

Global Education of Science

Subject

: Biology, Chemistry,

Mathematics, Physics : 11,12

Standard

Total Mark: 720

MCQ and MCQ

Paper Set : 1 Date : 27-07-2024 Time : 0H:20M

Biology - Section A (MCQ)

- (1) The unique mammalian characteristics are: [NEET 2023]
 - (A) pinna, monocondylic skull and mammary glands
 - (B) hairs, tympanic membrane and mammary glands
 - (C) hairs, pinna and mammary glands
 - (D) hairs, pinna and indirect development
- (2) Identify the wrong statement with reference to transport of OXYGEN. [NEET 2020]
 - (A) Low pCO_2 in alveoli favours the formation of oxyhaemoglobin.
 - (B) Binding of oxygen with haemoglobin is mainly related to partial pressure of O_2 .
 - (C) Partial pressure of CO_2 can interfere with O_2 binding with haemoglobin.
 - (D) Higher H^+ conc. in alveoli favours the formation of oxyhaemoglobin.
- (3) In cockroach, excretion is brought about by-
 - A. Phallic gland B. Urecose gland C. Nephrocytes D. Fat body E. Collaterial glands

Choose the correct answer from the options given below : [NEET 2023]

- (A) B and D only (B) A and E only
- (C) A, B and E only (D) B, C and D only
- (4) Match List I with List II :

List I	List II
A. Pleurobrachia	I. Mollusca
B. Radula	II. Ctenophora
C. Stomochord	III. Osteichthyes
D. Air bladder	IV. Hemichordata

Choose the correct answer from the options given below : **[NEET 2024]**

- (A) A II, B I, C IV, D III
- (B) A II, B IV, C I, D III
- (C) A IV, B III, C II, D I
- (D) A IV, B II, C III, D I
- (5) Which of the following statements is incorrect? [NEET 2021]
 - (A) Both ATP and $NADPH + H^+$ are synthesized during non-cyclic photophosphorylation.
 - (B) Stroma lamellae have PS I only and lack NADPreductase.
 - (C) Grana lamellae have both PS I and PS II.
 - (D) Cyclic photophosphorylation involves both PS I and PS - II.

- (6) The plant hormone used to destroy weeds in a field is : [NEET 2021] (A) *IAA*
 - (B) NAA (D) *IBA*
 - (C) 2, 4 D
- (7) What is the net gain of ATP when each molecule of glucose is converted to two molecules of pyruvic acid? [NEET 2022]
 - (A) Six (B) Two
 - (C) Eight (D) Four
- (8) Identify the incorrect statement. [NEET 2020]
 - (A) Due to deposition of tannins, resins, olls etc., heart wood is dark in colour
 - (B) Heart wood does not conduct water but gives mechanical support
 - (C) Sapwood is involved in conduction of water and minerals from root to leaf
 - (D) Sapwood is the innemost secondary xylem and is lighter in colour
- (9) Which of the following is not correct?
 - (A) Robert Brown discovered the cell.
 - (B) Schleiden and Schwann formulated the cell theory.
 - (C) Virchow explained that cells are formed from pre-existing cells.
 - (D) A unicellular organism carries out its life activities within a single cell.
- (10) Hormones may be [AIPMT 2004]
 - (A) Amino acid derivatives (B) Peptides
 - (C) Steroids (D) All the above
- (11) Which one of the following organisms bears hollow and pneumatic long bones? [NEET 2021]
 - (A) Neophron (B) Hemidactylus
 - (D) Ornithorhynchus (C) Macropus
- (12) Regarding Meiosis, which of the statements is incorrect? [NEET 2022]
 - (A) DNA replication occurs in S phase of Meiosis-II
 - (B) Pairing of homologous chromosomes and recombination occurs in Meiosis-I
 - (C) Four haploid cells are formed at the end of Meiosis-II
 - (D) There are two stages in Meiosis, Meiosis-I and II
- (13) Spindle fibers attach to kinetochores of chromosomes during [NEET 2024] (B) Anaphase
 - (A) Metaphase (C) Telophase
- (D) Prophase
- (14) Radial symmetry is NOT found in adults of phylum [NEET 2023] (A) Echinodermata (B) Ctenophora
 - (C) Hemichordata
- (D) Coelenterata

- (15) Which one of the following is not true regarding the release of energy during ATP synthesis through chemiosmosis ? It involves: [NEET 2022]
 - (A) Breakdown of electron gradient
 - (B) Movement of protons across the membrane to the stroma
 - (C) Reduction of NADP to $NADPH_2$ on the stroma side of the membrane
 - (D) Breakdown of proton gradient
- (16) Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason (R). Assertion (A):

Osteoporosis is characterised by decreased bone mass and increased chances of fractures.

Reason (R):

Common cause of osteoporosis is increased levels of estrogen.

In the light of the above statements, choose the most appropriate answer from the options given below: [NEET 2022]

- (A) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
- (B) (A) is correct but (R) is not correct
- (C) (A) is not correct but (R) is correct
- (D) Both (A) and (R) are correct and (R) is the correct explanation of (A)
- (17) Which of the following events does not occur in rough endoplasmic reticulum? [NEET 2018]
 - (A) Phospholipid synthesis
 - (B) Protein folding
 - (C) Cleavage of signal peptide
 - (D) Protein glycosylation
- (18) The Golgi complex participates in [NEET 2018]
 - (A) Activation of amino acid
 - (B) Fatty acid breakdown
 - (C) Respiration in bacteria
 - (D) Formation of secretory vesicles

(19) Match List *I* with List *II*.

List I	List II
A. Mast cells	I. Ciliated epithelium
<i>B.</i> Inner surface of bronchiole	<i>II</i> . Areolar connective tissue
C. Blood	<i>III</i> . Cuboidal epithe- lium
D. Tubular parts of nephron	<i>IV</i> . Specialised connective tissue

Choose the correct answer from the options give below: [NEET 2023]

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

- (C) A-II, B-III, C-I, D-IV (D) A-II, B-I, C-IV, D-III
- (20) Select the correct statements with reference to chordates. A. Presence of a mid-dorsal, solid and double nerve cord.
 - *B*. Presence of closed circulatory system. *C*. Presence of paired pharyngeal gill slits.
 - D. Presence of dorsal heart
 - E. Triploblastic pseudocoelomate animals.

Choose the correct answer from the options given below: [NEET 2023]

- (A) C, D and E only (B) A, C and D only
- (C) B and C only (D) B, D and E only
- (21) Which of the following structures or regions is incorrectly paired with its function? [NEET 2018]
 - (A) Corpus callosum : band of fibers connecting left and right cerebral hemispheres
 - (B) Medulla oblongata: Controls respiration and cardiovascular reflexes
 - (C) Hypothalamus: Production of releasing hormones and regulation of temperature, hunger and thirst
 - (D) Limbic system: Consists of fibre tracts that interconnect different regions of brain; controls movement.
- (22) Which of the following statements about inclusion bodies is incorrect? [NEET 2020]
 - (A) These represent reserve material in cytoplasm.
 - (B) They are not bound by any membrane.
 - (C) These are involved in ingestion of food particles.
 - (D) They lie free in the cytoplasm.
- (23) Given below are two statements:

Statement *I*: Mitochondria and chloroplasts both double membranes bound organelles.

Statement *II*: Inner membrane of mitochondria is relatively less permeable, as compared chloroplast.

In the light of the above statements, choose the mis appropriate answer from the options given below: [NEET 2024](A) Both Statement *I* and Statement *II* are incorrect.

- (B) Statement I is correct but Statement II is incorrect.
- (C) Statement I is incorrect but Statement II is correct.
- (D) Both Statement I and Statement II are correct.
- (24) What is the role of NAD^+ in cellular respiration? [NEET 2018]
 - (A) It is the final electron acceptor for anaerobic respiration
 - (B) It functions as an enzyme.
 - (C) Sr It is a nucleotide source for ATP synthesis
 - (D) It functions as an electron carrier.
- (25) The experimental proof for. semiconservative replication of DNA was first shown in a $_{\rm [NEET 2018]}$
 - (A) Virus (B) Fungus.
 - (C) Plant (D) Bacterium
- (26) Select the *correct* match : [NEET 2018]
 - (A) Francois Jacob and Jacques Monod Lac operon
 - (B) Alec Jeffreys Streptococcus pneumoniae
 - (C) Matthew Meselson and F. Stahl Pisumsativum
 - (D) Alfred Hershey and Martha Chase -TMV
- (27) Match the following columns and select the correct option.

Column –I	Column –II
(a) Clostridium butylicum	(i) Cyclosporin $-A$
(b) Trichoderma polysporum	(<i>ii</i>) Butyric Acid
(c) Monascus pur- pureus	(iii) Citric Acid
(d) Aspergillus niger	(<i>iv</i>) Blood cholesterol lowering agent
(a) (b) (c) (d) [NEET	[2020]
(A) (<i>iv</i>) (<i>iii</i>) (<i>iii</i>) ((i) (B) (iii) (iv) (ii) (
(C) (ii) (i) (iv) (ii	(i) (D) (i) (ii) (iv) (ii)

- (28) Use of bioresources by multinational companies and organisations without authorisation from the concerned country and its people is called [NEET 2018]
 - (A) Bioexploitaion
 - (B) Bio-infringement
 - (C) Biodegradation
 - (D) Biopiracy
- (29) What is the fate of a piece of *DNA* carrying only gene of interest which is transferred into an alien organism?

A. The piece of DNA would be able to multiply itself independently in the progeny cells of the organism.

B. It may get integrated into the genome of the recipient.

C. It may multiply and be inherited along with the host DNA.

D. The alien piece of DNA is not an integral part of chromosome.

E. It shows ability to replicate.

Choose the correct answer from the options given below: [NEET 2024]

- (C) A and E only (D) A and B only
- (30) Match List I with List II :

List I (Interaction)	List <i>II</i> (Species <i>A</i> and <i>B</i>)
A. Mutualism	I. + (A), 0(B)
B. Commensalism	II(A), 0(B)
C. Amensalism	III. + (A), -(B)
D. Parasitism	IV. + (A), + (B)

Choose the correct answer from the options given below: [NEET 2023]

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

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

(31) Given below are two statements:

Statement I: Mendel studied seven pairs of contrasting traits in pea plants and proposed the Laws of Inheritance Statement II :

Seven characters examined by Mendel in his experiment on pea plants were seed shape and colour, flower colour, pod shape and colour, flower position and stem height In the light of the above statements, choose the correct answer from the options given below: [NEET 2022]

	(B) Statement I is correct but Statement II is incorrect		
	(C) Statement I is incorrect but Statement II is correct		
	D) Both Statement I and Statement II are correct		
(32)	Which part of poppy pl "Smack"? [NEET 2018]	nich part of poppy plant is used to obtain the drug	
	(A) Leaves	(B) Latex	
	(C) Roots	(D) Flowers	
(33)	Melotic division of the 2020]	secondary oocyte is completed [NEET	
	(A) At the time of fusio	n of a sperm with an ovum	
	(B) Prior to ovulation		
	(C) At the time of copu	lation	
	(D) After zygote format	tion	
(34)	The recombination frequency between the genes $a \& c$ is 5% , $b \& c$ is 15% , $b \& d$ is 9% , $a \& b$ is 20% , $c \& d$ is 24% and $a \& d$ is 29% . What will be the sequence of these genes on a linear chromosome? [NEET 2022]		
	$(\mathbf{A}) \ a, b, a, c$	$(\mathbf{D}) = \frac{1}{2} \mathbf{b} = \mathbf{c}$	
(35)	(C) <i>a</i> , <i>c</i> , <i>b</i> , <i>a</i>	(D) a, a, b, c	
(33)	(A) WWF	(B) $FOAM$	
	(C) <i>IUCN</i>	(D) <i>GEAC</i>	
	Biology - Sectio	\mathbf{R} (MCO) (Attornet any 10)	
• • • • •	Diology Seette		
(36)	Match List <i>I</i> with List <i>I</i>	Ι	
	List I		
	A. Common cold	I. Plasmodium	
	B. Haemozoin	II. Typhoid	
	C. Widal test	III. Rhinoviruses	
	D. Allergy IV. Dust mites		
	[NEET 2024]		
	(A) $A - I, B - III, C - II, D - IV$		
	(B) $A - III, B - I, C - II, D - IV$		
	(C) $A - IV, B - II, C - III, D - I$		
	(D) $A - II, B - IV, C$	-III, D-I	
(37)	Select the <i>correct</i> mate	h [NEET 2018]	
	(A) G. Mendel -Transfor	mation	
	(B) Ribozymo -Nucleic	acid	
	(C) T.H. Morgan -Transduction		
	(C) T.H. Morgan -Transo	uction	
	(C) T.H. Morgan -Transo (D) $F_2 \times \text{Recessive pare}$	uction ent -Dihybrid cross	

(A) Both Statement I and Statement II are incorrect

(38) During the process of gene amplification using PCR, if very high temperature is not maintained in the beginning, then which of the following steps of PCR will be affected first? [NEET 2021]

(B) Extension

- (A) Annealing
- (C) Denaturation (D) Ligation
- (39) Which one of the following is the sequence on corresponding coding strand, if the sequence on mRNA formed is as follows 5'AUCGAUCGAUCGAUCGAUCGAUCGAUCGAUCGA'?

	[NEET 2023]				(A) $-160^{o}C$		(B) −120°C	
	(A) 3'ATCGATCGAT	CGATCGATCGATC	CGATCG5'		(C) $-196^{\circ}C$		(D) $-80^{\circ}C$	
	(B) 5'UAGCUAGCUA	GCUAGCUAGCUA	GCUAGC3'	UAGC3' (46) Given		Given below are two statements : one is labelled as		
	(C) 3'UAGCUAGCUA	GCUAGCUAGCUA	GCUAGC5'		Assertion (A) and the other is labelled as Reason (R) .			
	(D) 5'ATCGATCGAT	CGATCGATCGATC	CGATCG3'		Mendel's law of Ind	lependen	t assortment does not hold	
(40)	Given below are two st Assertion A and the oth Assertion A : Endometri blastocyst. Reason R : In the absended degenerates that cause In the light of the above answer from the option	atements: one is labell ner is labelled as Reaso um is necessary for imp ce of fertilization, the c s disintegration of end e statements, choose t is given below: [NEET 202	ed as n <i>R.</i> plantation of corpus luteum ometrium. he correct 3]		good for the genes chromosome. Reason (R) : Closely located gen In the light of the a answer from the op (A) Both (A) and (i) explanation of	that are l nes assort bove stat ptions give R) are cor (A)	independently. ements, choose the correct en below: [NEET 2022] rrect but (R) is not the correct	t
	(A) A is false but R is tr	ue.			(B) (A) is correct b	ut (R) is r	not correct	
	(B) Both A and R are tr	tue and R is the correct	t explanation		(C) (A) is not corre	ct but $(R$) is correct	
	of A. (C) Both A and R are tr	we but R is NOT the co	orrect		(D) Both (A) and (A) explanation of	(A) are cor (A)	rrect and (R) is the correct	
	explanation of A.(D) A is true but R is fa	lse.		(47)	Which of the follow pollen as fossils? [N	ving has p EET 2018]	proved helpful in preserving	
(41)	Upon exposure to UV ra	adiation, DNA stained v	with ethidium		(A) Sporopollenin		(B) Pollenkitt	
	bromide will show [NEET	2023]			(C) Oil content		(D) Cellulosic intine	
	(A) Bright blue selection	(B) Bright red CC	Diour	(48)	Identify the microo	rganism v	which is responsible for the	_
(42)	Which one of the follow	(D) Bright yellow	t be		A : [NEET 2022]	munosup		'
(12)	connected to Predation	1? [NEET 2022]			(A) Clostridium but	ylicum		
	(A) It might lead to exti	nction of a species			(B) Aspergillus nige	er		
	(B) Both the interacting	g species are negatively	/ impacted		(C) Streptocaccus	cenevisiae	2	
	(C) It is necessitated by	nature to maintain the	e ecological 📝		(D) Trichoderma po	lysporum	I	
	balance			(49)	Assertion (A) : A pe	erson goe	es to high altitude and	
(42)	(D) It helps in maintaini	ng species diversity in	a community		experiences 'altitud	le sicknes palpitatio	s' with symptoms like breathing and set the symptoms like breathing and set of the symptoms in the symptoms in the symptoms is the symptoms in the symptoms is the symptoms in the symptoms is	ופ
(43)	For effective treatment understanding its patho	of the disease, early d	agnosis and ortant. Which		Reason (R) : Due to	o low atm	nospheric pressure at high	
	of the following molecu	ular diagnostic techniqu	ues is very		altitude, the body o	does not g	get sufficient oxygen.	
	(A) Western Plotting To	on? [NEET 2021]			In the light of the a	bove stat	ements, choose the correct	
	(A) Western Blotting Te	achaicua			(A) Both (A) and (A)	R) are tru	e and (R) is the correct	
	(6) ELLCA Technique	echnique			explanation of	(A)		
	(C) <i>ELISA</i> reconfique				(B) Both (A) and (F	R) are true	e but (R) is not the correct	
(1 1)	(D) Hybridization lechn	lique	navor fram		explanation of	(A)		
(44)	the options given below	V :	nswer from		(C) (A) is true but ((R) is false	e	
	List I	List II]		(D) (A) is false but	(R) is true	2	
	A RNA polymerase	I snRNPs	-	(50)	Which of the follow	ving is not	t a natural/traditional	
	III		-		(A) Periodic abstine	ence	(B) Lactational amenorrhea	
	<i>B</i> hline Termination of transcription	II Promotor	[NEET 2024]		(C) Vaults		(D) Coitus interruptus	
	C Splicing of Exons	III Rho factor			Chemist	ry - Se	ection A (мсq)	
	D TATA box	IV SnRNAs, tRNA		(51)	Vander Waal's equa	ation of st	ate is obeyed by real gases. F	or
	(A) $A - III, B - II, C$	-IV, D-I			n moles of a real ga	as, the exp	pression will be [IIT 1992]	
	(B) $A - III, B - IV, C$	-I, D-II			(A) $\left(\frac{P}{n} + \frac{na}{V^2}\right) \left(\frac{V}{n-1}\right)$	$\overline{b} = RT$		

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

(D)
$$A - II, B - IV, C - I, D - III$$

(45) Pollen grains can be stored for several years in liquid nitrogen having a temperature of [NEET 2018]

(B) $\left(P + \frac{a}{V^2}\right) (V - b) = nRT$ (C) $\left(P + \frac{na}{V^2}\right) (nV - b) = nRT$

(D) $\left(P + \frac{n^2 a}{V^2}\right) (V - nb) = nRT$

(52) What is the correct relationship between the pHs of isomolar solutions of sodium oxide (pH_1) , sodium sulphide (pH_2) , sodium selenide (pH_3) and sodium telluride (pH_4) [AIPMT 2005]

(A) $pH_1 > pH_2 = pH_3 > pH_4$ (B) $pH_1 < pH_2 < pH_3 < pH_4$

- (C) $pH_1 < pH_2 < pH_3 = pH_4$
- (D) $pH_1 > pH_2 > pH_3 > pH_4$
- (53) The ionic radius of Na^+ ions is $1.02A^o$. The ionic radii (in A^o) of Mg^{2+} and Al^{3+} , respectively, are [JEE MAIN 2021]
 - (A) 1.05 and 0.99 (B) 0.72 and 0.54
 - (C) 0.85 and 0.99 (D) 0.68 and 0.72
- (54) The total number of isoelectronic species from the given set is

$O^{2-}, F^-, Al, Mg^{2+}, Na^+, O^{2-}, O^{2-}, Na^+, O^{2-}, O^$	O^+, Mg, Al^{3+}, F [jee main 2023]
(A) 5	(B) 4
(C) 3	(D) 2

- (55) Which contains strongest H-bond [IIT 1986]
 - (A) O H....S (B) S H...O(C) F - H...F (D) O - H...O
- (56) The graph between $|\psi|^2$ and $r\mbox{(radial distance)}$ is shown below. This represents [JEE MAIN 2019]



(A) 1s orbital

(C) 2s orbital

(D) 2p orbital

(B) 3s orbital

- (57) Which is the weakest among the following types of bond(A) Ionic bond(B) Metallic bond
 - (C) Covalent bond (D) Hydrogen bond
- (58) Which is not found in alkenes [AIIMS 1982]
 - (A) Chain isomerism (B) Geometrical isomerism
 - (C) Metamerism (D) Position isomerism
- (59) Which of the following compounds are covalent [IIT 1980]
 - (A) H_2 (B) CaO(C) KCl (D) Na_2S
 - $(D) N a_2 S$
- (60) Hydrogen ion concentration in mol/L in a solution of pH = 5.4 will be [AIEEE 2005] (A) 3.98×10^8 (B) 3.88×10^6

(A) 5.50×10	(b) 5.00 × 10
(C) 3.68×10^{-6}	(D) 3.98×10^{-6}

- (61) The electronic configuration of a metal M is $1s^2$, $2s^2 2p^6$, $3s^1$. The formula of its oxides will be (A) MO (B) M_2O
 - (C) M_2O_3 (D) MO_2
- (62) Match List-I with List-II :

List-I	List-II
(<i>a</i>) Li	(i) Poor water solubility of I^- salt
(<i>b</i>) Na	(ii) Most abundant element in cell fluid
(c) K	<i>(iii)</i> Bicarbonate salt used in fire extinguisher
(<i>d</i>) Cs	(<i>iv</i>) Carbonate salt decomposes easily on heating

Choose the correct answer from the options given below : [JEE MAIN 2021]

(A)
$$(a) - (iv), (b) - (iii), (c) - (ii), (d) - (i)$$

(B) $(a) - (i), (b) - (ii), (c) - (iii), (d) - (iv)$

(B)
$$(a) - (i), (b) - (ii), (c) - (iii), (d) - (iv)$$

C)
$$(a) - (iv), (b) - (ii), (c) - (iii), (d) - (i)$$

(D)
$$(a) - (i), (b) - (iii), (c) - (ii), (d) - (iv)$$

(63) IUPAC name for the compound [AIPMT 1998]

$$Cl CH_2CH_3$$

- (A) trans 3 iodo, 4-chloro, 3-pentene
- (B) cis 3 chloro, 3-iodo, 2-pentene
- (C) trans 2 chloro, 3-iodo, 2-pentene
- (D) cis 3 iodo, 4-chloro, 3-pentene
- (64) The alkaline earth metal nitrate that does not crystallise with water molecules is [JEE MAIN 2019]

(A)
$$Mg(NO_3)_2$$
 (B) $Sr(NO_3)_2$

- (C) $Ca(NO_3)_2$ (D) $Ba(NO_3)_2$
- (65) The ratio of the shortest wavelength of two spectral series of hydrogen spectrum is found to be about 9. The spectral series are [JEE MAIN 2019]
 - (A) Lyman and Paschen (B) Brackett and Pfund
 - (C) Paschen and Pfund (D) Balmer and Brackett
- (66) Which of the following can exhibit cis-trans isomerism [AIPMT 1989]
 - (A) $HC \equiv CH$ (B) ClCH = CHCl
 - (C) $CH_3.CHCl.COOH$ (D) $ClCH_2 CH_2Cl$
- (67) Consider the following reaction in a sealed vessel at equilibrium with concentrations of

$${\sf N}_2=3.0\!\times\!10^{-3}{\sf M}, {\sf O}_2=4.2\!\times\!10^{-3}{\sf M}$$
 and ${\sf NO}=2.8\!\times\!10^{-3}{\sf M}$

$$2\mathsf{NO}_{(\mathsf{g})}\rightleftharpoons\mathsf{N}_{2(\mathsf{g})}+\mathsf{O}_{2(\mathsf{g})}$$

If $0.1~{\rm mol}~{\rm L}~{\rm L}^{-1}$ of ${\rm NO}_{\rm (g)}$ is taken in a closed vessel, what will be degree of dissociation (α) of ${\rm NO}_{\rm (g)}$ at equilibrium? [NEET 2024]

- (A) 0.0889 (B) 0.8889
- (C) 0.717 (D) 0.00889
- (68) In a chemical equilibrium $A + B \rightleftharpoons C + D$, when one mole each of the two reactants are mixed, 0.6 mole each of the products are formed. The equilibrium constant calculated is [AIPMT 1989] (A) 1 (B) 0.36

