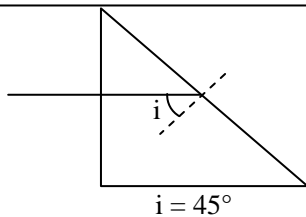


The prism will :

- (1) separate the red colour part from the green and blue colours
- (2) separate the blue colour part from the red and green colours
- (3) separate all the three colours from one another
- (4) not separate the three colours at all

Ans. [1]

Sol. **Students may find similar question in CP [Chapter : Ray Optics, Classrooms Notes]**



\therefore for no emergence

$$i > C$$

$$\sin i > \sin C$$

$$\sin i > \frac{1}{\mu}$$

$$\frac{1}{\sqrt{2}} > \frac{1}{\mu}$$

$$\mu > \sqrt{2}$$

Hence green and Blue colour will not emerge out