(A) 1	(B) 0.36
(C) 2.25	(D) 4/9

(69) Number of sigma bonds in $P_4 O_{10}$ is ${\rm [AIEEE \ 2002]}$

	(A) 6	(B) 7		(A) 2 M HCl	(B) 6 M NH ₃
	(C) 17	(D) 16		(C) 6 M NaOH	(D) H_2S gas
(70)	On combustion Li , Na and K oxides formed, respectively, a	in excess of air, the major are : [JEE MAIN 2020]	(78)	Consider the following reaction	ion The product 'X' is used [JEE
	(A) Li_2O, Na_2O and K_2O_2	(B) Li_2O, Na_2O_2 and K_2O		\mathbb{N} \mathbb{N} \mathbb{N} $\mathbb{H}_{3} \oplus \mathbb{O}$	$\longrightarrow \stackrel{\oplus}{\mathbb{N},Cl} \stackrel{\odot}{\longrightarrow} \stackrel{OH}{\longrightarrow} 'X'$
	(C) Li_2O, Na_2O_2 and KO_2	(D) Li_2O_2, Na_2O_2 and K_2O_2		└ ─ / `CH ₃ 'CH ₃	
(71)	Same mass of CH_4 and H_2 is	taken in container. The partial		(A) in acid base titration as a	n indicator
	(A) $8/9$	(B) 1/9		(B) in protein estimation as a	an alternative to ninhydrin
	(C) 1/2	(D) 1		(C) in laboratory test for phe	nols
(72)	Choose the correct set of rea	gents for the following		(D) as food grade colourant	
()	conversion	,	(79)	Which of the following speci	es is not paramagnetic ? [JEE
	trans $(Ph - CH = CH - CI)$ $(Ph - CH = CH - CH_3)$ [JE	$(H_3) ightarrow {\sf cis}$ E MAIN 2023]		MAIN 2017] (A) NO	(B) <i>CO</i>
	(A) Br_2 , alc KOH , $NaNH_2$, R	$Na\left(LiqNH_3 ight)$		(C) O ₂	(D) B ₂
	(B) Br_2 , alc KOH , $NaNH_2$,	H_2 Lindlar Catalyst	(80)	What is the <i>IUPAC</i> name of	f the organic compound formed
	(C) $Br_2, aqKOH, NaNH_2, H$	I_2 Lindlar Catalyst		Acetone $\frac{(i) C_2 H_5 MgBr, dry Ether}{}$	\rightarrow Product INEET 2021
	(D) Br_2 , aq KOH, $NaNH_2$, N	$a\left(LiqNH_3\right)$		(ii)H ₂ O,H ⁺	(P) ponton 2 ol
(73)	Under similar conditions of pr	ressure and temperature, $40 ml$		(A) 2 -methyl propan -2 -or	(B) peritari $-2-0$
	of ammonia gas, the final vol	ume of gas at the same	(81)	• Four successive members of	the first row transition
	temperature and pressure wi	II be mI [AIPMT 1993]		elements are listed below wi	th their atomic numbers. Which
	(A) 100	(B) 20		one of them is expected to h	ave the highest third ionization
	(C) 40	(D) 60		(A) Vanadium $(Z = 23)$	(B) Chromium $(Z = 24)$
(74)	The correct <i>IUPAC</i> name of	the following compound is		(C) Iron $(Z = 26)$	(D) Manganese $(Z = 25)$
	а он		(82)	Which of the following is suit	table to synthesize
	$ \land \land \land$			chlorobenzene? [NEET 2022]	(Cl
	Br			(A) Phenoi, $NaNO_2, BCi, C$	
	(Λ) 6 brome Ω chlore Λ	mathulhayan 4 al			
	(A) 0 -bromo-2-chioro-4-	shlarahayan 2 al			
	(B) $1-\text{bromo}-4-\text{methyl}-3-$, J,	
	(C) 6 -bromo-4-metriyi-2-			\sim	
(75)	(D) $1-\text{Dromo}-5-\text{Chioro}-4-$	metnymexan—3—0i		(C) <i>HCl</i> , Heating	
(75)	cubic, body centred cubic and	n of the cubic systems : simple d face centred cubic, then the		NH ₂	
	ratio of radii of the spheres in	these systems will be		,	
	(A) $\frac{1}{2}a \cdot \frac{\sqrt{3}}{2}a \cdot \frac{\sqrt{2}}{2}a$	(B) $1a : \sqrt{3}a : \sqrt{2}a$			
	(c) $\frac{1}{2}$ $\sqrt{3}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	(D) $\frac{1}{2} + \sqrt{2} + \frac{1}{2}$		(D) Banzana (12 anhydrous	FeClo
(76)	$(\bigcirc \frac{1}{2}u: \frac{1}{2}u: \frac{1}{2\sqrt{2}}u$	$\sqrt{2}u : \sqrt{3}u : \sqrt{2}u$	(83)	On heating lead (II) nitrate	gives a brown das (A) The das
(70)	a goldsmith contains $0.1 MA$	gNO_3 and $0.1 M$ AuCl. The	(00)	(A) on cooling changes to a	colourless solid/liquid (B). (B)
	solution was electrolyzed at 2	2V by passing a current of $1A$		on heating with NO changes	s to a blue solid (C) . The n in solid (C) is : The main 2020
	$\left(E_{A}^{0}+i_{A}\right) = 0.80 V. E_{A}^{0} + i_{A}$	= 1.69 V [JEE MAIN 2020]		(A) $+5$	(B) +2
	$\langle Ag^{+}/Ag \rangle \rightarrow An^{+}/Au$, , <u>, , , , , , , , , , , , , , , , , </u>			

- (A) only silver
- (B) only gold
- (C) silver and gold in equal mass proportion
- (D) silver and gold in proportion to their atomic weights
- (77) The only cations present in a slightly acidic solution are Fe^{3+} , Zn^{2+} and Cu^{2+} . The reagent that when added in excess to this solution would identify and separate Fe^{3+} in one step is [IIT 1997]

(C) +4

(A) 4

(C) 6

(A) $[CoCl_2(en)_2]$

(D) +3

(B) 5

(D) 7

(B) $[Co(CN)_5(NC)]^{3-}$

(D) $\left[\mathsf{Co} \left(\mathsf{NH}_3 \right)_4 \mathsf{CI}_2 \right]^+$

(84) The number of tripeptides formed by three different amino

acids using each amino acid once is..... [JEE MAIN 2024]

(85) Indicate the complex/complex ion which did not show any

geometrical isomerism : [JEE MAIN 2021]

(C) $\left[\mathsf{Co}\left(\mathsf{NH}_3\right)_3\left(\mathsf{NO}_2\right)_3\right]$



- (96) The reason for greater range of oxidation states in actinoids
 - (B) 5f, 6d and 7s levels having comparable energies
 - (C) 4f and 5d levels being close in energies
 - (D) the radioactive nature of actinoids.
- (97) The following data was obtained for chemical reaction given

	[NO] molL ⁻¹	H_2 molL ⁻¹	Rate mol L^{-1} s^{-1}
(A)	8×10^{-5}	8×10^{-5}	7×10^{-9}
(B)	24×10^{-5}	8×10^{-5}	2.1×10^{-8}
(C)	24×10^{-5}	32×10^{-5}	8.4×10^{-8}

The order of the reaction with respect to NO is [JEE MAIN

- (98) Higher order (>3) reactions are rare due to : [JEE MAIN 2015]
 - (A) shifting of equilibrium towards reactants due to elastic
 - (B) loss of active species on collision
 - (C) low probability of simultaneous collision of all the reacting species
 - (D) increase in entropy and activation energy as more molecules are involved
- (99) Which of the following would be expected to be most highly ionised in water [AIIMS 1982]

7

(93) Which of the following will not form a yellow precipitate on heating with an alkaline solution of iodine [AIPMT 2004]

(A) (a) and (c) only (B) (b), (c) and (d) only

(C) (a), (b) and (d) only (D) (b) and (d) only

(Major Product)

	(A) CH ₂ ClCH ₂ CH ₂ COOH	(B) CH ₃ CHCl.CH ₂ .COOH	(109)	$\left(\frac{1+i}{1-i}\right)^2 + \left(\frac{1-i}{1+i}\right)^2$ is equal to	
	(C) <i>CH</i> ₃ . <i>CH</i> ₂ . <i>CCl</i> ₂ . <i>COOH</i>	(D) <i>CH</i> ₃ . <i>CH</i> ₂ . <i>CHCl</i> . <i>COOH</i>		(A) 2 <i>i</i>	(B) $-2i$
(100)	All structures given below are	e of vitamin C . Most stable of		(C) -2	(D) 2
	(A)	(B)	(110)	Let a be the sum of all coefficients	cients in the expansion of
	OH ≝	OH		$(1-2x+2x^2)^{2023}(3-4x^2+(x^2+y^2))^{202}(3-4x^2+(x^2+y^2))^{202}(3-4x^2+(x^2+y^2))^{202}(3-4x^2+(x^2+y^2))^{202}(3-4x^2+(x^2+y^2))^{202}(3-4x^2+(x^2+y^2))^{202}(3-4x^2+(x^2+y^2))^{202}(3-4x^2+(x^2+y^2))^{202}(3-4x^2+(x^2+y^2))^{202}(3-4x^2+(x^2+y^2))^{202}(3-4x^2+(x^2+y^2))^{202}(3-4x^2+(x^2+y^2))^{202}(3-4x^2+(x^2+y^2))^{202}(3-4x^2+(x^2+y^2))^{202}(3-4x^2+(x^2+y^2))^{202}(3-4x^2+(x^2+y^2))^{202}(3-4x^2+(x^2+y^2))^{202}(3-4x^2+(x^2+x^2+(x^2+y^2))^{202}(3-4x^2+(x^2+x^2+(x^2+y^2))^{202}(3-4x^2+(x^2+x^2))^{202}(3-4x^2+(x^2+x^2))^{202}(3-4x^2+(x^2+x^2))^{202}(3-4x^2+(x^2+x^2))^{202}(3-4x^2+(x^2+x^2+(x^2+x^2))^{202}(3-4x^2+(x^2+x^2+(x^2+x^2+x^2))^{202}(3-4x^2+(x^2+x^2+(x^2+x^2))^{202}(3-4x^2+(x^2+x^2))^{202}(3-4x^2+(x^2+x^2))^{202}(3-4x^2+(x^2+x^2))^{202}(3-4x^2+(x^2+x^2))^{202}(3-4x^2+(x^2+x^2))^{202}(3-4x^2+(x^2+x^2))^{202}(3-4x^2+(x^2+x^2))^{202}(3-4x^2+(x^2+x^2))^{202}(3-4x^2+(x^2+x^2))^{202}(3-4x^2))$	$\left(+2x^3 ight)^{2024}$ and
	HO	HO		$b = \lim_{x \to 0} \left(\frac{J_0 \ \frac{1}{t^{2024} + 1} at}{x^2} \right)$. If	the equations $cx^2 + dx + e = 0$
	H**/(Hw CH		and $2bx^2 + ax + 4 = 0$ have a	a common root, where
	OH OH	Un		$c, d, e \in R$, then $d : c : e$ equal (A) $2 \cdot 1 \cdot 4$	IS [JEE MAIN 2024]
	(C)	(D)		(A) $2:1:4$	(B) $4 \cdot 1 \cdot 4$
	OH	HO	(111)	(C) $1:2:4$ $1 + \cos 2x + \cos 4x + \cos 6x$	(D) 1:1:4 =
	HO OH		()	(A) $2\cos x \cos 2x \cos 3x$	(B) $4\sin x \cos 2x \cos 3x$
	н он	OH		(C) $4\cos x \cos 2x \cos 3x$	(D) None of these
	Mathematics - S	ection A (MCO)	(112)	Domain of the function $\sqrt{\log}$	$\overline{\mathfrak{g}\left\{(5x-x^2)/6 ight\}}$ is
••••				(A) (2,3)	(B) [2,3]
(101)	$\ln \Delta ABC, \ \frac{\sin B}{\sin(A+B)} =$			(C) [1,2]	(D) [1,3]
	(A) $\frac{b}{a+b}$	(B) $\frac{b}{c}$	(113)	The number of numbers, stric	tly between 5000 and 10000
()	(C) $\frac{c}{b}$	(D) None of these		is [JEE MAIN 2023]	1, 5, 5, 7, 9 without repetition,
(102)	For any two complex numbe $ z_1 ^2 + z_2 ^2$ then	rs z_1, z_2 we have $ z_1+z_2 ^2 =$		(A) 6	(B) 12
	(A) Re $\left(\frac{z_1}{z}\right) = 0$	(B) Im $\left(\frac{z_1}{z}\right) = 0$		(C) 120	(D) 72
	(C) $\operatorname{Re}(z_1 z_2) = 0$	(D) $\lim_{z_1 \to z_2} (z_1 z_2) = 0$	(114)	If the center and radius of the	e circle $\left rac{z-2}{z-3} ight =2$ are
(103)	If (α, β) is the orthocentre of	the triangle ABC with vertices		respectively (α,β) and γ , the	$\sin 3(lpha+eta+\gamma)$ is equal to [JEE
	A(3, -7), B(-1, 2) and $C(4, -7)$	5), then $9lpha-6eta+60$ is equal		MAIN 2023] (A) 11	(B) 9
	(A) 30	(B) 25		(C) 10	(D) 12
	(C) 40	(D) 35	(115)	$\lim_{x \to -\infty} \left[\frac{x^{3/2} - 8}{2} \right] - \frac{1}{2}$	(-)
(104)	The approximate value of (7.	$(995)^{1/3}$ correct to four decimal	(113)	$\begin{bmatrix} 1 \\ x \rightarrow 4 \end{bmatrix} \begin{bmatrix} x-4 \end{bmatrix} \begin{bmatrix} 2 \\ y \end{bmatrix}$	(D) 9
	places is			(A) $3/2$	(B) 3
	(A) 1.9995	(B) 1.9996	(116)	(c) $2/3$	(D) $1/3$
(105)	(C) 1.999 All points lying inside the tria	(D) 1.9991 Ingle formed by the points	(110)	Then, the value of $\left \alpha^8 + \beta^8 \right $ i	s equal to [JEE MAIN 2022]
(105)	(1,3), $(5,0)$ and $(-1,2)$ satisf	fy [IIT 1986]		(A) 50	(B) 250
	(A) $3x + 2y \ge 0$	(B) $2x + y - 13 \le 0$		(C) 1250	(D) 1500
	(C) $2x - 3y - 12 \le 0$	(D) All the above	(117)	Let S be the set of all $a \in N$ triangle formed by the tange	such that the area of the near the point $P(h, a)$ h $a \in N$
(106)	The number of ways of select	ting 15 teams from 15 men and a man and a		on the parabola $y^2 = 2ax$ and	d the lines $x = b, y = 0$ is 16
	Woman, is [JEE MAIN 2015]			unit ² , then $\sum_{aes} a$ is equal to	D [JEE MAIN 2023]
	(A) 1120	(B) 1880		(A) 145	(B) 144
<i></i>	(C) 1960	(D) 1240	((C) 143 $\pi - 2\pi - 4\pi$	(D) 146
(107)	If the data x_1, x_2, \dots, x_{10} is su of these is 11, the mean of th	uch that the mean of first four ne remaining six is 16 and the	(118)	$\cos \frac{\pi}{7} \cos \frac{2\pi}{7} \cos \frac{4\pi}{7} =$	(D) ¹
	sum of squares of all of these	e is $2,000$; then the standard		(A) 0	(D) $\frac{1}{2}$
	deviation of this data is [JEE M, (A) $2\sqrt{2}$	AIN 2019] (B) 2	(119)	(C) $\frac{1}{4}$	(D) $-\overline{8}$ f sides of a triangle <i>ABC</i> such
	(C) 4	(D) $\sqrt{2}$	(113)	that $\frac{a+b}{7} = \frac{b+c}{8} = \frac{c+a}{9}$. If r ar	and R are the radius of incircle
(108)	Among the statements	(D) \V2		and radius of circumcircle of $\frac{R}{2}$ is equal t	the triangle ABC , respectively,
. ,	$(S1): (p \Rightarrow q) \lor ((\sim p) \land q) $ is	a tautology		(A) $\frac{5}{2}$	(B) 2
	(S2): $(q \Rightarrow p) \Rightarrow ((\sim p) \land q)$ (A) peither (S1) and (S2) is 7			(C) $\frac{3}{2}$	(D) 1
	(A) neutrer (β 1) and (β 2) is i	IUC	(120)	The line $x + y = 4$ divides the	e line joining the points $\left(-1,1 ight)$
	(c) only $(S1)$ is true			and $(5,7)$ in the ratio [IIT 1965]	
	(c) only (52) is frue	ruo		(A) 2:1	(B) 1:2
	(D) both $(S1)$ and $(S2)$ are II	rue		(C) $1:2$ externally	(D) None of these

(121) The greatest and least value of sin x cos x are (A) 1, −1 (B) $\frac{1}{2}, -\frac{1}{2}$ (C) $\frac{1}{4}, -\frac{1}{4}$ (D) 2, −2 (122) Three identical dice are rolled. The probability that same number will appear on each of them will be [117 1984] (A) $\frac{1}{6}$ (B) $\frac{1}{36}$ (C) $\frac{1}{18}$ (D) $\frac{3}{28}$ (123) In any $\triangle ABC$ if $a \cos B = b \cos A$, then the triangle is (A) Equilateral triangle (B) Isosceles triangle (C) Scalene (D) Right angled (124) If $\sin x + \cos x = \frac{1}{5}$, then $\tan 2x$ is (A) $\frac{25}{17}$ (B) $\frac{7}{25}$ (C) $\frac{25}{7}$ (D) $\frac{24}{7}$ (125) If (1 + 3p)/3, (1 - p)/4 and (1 - 2p)/2 are the probabilities of three mutually exclusive events, then the set of all values Of *p* is [AIEEE 2003 , IIT 1986] (A) $\frac{1}{3} \le p \le \frac{1}{2}$ (B) $\frac{1}{3}$ (C) $\frac{1}{2} \le p \le \frac{2}{3}$ (D) $\frac{1}{2}$ (126) Write the function in the simplest form: $tan^{-1}\left(\frac{\cos x - \sin x}{\cos x + \sin x}\right)$ (A) $-\frac{\pi}{4} + x$ (B) $-\frac{\pi}{4} - x$ (C) $\frac{\pi}{4} - x$ (D) $\frac{\pi}{4} + x$ (127) The distance of the point (1, 3, -7) from the plane passing through the point (1, -1, -1) having normal perpendicular to both the lines $\frac{x-1}{1} = \frac{y+2}{-2} = \frac{z-4}{3}$ and $\frac{x-2}{2} = \frac{y+1}{-1} = \frac{z+7}{-1}$ is [JEE MAIN 2017] (A) $\frac{10}{\sqrt{74}}$ (B) $\frac{20}{\sqrt{74}}$ (C) $\frac{10}{\sqrt{83}}$ (D) $\frac{5}{\sqrt{83}}$ (128) If a, b, c are non-coplanar vectors and λ is a real number then $[\lambda(a+b) \ \lambda^2 b \ \lambda c] = [a \ b+c \ b]$ for [AIEEE 2005] (A) Exactly three values of λ (B) Exactly two values of λ (C) Exactly one value of λ (D) No value of λ (129) A square piece of tin of side $30\,cm$ is to be made into a box without top by cutting a square from each corner and folding up the flaps to form a box. If the volume of the box is maximum, then its surface area (in cm^2) is equal to [JEE MAIN 2023] (A) 675 (B) 1025 (C) 800 (D) 900 (130) $\sin\left\{\tan^{-1}\left(\frac{1-x^2}{2x}\right) + \cos^{-1}\left(\frac{1-x^2}{1+x^2}\right)\right\}$ is equal to (A) 0 **(B)** 1 (C) $\sqrt{2}$ (D) $\frac{1}{\sqrt{2}}$ (131) If $f(x) = \sqrt{ax} + \frac{a^2}{\sqrt{ax}}$, then f'(a) =(A) -1 (B) 1 (C) 0 (D) a (132) Let y = y(x) be the solution of the differential equation $\sec^2 x dx + (e^{2y} \tan^2 x + \tan x) dy = 0$, $0 < x < \frac{\pi}{2}, y\left(\frac{\pi}{4}\right) = 0$. If $y\left(\frac{\pi}{6}\right) = \alpha$, Then $e^{8\alpha}$ is equal to..... [JEE MAIN 2024] (A) 9 **(B)** 10 (D) 12 (C) 11 (133) Let $f(x) = \min\{1, 1 + x \sin x\}, 0 \le x \le 2\pi$. If m is the number of points, where f is not differentiable and n is the number of points, where f is not continuous, then the

ordered pair (m, n) is equal to [JEE MAIN 2022] (A) (2,0)**(B)** (1,0) (D) (2,1) (C) (1,1) (134) $\int \sqrt{1 + \sin \frac{x}{2}} \, dx = [\text{IIT 1980}]$ (A) $\frac{1}{4} \left(\cos \frac{x}{4} - \sin \frac{x}{4} \right) + c$ (B) $4\left(\cos\frac{x}{4} - \sin\frac{x}{4}\right) + c$ (C) $4\left(\sin\frac{x}{4} - \cos\frac{x}{4}\right) + c$ (D) $4\left(\sin\frac{x}{4} + \cos\frac{x}{4}\right) + c$ (135) If the vectors, $\overrightarrow{p} = (a+1)\hat{i} + a\hat{j} + a\hat{k}$; $\overrightarrow{q} = a\hat{i} + (a+1)\hat{j} + a\hat{k}$ and $\overrightarrow{r} = a\hat{i} + a\hat{j} + (a + 1)\hat{k}(a \in R)$ are coplanar and $3(\overrightarrow{p} \cdot \overrightarrow{q})^2 - \lambda |\overrightarrow{r} \times \overrightarrow{q}|^2 = 0$, then the value of λ is [JEE MAIN 2020] (A) 0.5 (B) 1 (C) 1.5 (D) 2 Mathematics - Section B (MCQ) (Attempt any 10) (136) If the system of linear equations x - 2y + kz = 1; 2x + y + z = 2; 3x - y - kz = 3 Has a solution $(x, y, z) \neq 0$, then (x, y) lies on the straight line whose equation is [JEE MAIN (A) 3x - 4y - 1 = 0(B) 4x - 3y - 4 = 0(D) 3x - 4y - 4 = 0(C) 4x - 3y - 1 = 0(137) $\int_{0}^{3} |2 - x| dx$ equals (A) 2/7 (B) 5/2 (C) 3/2 (D) -3/2(138) The function $f(x) = \log(1+x) - \frac{2x}{2+x}$ is increasing on (A) (0, ∞) (B) $(-\infty, 0)$ (C) $(-\infty,\infty)$ (D) None of these (139) If $u = \sin^{-1}\left(\frac{y}{x}\right)$, then $\frac{\partial u}{\partial x}$ is equal to (A) $-\frac{y}{x^2+y^2}$ (B) $\frac{x}{\sqrt{1-u^2}}$ (C) $\frac{-y}{\sqrt{x^2-y^2}}$ (D) $\frac{-y}{x\sqrt{x^2-y^2}}$ (140) If the system of linear equations 2x + 2y + 3z = a; 3x - y + 5z = b; x - 3y + 2z = c Where a, b, c are non zero real numbers, has more than one solution, then [JEE MAIN 2019] (B) b - c - a = 0(A) b - c + a = 0(C) a + b + c = 0(D) b + c - a = 0(141) If we consider only the principal values of the inverse trigonometric functions, then the value of $\tan\left(\cos^{-1}\frac{1}{5\sqrt{2}} - \sin^{-1}\frac{4}{\sqrt{(17)}}\right)$ is [IIT 1994] (A) $\sqrt{29/3}$ (B) 29/3 (C) $\sqrt{3/29}$ (D) 3/29 (142) Let f be a differentiable function such that $x^2f(x) - x = 4\int tf(t)dt, f(1) = \frac{2}{3}$. Then 18f(3) is equal to [JEE MAIN 2023] (A) 160 (B) 210 (C) 180 (D) 150 (143) The line, that is coplanar to the line $\frac{x+3}{-3} = \frac{y-1}{1} = \frac{z-5}{5}$, is per MAIN 2023] (A) $\frac{x+1}{1} = \frac{y-2}{2} = \frac{z-5}{5}$ (B) $\frac{x+1}{1} = \frac{y-2}{2} = \frac{z-5}{5}$ (C) $\frac{x+1}{-1} = \frac{y-2}{2} = \frac{z-5}{4}$ (D) $\frac{x-1}{-1} = \frac{y-2}{2} = \frac{z-5}{5}$

(144) Let the acute angle bisector of the two planes x - 2y - 2z + 1 = 0 and 2x - 3y - 6z + 1 = 0 be the plane P.

	Then which of the following (A) $\begin{pmatrix} 3 & 1 & -1 \\ \end{pmatrix}$	points lies on P? [JEE MAIN 2021] (B) $\begin{pmatrix} -2 & 0 & -\frac{1}{2} \end{pmatrix}$		temperature. Choose the correct answer f	rom the options given below:
	(A) $(3, 1, -\frac{1}{2})$	(D) $(-2, 0, -\frac{1}{2})$		[JEE MAIN 2022]	
(145)	(C) $(0, 2, -4)$	(D) $(4, 0, -2)$		(A) (1) and (4) only	(B) $(1),(2)$ and (4) only
(145)	A(2, 1, 1), B(1, 2, 5), C(-2, -	-3.5) and $D(1, -6, -7)$ is equal		(C) (2) and (4) only	(D) $(1), (2)$ and (5) only
	to [JEE MAIN 2023]		(153)) In a simple harmonic oscillat	or, at the mean position [AIEEE
	(A) 48	(B) 8√38		2002]	m notontial onorgy is mayimum
	(C) 54	(D) $9\sqrt{38}$, potential energy is maximum
(146)) Two dice are thrown indeper	ndently. Let A be the event that		(B) Both kinetic and potenti	al energies are maximum
	appeared on the 2^{nd} die, B k	be the event that the number		(C) Kinetic energy is maximu	ım, potential energy is minimum
	appeared on the 1^{st} die is ev	en and that on the second die		(D) Both kinetic and potenti	al energies are minimum
	is odd, and C be the event the second and that on the	hat the number appeared on the	(154)) A stretched string resonates	with tuning fork frequency
	(A) the number of favourable	e cases of the event		512 Hz when length of the string required to vibrate response.	string is $0.5\ m$. The length of the sonantly with a tuning fork of
	$(A \cup B) \cap C \text{ is } 6$			frequency $256 Hz$ would be	
	(B) A and B are mutually exercise	chusive		(A) 025	(B) 0.5
	(C) The number of favourable	e cases of the events A, B and		(C) 2	(D) 1
	C are $15, 6$ and 6 respect	ively	(155)) A large tank filled with wate	r to a height 'h' is to be emptied
	(D) B and C are independen	t		through a small hole at the k for the level of water to fall f	bottom. The ratio of time taken from h to $\frac{h}{2}$ and from $\frac{h}{2}$ to zero is
(147)) The value of $\int_0^8 x-5 dx$ is			(A) $\sqrt{2}$	(B) $\frac{1}{\sqrt{2}}$
	(A) 17	(B) 12		(C) $\sqrt{2} - 1$	(D) <u>1</u>
	(C) 9	(D) 18	(156)	$(C) \sqrt{2}$ 1	$\sqrt{2}$, $\sqrt{2}-1$
(148)) If the normal to the curve y^2	=5x-1, at the point $(1,-2)$ is	(150)	[AllMS 1999]	to the clustery of a substance
	of the form $ax - 5y + b = 0$,	then a and b are		(A) Hammering and annealir	ng
	(A) $4, -14$	(b) $4, 14$		(B) Change in temperature	
	(C) $-4, 14$	(D) -4, -14		(C) Impurity in substance	
(149)) The function $^{\prime}f^{\prime}$ is defined by	$y f(x) = \begin{cases} 2x - 1, & if \ x > 2 \\ k, & if \ x = 2 \\ 2x - 1, & if \ x = 2 \end{cases}$		(D) All of these	
	is continuous, then the value	$\int x^2 - 1, if \ x < 2$	(157)) A cubical block of side $0.5m$	floats on water with 30% of its
	(A) 2	(B) 3		volume under water kg	is the maximum weight that car
	(C) 4	(D) −3		? [Take density of water $= 1$	$(0^3 kg/m^3$] [JEE MAIN 2019]
(150)) If A and B are two events su	ich that $P(A) \neq 0$ and		(A) 46.3	(B) 65.4
	$P(B) \neq 1$, then $P\left(\frac{\overline{A}}{\overline{B}}\right) = [1]$	[1982]		(C) 30.1	(D) 87.5
	(A) $1 - P\left(\frac{A}{B}\right)$	(B) $1 - P\left(\frac{\overline{A}}{\overline{A}}\right)$	(158)) The path of a projectile in th	e absence of air drag is shown ir
	(D)	(B)		the figure by dotted line. If t	the air resistance is not ignored
	(C) $\frac{1-P(A \cup B)}{P(\overline{B})}$	(D) $\frac{P(A)}{P(\overline{B})}$		appropriate for the projectil	e
	Physics - Sec	tion A (MCO)		v 1	
				\sim	
(151)) The escape velocity of a sphe	ere of mass m is given by $(G =$		and the	
	Universal gravitational const and $P_{\rm e}$ — Padius of the earth	ant; $M_e =$ Mass of the earth			\backslash
	(A) $\sqrt{2GM_e}$	(B) $\frac{GM_e}{2\pi^2}$		4 R (\overrightarrow{D}^{x}
	$(\neg) \bigvee_{R_e}^{R_e}$	$(-) R_e^2$			
	(C) $\sqrt{\frac{2Gm}{R_e}}$	(D) $\sqrt{\frac{GM_e}{R_e}}$		(A) <i>B</i>	(B) A
(152)) Following statements are give	ven :	((C) <i>D</i>	(D) <i>C</i>
	(1) The average kinetic energy when the temperature is red	gy of a gas molecule decreases	(159)) A liquid does not wet the so	lid surface if angle of contact is
	(2) The average kinetic energy	gy of a gas molecule increases		(A) 0	(B) equal to 45°
	with increase in pressure at c	constant temperature.		(C) equal to 60°	(D) greater than 90°
	(3) The average Kinetic energy with increases in volume	gy of a gas molecule decreases	(160)) A particle $(m = 1 \text{ kg})$ slides	down a frictionless track (AOC
	(4) Pressure of a gas increase	es with increase in temperature	(starting from rest at a point	A (height 2 m). After reaching
	at constant pressure.	acoc with increase in		C, the particle continues to r	move freely in air as a projectile.
1	(a) the volume of gas decrea	ases with inclease in	l	when it reaching its highest	point <i>r</i> (neight 1 m), the

kinetic energy of the particle (in J) is : (Figure drawn is appropriate answer from the options given below [JEE MAIN schematic and not to scale; take $g = 10 \text{ ms}^{-2}$ [JEE MAIN 2020] 2021] (A) Both A and R are correct but R is NOT the correct eroht explanation of A(B) A is correct but R is not correct (C) Both A and R are correct and R is the correct explanation of A(D) A is not correct but R is correct (A) 8 **(B)** 10 (168) A moving block having mass m, collides with another stationary block having mass 4 m. The lighter block comes (C) 15 (D) 13 to rest after collision. When the initial velocity of the lighter (161) Given below are two statements: one is labelled as block is v, then the value of coefficient of restitution (e) will Assertion A and the other is labelled as Reason Rbe [NEET 2018] Assertion A : A spherical body of radius $(5 \pm 0.1) mm$ having (A) 0.5 (B) 0.25 a particular density is falling through a liquid of constant density. The percentage error in the calculation of its (C) 0.4 (D) 0.8 terminal velocity is 4 %. (169) In the below graph, point D indicates Reason R: The terminal velocity of the spherical body falling through the liquid is inversely proportional to its radius. In the light of the above statements, choose the correct answer from the options given below on : [JEE MAIN 2023] Stress (A) Both A and R are true but R is NOT the correct explanation of A(B) Both A and R are true and R is the correct explanation of A(C) A is false but R is true Strain (A) Limiting point (B) Yield point (D) A is true but R is false (C) Breaking point (D) None of the above (162) A man goes 10 m towards North, then 20 m towards east then displacement is......m (170) The rms speed of oxygen molecule in a vessel at particular temperature is $(1+\frac{5}{x})^{\frac{1}{2}}v$, where v is the average speed of (A) 22.5 (B) 25 the molecule. The value of x will be:(Take $\pi = \frac{22}{7}$) [JEE MAIN (C) 25.5 (D) 30 2023] (163) Where will it be profitable to purchase 1 kilogram sugar (A) 28 (B) 27 (A) At poles (B) At equator (C) 8 (D) 4 (C) At 45° latitude (D) At 40° latitude (171) Wavelength of ray of light is 0.00006 m. It is equal to (164) Parsec is a unit of [AIIMS 2005] microns (A) Distance (B) Velocity (A) 6 **(B)** 60 (C) Time (D) Angle (C) 600 (D) 0.6 (165) A ball is thrown up vertically with a certain velocity so that, (172) An automobile moves on a road with a speed of $54 \, kmh^{-1}$. it reaches a maximum height h. Find the ratio of the times in The radius of its wheels is 0.45 m and the moment of inertia which it is at height $\frac{h}{3}$ while going up and coming down of the wheel about its axis of rotation is $3 kgm^2$. If the respectively. [JEE MAIN 2022, JEE MAIN 2021] vehicle is brought to rest in 15 s, the magnitude of average (A) $\frac{\sqrt{2}-1}{\sqrt{2}+1}$ (B) $\frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}$ torque transmitted by its brakes to the wheel is $kg m^2 s^{-2}$. [AIPMT 2015] (C) $\frac{\sqrt{3}-1}{\sqrt{3}+1}$ (D) $\frac{1}{3}$ (A) 2.86 (B) 6.66 (166) Which of the following physical quantities have the same (D) 10.86 (C) 8.58 dimensions? [JEE MAIN 2022] (173) Consider two containers A and B containing monoatomic (A) Electric displacement (\vec{D}) and surface charge density gases at the same Pressure (P), Volume (V) and Temperature (T). The gas in A is compressed isothermally to (B) Displacement current and electric field $\frac{1}{8}$ of its original volume while the gas B is compressed (C) Current density and surface charge density adiabatically to $\frac{1}{8}$ of its original volume. The ratio of final pressure of gas in B to that of gas in A is [JEE MAIN 2023] (D) Electric potential and energy (B) $8^{\frac{3}{2}}$ (A) 8 (167) Given below are two statements: one is labelled as (C) $\frac{1}{8}$ (D) 4 Assertion A and the other is labelled as Reason R. Assertion A: The escape velocities of planet A and B are (174) A large block of wood of mass M = 5.99 kg is hanging from two long massless cords. A bullet of mass m = 10 g is fired same. But A and B are of unequal mass. Reason R: The product of their mass and radius must be into the block and gets embedded in it. The (block + bullet) same, $M_1 R_1 = M_2 R_2$ then swing upwards, their centre of mass rising a vertical In the light of the above statements, choose the most distance $h = 9.8 \, cm$ before the (block + bullet) pendulum



- charge on $15 \ \mu F$ is..... μC [AIIMS 2000]

 (A) 50
 (B) 100

 (C) 200
 (D) 280
- (178) In the circuit shown here $C_1 = 6 \ \mu F$, $C_2 = 3 \ \mu F$ and battery $B = 20 \ V$. The switch S_1 is first closed. It is then opened and afterwards S_2 is closed. What is the charge finally on C_2 μC



(179) A 20 *Henry* inductor coil is connected to a 10 *ohm* resistance in series as shown in figure. The time at which rate of dissipation of energy (Joule's heat) across resistance is equal to the rate at which magnetic energy is stored in the inductor, is [JEE MAIN 2019]



(C) $\frac{1}{2} \ln 2$

- (D) 2 ln 2
- (180) The depletion layer in the P-N junction region is caused by ${\rm [AIPMT 1991]}$

- (A) Drift of holes
- (B) Diffusion of charge carriers
- (C) Migration of impurity ions
- (D) Drift of electrons

(A

(181) Two cells of same emf but different internal resistances I_1 and I_2 are connected in series with a resistance R. The value of resistance R, for which the potential difference across second cell is zero, is [JEE MAIN 2022]

A)
$$r_2 - r_1$$
 (B) $r_1 - r_2$

(C)
$$r_1$$
 (D) r_2

(182) Two bar magnets oscillate in a horizontal plane in earth's magnetic field with time periods of 3 s and 4 s respectively. If their moments of inertia are in the ratio of 3:2 then the ratio of their magnetic moments will e. [JEE MAIN 2022]

(C) 1:3 (D) 27:16

(183) Two short magnets of equal dipole moments M are fastened perpendicularly at their centre (figure). The magnitude of the magnetic field at a distance d from the centre on the bisector of the right angle is



	$4\pi \ a^{\circ}$	`	1	4π	a°	
(C)	$\frac{\mu_0}{4\pi} \frac{2\sqrt{2}M}{d^3}$	(C))	$\frac{\mu_0}{4\pi}$	$\frac{2M}{d^3}$	

(184) In a parallel plate capacitor set up, the plate area of capacitor is $2 m^2$ and the plates are separated by 1 m. If the space between the plates are filled with a dielectric material of thickness 0.5 m and area $2 m^2$ (see *fig.*) the capacitance of the set-up will be ε_0

(Dielectric constant of the material = 3.2) and (Round off to the Nearest Integer) $\mbox{\tiny [JEE MAIN 2021]}$



(B) 5 (D) 6

(185) Two solid conductors are made up of same material, have same length and same resistance. One of them has a circular cross section of area A_1 and the other one has a square cross section of area A_2 . The ratio $\frac{A_1}{A_2}$ is [NEET 2020]

(A) 2	(B) 1.5
() =	(-)

(D) 0.8

(C) 1

Physics - Section B (MCQ) (Attempt any 10)

- (186) In an NPN transistor circuit, the collector current is 10 mA. If 90% of the electrons emitted reach the collector, the emitter current (i_E) and base current (i_B) are given by [AIIMS] 1989]
 - (A) $i_E = -1 \, mA, i_B = 9 \, mA$
 - (B) $i_E = 9 \, mA$, $i_B = -1 \, mA$
 - (C) $i_E = 1 \, mA, i_B = 11 \, mA$
 - (D) $i_E = 11 \, mA, i_B = 1 \, mA$
- (187) Two identical charged spheres suspended from a common point by two massless strings of lengths l, are initially at a distance d ($d \ll l$) apart because of their mutual repulsion. The charges begin to leak from both the spheres at a constant rate. As a result, the spheres approach each other with a velocity v. Then v varies as a function of the distance x between the spheres, as [NEET 2016 , AIEEE 2011]
 - (B) $v \propto x^{-\frac{1}{2}}$ (A) $v \propto x$
 - (D) $v \propto x^{\frac{1}{2}}$ (C) $v \propto x^{-1}$
- (188) An alternating voltage $v(t) = 220 \sin 100\pi l \, volt$ is applied to a purely resistive load of $50\,\Omega$. The time taken for the current to rise from half of the peak value of the peak value **İS....***ms* [JEE MAIN 2019]

(A) 2.2	(B) 3.3
(C) 5	(D) 7.2

- (189) Barrier potential of a P N junction diode does not depend ON [AIPMT 2003]
 - (A) Temperature (B) Forward bias
 - (D) Diode design (C) Doping density
- (190) In an experiment, electrons are accelerated, from rest, by applying, a voltage of 500 V. Calculate the radius of the path if a magnetic field 100 mT is then applied. [Charge of the ${\rm electron} = 1.6 \times 10^{-19}\,C$ Mass of the electron $=9.1 imes10^{-31}\,kg$] [jee main 2019] (A) $7.5 \times 10^{-3} m$ (B) $7.5 \times 10^{-2} m$

(C) 7.5 m (D) $7.5 \times 10^{-4} m$

(191) A uniform wire of length l and radius r has a resistance of 100Ω . It is recast into a wire of radius $\frac{r}{2}$. The resistance of new wire will be Ω [JEE MAIN 2017] (A) 1600 (B) 400

(~)	1000	(0)	400
(C)	200	(D)	100

(192) A 16 Ω wire is bend to form a square loop. A 9 V battery with internal resistance 1Ω is connected across one of its sides. If a 4 μ F capacitor is connected across one of its diagonals, the energy stored by the capacitor will be $\frac{x}{2} \mu J$. where x =_____. [JEE MAIN 2024]

(A) 52	(B) 42
(C) 81	(D) 12

(193) The charge on capacitor of capacitance $15\mu F$ in the figure given below is . . . μc [JEE MAIN 2022]

(B) 130

(D) 585



- $\frac{x}{x+4}$ is the ratio of energies of photons produced due to (194) transition of an electron of hydrogen atom from its (i) third permitted energy level to the second level and (ii)the highest permitted energy level to the second permitted level. The value of \boldsymbol{x} will be. [JEE MAIN 2022] (A) 6 (B) 5

 - (C) 4 (D) 3
- (195) In a Young's double slit experiment, a student observes 8 fringes in a certain segment of screen when a monochromatic light of 600 nm wavelength is used. If the wavelength of light is changed to 400 nm, then the number of fringes he would observe in the same region of the screen **İS:** [NEET 2022] (B) 9
 - (A) 8 (C) 12
 - (D) 6
- (196) In the circuit shown below, maximum zener diode current will bemA [JEE MAIN 2022]



- (C) 95 (D) 45
- (197) A magnet of magnetic moment $50 \,\hat{i} \, A m^2$ is placed along the x-axis in a magnetic field $\vec{B} = (0.5\,\hat{i} + 3.0\,\hat{j})T$. The torque acting on the magnet is
 - (A) $175 \hat{k} N m$ (B) $150 \ \hat{k} \ N - m$
 - (D) $25\sqrt{37}\,\hat{k}\,N-m$ (C) $75 \hat{k} N - m$
- (198) A parallel plate capacitor is charged by connecting it to a battery through a resistor. If l is the current in the circuit, then in the gap between the plates: [NEET 2024]
 - (A) Displacement current of magnitude equal to / flows in the same direction as /
 - (B) Displacement current of magnitude equal to / flows in a direction opposite to that of I
 - (C) Displacement current of magnitude greater than / flows but can be in any direction
 - (D) There is no current
- (199) An object is placed at a distance of $12 \, cm$ in front of a plane mirror. The virtual and erect image is formed by the mirror. Now the mirror is moved by $4 \, cm$ towards the stationary object. The distance by which the position of image would be shifted, will be: [JEE MAIN 2023]
 - (A) 4 cm towards mirror (B) 8 cm towards mirror
 - (C) $8 \, cm$ away from mirror (D) 2 cm towards mirror
- (200) A metallic surface is illuminated with radiation of wavelength λ , the stopping potential is V_0 . If the same surface is illuminated with radiation of wavelength 2λ , the stopping potential becomes $\frac{V_0}{4}$. The threshold wavelength for this metallic surface will be - [JEE MAIN 2023]
 - (A) $\frac{\lambda}{4}$ (B) 4λ
 - (C) $\frac{3}{2}\lambda$ (D) 3λ



Global Education of Science

Subject

: Biology, Chemistry, Mathematics, Physics

Standard : 11,12

Total Mark : 720

MCQ and MCQ

Paper Set : 1 Date : 27-07-2024 : 0H:20M Time

(Answer Key)

Biology - Section A (MCQ)

1 - C	2 - D	3 - D	4 - A	5 - D	6 - C	7 - B	8 - D	9 - A	10 - D
11 - A	12 - A	13 - A	14 - C	15 - A	16 - B	17 - A	18 - D	19 - D	20 - C
21 - D	22 - C	23 - B	24 - D	25 - D	26 - A	27 - C	28 - D	29 - B	30 - C
31 - D	32 - B	33 - A	34 - C	35 - C					

Biology - Section B (MCQ)

36 - B	37 - B	38 - C	39 - D	40 - C	41 - A	42 - B	43 - C	44 - C	45 - C
46 - B	47 - A	48 - D	49 - A	50 - C					

Chemistry - Section A (MCQ)

51 - D	52 - D	53 - B	54 - A	55 - C	56 - C	57 - D	58 - C	59 - A	60 - D
61 - B	62 - A	63 - C	64 - D	65 - A	66 - B	67 - C	68 - C	69 - D	70 - C
71 - A	72 - B	73 - B	74 - D	75 - C	76 - D	77 - D	78 - A	79 - B	80 - D
81 - D	82 - D	83 - D	84 - C	85 - B					

Chemistry - Section B (MCQ)

86 - C	87 - B	88 - D	89 - B	90 - C	91 - A	92 - B	93 - A	94 - D	95 - C
96 - B	97 - A	98 - C	99 - C	100 - A					

Mathematics - Section A (MCQ)

101 - B	102 - A	103 - B	104 - A	105 - D	106 - D	107 - B	108 - A	109 - C	110 - D
111 - C	112 - B	113 - D	114 - D	115 - B	116 - A	117 - D	118 - D	119 - A	120 - B
121 - B	122 - B	123 - B	124 - D	125 - A	126 - C	127 - C	128 - D	129 - C	130 - B
131 - C	132 - A	133 - B	134 - C	135 - B					

Mathematics - Section B (MCQ)

136 - B	137 - B	138 - A	139 - D	140 - B	141 - D	142 - A	143 - B	144 - B	145 - B
146 - A	147 - A	148 - A	149 - B	150 - C					

Physics - Section A (MCQ)

151 -	А	152 - A	153 - C	154 - D	155 - C	156 - D	157 - D	158 - A	159 - D	160 - B
161 -	D	162 - A	163 - B	164 - A	165 - B	166 - A	167 - B	168 - B	169 - C	170 - A
171 -	В	172 - B	173 - D	174 - C	175 - C	176 - A	177 - C	178 - C	179 - D	180 - B
181 -	А	182 - B	183 - C	184 - C	185 - C					

Physics - Section B (MCQ)

186 - D	187 - B	188 - B	189 - D	190 - D	191 - A	192 - C	193 - A	194 - B	195 - C
196 - A	197 - B	198 - A	199 - B	200 - D					



Global Education of Science

Subject

: Biology, Chemistry, Mathematics, Physics

Standard : 11,12 MCQ and MCQ

(Solutions)

Paper Set : 1 Date : 27-07-2024 Time : 0H:20M

Total Mark: 720

Biology - Section A (MCQ)

- (1) The unique mammalian characteristics are: [NEET 2023]
 - (A) pinna, monocondylic skull and mammary glands
 - (B) hairs, tympanic membrane and mammary glands
 - (C) hairs, pinna and mammary glands
 - (D) hairs, pinna and indirect development

Solution:(Correct Answer:C)

Option (3) is correct answer because presence of hairs, pinna and mammary glands are unique features of mammals. Options (2), (3) and (4) are not correct because, monocondylic skull is present in reptiles and aves whereas mammals have dicondylic skull. Tympanic membrane is present in amphibians also, so it is not considered as unique feature.

Indirect development is not seen in mammals.

- (2) Identify the wrong statement with reference to transport of oxygen. [NEET 2020]
 - (A) Low pCO_2 in alveoli favours the formation of oxyhaemoglobin.
 - (B) Binding of oxygen with haemoglobin is mainly related to partial pressure of O_2 .
 - (C) Partial pressure of CO_2 can interfere with O_2 binding with haemoglobin.
 - (D) Higher H^+ conc. in alveoli favours the formation of oxyhaemoglobin.

Solution:(Correct Answer:D)

Higher H^+ conc. in alveoli favours the formation of oxyhaemoglobin.

(3) In cockroach, excretion is brought about by-

A. Phallic gland B. Urecose gland C. Nephrocytes D. Fat body E. Collaterial glands

Choose the correct answer from the options given below : [NEET 2023]

(A) B and D only	(B) A and E only

(C) A, B and E only (D) B, C and D only

Solution:(Correct Answer:D)

Option (4) is the answer because,

In cockroach, excretion is brought about by Malpighian tubules, fat body, nephrocytes and urecose glands. Urecose glands are present in male cockroach of some species. They synthesise uric acid. Nephrocytes are large, colourless, ovoid, binucleate cells attached to the dorsal diaphragm in the body cavity. Fat body accumulates, produces and stores uric acid.

Phallic gland is the structure of male reproductive system of

cockroach and it secretes the outer layer of spermatophore. Collaterial gland is the structure of female reproductive system of cockroach and it secretes the hard egg-case or ootheca around fertilised eggs.

(4) Match List I with List II :

List I	List II
A. Pleurobrachia	I. Mollusca
B. Radula	II. Ctenophora
C. Stomochord	III. Osteichthyes
D. Air bladder	IV. Hemichordata

Choose the correct answer from the options given below : [NEET 2024]

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

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

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

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

Solution:(Correct Answer:A)

The correct answer is option (1) as A. Pleurobrachia - is a member of phylum Ctenophora. B. Radula - is a rasping feeding organ present in phylum Mollusca.

C. Stomochord - Rudimentary structure similar to notochord found in the collar region of D. Air bladder - is found in Osteichthyes which provides them buoyancy.

- (5) Which of the following statements is incorrect? [NEET 2021]
 - (A) Both ATP and $NADPH + H^+$ are synthesized during non-cyclic photophosphorylation.
 - (B) Stroma lamellae have PS I only and lack NADPreductase.
 - (C) Grana lamellae have both PS I and PS II.
 - (D) Cyclic photophosphorylation involves both PS I and PS - II.

Solution:(Correct Answer:D)

(6) The plant hormone used to destroy weeds in a field is : **INEET** 2021]

B)	NAA
	3)

(C) 2, 4 − D	(D) <i>IBA</i>
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Solution:(Correct Answer:C)

(7) What is the net gain of ATP when each molecule of glucose is converted to two molecules of pyruvic acid ? [NEET 2022]

(A) Six	(B) Two
---------	----------------

(C) Eight (D) Four

Solution:(Correct Answer:B)

- (8) Identify the incorrect statement. [NEET 2020]
 - (A) Due to deposition of tannins, resins, olls etc., heart wood is dark in colour
 - (B) Heart wood does not conduct water but gives mechanical support
 - (C) Sapwood is involved in conduction of water and minerals from root to leaf
 - (D) Sapwood is the innemost secondary xylem and is lighter in colour

Solution:(Correct Answer:D)

Sapwood is the innermost secondary xylem and is lighter in colour

(9) Which of the following is not correct?

- (A) Robert Brown discovered the cell.
- (B) Schleiden and Schwann formulated the cell theory.
- (C) Virchow explained that cells are formed from pre-existing cells.
- (D) A unicellular organism carries out its life activities within a single cell.

Solution:(Correct Answer:A)

 $\left(a\right)$ Robert Brown did not discover the cell. The cell was discovered by Robert Hook.

(10) Hormones may be [AIPMT 2004]

- (A) Amino acid derivatives (B) Peptides
- (C) Steroids (D) All the above

Solution:(Correct Answer:D)

(d)Hormones composition is polypeptide proteins amines or steroid.

- (11) Which one of the following organisms bears hollow and pneumatic long bones? [NEET 2021]
 - (A) Neophron (B) Hemidactylus
 - (C) Macropus (D) Ornithorhynchus

Solution:(Correct Answer:A)

- (12) Regarding Meiosis, which of the statements is incorrect? [NEET 2022]
 - (A) DNA replication occurs in S phase of Meiosis-II
 - (B) Pairing of homologous chromosomes and recombination occurs in Meiosis–*I*
 - (C) Four haploid cells are formed at the end of Meiosis-II
 - (D) There are two stages in Meiosis, Meiosis-I and II

Solution:(Correct Answer:A)

- (13) Spindle fibers attach to kinetochores of chromosomes during [NEET 2024]
 - (A) Metaphase (B) Anaphase
 - (C) Telophase (D) Prophase

Solution:(Correct Answer:A)

Spindle fibers attach to kinetochores of chromosome in metaphase stage.

- (14) Radial symmetry is NOT found in adults of phylum [NEET 2023]
 - (B) Ctenophora
 - (C) Hemichordata (D) Coelenterata

Solution:(Correct Answer:C)

(A) Echinodermata

Option (3) is the correct answer because hemichrodates are bilaterally symmetrical animals. Option (4) is not the answer because coelenterates are radially symmetrical organisms. Option (1) is not the answer because adult echinoderms are radially symmetrical in adult stage Option (2) is not the answer because ctenophores are radially symmetrical organisms.

- (15) Which one of the following is not true regarding the release of energy during ATP synthesis through chemiosmosis ? It involves: [NEET 2022]
 - (A) Breakdown of electron gradient
 - (B) Movement of protons across the membrane to the stroma
 - (C) Reduction of NADP to $NADPH_2$ on the stroma side of the membrane
 - (D) Breakdown of proton gradient

Solution:(Correct Answer:A)

- (16) Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason (R). Assertion (A):
 - Osteoporosis is characterised by decreased bone mass and increased chances of fractures.
 - Reason (R):

Common cause of osteoporosis is increased levels of estrogen.

In the light of the above statements, choose the most appropriate answer from the options given below: [NEET 2022]

- (A) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
- **(B)** (A) is correct but (R) is not correct
- (C) (A) is not correct but (R) is correct
- (D) Both (A) and (R) are correct and (R) is the correct explanation of (A)

Solution:(Correct Answer:B)

- (17) Which of the following events does not occur in rough endoplasmic reticulum? [NEET 2018]
 - (A) Phospholipid synthesis
 - (B) Protein folding
 - (C) Cleavage of signal peptide
 - (D) Protein glycosylation

Solution:(Correct Answer:A)

- (18) The Golgi complex participates in [NEET 2018]
 - (A) Activation of amino acid
 - (B) Fatty acid breakdown
 - (C) Respiration in bacteria
 - (D) Formation of secretory vesicles

Solution:(Correct Answer:D)

(19) Match List *I* with List *II*.

List I	List II		
A. Mast cells	I. Ciliated epithelium		
<i>B.</i> Inner surface of bronchiole	<i>II</i> . Areolar connective tissue		
C. Blood	<i>III</i> . Cuboidal epithe- lium		
D. Tubular parts of nephron	<i>IV.</i> Specialised connective tissue		

Choose the correct answer from the options give below: [NEET 2023]

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

Solution:(Correct Answer:D)

Option (4) is the correct answer because,

- Areolar connective tissue contains fibroblasts (cells that produce and secrete fibres), macrophages and mast cells.

- Inner surface of bronchioles is lined by ciliated epithelium.
- Blood is a specialised connective tissue.
- Tubular parts of nephron are lined by cuboidal epithelium.
- (20) Select the correct statements with reference to chordates.
 - A. Presence of a mid-dorsal, solid and double nerve cord.
 - *B*. Presence of closed circulatory system.
 - C. Presence of paired pharyngeal gill slits.
 - D. Presence of dorsal heart

E. Triploblastic pseudocoelomate animals.

Choose the correct answer from the options given below: [NEET 2023]

(A) C, D and E only	(B) A, C and D only
(C) B and C only	(D) B, D and E only

Solution:(Correct Answer:C)

Option (3) is the correct answer because statements B and C only are correct. Option (2), (3) and (4) are not correct. The chordate characters are presence of closed circulatory system and presence of pharyngeal gill slits. Nerve cord is dorsal, hollow and single. Heart is ventral. They are triploblastic and coelomate.

- (21) Which of the following structures or regions is incorrectly paired with its function? [NEET 2018]
 - (A) Corpus callosum : band of fibers connecting left and right cerebral hemispheres
 - (B) Medulla oblongata: Controls respiration and cardiovascular reflexes
 - (C) Hypothalamus: Production of releasing hormones and regulation of temperature, hunger and thirst
 - (D) Limbic system: Consists of fibre tracts that interconnect different regions of brain; controls movement.

Solution:(Correct Answer:D)

- (22) Which of the following statements about inclusion bodies is incorrect? [NEET 2020]
 - (A) These represent reserve material in cytoplasm.
 - (B) They are not bound by any membrane.
 - (C) These are involved in ingestion of food particles.
 - (D) They lie free in the cytoplasm.

Solution:(Correct Answer:C)

These are involved in ingestion of food particles.

(23) Given below are two statements:

Statement *I*: Mitochondria and chloroplasts both double membranes bound organelles.

Statement *II*: Inner membrane of mitochondria is relatively less permeable, as compared chloroplast.

In the light of the above statements, choose the mis appropriate answer from the options given below: [NEET 2024]

- (A) Both Statement I and Statement II are incorrect.
- (B) Statement I is correct but Statement II is incorrect.
- (C) Statement I is incorrect but Statement II is correct.
- (D) Both Statement I and Statement II are correct.

Solution:(Correct Answer:B)

Both mitochondria and chloroplasts are double membrane bound cell organelles.

Transport of ions occurs across the inner membrane of mitochondria. The inner membrane of chloroplast is impermeable to ions and metabolites. Therefore, it is said that inner membrane of mitochondria is relatively more permeable to that of chloroplast.

- (24) What is the role of NAD^+ in cellular respiration? [NEET 2018]
 - (A) It is the final electron acceptor for anaerobic respiration
 - (B) It functions as an enzyme.
 - (C) Sr It is a nucleotide source for ATP synthesis
 - (D) It functions as an electron carrier.

Solution:(Correct Answer:D)

- (25) The experimental proof for. semiconservative replication of DNA was first shown in a $_{\rm [NEET 2018]}$
 - (A) Virus (B) Fungus.
 - (D) Bacterium

Solution:(Correct Answer:D)

(C) Plant

- (26) Select the *correct* match : [NEET 2018]
 - (A) Francois Jacob and Jacques Monod -Lacoperon
 - (B) Alec Jeffreys Streptococcus pneumoniae
 - (C) Matthew Meselson and F. Stahl Pisumsativum
 - (D) Alfred Hershey and Martha Chase -TMV

Solution:(Correct Answer:A)

(27) Match the following columns and select the correct option.

Column $-I$	Column –II	
(a) Clostridium butylicum	(i) Cyclosporin $-A$	
(b) Trichoderma polysporum	(ii) Butyric Acid	
(c) Monascus pur- pureus	(iii) Citric Acid	
(d) Aspergillus niger	(<i>iv</i>) Blood cholesterol lowering agent	
(a) (b) (c) (d) [NEET	[2020]	•
(A) (<i>iv</i>) (<i>iii</i>) (<i>iii</i>) (<i>i</i>) (B) (<i>iii</i>) (<i>iv</i>)	(ii) (i)
(C) (<i>ii</i>) (<i>i</i>) (<i>iv</i>) (<i>ii</i>)	<i>i</i>) (D) (<i>i</i>) (<i>ii</i>) (<i>i</i>)	v) (iii)

Solution:(Correct Answer:C)

 $(ii) \quad (i) \quad (iv) \quad (iii)$

- (28) Use of bioresources by multinational companies and organisations without authorisation from the concerned country and its people is called [NEET 2018]
 - (A) Bioexploitaion
 - (B) Bio-infringement
 - (C) Biodegradation
 - (D) Biopiracy

Solution:(Correct Answer:D)

(29) What is the fate of a piece of *DNA* carrying only gene of interest which is transferred into an alien organism?

A. The piece of DNA would be able to multiply itself independently in the progeny cells of the organism.

B. It may get integrated into the genome of the recipient.

C. It may multiply and be inherited along with the host DNA.

D. The alien piece of DNA is not an integral part of chromosome.

E. It shows ability to replicate.

Choose the correct answer from the options given below: [NEET 2024]

(A) D and EV only	(B) B and C only
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(C) A and E only (D) A and B only

Solution:(Correct Answer:B)

Correct answer is option (2) because

The fate of a piece of *DNA* carrying only gene of interest which is transferred into an alien organism are:

(B) It may get integrated into the genome of the recipient(C) It may multiply and be inherited along with the hostDNA

 \Rightarrow This piece of DNA would not be able to multiply itself in the progeny cells of the organism but when gets integrated into the genome of the recipient, it may multiply and be inherited along with the host DNA.

(30) Match List I with List II:

List I (Interaction)	List <i>II</i> (Species <i>A</i> and <i>B</i>)
A. Mutualism	I. + (A), 0(B)
B. Commensalism	II(A), 0(B)
C. Amensalism	III. + (A), -(B)
D. Parasitism	IV. + (A). + (B)

Choose the correct answer from the options given below: [NEET 2023]

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

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

Solution:(Correct Answer:C)

 $\left(+,+\right)$ Mutualism : In this interaction, both the interacting species are benefitted.

 $\left(+,0\right)$ Commensalism : Only one species is benefitted and the other species remains unharmed.

 $\left(-,0\right)$ Amensalism : Neither species is benefitted. One remains unharmed and the other is harmed.

 $\left(+,-\right)$ Parasitism : One species is benefitted and other is negatively effected.

(31) Given below are two statements: Statement *I*:

Mendel studied seven pairs of contrasting traits in pea plants and proposed the Laws of Inheritance Statement *II* :

Seven characters examined by Mendel in his experiment on pea plants were seed shape and colour, flower colour, pod shape and colour, flower position and stem height In the light of the above statements, choose the correct answer from the options given below: [NEET 2022]

- (A) Both Statement I and Statement II are incorrect
- (B) Statement I is correct but Statement II is incorrect
- (C) Statement I is incorrect but Statement II is correct
- (D) Both Statement I and Statement II are correct

Solution:(Correct Answer:D)

- (32) Which part of poppy plant is used to obtain the drug "Smack"? [NEET 2018]
 - (A) Leaves (B) Latex
 - (C) Roots (D) Flowers

Solution:(Correct Answer:B)

- (33) Melotic division of the secondary oocyte is completed [NEET 2020]
 - (A) At the time of fusion of a sperm with an ovum
 - (B) Prior to ovulation
 - (C) At the time of copulation
 - (D) After zygote formation

Solution:(Correct Answer:A)

At the time of fusion of a sperm with an ovum

- (34) The recombination frequency between the genes a & c is 5 %, b & c is 15 %, b & d is 9%, a & b is 20%, c & d is 24% and a & d is 29%. What will be the sequence of these genes on a linear chromosome? [NEET 2022]
 - (A) d, b, a, c (B) a, b, c, d
 - (C) a, c, b, d (D) a, d, b, c

Solution:(Correct Answer:C)

- (35) List of endangered species was released by [NEET 2024]
 - (A) *WWF* (B) *FOAM*

(C) *IUCN* (D) *GEAC*

Solution:(Correct Answer:C)

List of endangered species was released by - IUCN.

... Biology - Section B (MCQ) (Attempt any 10) ...

(36) Match List I with List II

List I	List II
A. Common cold	I. Plasmodium
B. Haemozoin	II. Typhoid
C. Widal test	III. Rhinoviruses
D. Allergy	IV. Dust mites

:Choose the correct answer from the options given below :

[NEET 2024]

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

Solution:(Correct Answer:B)

- Common cold is caused by Rhinoviruses
- Haemozoin is released in blood due to ruptured RBCs after Plasmodium infection.
- Widal test is used to confirm the typhoid fever.
- Allergy is caused due to dust mites.
- (37) Select the *correct* match [NEET 2018]
 - (A) G. Mendel -Transformation
 - (B) Ribozymo -Nucleic acid
 - (C) T.H. Morgan -Transduction
 - (D) $F_2 \times \text{Recessive parent -Dihybrid cross}$

Solution:(Correct Answer:B)

- (38) During the process of gene amplification using PCR, if very high temperature is not maintained in the beginning, then which of the following steps of PCR will be affected first? [NEET 2021]
 - (A) Annealing (B) Extension
 - (C) Denaturation (D) Ligation

Solution:(Correct Answer:C)

(39) Which one of the following is the sequence on corresponding coding strand, if the sequence on mRNA formed is as follows

5' AUCGAUCGAUCGAUCGAUCGAUCGAUCG3'? [NEET 2023]

- (A) 3'ATCGATCGATCGATCGATCGATCGATCG5'
- (B) 5'UAGCUAGCUAGCUAGCUAGCUAGCUAGC3'
- (C) 3'UAGCUAGCUAGCUAGCUAGCUAGCUAGC5'
- (**D**) 5'ATCGATCGATCGATCGATCGATCGATCG3'

Solution:(Correct Answer:D)

(40) Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R. Assertion A: Endometrium is necessary for implantation of blastocyst.
Reason R: In the absence of fertilization, the corpus luteum degenerates that causes disintegration of endometrium. In the light of the above statements, choose the correct answer from the options given below: [NEET 2023]

- (A) A is false but R is true.
- (B) Both A and R are true and R is the correct explanation of A.
- (C) Both A and R are true but R is NOT the correct explanation of A.
- (D) A is true but R is false.

Solution:(Correct Answer:C)

Option (3) is the correct answer because both Assertion and Reason are true. Implantation is embedding of the blastocyst into endometrium of uterus. Correct explanation of reason is Corpus luteum secretes large amount of progesterone which is essential for maintenance of endometrium of uterus. In absence of fertilisation, the corpus luteum degenerates hence the decrease in the level of progesterone hormone will cause disintegration of endometrium leading to menstruation.

- (41) Upon exposure to UV radiation, DNA stained with ethidium bromide will show [NEET 2023]
 - (A) Bright orange colour (B) Bright red colour
 - (C) Bright blue colour (D) Bright yellow colour

Solution:(Correct Answer:A)

Option (1) is the correct answer because in recombinant DNA technology the separated DNA fragments can be visualised only after staining the DNA with a substance known as ethidium bromide followed by exposure to U.V. radiation. You can see bright orange coloured bands of DNA in an ethidium bromide stained gel exposed to U.V. light.

- (42) Which one of the following statements cannot be connected to Predation? [NEET 2022]
 - (A) It might lead to extinction of a species
 - (B) Both the interacting species are negatively impacted
 - (C) It is necessitated by nature to maintain the ecological balance
 - (D) It helps in maintaining species diversity in a community

Solution:(Correct Answer:B)

- (43) For effective treatment of the disease, early diagnosis and understanding its pathophysiology is very important. Which of the following molecular diagnostic techniques is very useful for early detection? [NEET 2021]
 - (A) Western Blotting Technique
 - (B) Southern Blotting Technique
 - (C) ELISA Technique
 - (D) Hybridization Technique

Solution:(Correct Answer:C)

(44) Match List *I* with List *II*:Choose the correct answer from the options given below :

List I	List II	
A RNA polymerase	I snRNPs	
<i>B</i> hline Termination of transcription	II Promotor	[NEET 2024]
C Splicing of Exons	III Rho factor	
D TATA box	IV SnRNAs, tRNA	

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

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

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

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

Solution:(Correct Answer:C)

- In eukaryotes, RNA polymerase *III* codes for snRNAs, tRNA and 5s rRNA.

- Splicing of exons is performed by snRNPs.

- $TATA\ \mathrm{box}$ is present in promoter region of transcription unit.

- Rho factor is responsible for termination of transcription.
- (45) Pollen grains can be stored for several years in liquid nitrogen having a temperature of [NEET 2018]

(A) $-160^{\circ}C$ (B) $-120^{\circ}C$ (C) $-196^{\circ}C$ (D) $-80^{\circ}C$

Solution:(Correct Answer:C)

(46) Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason (R). Assertion (A):

Mendel's law of Independent assortment does not hold good for the genes that are located closely on the same chromosome.

Reason (R) :

Closely located genes assort independently. In the light of the above statements, choose the correct answer from the options given below: [NEET 2022]

- (A) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
- **(B)** (A) is correct but (R) is not correct
- (C) (A) is not correct but (R) is correct
- (D) Both (A) and (R) are correct and (R) is the correct explanation of (A)

Solution:(Correct Answer:B)

- (47) Which of the following has proved helpful in preserving pollen as fossils? [NEET 2018]
 - (A) Sporopollenin (B) Pollenkitt
 - (C) Oil content (D) Cellulosic intine

Solution:(Correct Answer:A)

(48) Identify the microorganism which is responsible for the production of an immunosuppressive molecule cyclosporin

A: [NEET 2022]

- (A) Clostridium butylicum
- (B) Aspergillus niger
- (C) Streptocaccus cenevisiae
- (D) Trichoderma polysporum

Solution:(Correct Answer:D)

(49) Assertion (A) : A person goes to high altitude and experiences 'altitude sickness' with symptoms like breathing difficulty and heart palpitations.

Reason (R) : Due to low atmospheric pressure at high altitude, the body does not get sufficient oxygen.

In the light of the above statements, choose the correct answer from the options given below. [NEET 2021]

- (A) Both (A) and (R) are true and (R) is the correct explanation of (A)
- (B) Both (A) and (R) are true but (R) is not the correct explanation of (A)
- (C) (A) is true but (R) is false
- (D) (A) is false but (R) is true

Solution:(Correct Answer:A)

null

(C) Vaults

- (50) Which of the following is not a natural/traditional contraceptive method? [NEET 2024]
 - (A) Periodic abstinence (B) Lactational amenorrhea
 - (D) Coitus interruptus

Solution:(Correct Answer:C)

The correct answer is option (3) as

Vault is a barrier method of contraception which is made of rubber that is inserted into the female reproductive tract to cover the cervix during the coitus.

- Option (1) is incorrect as periodic abstinence is also a natural method of contraception in which couples avoid coitus during the fertile period.

- Option (2) is incorrect as lactational amenorrhea is also a natural method of contraception which is based on the fact that ovulation and therefore the cycle do not occur during the period of intense lactational following parturition.

- Option (4) is incorrect as coitus interruptus is a natural method of contraception in which male partner withdraws his penis from the vagina just before ejaculation so as to avoid insemination.

Chemistry - Section A (MCQ)

- (51) Vander Waal's equation of state is obeyed by real gases. For n moles of a real gas, the expression will be [IIT 1992]
 - (A) $\left(\frac{P}{n} + \frac{na}{V^2}\right) \left(\frac{V}{n-b}\right) = RT$
 - (B) $\left(P + \frac{a}{V^2}\right) (V b) = nRT$
 - (C) $\left(P + \frac{na}{V^2}\right) (nV b) = nRT$

(D)
$$\left(P + \frac{n^2 a}{V^2}\right) (V - nb) = nRT$$

Solution:(Correct Answer:D)

For ' n ' moles of the real gas, the Van der Waal's equation is: $\left(P + \frac{a^2}{V^2}\right)(V - nb) = nRT$

(52) What is the correct relationship between the pHs of isomolar solutions of sodium oxide (pH_1) , sodium sulphide (pH_2) , sodium selenide (pH_3) and sodium telluride (pH_4)

[AIPMT 2005]

(A) $pH_1 > pH_2 = pH_3 > pH_4$ (B) $pH_1 < pH_2 < pH_3 < pH_4$ (C) $pH_1 < pH_2 < pH_3 = pH_4$ (D) $pH_1 > pH_2 > pH_3 > pH_4$

Solution:(Correct Answer:D)

(d) Order of acidic strength is $H_2Te > H_2Se > H_2S > H_2O$ Na_2O is a salt of $NaOH + H_2O$ and H_2O is least acidic among given acids hence pH in this case will be maximum.

(53) The ionic radius of Na^+ ions is $1.02A^o$. The ionic radii (in A^o) of Mg^{2+} and Al^{3+} , respectively, are [JEE MAIN 2021] (A) 1.05 and 0.99**(B)** 0.72 and 0.54

(C) 0.85 and 0.99(D) 0.68 and 0.72

Solution:(Correct Answer:B)

The ionic radii order is

 $Na^+ > Mq^{2+} > Al^{3+}$

(54) The total number of isoelectronic species from the given set ic

13	
O^{2-}, F^-, Al, Mg	$^{2+}, Na^+, O^+, Mg, Al^{3+}, F$ [jee main 2023]
(A) 5	(B) 4
(C) 3	(D) 2

Solution:(Correct Answer:A)

Isoelectronic species $O^{2\Theta}, F^{\Theta}, Mg^{2+}, Na^{\oplus}, Al^{3+}$

(55) Which contains strongest H-bond [IIT 1986]

(C) $F - HF$	(D) <i>O</i> − <i>HO</i>
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Solution:(Correct Answer:C)

(c)The strongest hydrogen bond is in hydrogen fluoride because the power of hydrogen bond ∞ electronegativity of atom and

electronegativity $\propto \frac{1}{\text{atomic size}}$

So fluorine has maximum electronegativity and minimum atomic size.

(56) The graph between $|\psi|^2$ and r (radial distance) is shown below. This represents [JEE MAIN 2019]



Solution:(Correct Answer:C)

As we know that for s- orbital graph start from top and no. of radial node = n - l - 1 For 2s orbital it will = 2 - 0 - 1 = 1 \therefore The graph is of 2s



- (57) Which is the weakest among the following types of bond (A) Ionic bond (B) Metallic bond
 - (C) Covalent bond
- (D) Hydrogen bond
- Solution:(Correct Answer:D)

(d)Hydrogen bonding is developed due to inter atomic attraction so it is the weakest.

- (58) Which is not found in alkenes [AIIMS 1982]
 - (A) Chain isomerism
- (B) Geometrical isomerism (D) Position isomerism
- (C) Metamerism

Solution:(Correct Answer:C)

(c) Metamerism is a special types of isomerism shown by secondary amines, ethers and ketones.

(59) Which of the following compounds are covalent [IIT 1980]

(A) <i>H</i> ₂	(B) <i>CaO</i>

(C) KCl (D) Na_2S

Solution:(Correct Answer:A)

(a)Two identical atoms are joined with covalent bond so H_2 will be covalent.

- (60) Hydrogen ion concentration in mol/L in a solution of pH = 5.4 will be [AIEEE 2005]
 - (A) 3.98×10^8 (B) 3.88×10^6 (C) 3.68×10^{-6}

(D) 3.98×10^{-6}

Solution:(Correct Answer:D)

(d) $pH = -\log[H^+]$ $5.4 = -\log[H^+]; [H^+] = 3.98 \times 10^{-6}.$

(61) The electronic configuration of a metal M is $1s^2$, $2s^2 2p^6$, $3s^1$. The formula of its oxides will be (A) MO **(B)** *M*₂*O*

(C) M_2O_3 (D) MO_2

Solution:(Correct Answer:B)

(b)The electronic configuration of Na (Z = 11)is $1s^2$, $2s^22p^6$, $3s^1$. The oxide of Na is Na_2O .

(62) Match List-I with List-II:

List-I	List-II	
(<i>a</i>) Li	(i) Poor water solubility of I^- salt	
(<i>b</i>) Na	(ii) Most abundant element in cell fluid	
(<i>c</i>) K	<i>(iii)</i> Bicarbonate salt used in fire extinguisher	
(<i>d</i>) Cs	(iv) Carbonate salt decomposes easily on heating	

Choose the correct answer from the options given below : [JEE MAIN 2021]

(A) (a) - (iv), (b) - (iii), (c) - (ii), (d) - (i)(B) (a) - (i), (b) - (ii), (c) - (iii), (d) - (iv)(C) (a) - (iv), (b) - (ii), (c) - (iii), (d) - (i)

(D) (a) - (i), (b) - (iii), (c) - (ii), (d) - (iv)

Solution:(Correct Answer:A)

 $(a) \ \mathrm{C_{sl}}$ salt is poor water soluble due to it's lowhydration energy

(b) NaHCO₃ is used in fire extinguisher
(c) K is most abundant element in cell fluid
(d) Li₂CO₃ decomposes easily due to high
covalentcharacter caused by small size Li⁺ cation.

(63) IUPAC name for the compound [AIPMT 1998]

$$CI = C = CH_2CH_3$$

$$H_3C = I$$

(A) trans 3 iodo, 4-chloro, 3-pentene

- (B) cis 3 chloro, 3-iodo, 2-pentene
- (C) trans 2 chloro, 3-iodo, 2-pentene
- (D) cis 3 iodo, 4-chloro, 3-pentene

Solution:(Correct Answer:C)

(c) Trans 2-chloro, 3-iodo, 2-pentene



(64) The alkaline earth metal nitrate that does not crystallise with water molecules is [JEE MAIN 2019]
 (A) M (MO)

(A) $Mg(NO_3)_2$	(B) $Sr(NO_3)_2$
(C) $Ca(NO_3)_2$	(D) $Ba(NO_3)_2$

Solution:(Correct Answer:D)

Due to larger size of Ba^{2+} ion, $Ba(NO_3)_2$ can not hold water molecules during crystallization.

(65) The ratio of the shortest wavelength of two spectral series of hydrogen spectrum is found to be about 9. The spectral series are [JEE MAIN 2019]

(A) Lyman and Paschen	(B) Brackett and Pfund
-----------------------	------------------------

(C) Paschen and Pfund (D) Balmer and Brackett

Solution:(Correct Answer:A)

 $\frac{\frac{1}{\lambda_2} = R_H \left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right) Z^2}{\frac{1}{\lambda_1} = R_H \left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right) Z^2}$

As for shortest wavelength both n_1 and n_2^1 are ∞

 $\therefore \frac{\lambda_1}{\lambda_2} = \frac{9}{1} = \frac{n_1^1}{n_1^2}$

Now if $n_1^1 = 3$ and n_1 is 1 it will justify the statement hence Lyman and Paschen is correct.

(66) Which of the following can exhibit cis-trans isomerism [AIPMT 1989]

(A) $HC \equiv CH$	(B) $ClCH = CHCl$
(C) <i>CH</i> ₃ . <i>CHCl</i> . <i>COOH</i>	(D) $ClCH_2 - CH_2Cl$

Solution:(Correct Answer:B) (b)

$$CI = CH = CH$$

$$CI = CH = CH$$

$$CI = CH$$

$$(trans)$$

(67) Consider the following reaction in a sealed vessel at equilibrium with concentrations of

$$N_2 = 3.0 \times 10^{-3} M, O_2 = 4.2 \times 10^{-3} M$$
 and $NO = 2.8 \times 10^{-3} M$.

 $2\mathsf{NO}_{(\mathsf{g})} \rightleftharpoons \mathsf{N}_{2(\mathsf{g})} + \mathsf{O}_{2(\mathsf{g})}$

If $0.1~{\rm mol}~{\rm L}~{\rm L}^{-1}$ of ${\rm NO}_{\rm (g)}$ is taken in a closed vessel, what will be degree of dissociation (α) of ${\rm NO}_{\rm (g)}$ at equilibrium? [NEET 2024]

(A) 0.0889	(B) 0.8889
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(C) 0.717 (D) 0.00889

Solution:(Correct Answer:C)

$$\begin{split} &2\text{NO}_{(\text{g})} \rightleftharpoons \text{N}_{2(\text{g})} + \text{O}_{2(\text{g})} \\ &\textbf{K}_{\text{c}} = \frac{[\text{N}_2][\text{O}_2]}{[\text{NO}]^2} \\ &= \frac{3 \times 10^{-3} \times 4.2 \times 10^{-3}}{2.8 \times 10^{-3} \times 2.8 \times 10^{-3}} \\ &= 1.607 \\ &2\text{NO}_{(\text{g})} \rightleftharpoons \text{N}_{2(\text{g})} + \text{O}_{2(\text{g})} \\ &\textbf{t} = 0 \\ &0.1 \quad 0 \quad 0 \\ &0.1 - 0.1\alpha \quad 0.05\alpha \quad 0.05\alpha \\ &\textbf{K}_{\text{c}} = \frac{0.05\alpha \times 0.05\alpha}{(0.1 - 0.1\alpha)^2} \\ &\textbf{K}_{\text{c}} = \frac{0.05\alpha \times 0.05\alpha}{0.01(1 - \alpha)^2} \\ &\textbf{K}_{\text{c}} = \frac{0.05\alpha \times 0.05\alpha}{0.01(1 - \alpha)^2} \\ &1.607 = \frac{(0.05)^2 \alpha^2}{(0.05)^2 \alpha^2} \\ &\frac{\alpha^2}{(1 - \alpha)^2} = \frac{1.607 \times (0.1)^2}{(0.05)^2} \\ &\frac{\alpha}{1 - \alpha} = 1.27 \times 0.1 \\ &\frac{\alpha}{1 - \alpha} = 2.54 \\ &\alpha = 2.54 - 2.54\alpha \\ &3.54\alpha = 2.54 \\ &\alpha = \frac{2.54}{3.54} = 0.717 \end{split}$$

(68) In a chemical equilibrium $A + B \rightleftharpoons C + D$, when one mole each of the two reactants are mixed, 0.6 mole each of the products are formed. The equilibrium constant calculated is [AIPMT 1989]

(A) 1	(B) 0.36

(C) 2.25 (D) 4/9

Solution:(Correct Answer:C)

(c) $A + B \rightleftharpoons C + D$ Initial 1 1 0 0 remaining at equilibrium 0.4 0.4 0.6 0.6 $K = \frac{[C] [D]}{[A] [B]} = \frac{0.6 \times 0.6}{0.4 \times 0.4} = \frac{36}{16} = 2.25.$

(69) Number of sigma bonds in P_4O_{10} is [AIEEE 2002]

(A) 6	(B) 7
(C) 17	(D) 16

Solution:(Correct Answer:D)

(d) Structure of P_4O_{10} - is Each phosphorus is attached to 4 oxygen atoms.



- (70) On combustion Li, Na and K in excess of air, the major oxides formed, respectively, are : [JEE MAIN 2020]
 (A) Li₂O, Na₂O and K₂O₂ (B) Li₂O, Na₂O₂ and K₂O
 - (C) Li_2O, Na_2O_2 and KO_2 (D) Li_2O_2, Na_2O_2 and K_2O_2

Solution:(Correct Answer:C)

 $Li + O_2 \rightarrow Li_2O$ (Major Oxides) excess $Na+' \rightarrow Na_2O_2(')$ $K+' \rightarrow KO_2(')$

(71) Same mass of CH_4 and H_2 is taken in container. The partial pressure caused by H_2 is [IIT 1989]

(A)	8/9	(B) 1/9
(C)	1/2	(D) 1

Solution:(Correct Answer:A)

(a) N_{CH_4} = number of moles of $CH_4 = \frac{m}{16}$ N_{H_2} = number of moles of $H_2 = \frac{m}{2}$ fraction partial pressure of H_2 is $H_2 = \frac{n_{H_2}}{n_{H_2} + n_{CH_4}} = \frac{\frac{m}{2}}{\frac{m}{2} + \frac{m}{16}} = \frac{\frac{m}{2}}{\frac{9m}{16}} = \frac{8}{9}$

(72) Choose the correct set of reagents for the following conversion trans $(Ph - CH = CH - CH_3) \rightarrow cis$

 $(Ph - CH = CH - CH_3)$ [JEE MAIN 2023]

- (A) Br_2 , alc KOH, $NaNH_2$, $Na(LiqNH_3)$
- (B) Br_2 , alc KOH, $NaNH_2$, H_2 Lindlar Catalyst
- (C) $Br_2, aqKOH, NaNH_2, H_2$ Lindlar Catalyst
- (D) Br_2 , aq KOH, $NaNH_2$, $Na(LiqNH_3)$

Solution:(Correct Answer:B)



- (73) Under similar conditions of pressure and temperature, $40\,ml$ of slightly moist hydrogen chloride gas is mixed with $20\,ml$ of ammonia gas, the final volume of gas at the same temperature and pressure will beml [AIPMT 1993]
 - (A) 100 (B) 20
 - (C) 40 (D) 60

Solution:(Correct Answer:B)

(74) The correct IUPAC name of the following compound is



- (A) 6-bromo-2-chloro-4-methylhexan-4-ol
- (B) 1-bromo-4-methyl-5-chlorohexan-3-ol
- (C) 6-bromo-4-methyl-2-chlorohexan-4-ol
- (D) 1-bromo-5-chloro-4-methylhexan-3-ol

Solution:(Correct Answer:D)





(75) If *a* stands for the edge length of the cubic systems : simple cubic, body centred cubic and face centred cubic, then the ratio of radii of the spheres in these systems will be respectively [AIPMT 2008]

(A)
$$\frac{1}{2}a : \frac{\sqrt{3}}{2}a : \frac{\sqrt{2}}{2}a$$

(C) $\frac{1}{2}a : \frac{\sqrt{3}}{2}a : \frac{1}{2\sqrt{2}}a$ (D) $\frac{1}{2}a : \sqrt{3}a : \frac{1}{\sqrt{2}}a$

(B) $1a : \sqrt{3}a : \sqrt{2}a$

Solution:(Correct Answer:C)

For Simple cubic = $r^+ + r^- = a/2$ For Body centred = $r^+ + r^- = a\sqrt{3}/4$ where a = edge length, $r^+ + r^-$ = interatomic distance. For Face centered $r^+ + r^- = \frac{a}{2\sqrt{2}}$ Ratio of radii of the three will be

 $\frac{a}{2}$: $\frac{a\sqrt{3}}{4}$: $\frac{a}{2\sqrt{2}}$

(76) $250 \ mL$ of a waste solution obtained from the workshop of a goldsmith contains $0.1 \ MAgNO_3$ and $0.1 \ M$ AuCl. The solution was electrolyzed at $2 \ V$ by passing a current of $1 \ A$ for 15 minutes. The metal/metals electropositive will be

$$\left(E^0_{Ag^+/Ag} = 0.80 \, V, E^0_{An^+/Au} = 1.69 \, V
ight)$$
 [jee main 2020]

- (A) only silver
- (B) only gold
- (C) silver and gold in equal mass proportion
- (D) silver and gold in proportion to their atomic weights

Solution:(Correct Answer:D)

As voltage is '2V' so both Ag^+ & Au^+ will reduce and their equal gm equivalent will reduce so amea Aa = amea of Au

gmeq Ag = gmeq of Au $\frac{Wt_{Ag}}{E_{qwtAg}} = \frac{Wt_{Au}}{E_{qwtAu}}$ So $\frac{wt_{Ag}}{wt_{Au}} = \frac{E_{qwt_{Au}}}{E_{qwtAu}} = \frac{Atwt_{Ag}}{Atwt_{Au}}$

(77) The only cations present in a slightly acidic solution are Fe^{3+} , Zn^{2+} and Cu^{2+} . The reagent that when added in excess to this solution would identify and separate Fe^{3+} in one step is [IIT 1997]

(A) 2M HCl (B) 6M NH₃ (C) 6M NaOH (D) H₂S gas

Solution:(Correct Answer:D)

It's Obvious.

(78) Consider the following reaction The product 'X' is used [JEE MAIN 2020]

$$\underbrace{ \left(\begin{array}{c} \\ \\ \end{array}\right)}_{\text{CH}_3} + \underset{\text{Na SO}_3}{\overset{\oplus}{\text{SO}_3}} - \underbrace{ \begin{array}{c} \\ \\ \end{array}\right)}_{\text{N_2Cl}} \xrightarrow{\text{OH}}_{\text{N_2Cl}} \xrightarrow{\text{OH}}_{\text{VX}}$$

- (A) in acid base titration as an indicator
- (B) in protein estimation as an alternative to ninhydrin
- (C) in laboratory test for phenols
- (D) as food grade colourant

Solution:(Correct Answer:A)



It is an acid base indicator

(79) Which of the following species is not paramagnetic ? [JEE MAIN 2017]

(A) <i>NO</i> (B	CO
------------------	----

(C) O₂

Solution:(Correct Answer:B)

The electronic configuration of the given species is as follows:

(D) B₂

 $\begin{array}{l} \mathsf{O}_{2}:\sigma 1s^{2},\sigma^{*}1s^{2},\sigma 2s^{2},\sigma^{*}2s^{2},\sigma 2p_{x}^{2}, \left\{ \begin{array}{l} \pi 2p_{y}^{2}, \\ \pi 2p_{z}^{2}, \end{array} \right\} \left\{ \begin{array}{l} \pi^{*}2p_{y}^{1}, \\ \pi^{*}2p_{z}^{1} \end{array} \right. \\ \mathsf{B}_{2}:\sigma 1s^{2},\sigma^{*}1s^{2},\sigma 2s^{2},\sigma^{*}2s^{2}, \left\{ \begin{array}{l} \pi 2p_{y}^{1}, \\ \pi 2p_{z}^{1} \end{array} \right\} \\ \mathsf{NO}:\sigma 1s^{2},\sigma^{*}1s^{2},\sigma 2s^{2},\sigma^{*}2s^{2},\sigma 2p_{x}^{2}, \left\{ \begin{array}{l} \pi 2p_{y}^{2}, \\ \pi 2p_{z}^{2}, \end{array} \right\} \left\{ \begin{array}{l} \pi^{*}2p_{y}^{1}, \\ \pi^{*}2p_{z}^{0}, \\ \pi^{*}2p_{z}^{0}, \end{array} \right\} \\ \mathsf{CO}: \text{ No unpaired electron is present in the molecule, } \end{array}$

therefore, is not paramagnetic.

(80) What is the *IUPAC* name of the organic compound formed in the following chemical reaction?

Acetone $\xrightarrow{(i) C_2H_5MgBr, dry Ether}_{(ii)H_2O,H^+}$ Product [NEET 2021] (A) 2-methyl propan-2-ol (B) pentan-2-ol (C) pentan-3-ol (D) 2-methyl butan-2-ol

Solution:(Correct Answer:D)

$$CH_{3} - C - CH_{3} \xrightarrow{\overset{\circ}{C_{2}}H_{5}\overset{\circ}{MgBr}}_{dry \text{ ether}} CH_{3} - CH_{3} \xrightarrow{\overset{\circ}{C_{2}}H_{5}}_{O} \xrightarrow{\overset{\circ}{H_{3}}O^{\oplus}}_{OH} \xrightarrow{\overset{\circ}{T}CH_{3}}_{1} \xrightarrow{\overset{\circ}{C_{2}}H_{5}}_{C} - CH_{3} \xrightarrow{\overset{\circ}{H_{3}}O^{\oplus}}_{OH} \xrightarrow{\overset{\circ}{T}CH_{3}}_{OH} \xrightarrow{\overset{\circ}{C_{2}}C_{2}}_{OH} CH_{3} \xrightarrow{\overset{\circ}{T}CH_{3}}_{OH} \xrightarrow{\overset{}{T}CH_{3}}_{OH} \xrightarrow{\overset{\circ}{T}CH_{3}}_{OH} \xrightarrow{\overset{}{T}CH_{3}}_{OH}$$

(81) Four successive members of the first row transition elements are listed below with their atomic numbers. Which one of them is expected to have the highest third ionization enthalpy [AIPMT 2005]

(A) Vanadium (Z = 23) (B) Chromium (Z = 24)

(C) Iron (Z = 26)

(D) Manganese (Z = 25)

Solution:(Correct Answer:D)

(d)₂₅ $Mn = 3d^54s^2$ After losing two electron electronic configuration will be like this ($_{25}Mn^{+2}3d^5$) and this is most stable configuration due to half filled orbitals hence third ionization enthalpy will be highest in this case.

- (82) Which of the following is suitable to synthesize chlorobenzene? [NEET 2022]
 - (A) Phenol, NaNO₂, HCl, CuCl





(D) Benzene, Cl_2 , anhydrous $FeCl_3$

Solution:(Correct Answer:D)



(83) On heating, lead(II) nitrate gives a brown gas (A). The gas (A) on cooling changes to a colourless solid/liquid (B). (B) on heating with NO changes to a blue solid (C). The oxidation number of nitrogen in solid (C) is : [JEE MAIN 2020]

(A)
$$+5$$
 (B) $+2$

Solution:(Correct Answer:D)

$$Pb(NO_3)_2 \xrightarrow{\Delta} PbO + \frac{2NO_2}{Brown \, gas(A)} + \frac{1}{2}O_2(g)$$
$$NO_2(g) \xrightarrow{\Delta} \frac{N_2O_3}{(B)}$$

 $\begin{array}{l} N_2O_4+NO \stackrel{\Delta}{\longrightarrow} \frac{N_2O_3}{Blue\ solid}\ (C)\\ O.S.\ \text{of nitrogen in}\ N_2O_3\ \text{is +3}\\ N_2O_32x+3(-2)=0\\ x=+3 \end{array}$

(84) The number of tripeptides formed by three different amino acids using each amino acid once is...... [JEE MAIN 2024]
(A) 4
(B) 5

(D) 7

(D) $[Co(NH_3)_4 Cl_2]^+$

(C) 6

Solution:(Correct Answer:C)

Let 3 different amino acid are A,B,C then following combination of tripeptides can be formed-ABC, ACB, BAC, BCA, CAB, CBA

(85) Indicate the complex/complex ion which did not show any geometrical isomerism : [JEE MAIN 2021]

(A) $[CoCl_2(en)_2]$ (B) $[Co(CN)_5(NC)]^{3-1}$

(C) $[Co(NH_3)_3(NO_2)_3]$

Solution:(Correct Answer:B)

(1) [CoCl₂(en)₂] show Cis-trans isomerism
 (2) [Co(CN)₅(NC)]⁻³ can't Show G.I.
 (3) [Co (NH₃)₃ (NO₂)₃]
 Show fac & mer isomerism
 (4) [Co (NH₃)₄ Cl₂][⊕] show cis & trans isomerism

Chemistry - Section B (MCQ) (Attempt any 10)

(86) Hydrogen peroxide reacts with iodine in basic medium to give : [JEE MAIN 2021]

(A) IO_4^- (B) IO^-

(C) I^- (D) IO_3^-

Solution:(Correct Answer:C)

 $\mathsf{I}_2 + \mathsf{H}_2\mathsf{O}_2 + 2\mathsf{O}\mathsf{H}^- \longrightarrow 2\mathsf{I} + 2\mathsf{H}_2\mathsf{O} + \mathsf{O}_2$

- (87) Assign A, B, C, D from given type of reaction. $Fe(CN)_2 \downarrow +4KCN \longrightarrow K_4[Fe(CN)_6]$
 - (A) For precipitate formation reaction
 - (B) For precipitate dissolution reaction
 - (C) For precipitate exchange reaction
 - (D) For no reacton

Solution:(Correct Answer:B)

(88) Decarboxylation of all six possible forms of diaminobenzoic acids $C_6H_3 (NH_2)_2 COOH$ yields three products A, B and C. Three acids give a product 'A', two acids gives a product 'B' and one acid give a product 'C'. The melting point of product 'C' is°C. [JEE MAIN 2022]

(A) 63 (B) 90

(C) 104 (D) 142

Solution:(Correct Answer:D)



- (89) If doubling the concentration of a reactant 'A' increases the rate 4 times and tripling the concentration of 'A' increases the rate 9 times, the rate is proportional to [AIIMS 1991]
 - (A) Concentration of 'A'
 - (B) Square of concentration of 'A'
 - (C) Under root of the concentration of 'A'
 - (D) Cube of concentration of 'A'

Solution:(Correct Answer:B)

(b) $2^2 = 4$, $3^2 = 9$

- (90) Arsenic drugs are mainly used in the treatment of [AIIMS 1992](A) Jaundice(B) Typhoid
 - (C) Syphilis (D) Cholera

Solution:(Correct Answer:C)

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(c) Arsenic drugs are poisonous for syphilis.
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(91) Consider the following reaction

(image) $\xrightarrow{H_2} A$ The product A is [AIPMT 2012]



(A) C_6H_5CHO (B) C_6H_5OH

(C) $C_6H_5COCH_3$

(D) C_6H_5Cl

Solution:(Correct Answer:A)

In Rosenmund reaction, acid chloride reacts with H_2 in the presence of Pd/BaSO₄ to yield aldehyde.



(92) The given reaction can occur in the presence of: (1) Bromine water (2) ${\rm Br}_2$ in ${\rm CS}_2,273$ K (3) ${\rm Br}_2/{\rm FeBr}_3$ (4) ${\rm Br}_2$ in ${\rm CHCl}_3,273$ K

Choose the correct answer from the options given below: [JEE MAIN 2021]



(Major Product)

- (A) (a) and (c) only
- (C) (a), (b) and (d) only (D) (b) and (d) only

Solution:(Correct Answer:B)

Bromine water gives tribromo products, other gives monbromo products in which para is major product.

(93) Which of the following will not form a yellow precipitate on heating with an alkaline solution of iodine [AIPMT 2004]

(B) *CH*₃*CH*₂*OH*

(C) $CH_3CH(OH)CH_3$

(A) CH_3OH

(D) $CH_3CH_2CH(OH)CH_3$

(B) (b), (c) and (d) only

Solution:(Correct Answer:A)

(a) Formation of a yellow precipitate on heating a compound with an alkaline solution of iodine is known as iodoform reaction. Methyl alcohol does not respond to this test. lodoform test is exhibited by ethyl alcohol, acetaldehyde, acetone, methyl ketone and those alcohols which possess $CH_3CH(OH)$ – group.

(D) 10_3^{-1}

- (94) In alkaline medium. MnO₄⁻oxidises I⁻ to [JEE MAIN 2024]
 - (A) IO_{4}^{-} $(B) IO^{-}$
 - (C) I₂

Solution:(Correct Answer:D)

 $2\mathsf{MnO}_4^- + \mathsf{H}_2\mathsf{O} + \mathsf{I}^- \xrightarrow{\text{allcaline medium}} 2\mathsf{MnO}_2 + 2\mathsf{OH}^- + \mathsf{IO}_3^-$

(95) Which of the following molecules is most suitable to disperse benzene in water [AIIMS 2005]

(A) null



(B) null



(C) null



(D) null



Solution:(Correct Answer:C)

(c) Benzene is non polar in nature. As we know that non-polar disperses more to non-polar substances. Therefore, meta-metyl nonylbenzene being nonpolar from both sides will disperse more to benzene. All other substances (a, b and d) have either one side polar or both sides polar.



non-polar end

CH₃

- (96) The reason for greater range of oxidation states in actinoids is attributed to [NEET 2017]
 - (A) actinoid contraction
 - (B) 5f, 6d and 7s levels having comparable energies
 - (C) 4f and 5d levels being close in energies
 - (D) the radioactive nature of actinoids.

Solution:(Correct Answer:B)

Minimum energy gap between

5f, 6d and 7s subshell. Thats why exitation will be easier.

(97) The following data was obtained for chemical reaction given below at 975 K. $2NO_{(g)} + 2H_{2(g)} \rightarrow N_{2(g)} + 2H_2O_{(g)}$

[NO] H_2 Rate $molL^{-1}$ $\mathsf{mol}L^{-1}$ molL⁻ s^{-1} 8×10^{-5} 8×10^{-5} 7×10^{-9} (A) 24×10^{-5} 8×10^{-5} 2.1×10^{-8} (B) 24×10^{-5} 32×10^{-5} 8.4×10^{-8} (C)

The order of the reaction with respect to NO is [JEE MAIN 2021]

(A) 1 **(B)** 4

(C) 2

(D) 3 Solution:(Correct Answer:A)

 $7 \times 10^{-9} = \mathsf{K} \times (8 \times 10^{-5})^{\mathsf{x}} (8 \times 10^{-5})^{\mathsf{y}} \dots \dots \dots (1)$ $2.1 \times 10^{-8} = \mathbf{K} \times (24 \times 10^{-5})^{\mathbf{x}} (8 \times 10^{-5})^{\mathbf{y}} \dots (2)$ $\frac{1}{2} = \left(\frac{1}{2}\right)^{\mathsf{X}} \Rightarrow \mathsf{X} = 1$

- (98) Higher order (>3) reactions are rare due to : [JEE MAIN 2015]
 - (A) shifting of equilibrium towards reactants due to elastic collisions
 - (B) loss of active species on collision
 - (C) low probability of simultaneous collision of all the reacting species
 - (D) increase in entropy and activation energy as more molecules are involved

Solution:(Correct Answer:C)

Reactions of higher order (> 3) are very rate due to very less chances of many molecules to undergo effective collisions.

- (99) Which of the following would be expected to be most highly ionised in water [AIIMS 1982]
 - (A) $CH_2ClCH_2CH_2COOH$ (B) $CH_3CHCl.CH_2.COOH$
 - (C) $CH_3.CH_2.CCl_2.COOH$ (D) $CH_3.CH_2.CHCl.COOH$

Solution:(Correct Answer:C)

 $CH_3 - CH_2 - CCl_2 - COOH;$ α , α - dichloro butanoic acid is most acidic. Hence it will easily loose H^+ ions in solution.

(100) All structures given below are of vitamin C. Most stable of them is: [JEE MAIN 2023]

(D)



(A)







Solution:(Correct Answer:A)

H-bonding stabilised vitamin C



Mathematics - Section A (MCQ)	(105) All points lying inside the triangle formed by the points $(1,3), (5,0)$ and $(-1,2)$ satisfy [IIT 1986]
(101) In $\triangle ABC$, $\frac{\sin B}{\sin(A+B)} =$	(A) $3x + 2y \ge 0$ (B) $2x + y - 13 \le 0$
(A) $\frac{b}{a+b}$ (B) $\frac{b}{c}$	(C) $2x - 3y - 12 \le 0$ (D) All the above
(C) $\frac{c}{b}$ (D) None of these	
Solution:(Correct Answer:B)	Solution:(Correct Answer:D)
(b) $\frac{\sin B}{\sin(A+B)} = \frac{\sin B}{\sin C} = \frac{b}{c}$.	(d) For $(1, 3)$, $3x + 2y = 3 + 6 > 0$, for $(5, 0) 3 \times 5 + 0 > 0$ and
(102) For any two complex numbers z_1, z_2 we have $ z_1 + z_2 ^2 =$	(-1, 2) for $(-1, 2), -3 + 4 > 0.$
$ z_1 ^2 + z_2 ^2$ then (A) $\operatorname{Pe}\left(z_1\right) = 0$ (B) $\operatorname{Im}\left(z_1\right) = 0$	Similarly other inequalities hold good.
(A) $\operatorname{Re}\left(\frac{1}{z_2}\right) = 0$ (B) $\operatorname{Im}\left(\frac{1}{z_2}\right) = 0$	
(C) $\operatorname{Re}(z_1 z_2) = 0$ (D) $\operatorname{Im}(z_1 z_2) = 0$	(106) The number of ways of selecting 15 teams from 15 men and
Solution:(Correct Answer:A) (a) We have $ z_1 + z_2 ^2 = z_1 ^2 + z_2 ^2$	Woman, is [JEE MAIN 2015]
$= z_1 ^2 + z_2 ^2 + 2 z_1 z_2 \cos(\theta_1 - \theta_2)$	(A) 1120 (B) 1880
$= z_1 ^2 + z_2 ^2$ Where $\theta_1 = arg(z_1), \theta_2 = arg(z_2)$	(C) 1960 (D) 1240
$=>\cos(\theta_1-\theta_2)=0 \Rightarrow \theta_1-\theta_2=\frac{\pi}{2}$	
$= \operatorname{sarg}\left(\frac{z_1}{z_2}\right) = \frac{\pi}{2} \Rightarrow \operatorname{Re}\left(\frac{z_1}{z_2}\right) = \frac{ z_1 }{ z_2 } \cos\left(\frac{\pi}{2}\right) = 0$	Solution:(Correct Answer:D)
Note : Also Re $\left(\frac{z_1}{z_2}\right) = 0 \Rightarrow$ Re $(z_1\overline{z_2}) = 0$	Number of ways of selecting a man and a woman for a team from 15 men 15 women
== > $z_1 z_2$ is purely imaginary.	$= 15 \times 15 = (15)^2$
(103) If (α, β) is the orthocentre of the triangle ABC with vertice $A(3, -7)$ $B(-1, 2)$ and $C(4, 5)$ then $9\alpha - 6\beta + 60$ is equal	e_{S} Number of ways of selecting a man and a woman for next team out of the remaining 14 men 14 women.
to: [JEE MAIN 2023]	$= 14 \times 14 = (14)^2$
(A) 30 (B) 25	Hence required number of ways
(C) 40 (D) 35	$(15)^2 + (14)^2 + \dots + (1)^2$ = $\frac{15 \times 16 \times 31}{12} = 1240$
Solution:(Correct Answer:B) Altitude of BC: $u + 7 = \frac{-5}{2}(x - 3)$	6 1210
3y + 21 = -5x + 15	(107) If the data is used in such that the mean of first four
5x + 3y + 6 = 0 Altitude of $AC: y - 2 = \frac{-1}{12}(x + 1)$	of these is 11, the mean of the remaining six is 16 and the
12y - 24 = -x - 1	sum of squares of all of these is 2,000; then the standard
$\alpha = \frac{-47}{19}, \beta = \frac{121}{57}$	(A) $2\sqrt{2}$ (B) 2
$9\alpha - 6\beta + 60 = 25$	(C) 4 (D) $\sqrt{2}$
A(5,-7)	
	Solution:(Correct Answer:B)
m=12	$x_1 + \ldots + x_4 = 44$ $x_5 + \ldots + x_{10} = 96$
	$\bar{x}_{5} + \dots + \bar{x}_{10} = 50$ $\bar{x} = 14, \sum x_{i} = 140$
	Variance $= \frac{\sum x_i^2}{n} - \bar{x}^2 = 4$
B(-1,2) 3 C(4,5)	
$m = \frac{1}{5}$	
(104) The approximate value of $(7.995)^{1/3}$ correct to four decima	(108) Among the statements (S1): $(p \Rightarrow q) \lor ((\sim p) \land q)$ is a tautology
places is	$(S2): (q \Rightarrow p) \Rightarrow ((\sim p) \land q)$ is a contradiction [JEE MAIN 2023]
(A) 1.9995 (B) 1.9996	(A) neither $(S1)$ and $(S2)$ is True
(C) 1.999 (D) 1.9991	(B) only (S1) is True
Solution:(Correct Answer:A) (a) $(7,005)^{1/3}$ (b) $(7,005)^{1/3}$ (c) $(7,005)^{1/3}$ (c) $(7,005)^{1/3}$	(C) only $(S2)$ is True
$\begin{bmatrix} (a) (1.993) & = (8 - 0.003)^{1/3} = (8)^{1/3} \begin{bmatrix} 1 - \frac{0.003}{8} \end{bmatrix}^{1/3} \\ 2 \begin{bmatrix} 1 & 1 \\ 1 & 0.005 \end{bmatrix} = \frac{1}{3} (\frac{1}{3} - 1) (0.005)^{2} \end{bmatrix}$	(D) both $(S1)$ and $(S2)$ are True
$= 2 \begin{bmatrix} 1 - \frac{1}{3} \times \frac{-1000}{3} + \frac{1000}{2+1} \left(\frac{0000}{3} \right)^2 + \dots \end{bmatrix}$	
$= 2 \left[1 - \frac{0.005}{24} - \frac{3 \times 3}{1} \times \frac{(0.005)}{8}^{-} + \dots \right]$	Solution:(Correct Answer:A)
$-2(1-0.000200) = 2 \times 0.399192 = 1.9990$	

	(p →	(p	∨((~ p) ∧	q)		
	p	q	$p \rightarrow q$	~p^q	$(p \rightarrow q) \vee$	(~p)∧q)
	Т	Т	Т	F		Г
	Т	F	F	F]	F
	F	Т	Т	Т		Г
	F	F	Т	F		Г
	Not a	tau	ıtology			
	p	q	q→p	(~p) ^ q	$(q \rightarrow p) \vee$	r (~ p) ∧ q)
	Т	Т	Т	F	1	F
	T	F	Т	F]	F
	F	T	F	T		Г
	F	F	T	F		F
(109)	$\left(\frac{1+i}{1-i}\right)^2$ (A) 2 <i>i</i>	2 +	$\left(\frac{1-i}{1+i}\right)^2$ is e	equal to (3) –2 <i>i</i>	
	(C) −2			(I	D) 2	
	Solutio	on:(Correct A	nswer:C)		
	(c) $\left(\frac{1+1}{1-1}\right)$	$\left(\frac{-i}{i}\right)^2$	$+\left(\frac{1-i}{1+i}\right)^2$	$e^2 = \frac{2i}{-2i} + $	$\left(\frac{-2i}{2i}\right) = -2.$	
(110)	Let a be $(1 - 2a)$ $b = \lim_{x \to a} b$	e th $x + x \rightarrow 0$	the sum of a $2x^2$) ²⁰²³ ($\int_0^x \frac{\log(1+1)}{t^{2024}}$	all coefficients $3 - 4x^2 + \frac{t}{t+1}dt$). If the second	ents in the ex $2x^3ig)^{2024}$ and ne equations	pansion of $cx^2 + dx + e = 0$
	and 2b	x^2 +	-ax + 4 =	0 have a c	ommon root	, where
	$c, d, e \in$	E R,	then $d:c$: e equals	[JEE MAIN 2024]	
	(n) 2	1.°	± 4	($1 \cdot 1 \cdot 4$	X
	Solutio	∠ : ∠ on:(± Correct A	יי) (Inswer:D) 1:1:4	100
	Put x =	= 1				
	a = 1 b = lim Using <i>l</i> b = lim Now,	$1 \\ L'H \\ x \rightarrow 0 \\ x \rightarrow 0$	$ \begin{array}{c} & \int_{0}^{x} \frac{\ln(1+t)}{1+t^{2024}} \\ OPITAL \\ 0 \\ 0 \\ \frac{\ln(1+x)}{(1+x^{2024})} \\ 2 \\ + dx + e \end{array} $	$\frac{dt}{Rule} \times \frac{1}{2x} = \frac{1}{2}$ $= 0, x^{2} - (D)$	$+ \mathbf{x} + 4 = 0$	
	$\therefore \frac{c}{1} =$	$\frac{d}{1} =$	$=\frac{e}{4}$, , , , , , , , , , , , , , , , , , ,	,	
(111)	$1 + \cos \theta$	52x	$+\cos 4x$ -	$+\cos 6x =$		
	(A) 2 co	$\operatorname{DS} x$	$\cos 2x \cos 2x$	3x (B) $4 \sin x \cos x$	$2x\cos 3x$
	(C) 4 cc	$\operatorname{os} x$	$\cos 2x \cos x$	3 <i>x</i> (I	D) None of th	nese
	Solution (c) 1 + = (1 + = 2 cos = 2 co = 4 co	on:(cos cos s ² 3; s 3; s x	Correct A $5 2x + \cos 3$ $5 6x) + (\cos 3x)$ $x + 2 \cos 3x$ $x (\cos 3x - \cos 2x)$ co	$4x + \cos x + \cos 2x + \cos x$ $+ \cos x$ $+ \cos x$ $+ \cos x$	6xs $4x)$	
(112)	Domair	ו of	the functi	on $\sqrt{\log \{}$	$(5x - x^2)/6$	is
	(A) (2,3	3)		(3) [2,3]	
	(C) [1,2	2]		([D) [1,3]	
	Solutio	on:(Correct A	nswer:B)	-	
	(b) log or x^2 – Hence	$\begin{cases} \frac{5}{2} \\ -5x \\ 2 \le 2 \end{cases}$	$\frac{x-x^2}{6} \bigg\} \ge 0$ + 6 \le 0 c x \le 3.	$D \Rightarrow \frac{5x-x}{6}$ or $(x-2)$ (so	$\frac{2}{r} \ge 1$ $(x-3) \le 0.$	

(113)	The number of numbers, strictly between 5000 and 10000
	can be formed using the digits $1, 3, 5, 7, 9$ without repetition,
	IS

12

(C) 120 (D) 72

Solution:(Correct Answer:D)

Numbers between 5000 and 10000 Using digits 1, 3, 5, 7, 9 Total Numbers = $3 \times 4 \times 3 \times 2 = 72$

	3 4 3 2	
(114)	If the center and radius of the respectively (α, β) and γ , the MAIN 2023] (A) 11 (C) 10	e circle $\left \frac{z-2}{z-3}\right = 2$ are en $3(\alpha + \beta + \gamma)$ is equal to [JEE (B) 9 (D) 12
	$\begin{aligned} & \text{Solution:} (\text{Correct Answer:} \text{D} \\ & \sqrt{(x-2)^2+y^2} = 2\sqrt{(x-3)^2} \\ & = x^2+y^2-4x+4 = 4x^2+2x^2+2x^2+3y^2-20x+32=0 \\ & = x^2+y^2-\frac{20}{3}x+\frac{32}{3}=0 \\ & = (\alpha,\beta) = \left(\frac{10}{3},0\right) \\ & \gamma = \sqrt{\frac{100}{9}-\frac{32}{3}} = \sqrt{\frac{4}{9}} = \frac{2}{3} \\ & 3(\alpha,\beta,\gamma) = 3\left(\frac{10}{3}+\frac{2}{3}\right) \\ & = 12 \end{aligned}$	$\frac{y}{(4y^2 - 24x + 36)}$
(115)	$\lim_{x\to 4} \left[\tfrac{x^{3/2}-8}{x-4} \right] =$	
	(A) 3/2	(B) 3
	(C) 2/3	(D) 1/3
	Solution:(Correct Answer:B)
	(b) $y = \lim_{x \to 4} \left[\frac{x^{3/2} - 8}{x - 4} \right] = \lim_{x \to 4} \left \frac{x + 4}{x - 4} \right $ == > $y = \lim_{x \to 4} \frac{(x^{1/2} - 2)(x + 4 + 2)(x + 4 + 2)}{(\sqrt{x} - 2)(\sqrt{x} + 2)}$ == > $y = \lim_{x \to 4} \frac{(x + 4 + 2\sqrt{x})}{(\sqrt{x} + 2)} = \frac{4}{4}$ Trick : Applying L - Hospital $\lim_{x \to 4} \frac{\frac{3}{2}x^{1/2}}{1} = \frac{3}{2}(4)^{1/2} = 3.$	$\begin{bmatrix} \frac{(x^{1/2})^3 - (2)^3}{(\sqrt{x} - 2)(\sqrt{x} + 2)} \end{bmatrix}_{\frac{\sqrt{x}}{\sqrt{4}}}$ = $\frac{12}{\sqrt{4} + 2} = \frac{12}{4} = 3.$ s rule, we get
(116)	Let α and β be the roots of t Then, the value of $ \alpha^8 + \beta^8 $ (A) 50	the equation $x^2 + (2i - 1) = 0$. is equal to [JEE MAIN 2022] (B) 250
	(C) 1250	(D) 1500
	Solution:(Correct Answer:A $X^2 = 1 - 2i \Rightarrow \alpha^2 = 1 - 2i$ Hence $\alpha^8 = \beta^8$ $ \alpha^8 + \beta^8 = 2\alpha^8 = 2 \alpha^2 ^4$ $= 2\sqrt{5}^4 = 50$) $2i, \beta^2 = 1 - 2i$

(117) Let S be the set of all $a \in N$ such that the area of the triangle formed by the tangent at the point $P(b, c), b, c \in N$, on the parabola $y^2 = 2ax$ and the lines x = b, y = 0 is 16 unit ², then $\sum_{aes} a$ is equal to [JEE MAIN 2023] (A) 145 (B) 144 (C) 143 (D) 146

Solution:(Correct Answer:D) (1 As P(b,c) lies on parabola so $c^2 = 2ab$ Now equation of tangent to parabola $y^2 = 2ax$ in point form is $y_1 = 2a\frac{(x+x_1)}{2}, (x_1, y_1) = (b, c)$ $\Rightarrow yc = a(x+b)$ For point B, put y = 0, now x = -bSo, area of $\triangle PBA, \frac{1}{2} \times AB \times AP = 16$ $\Rightarrow \frac{1}{2} \times 2b \times c = 16$ $\Rightarrow bc = 16$ As b and c are natural number so possible values of (b, c) are (1, 16), (2, 8), (4, 4), (8, 2) and (16, 1)Now from equation (1) $a = \frac{c^2}{2b}$ and $a \in N$, so values of (b, c)(C) Scalene are (1, 16), (2, 8) and (4, 4) now values of are 128, 16 and 2. Hence sum of values of a is 146. (118) $\cos \frac{\pi}{7} \cos \frac{2\pi}{7} \cos \frac{4\pi}{7} =$ (A) 0 (B) $\frac{1}{2}$ (C) $\frac{1}{4}$ (D) $-\frac{1}{8}$ Solution:(Correct Answer:D) (d) $\cos \frac{\pi}{7} \cdot \cos \frac{2\pi}{7} \cdot \cos \frac{4\pi}{7}$ $\sin\left(2^3, \frac{\pi}{7}\right)$ (C) $\frac{20}{7}$ $\overline{2^3 \operatorname{sin}\left(\frac{\pi}{7}\right)}$ $sin \frac{8\pi}{7}$ $=\frac{1}{8\sin\frac{\pi}{7}}$ $=-\frac{1}{8}.$ (119) Let a, b and c be the length of sides of a triangle ABC such that $\frac{a+b}{7} = \frac{b+c}{8} = \frac{c+a}{9}$. If r and R are the radius of incircle and radius of circumcircle of the triangle ABC, respectively, then the value of $\frac{R}{r}$ is equal to [JEE MAIN 2022] (A) $\frac{5}{2}$ (B) 2 (C) $\frac{3}{2}$ (D) 1 Solution:(Correct Answer:A) $\frac{a+b}{7} = \frac{b+c}{8} = \frac{c+a}{9} = \lambda$ $a + b = 7\lambda, b + c = 8\lambda, a + c = 9\lambda$ $\Rightarrow a + b + c = 12\lambda$ Now $a = 4\lambda, b = 3\lambda, c = 5\lambda$ $:: c^2 = b^2 + a^2$ $\angle C = 90^{\circ}$ $\Delta = \tfrac{1}{2} a b \sin C = \tfrac{1}{2} a b$ $\frac{R}{r} = \frac{c}{2\sin C} \times \frac{s}{\Delta} = \frac{c}{2} \times \frac{6\lambda}{\frac{1}{2}ab} = \frac{c}{ab} \times 6\lambda = \frac{5}{2}$ (120) The line x + y = 4 divides the line joining the points (-1, 1)and (5,7) in the ratio [IIT 1965] (A) 2:1 **(B)** 1 : 2 (C) 1:2 externally (D) None of these Solution:(Correct Answer:B) (b) Ratio= $-\left(\frac{-1+1-4}{5+7-4}\right) = \frac{1}{2}$.(Using the formula given in the book) (C) $\frac{\pi}{4} - x$ (121) The greatest and least value of $\sin x \cos x$ are **(A)** 1, −1 **(B)** $\frac{1}{2}, -\frac{1}{2}$ (C) $\frac{1}{4}, -\frac{1}{4}$ (D) 2, −2 Solution:(Correct Answer:B) (b) Let $f(x) = \sin x \cos x = \frac{1}{2} \sin 2x$ We know $-1 \le \sin 2x \le 1 \Rightarrow -\frac{1}{2} \le \frac{1}{2} \sin 2x \le \frac{1}{2}$ Thus the greatest and least value of f(x) are $\frac{1}{2}$ and $-\frac{1}{2}$ respectively.

22)	Three identical dice are rolled number will appear on each c	. The probability that same of them will be [111 1984]
	(A) $\frac{1}{6}$	(B) $\frac{1}{36}$
	(C) $\frac{1}{18}$	(D) $\frac{3}{28}$
	Solution:(Correct Answer:B)	1
	(b) Same number can appear Hence required probability =	in 6 ways. $\frac{6}{216} = \frac{1}{36}$.

- (123) In any ΔABC if $a \cos B = b \cos A$, then the triangle is
 - (A) Equilateral triangle (B) Isosceles triangle
 - Scalene (D) Right angled

Solution:(Correct Answer:B)

(b) $\sin A \cos B - \cos A \sin B = 0$ == > $\sin(A - B) = 0$ == > A = B*i.e.*, isosceles triangle.

(124) If $\sin x + \cos x = \frac{1}{5}$, then $\tan 2x$ is

(A)	$\frac{25}{17}$	(B) $\frac{7}{25}$
(C)	$\frac{25}{7}$	(D) $\frac{24}{7}$

Solution:(Correct Answer:D)

(d) $\sin x + \cos x = \frac{1}{5}$ == > $\sin^2 x + \cos^2 x + 2 \sin x \cos x = \frac{1}{25}$ $\sin 2x = \frac{-24}{25}$ == > $\cos 2x = \frac{-7}{25}$ == > $\tan 2x = \frac{24}{7}$.

(125) If (1+3p)/3, (1-p)/4 and (1-2p)/2 are the probabilities of three mutually exclusive events, then the set of all values of p is [AIEEE 2003, IIT 1986]

(A) $\frac{1}{3} \le p \le \frac{1}{2}$	(B) $\frac{1}{3}$
(C) $\frac{1}{2} \le p \le \frac{2}{3}$	(D) $\frac{1}{2}$

Solution:(Correct Answer:A)

(a) Since $\frac{(1+3p)}{3}$, $\frac{(1-p)}{4}$ and $(\frac{1-2p}{2})$ are the probabilities of the three events, we must have $0 \le \frac{1+3p}{3} \le 1$, $0 \le \frac{1-p}{4} \le 1$ and $0 \le \frac{1-2p}{2} \le 1$ $\Rightarrow -1 \le 3p \le 2$, $-3 \le p \le 1$ and $-1 \le 2p \le 1$ $\Rightarrow -\frac{1}{3} \le p \le \frac{2}{3}$, $-3 \le p \le 1$ and $-\frac{1}{2} \le p \le \frac{1}{2}$ Also as $\frac{1+3p}{3}$, $\frac{1-p}{4}$ and $\frac{1-2p}{2}$ are the probabilities of three mutually exclusive events $0 \le \frac{1+3p}{3} + \frac{1-p}{4} + \frac{1-2p}{2} \le 1$ $\Rightarrow 0 \le 4 + 12p + 3 - 3p + 6 - 12p \le 12$ $\Rightarrow \frac{1}{3} \le p \le \frac{13}{3}$ Thus the required value of p are such that $Max_{3} \{-\frac{1}{3}, -3, -\frac{1}{2}, \frac{1}{3}\} \le p \min_{3} \{\frac{2}{3}, 1, \frac{1}{2}, \frac{13}{3}\}$ $\Rightarrow \frac{1}{3} \le p \le \frac{1}{2}$.

(126) Write the function in the simplest form: $\tan^{-1}\left(\frac{\cos x - \sin x}{\cos x + \sin x}\right)$

A)
$$-\frac{\pi}{4} + x$$
 (B) $-\frac{\pi}{4} - x$
(D) $\frac{\pi}{4} + x$

Solution:(Correct Answer:C)

$$\tan^{-1}\left(\frac{\cos x - \sin x}{\cos x + \sin x}\right)$$

= $\tan^{-1}\left(\frac{1 - \left(\frac{\sin x}{\cos x}\right)}{1 + \left(\frac{\sin x}{\cos x}\right)}\right)$
= $\tan^{-1}\left(\frac{1 - \tan x}{1 + \tan x}\right)$
= $\tan^{-1}(1) - \tan^{-1}(\tan x)\left[\because \frac{-y}{xy} = \tan^{-1}x - \tan^{-1}y\right]$
= $\frac{\pi}{4} - x$

(127) The distance of the point (1, 3, -7) from the plane passing through the point (1, -1, -1) having normal perpendicular to both the lines $\frac{x-1}{1} = \frac{y+2}{-2} = \frac{z-4}{3}$ and $\frac{x-2}{2} = \frac{y+1}{-1} = \frac{z+7}{-1}$ is \dots [JEE MAIN 2017] (A) $\frac{10}{\sqrt{74}}$ (B) $\frac{20}{\sqrt{74}}$ (C) $\frac{10}{\sqrt{83}}$ (D) $\frac{5}{\sqrt{83}}$

Solution:(Correct Answer:C)

Let the plane be $\begin{array}{c|c} a(x-1) + b(y+1) + c(z+1) = 0 \\ \text{Normal vector} \\ \hline \hat{i} & \hat{j} & \hat{k} \\ 1 & -2 & 3 \\ 2 & -1 & -1 \\ \end{array} = 5\hat{i} + 7\hat{j} + 3\hat{k} \\ \begin{array}{c|c} \text{So plane is } 5(x-1) + 7(y+1) + 3(z+1) = 0 \\ \Rightarrow 5x + 7y + 3z + 5 = 0 \\ \text{Distance of point } (1, 3, -7) \text{ from the plane is } \\ \frac{5+21-21+5}{\sqrt{25+49+9}} = \frac{10}{\sqrt{83}} \end{array}$

- (128) If a, b, c are non-coplanar vectors and λ is a real number then $[\lambda(a+b) \ \lambda^2 b \ \lambda c] = [a \ b + c \ b]$ for [AIEEE 2005] (A) Exactly three values of λ (B) Exactly two values of λ
 - (C) Exactly one value of λ (D) No value of λ

Solution:(Correct Answer:D)

(d) $[\lambda(a+b) \ \lambda^2 b \ \lambda c] = [a \ b \ + c \ b]$ == > $\lambda(a+b).(\lambda^2 b \times \lambda c) = a.((b+c) \times b)$ == > $\lambda(a+b).\lambda^3(b \times c) = a.(b \times b + c \times b)$ == > $\lambda^4[a.(b \times c) + b.(b \times c)] = a.(c \times b)$ == > $\lambda^4[a \ b \ c] = -[a \ b \ c] == > [a \ b \ c](\lambda^4 + 1) = 0$ Since a, b, c are non-coplanar, so $[a \ b \ c] \neq 0$ $\therefore \lambda^4 = -1$. Hence no real value of λ .

(A) 675	(B) 1025
(C) 800	(D) 900

Solution:(Correct Answer:C)

Volume $(V) = x(30 - 2x)^2$ $\frac{dV}{dx} = (30 - 2x)(30 - 6x) = 0$ x = 5 cmSurface area = $4 \times 5 \times 20 + (20)^2 = 800 cm^2$ **30 - 2x 30 cm**

(130)
$$\sin \left\{ \tan^{-1} \left(\frac{1-x^2}{2x} \right) + \cos^{-1} \left(\frac{1-x^2}{1+x^2} \right) \right\}$$
 is equal to
(A) 0 (B) 1
(C) $\sqrt{2}$ (D) $\frac{1}{\sqrt{2}}$

Solution:(Correct Answer:B)

(b) $\sin \left[\tan^{-1} \left(\frac{1-x^2}{2x} \right) + \cos^{-1} \left(\frac{1-x^2}{1+x^2} \right) \right]$ Putting $x = \tan \theta$ we get,

$$\begin{aligned} & \sin\left[\tan^{-1}\left(\frac{1-\tan^2\theta}{2\tan\theta}\right) + \cos^{-1}\left(\frac{1-\tan^2\theta}{1+\tan^2\theta}\right)\right] \\ &= \sin[\tan^{-1}(\cot 2\theta) + \cos^{-1}(\cos 2\theta)] \\ &= \sin[\tan^{-1}\tan(\pi/2 - 2\theta) + \cos^{-1}\cos 2\theta] \\ &= \sin\frac{\pi}{2} = 1. \end{aligned}$$

(131) If
$$f(x) = \sqrt{ax} + \frac{a^2}{\sqrt{ax}}$$
, then $f'(a) =$

Solution:(Correct Answer:C)

(c) $f(x) = \sqrt{ax} + \frac{a^2}{\sqrt{ax}}$, then == > $f'(x) = \frac{\sqrt{a}}{2\sqrt{x}} + \frac{a^2}{\sqrt{a}} \left(\frac{-1}{2}x^{-3/2}\right)$ == > $f'(x) = \frac{\sqrt{a}}{2\sqrt{x}} - \frac{a^2}{2\sqrt{a}}x^{-3/2}$ == > $f'(a) = \frac{\sqrt{a}}{2\sqrt{a}} - \frac{a^2}{2\sqrt{a} \cdot a^{3/2}}$ == > $f'(a) = \frac{1}{2} - \frac{a^2}{2a^2} = 0$.

(132) Let y = y(x) be the solution of the differential equation $\sec^2 x dx + (e^{2y} \tan^2 x + \tan x) dy = 0$,

 $0 < x < rac{\pi}{2}, y\left(rac{\pi}{4}
ight) = 0.$ If $y\left(rac{\pi}{6}
ight) = lpha$, Then e^{8lpha} is equal to......

- **(A)** 9 **(B)** 10
- (C) 11 (D) 12

Solution:(Correct Answer:A)

$$\begin{split} \sec^2 x \frac{dx}{dy} + e^{2y} \tan^2 x + \tan x &= 0 \\ \left(\operatorname{Put} \tan x = t \Rightarrow \sec^2 x \frac{dx}{dy} = \frac{dt}{dy} \right) \\ \frac{dt}{dy} + e^{2y} \times t^2 + t &= 0 \\ \frac{dt}{dy} + t &= -t^2 \cdot e^{2y} \\ \frac{1}{t^2} \frac{dt}{dy} + \frac{1}{t} &= -e^{2y} \\ \left(\operatorname{Put} \frac{1}{t} = u \quad \frac{-1}{t^2} \frac{dt}{dy} = \frac{du}{dy} \right) \\ \frac{-du}{dy} + u &= -e^{2y} \\ \frac{du}{dy} - u &= e^{2y} \\ \operatorname{I.F.} &= e^{-\int dy} = e^{-y} \\ ue^{-y} &= \int e^{-y} \times e^{2y} dy \\ \frac{1}{\tan x} \times e^{-y} &= e^{y} + c \\ x &= \frac{\pi}{4}, y = 0, c = 0 \\ x &= \frac{\pi}{6}, y = \alpha \\ \sqrt{3}e^{-\alpha} &= e^{\alpha} + 0 \\ e^{2\alpha} &= \sqrt{3} \\ e^{8\alpha} &= 9 \end{split}$$

(133) Let $f(x) = \min\{1, 1 + x \sin x\}, 0 \le x \le 2\pi$. If m is the number of points, where f is not differentiable and n is the number of points, where f is not continuous, then the ordered pair (m, n) is equal to [JEE MAIN 2022]

(A) (2,0) (B) (1,0)

(C) (1,1) (D) (2,1)

Solution:(Correct Answer:B)

No. of non-differentiable points $= 1 \ (m)$ No. of not continuous points $= 0 \ (n) \ (m, n) = (1, 0)$



(134) $\int \sqrt{1 + \sin \frac{x}{2}} \, dx = [117 \, 1980]$ (B) $4\left(\cos\frac{x}{4} - \sin\frac{x}{4}\right) + c$ (A) $\frac{1}{4} \left(\cos \frac{x}{4} - \sin \frac{x}{4} \right) + c$ (C) $4\left(\sin\frac{x}{4} - \cos\frac{x}{4}\right) + c$ (D) $4\left(\sin\frac{x}{4} + \cos\frac{x}{4}\right) + c$ Solution:(Correct Answer:C) (c) $\int \sqrt{1 + \sin \frac{x}{2}} dx =$ $\int \sqrt{\left(\sin^2\frac{x}{4} + \cos^2\frac{x}{4} + 2\sin\frac{x}{4}\cos\frac{x}{4}\right)} \, dx$ $= \int \left(\sin\frac{x}{4} + \cos\frac{x}{4}\right) dx = 4 \left(\sin\frac{x}{4} - \cos\frac{x}{4}\right) + c.$ (135) If the vectors, $\vec{p} = (a+1)\hat{i} + a\hat{j} + a\hat{k}$; $\vec{q} = a\hat{i} + (a+1)\hat{j} + a\hat{k}$ and $\overrightarrow{\mathbf{r}} = \mathbf{a}\hat{\mathbf{i}} + \mathbf{a}\hat{\mathbf{j}} + (\mathbf{a} + 1)\hat{\mathbf{k}}(\mathbf{a} \in \mathbf{R})$ are coplanar and $3(\overrightarrow{\mathbf{p}} \cdot \overrightarrow{\mathbf{q}})^2 - \lambda |\overrightarrow{\mathbf{r}} \times \overrightarrow{\mathbf{q}}|^2 = 0$, then the value of λ is DEE MAIN 20201 (A) 0.5 **(B)** 1 (C) 1.5 (D) 2 Solution:(Correct Answer:B) $\overrightarrow{\mathbf{p}} = (\mathbf{a} + 1)\hat{\mathbf{i}} + \hat{\mathbf{a}}\hat{\mathbf{j}} + \hat{\mathbf{a}}\hat{\mathbf{k}}$ $\overrightarrow{\mathsf{q}} = \mathsf{a}\mathbf{\hat{i}} + (\mathsf{a}+1)\mathbf{\hat{j}} + \mathsf{a}\mathbf{\hat{k}}$ and $\vec{\mathbf{r}} = \mathbf{a}\hat{\mathbf{i}} + \mathbf{a}\hat{\mathbf{j}} + (\mathbf{a} + 1)\hat{\mathbf{k}}$ $\overline{p}, \overrightarrow{q}, \overrightarrow{r}$ are coplanar $\Rightarrow \quad \left[\begin{array}{cc} \overline{p} & \overline{q} & \overline{r} \end{array} \right] = 0$ $\Rightarrow \begin{vmatrix} a+1 & a & a \\ a & a+1 & a \\ a & a & a+1 \end{vmatrix} = 0$ $\Rightarrow 3a+1=0 \Rightarrow a=-\frac{1}{3}$ $\overrightarrow{\mathbf{p}} \cdot \overrightarrow{\mathbf{q}} = -\frac{1}{3}, \quad \overrightarrow{\mathbf{r}} \cdot \overrightarrow{\mathbf{q}} = -\frac{1}{3}$ $|\overrightarrow{\mathbf{r}}|^2 = |\overrightarrow{\mathbf{q}}|^2 = \frac{2}{3}$ $\begin{aligned} 3(\overline{\mathfrak{p}} \cdot \overline{\mathfrak{q}})^2 &- \lambda | \overrightarrow{\mathbf{r}} \times \overrightarrow{\mathfrak{q}} |^2 = 0 \\ \Rightarrow \quad \lambda &= \frac{3(\overline{\mathfrak{p}} \cdot \overline{\mathfrak{q}})^2}{|\overline{\mathfrak{r}} \times \overline{\mathfrak{q}}|^2} = \frac{3(\overline{\mathfrak{p}} \cdot \overline{\mathfrak{q}})^2}{|\overline{\mathfrak{r}}|^2 |\overline{\mathfrak{q}}|^2 - (\overline{\mathfrak{r}} \cdot \overline{\mathfrak{q}})^2} = 1.00 \end{aligned}$ Mathematics - Section B (MCQ) (Attempt any 10) (136) If the system of linear equations x - 2y + kz = 1; 2x + y + z = 2; 3x - y - kz = 3 Has a solution $(x, y, z) \neq 0$, then (x, y) lies on the straight line whose equation is **THEE MAIN** 2019] (A) 3x - 4y - 1 = 0**(B)** 4x - 3y - 4 = 0(D) 3x - 4y - 4 = 0(C) 4x - 3y - 1 = 0Solution:(Correct Answer:B) For infinitly many solution 1 - 2 k $2 \ 1 \ 1$ -03 -1 -k $\Rightarrow k = \frac{-1}{2}$ Also consider x - 2y + k = 1 and 2x + y + z = 2 $\Rightarrow 2x - 4y - z - 2$ 2x + y + z = 2 $\Rightarrow 4x - 3y = 4$ (137) $\int_0^3 |2 - x| dx$ equals (A) 2/7 **(B)** 5/2 (C) 3/2 (D) -3/2 Solution:(Correct Answer:B) (b) $I = \int_0^3 |2 - x| dx$ $= \int_{0}^{2} (2-x) dx + \int_{2}^{3} -(2-x) dx$ $= \int_{0}^{2} (2-x) \, dx - \int_{2}^{3} (2-x) \, dx = \left[2x - \frac{x^{2}}{2}\right]_{0}^{2} - \left[2x - \frac{x^{2}}{2}\right]_{2}^{3}$ $\Rightarrow I = [4-2] - \left[6 - \frac{9}{2} - (4-2)\right] \\ = 2 - \left[4 - \frac{9}{2}\right] = \frac{5}{2}.$

(138) The function $f(x) = \log(1+x) - \frac{2x}{2+x}$ is increasing on **(A)** (0, ∞) (B) (−∞, 0) (C) $(-\infty,\infty)$ (D) None of these Solution:(Correct Answer:A) (a) $f(x) = \log(1+x) - \frac{2x}{2+x}$ $\Rightarrow f'(x) = \frac{1}{1+x} - \frac{(2+x)\cdot(2-2x)}{(2+x)^2}$ == > $f'(x) = \frac{x^2}{(x+1)(x+2)^2}$ Obviously, f'(x) > 0 for all x > 0Hence f(x) is increasing on $(0, \infty)$. (139) If $u = \sin^{-1}\left(\frac{y}{x}\right)$, then $\frac{\partial u}{\partial x}$ is equal to (A) $-\frac{y}{x^2+y^2}$ (B) $\frac{x}{\sqrt{1-u^2}}$ (C) $\frac{-y}{\sqrt{x^2-y^2}}$ (D) $\frac{-y}{x\sqrt{x^2-y^2}}$ Solution:(Correct Answer:D) (d) $u = \sin^{-1} \frac{y}{x}$; $\therefore \frac{\partial u}{\partial x} = \frac{1}{\sqrt{1-\frac{y^2}{x^2}}} \cdot \left(-\frac{y}{x^2}\right) = -\frac{y}{x\sqrt{x^2-y^2}}.$ (140) If the system of linear equations 2x + 2y + 3z = a; 3x - y + 5z = b; x - 3y + 2z = c Where a, b, c are non zero real numbers, has more than one solution, then [JEE MAIN 2019] (A) b - c + a = 0**(B)** b - c - a = 0(C) a + b + c = 0(D) b + c - a = 0Solution:(Correct Answer:B) 2x + 2y + 3z = a (1)3x - y + 5z = b(2)x - 3y + 2z = c (3) (2x + 2y + 3z) + (x - 3y + 2z) - (3x - y + 5z) = 0 $\Rightarrow a + c - b = 0$ (141) If we consider only the principal values of the inverse trigonometric functions, then the value of $\tan\left(\cos^{-1}\frac{1}{5\sqrt{2}} - \sin^{-1}\frac{4}{\sqrt{(17)}}\right)$ is [IIT 1994] (A) $\sqrt{29/3}$ (B) 29/3 (C) $\sqrt{3/29}$ **(D)** 3/29 Solution:(Correct Answer:D) (d) $\tan\left(\cos^{-1}\frac{1}{5\sqrt{2}} - \sin^{-1}\frac{4}{\sqrt{17}}\right)$ $= \tan(\tan^{-1}7 - \tan^{-1}4) = \tan\left[\tan^{-1}\left(\frac{7-4}{1+28}\right)\right] = \frac{3}{29}.$ (142) Let f be a differentiable function such that $x^{2}f(x) - x = 4 \int tf(t)dt, f(1) = \frac{2}{3}$. Then 18f(3) is equal to [JEE MAIN 2023] **(A)** 160 (B) 210 (C) 180 (D) 150 Solution:(Correct Answer:A) Differentiate the given equation $\Rightarrow 2xf(x) + x^2f'(x) - 1 = 4xf(x)$ $\Rightarrow x^2 \frac{dy}{dx} - 2xy = 1$ $\Rightarrow \frac{dy}{dx} + \left(-\frac{2}{x}\right)y = \frac{1}{x^2}$ IF. = $e^{\int -\frac{2}{x}tnx} = \frac{1}{x^2}$ $\begin{array}{l} \begin{array}{l} & 1 \\ \therefore y \left(\frac{1}{x^2}\right) = \int \frac{1}{x^4} dx \\ \Rightarrow \frac{y}{x^2} = \frac{-1}{3x^3} + c \\ \Rightarrow y = -\frac{1}{3x^3} + c \end{array}$ $\Rightarrow y - \frac{3x}{3x} + cx^{2}$ $\Rightarrow y = -\frac{1}{3x} + cx^{2}$ $\because f(1) = \frac{2}{3} = -\frac{1}{3} + c \Rightarrow c = 1$ $f(x) = -\frac{1}{3x} + x^{2}$

18f(3) = 160

 $=\frac{1}{2}(\overrightarrow{AB}-\overrightarrow{AD})\times\overrightarrow{AC}$ (143) The line, that is coplanar to the line $\frac{x+3}{-3} = \frac{y-1}{1} = \frac{z-5}{5}$, is [JEE MAIN 2023] $= \frac{1}{2}(8\hat{j} + 12\hat{k}) \times (-4)(\hat{i} + \hat{j} - \hat{k})$ (A) $\frac{x+1}{1} = \frac{y-2}{2} = \frac{z-5}{5}$ (B) $\frac{x+1}{-1} = \frac{y-2}{2} = \frac{z-5}{5}$ (C) $\frac{x+1}{-1} = \frac{y-2}{2} = \frac{z-5}{4}$ (D) $\frac{x-1}{-1} = \frac{y-2}{2} = \frac{z-5}{5}$ $= \frac{1}{2} \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0 & 8 & 12 \\ 1 & 1 & -1 \end{vmatrix}$ Solution:(Correct Answer:B) $= (-2)(-20\hat{i} + 12\hat{j} - 8\hat{k})$ Condition of co-planarity $= 8(5\hat{i} - 3\hat{j} + 2\hat{k})$ $x_2 - x_1 \quad a_1 \quad a_2$: Area = $|\vec{v}| = 8\sqrt{25 + 9 + 4} = 8\sqrt{38}$ Ans. $y_2 - y_1 \quad b_1 \quad b_2$ = 0 $\overrightarrow{AB} = -\hat{i} + \hat{j} + 4\hat{k}$ $z_2 - z_1 \quad c_1 \quad c_2$ $\overrightarrow{\overline{AD}} = -\hat{i} - 7\hat{j} - 8\hat{k}$ Where a_1, b_1, c_1 are direction cosine of 1^{st} line and a_2, b_2, c_2 $\overrightarrow{AC} = -4\hat{i} - 4\hat{j} + 4\hat{k}$ are direction cosine of 2^{nd} line. Now, solving options Point (-3, 1, 5) and point (-1, 2, 5)-3 1 5 2 5 1 (1) -2 -1 0= -3(5) - (10) + 5(-1+4)= -15 - 10 + 15 = -10(146) Two dice are thrown independently. Let A be the event that (2) Point (-1, 2, 5)the number appeared on the 1st die is less than the number -3 1 5 appeared on the 2^{nd} die, B be the event that the number -1 2 5 appeared on the 1st die is even and that on the second die -2 -1 0is odd, and C be the event that the number appeared on the = 3(5) - (10) + 5(1+4) 1^{st} die is odd and that on the 2^{nd} is even. Then [JEE MAIN 2023] -25 + 25 = 0(A) the number of favourable cases of the event (3) Point (-1, 2, 5)-3 1 5 $(A \cup B) \cap C$ is 6 -1 $2 \ 4$ (B) A and B are mutually exchusive -2 -1 0-3(4) - (8) + 5(1+4)(C) The number of favourable cases of the events A, B and C are 15, 6 and 6 respectively -12 - 8 + 25 = 5(4) Point (-1, 2, 5)(D) B and C are independent -3 1 5 -1 2 5 Solution:(Correct Answer:A) $4 \ 1 \ 0$ A: no. on 1^{st} die < no. on 2^{nd} die -3(-5) - (-20) + 5(-1-8)A: no. on 1^{st} die = even and no. of 2^{nd} die = odd 15 + 20 - 45 = -10C : no. on 1^{ti} die = odd and no. on 2^{nd} die = even n(A) = 5 + 4 + 3 + 2 + 1 = 15(144) Let the acute angle bisector of the two planes n(B) = 9x - 2y - 2z + 1 = 0 and 2x - 3y - 6z + 1 = 0 be the plane P. n(C) = 9Then which of the following points lies on P? [JEE MAIN 2021] $n((A \cup B) \cap C) = (A \cap C) \cup (B \cap C)$ = (3 + 2 + 1) + 0 = 6.**(B)** $(-2, 0, -\frac{1}{2})$ (A) $(3, 1, -\frac{1}{2})$ (147) The value of $\int_{0}^{8} |x-5| dx$ is (C) (0, 2, -4)(D) (4, 0, -2)**(A)** 17 Solution:(Correct Answer:B) $P_1: x - 2y - 2z + 1 = 0$ (C) 9 $P_2: 2x - 3y - 6z + 1 = 0$ Solution:(Correct Answer:A) $\left|\frac{\mathsf{x}-2\mathsf{y}-2\mathsf{z}+1}{\sqrt{1+4+4}}\right| = \left|\frac{2\mathsf{x}-3\mathsf{y}-6\mathsf{z}+1}{\sqrt{2^2+3^2+6^2}}\right|$ (a) $I = \int_0^8 |x - 5| dx$ = $\int_0^5 -(x - 5) dx + \int_5^8 (x - 5) dx = 17.$ $\frac{x-2y-2z+1}{2} = \pm \frac{2x-3y-6z+1}{2}$ Since $a_1a_2 + b_1b_2 + c_1c_2 = 20 > 0$ (148) If the normal to the curve $y^2 = 5x - 1$, at the point (1, -2) is ... Negative sign will give acute bisector of the form ax - 5y + b = 0, then a and b are 7x - 14y - 14z + 7 = -[6x - 9y - 18z + 3] $\Rightarrow 13x - 23y - 32z + 10 = 0$ **(A)** 4, -14 $\left(-2,0,-\frac{1}{2}\right)$ satisfy it **(C)** −4, 14 Solution:(Correct Answer:A) (145) The area of the quadrilateral ABCD with vertices A(2,1,1), B(1,2,5), C(-2,-3,5) and D(1,-6,-7) is equal (a) We have, $y^2 = 5x - 1....(i)$ At (1, -2); $\frac{dy}{dx} = \left[\frac{5}{2y}\right]_{(1, -2)} = \frac{-5}{4}$ to [JEE MAIN 2023] (A) 48 **(B)** $8\sqrt{38}$ \therefore Equation of normal at the point (1,-2) is, (C) 54 (D) $9\sqrt{38}$ $[y - (-2)] \left[\frac{-5}{4}\right] + x - 1 = 0$ $\therefore 4x - 5y - 14 = 0 \dots (ii)$ Solution:(Correct Answer:B) As the normal is of the form ax - 5y + b = 0, comparing this Vector Area $= \overrightarrow{v}$ with (ii), $=\frac{1}{2}\overrightarrow{AB}\times\overrightarrow{AC}+\frac{1}{2}\overrightarrow{AC}\times\overrightarrow{AD}$ we get a = 4 and b = -14.

(B) 12

(D) 18

(B) 4,14

(D) −4, −14



Solution:(Correct Answer:A)

 $\begin{array}{l} KE_{\mathrm{avg}} = \frac{3}{2}KT \\ P = \frac{1}{3}\rho V_{\mathrm{rus}}^2 \end{array}$

Note : Statement (4) is correct only if we consider it at constant volume and not constant pressure. Ideally, this question must be bonus but most appropriate answer is option (A).

(153) In a simple harmonic oscillator, at the mean position FAIEEE 20021

- (A) Kinetic energy is minimum, potential energy is maximum
- (B) Both kinetic and potential energies are maximum
- (C) Kinetic energy is maximum, potential energy is minimum
- (D) Both kinetic and potential energies are minimum

Solution:(Correct Answer:C)

(c) $K.E = \frac{1}{2}k(A^2 - x^2); U = \frac{1}{2}kx^2$ At the mean position x = 0 $\therefore K.E. = \frac{1}{2}kA^2 = Maximum and U = 0$

(154) A stretched string resonates with tuning fork frequency 512 Hz when length of the string is 0.5 m. The length of the string required to vibrate resonantly with a tuning fork of **(B)** 0.5

(D) 1

Solution:(Correct Answer:D)

 $f = \frac{1}{2l} \left[\frac{T}{\mu} \right]^{\frac{1}{2}}$ When f is halved, the length is doubled.

(155) A large tank filled with water to a height 'h' is to be emptied through a small hole at the bottom. The ratio of time taken for the level of water to fall from h to $\frac{h}{2}$ and from $\frac{h}{2}$ to zero is

(A)
$$\sqrt{2}$$
 (B) $\frac{1}{\sqrt{2}}$

(D) $\frac{1}{\sqrt{2}-1}$

Solution:(Correct Answer:C)

(c)Time taken for the level to fall from H to H'

$$= \frac{A}{A_0} \sqrt{\frac{2}{g}} \left[\sqrt{H} - \sqrt{H'} \right]$$

According to problem- the time taken for the level to fall

from h to $\frac{h}{2} t_1 = \frac{A}{A_0} \sqrt{\frac{2}{g}} \left| \sqrt{h} - \sqrt{\frac{h}{2}} \right|$

and similarly time taken for the level to fall from $\frac{h}{2}$ to zero

$$t_2 = \frac{A}{A_0}\sqrt{\frac{2}{g}} \left[\sqrt{\frac{h}{2}} - 0\right] \therefore \frac{t_1}{t_2} = \frac{1 - \frac{1}{\sqrt{2}}}{\frac{1}{\sqrt{2}} - 0} = \sqrt{2} - 1.$$

- (156) Which of the following affects the elasticity of a substance
 - (A) Hammering and annealing
 - (B) Change in temperature
 - (C) Impurity in substance

Solution:(Correct Answer:D)

(d) Elasticity depends on temperature. Also, elasticity changes due to impurities because they

increase binding of crystal grains, hence enhancing

Hammering also changes the structure of material as crystal grains break up into smaller units which plays a large role in determining elasticity (increases elasticity).

Also, annealing tends to form a uniform orientation of crystal grains, hence producing larger crystal and changing elasticity.

(157) A cubical block of side 0.5 m floats on water with 30% of its volume under water. kg is the maximum weight that can be put on the block without fully submerging it under water ? [Take density of water $= 10^3 \, kg/m^3$] [JEE MAIN 2019]

	10 ng/ne]
(A) 46.3	(B) 65.4
(C) 30.1	(D) 87.5

(D) 87.5

Solution:(Correct Answer:D)

$$0.3 \ell^{3} \rho_{\omega} = \ell^{3} \rho$$

$$\rho = 300 \frac{kg}{m^{3}}$$

$$m + \ell^{3} \rho = \ell^{3} \rho_{\omega}$$

$$M = \ell^{3} (\rho_{w} - \rho) = (0.5)^{3} \{1000 - 300\}$$

$$= 700 \times (0.5)^{3}$$

$$= 87.5 kg$$

(158) The path of a projectile in the absence of air drag is shown in the figure by dotted line. If the air resistance is not ignored then which one of the path shown in the figure is appropriate for the projectile



(C) D

Solution:(Correct Answer:A)

(a) If air resistance is taken into consideration then range and maximum height, both will decrease.

(D) C

(159) A liquid does not wet the solid surface if angle of contact is [NEET 2020]

(A) 0

(B) equal to 45°

(C) equal to 60° (D) greater than 90°

Solution:(Correct Answer:D)

If angle of contact is greater than 90° , then liquid will not wet the wall of container.

(160) A particle (m = 1 kg) slides down a frictionless track (AOC) starting from rest at a point A (height 2 m). After reaching C, the particle continues to move freely in air as a projectile. When it reaching its highest point P (height 1 m). the kinetic energy of the particle (in J) is : (Figure drawn is schematic and not to scale; take $g = 10 \text{ ms}^{-2}$ [JEE MAIN 2020]

(B) 10



(C) 15 (D) 13

Solution:(Correct Answer:B)

Mechanical energy conservation between A and P $U_1 + K_1 (= 0) = K_2 + U_2$ $mg \times 2 = mg \times 1 + K_2$ $K_2 = mg \times 1 = 10J$

- (161) Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason RAssertion A : A spherical body of radius $(5 \pm 0.1) mm$ having a particular density is falling through a liquid of constant density. The percentage error in the calculation of its terminal velocity is 4 %. Reason R: The terminal velocity of the spherical body falling through the liquid is inversely proportional to its radius. In the light of the above statements, choose the correct answer from the options given below on : [JEE MAIN 2023]
 - (A) Both A and R are true but R is NOT the correct explanation of A
 - (B) Both A and R are true and R is the correct explanation of A
 - (C) A is false but R is true
 - (D) A is true but R is false

Solution:(Correct Answer:D)

Terminal velocity of a spherical body in liquid $\Rightarrow V_t \propto r^2$ $\Rightarrow \frac{\Delta V_t}{V_t} = 2 \cdot \frac{\Delta r}{r}$ $\Rightarrow \frac{\Delta V_t}{V_t} \times 100\% = 2\frac{(0.1)}{5} \times 100 = 4\%$ Also $V_t \propto r^2$

Reason R is false

(162) A man goes 10 m towards North, then 20 m towards east then displacement is......m

(A) 22.5	(B) 25
(C) 25.5	(D) 30

Solution:(Correct Answer:A)

(a) $\vec{r} = 20\hat{i} + 10\hat{j}$ $\therefore r = \sqrt{20^2 + 10^2} = 22.5 \, m$

- (163) Where will it be profitable to purchase 1 kilogram sugar (A) At poles (B) At equator
 - (C) At 45° latitude (D) At 40° latitude

Solution:(Correct Answer:B)

(b)Weight is least at the equator.

- (164) Parsec is a unit of [AIIMS 2005]
 - (A) Distance (B) Velocity
 - (C) Time (D) Angle

Solution:(Correct Answer:A)

(a) Astronomical unit of distance.

(165) A ball is thrown up vertically with a certain velocity so that, it reaches a maximum height h. Find the ratio of the times in which it is at height $\frac{h}{3}$ while going up and coming down respectively. [JEE MAIN 2022, JEE MAIN 2021]

(B) $\frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}$

(D) $\frac{1}{2}$

(A)
$$\frac{\sqrt{2}-1}{\sqrt{2}+1}$$

(C) $\frac{\sqrt{3}-1}{\sqrt{3}+1}$

Solution:(Correct Answer:B)

$$\begin{aligned} \text{Max. Height} &= h = \frac{u^{*}}{2g} \\ \Rightarrow u &= \sqrt{2gh} \\ S &= ut + \frac{1}{2}at^{2} \\ \frac{h}{3} &= \sqrt{2ght} + \frac{1}{2}(-g)t^{2} \\ \frac{gt^{2}}{2} &- \sqrt{2ght} + \frac{h}{3} = 0 \quad \text{(Roots are } t_{1}\&t_{2}\text{)} \\ \frac{t_{2}}{t_{1}} &= \frac{\sqrt{2gh} + \sqrt{2gh - 4\times\frac{g}{2}\times\frac{h}{3}}}{\sqrt{2gh} - \sqrt{2gh - 4\times\frac{g}{2}\times\frac{h}{3}}} = \frac{\sqrt{2gh} + \sqrt{\frac{4gh}{3}}}{\sqrt{2gh} - \sqrt{\frac{4gh}{3}}} = \frac{\sqrt{3} + \sqrt{2gh}}{\sqrt{3} - \sqrt{2gh}} \end{aligned}$$



- (166) Which of the following physical quantities have the same dimensions? [JEE MAIN 2022]
 - (A) Electric displacement (\overrightarrow{D}) and surface charge density
 - (B) Displacement current and electric field
 - (C) Current density and surface charge density
 - (D) Electric potential and energy

Solution:(Correct Answer:A)

Electric displacement $\overrightarrow{D} = \epsilon_0 \overrightarrow{E}$ $[D] = [\epsilon_0 E] = \left[\epsilon_0 \frac{\sigma}{\epsilon_0}\right]$ $[D] = [\sigma]$

- \rightarrow Surface change density = σ .
- (167) Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R. Assertion A : The escape velocities of planet A and B are same. But A and B are of unequal mass.
 Reason B : The product of their mass and radius must be

Reason R: The product of their mass and radius must be same, $M_1R_1 = M_2R_2$

In the light of the above statements, choose the most appropriate answer from the options given below [JEE MAIN 2021]

- (A) Both A and R are correct but R is NOT the correct explanation of A
- **(B)** A is correct but R is not correct
- (C) Both A and R are correct and R is the correct explanation of A
- (D) A is not correct but R is correct

Solution:(Correct Answer:B)

$$\begin{split} V_e &= \sqrt{\frac{2GM}{R}} \\ \frac{M_1}{R_1} &= \frac{M_2}{R_2} \\ M_1 R_2 &= M_2 R_1 \\ \text{Hence reason } R \text{ is not correct.} \end{split}$$

(168) A moving block having mass m, collides with another stationary block having mass 4m. The lighter block comes to rest after collision. When the initial velocity of the lighter block is v, then the value of coefficient of restitution (e) will be [NEET 2018]

A) 0.5	(B) 0.25
(C) 0.4	(D) 0.8

Solution:(Correct Answer:B)

Let final velocity of the block of mass $4m=v^\prime$

Initial velocity of block of mass 4m = 0Final velocity of block of mass m = 0According to law of conservation of linear momentum $mv + 4m \times 0 = 4mv' + 0 \Rightarrow v' = v/4$ Coefficient of restitution,

$$e = \frac{\text{Re letive velocity of separation}}{\text{Re letive velocity of separation}}$$
$$= \frac{v/4}{-0.25}$$

(169) In the below graph, point D indicates





(170) The rms speed of oxygen molecule in a vessel at particular temperature is $(1 + \frac{5}{x})^{\frac{1}{2}} v$, where v is the average speed of the molecule. The value of x will be:(Take $\pi = \frac{22}{7}$) [JEE MAIN 2023]

27
2

(C) 8 (D) 4

Solution:(Correct Answer:A)

$$\sqrt{\frac{3RT}{M}} = \left(1 + \frac{5}{x}\right)^{\frac{1}{2}} \sqrt{\frac{5}{2}}$$
$$\Rightarrow \frac{3 \times 22}{7 \times 8} = 1 + \frac{5}{x}$$
$$\Rightarrow x = 28$$

(171) Wavelength of ray of light is 0.00006 m. It is equal to

microns	
(A) 6	(B) 60

(C) 600 (D) 0.6

Solution:(Correct Answer:B)

(b) $6 \times 10^{-5} = 60 \times 10^{-6} = 60 \ microns$

(172) An automobile moves on a road with a speed of $54 \, kmh^{-1}$. The radius of its wheels is $0.45 \, m$ and the moment of inertia of the wheel about its axis of rotation is $3 \, kgm^2$. If the vehicle is brought to rest in $15 \, s$, the magnitude of average torque transmitted by its brakes to the wheel is

 $kg m^2 s^{-2}$. [AIPMT 2015]

(A) 2.86 (B) 6.66

(C) 8.58 (D) 10.86

Solution:(Correct Answer:B)

Here,

Speed of the automobile, $v = 54 \, km \, h^{-1} = 54 \times \frac{5}{18} \, m \, s^{-1} = 15 \, m \, s^{-1}$ Radius of the wheel of the automoblie, R = 0.45mMoment of inertia of the wheel about its axis of rotation, $I = 3 \, kg \, m^2$

Time in which the vehicle brought to rest. t = 15 sThe initial angular speed of the wheel is $\omega i = \frac{v}{R} = \frac{15 m s^{-1}}{0.45 m} = \frac{1500}{45} rad s^{-1} = \frac{100}{3} rad s^{-1}$ and its final angular speed is $\omega_f = 0$ (as the vehicle comes to rest) ... The angular retardation of the wheel is $\alpha = \frac{\omega_f - \omega_i}{t} = \frac{0 - \frac{100}{15 s}}{15 s} = -\frac{100}{45} rad s^{-2}$ The magnitude of required torque is
$$\begin{split} \tau &= I \left| \alpha \right| = \left(3 \, kg \, m^2 \right) \left(\frac{100}{45} rad \, s^{-2} \right) \\ &= \frac{20}{3} \, kg \, m^2 s^{-2} = 6.66 \, kg \, m^2 s^{-2} \end{split}$$

(173) Consider two containers A and B containing monoatomic gases at the same Pressure (P), Volume (V) and Temperature (T). The gas in A is compressed isothermally to $rac{1}{8}$ of its original volume while the gas B is compressed adiabatically to $\frac{1}{8}$ of its original volume. The ratio of final (B) $8^{\frac{3}{2}}$ (A) 8

(C) $\frac{1}{8}$

Solution:(Correct Answer:D)

Isothermal process, T = constantPV = nRT = constant

 $P_1V_1 = P_2V_2$ $PV = P_A(V/8)$ $P_A = 8P$

Adiabatic process, PV $\gamma = \text{constant } \gamma$ for monoatomic gas is $\frac{5}{2}$.

(D) 4

$$\begin{split} \overset{\circ}{P}_{1}V_{1}^{\gamma} &= P_{2}V_{2}^{\gamma} \\ \frac{P_{B}}{P} &= \left(\frac{V_{1}}{V_{2}}\right)^{\gamma} = \left(\frac{V}{V/8}\right)^{\frac{5}{3}} \\ P_{B} &= 32P \\ \frac{P_{B}}{P_{A}} &= \frac{32P}{8P} = 4 \end{split}$$

(174) A large block of wood of mass M = 5.99 kg is hanging from two long massless cords. A bullet of mass m = 10 g is fired into the block and gets embedded in it. The (block + bullet) then swing upwards, their centre of mass rising a vertical distance $h = 9.8 \, cm$ before the (block + bullet) pendulum comes momentarily to rest at the end of its arc. The speed of the bullet just before collision is: (Take $q = 9.8 m s^{-2}$) (in m/s) [JEE MAIN 2021]



Solution:(Correct Answer:C)

From energy conservation, after bullet gets embedded till the system comes momentarily at rest] $(M+m)gh = \frac{1}{2}(M+m)v_1^2$ $[v_1 \text{ is velocity after collision}]$ $\therefore v_1 = \sqrt{2gh}$ Applying momentum conservation, (just before and just after collision) $mv = (M+m)v_1$ $v = \left(\frac{M+m}{m}\right)v_1 = \frac{6}{10 \times 10^{-3}} \times \sqrt{2 \times 9.8 \times 9.8 \times 10^{-2}}$ $\approx 831.55 \, m/s$

- (175) Curies law can be written as
 - (A) $\chi \propto (T T_c)$ (C) $\chi \propto \frac{1}{T}$

Solution:(Correct Answer:C)

According to Curie's law $x \propto \frac{1}{T}$

(176) A capacitor of capacitance $150.0 \, \mu F$ is connected to an alternating source of emf given by $E = 36 \sin(120\pi t)V$. The maximum value of current in the circuit is approximately equal to $\dots A$ [JEE MAIN 2023]

(B) $\chi \propto \frac{1}{T-T_c}$

(D) $\chi \propto T$

(B) $\frac{1}{\sqrt{2}}$

(D) $2\sqrt{2}$

(C) $\sqrt{2}$

Solution:(Correct Answer:A)

 $I_0 = \frac{E_0}{x_c} = \frac{E_0}{\underline{1}} = E_0 \omega_c$ $\Rightarrow I_0 = 36 \times 120\pi \times 150 \times 10^{-6}$ $\Rightarrow I_0 = 2.03$ $\simeq 2 A$

- (177) Three capacitors of capacitance $3 \mu F$, $10 \mu F$ and $15 \mu F$ are connected in series to a voltage source of 100 V. The charge on $15\,\mu\,F$ is..... μC [AIIMS 2000]
 - (A) 50 **(B)** 100

(C) 200 (D) 280

Solution:(Correct Answer:C)

(c) $\frac{1}{C_{eq}}=\frac{1}{3}+\frac{1}{10}+\frac{1}{15}\Rightarrow C_{eq}=2\,\mu F$ Charge on each capacitor $Q = C_{eq} \times V \Rightarrow 2 \times 100 = 200 \,\mu C$

(178) In the circuit shown here $C_1 = 6 \, \mu F, \ C_2 = 3 \, \mu F$ and battery B = 20 V. The switch S_1 is first closed. It is then opened and afterwards S_2 is closed. What is the charge finally on C_2 μC



(c) Common potential $V = \frac{6 \times 20 + 3 \times 0}{(6+3)} = \frac{120}{9} Volt$ So, charge on $3 \, \mu F$ capacitor $Q_2 = 3 \times 10^{-6} \times \frac{120}{9} = 40 \,\mu C$

(179) A 20 Henry inductor coil is connected to a 10 ohmresistance in series as shown in figure. The time at which rate of dissipation of energy (Joule's heat) across resistance is equal to the rate at which magnetic energy is stored in the inductor, is [JEE MAIN 2019]



Solution:(Correct Answer:D)

$$\begin{split} LIDI &= I^2 R \\ L \times \frac{E}{10} \left(-e^{-t/2} \right) \times \frac{-1}{2} &= \frac{E}{10} \left(1 - e^{-t/2} \right) \times 10 \\ e^{-1/2} &= 1 - e^{-1/2} \quad ; \quad t = 2\ell n 2 \end{split}$$

- (180) The depletion layer in the P-N junction region is caused by ${\rm [AIPMT 1991]}$
 - (A) Drift of holes
 - (B) Diffusion of charge carriers
 - (C) Migration of impurity ions
 - (D) Drift of electrons

Solution:(Correct Answer:B)

(b)Due to the large concentration of electrons in N-side and holes in P-side, they diffuses from their own side to other side. Hence depletion region produces.

(181) Two cells of same emf but different internal resistances I_1 and I_2 are connected in series with a resistance R. The value of resistance R, for which the potential difference across second cell is zero, is [JEE MAIN 2022]

(A) $r_2 - r_1$	(B) $r_1 - r_2$
(C) r ₁	(D) r ₂

Solution:(Correct Answer:A)

$$I = \frac{2E}{R+I_1+I_2} \dots (i)$$

But $V_A - V_B = E - I_2 = 0$
 $\Rightarrow I = \frac{E}{I_2} \dots (ii)$
Comparing values of I from (i) and (ii)
$$\frac{E}{r_2} = \frac{2E}{R+r_1+r_2}$$

 $\Rightarrow R = r_2 - r_1$
E E E
A I R

(182) Two bar magnets oscillate in a horizontal plane in earth's magnetic field with time periods of 3 s and 4 s respectively. If their moments of inertia are in the ratio of 3:2 then the ratio of their magnetic moments will e. [JEE MAIN 2022]

(A) 2:1	(B) 8:3
A) $2:1$	(B) 8:3

Solution:(Correct Answer:B)

$$\begin{split} T &= 2\pi \sqrt{\frac{I}{MB_H}} \\ \frac{T_1}{T_2} &= \frac{2\pi \sqrt{\frac{I_1}{M_1B_H}}}{2\pi \sqrt{\frac{I_2}{M_2B_H}}} = \frac{3}{4} \\ \sqrt{\frac{I_1}{I_2}} &\times \frac{M_2}{M_1} = \frac{3}{4} \\ \sqrt{\frac{I_1}{I_2}} &\times \sqrt{\frac{M_2}{M_1}} = \frac{3}{4} \\ \sqrt{\frac{3}{2}} &\times \sqrt{\frac{M_2}{M_1}} = \frac{3}{4} \\ \frac{3}{2} &\times \frac{M_2}{M_1} = \frac{9}{16} \\ \frac{M_1}{M_2} &= \frac{8}{3} \end{split}$$

(183) Two short magnets of equal dipole moments M are fastened perpendicularly at their centre (figure). The magnitude of the magnetic field at a distance d from the centre on the bisector of the right angle is



Solution:(Correct Answer:C)

(c)Resultant magnetic moment of the two magnets is $M_{net}=\sqrt{M^2+M^2}=\sqrt{2}M$

Imagine a short magnet lying along OP with magnetic moment equal to $M\sqrt{2}$. Thus point P lies on the axial line of the magnet.

: Magnitude of magnetic field at P is given by $B = \frac{\mu_0}{4\pi} \cdot \frac{2\sqrt{2}M}{d^3}$



(184) In a parallel plate capacitor set up, the plate area of

capacitor is $2m^2$ and the plates are separated by 1m. If the space between the plates are filled with a dielectric material of thickness 0.5m and area $2m^2$ (see *fig.*) the capacitance of the set-up will be ε_0

(Dielectric constant of the material = 3.2) and (Round off to the Nearest Integer) $_{\rm [JEE\ MAIN\ 2021]}$



(185) Two solid conductors are made up of same material, have same length and same resistance. One of them has a circular cross section of area A_1 and the other one has a square cross section of area A_2 . The ratio $\frac{A_1}{4}$ is [NEET 2020]

(A) 2	(B) 1.5
(C) 1	(D) 0.8

Solution:(Correct Answer:C)

Resistance of conductor is given as $R = \frac{\rho l}{A}$ $\therefore \quad A = \frac{\rho l}{R}$ $\Rightarrow \frac{A_1}{A_2} = \frac{\rho_1}{\rho_2} \times \frac{L_1}{I_2} \left(\frac{R_2}{R_1}\right)$ $\Rightarrow \frac{A_1}{A_2} = 1 \quad [\because R_1 = R_2, I_1 = l_2 \text{ and for same material } \rho_1 = \rho_2]$

Physics - Section B (MCQ) (Attempt any 10)

(186) In an NPN transistor circuit, the collector current is $10\,mA.$ If 90% of the electrons emitted reach the collector, the emitter current (i_E) and base current (i_B) are given by [AIIMS 1989]

(A) $i_E = -1 \, mA, i_B = 9 \, mA$

(B) $i_E = 9 \, mA, i_B = -1 \, mA$

- (C) $i_E = 1 \, mA, i_B = 11 \, mA$
- **(D)** $i_E = 11 \, mA, i_B = 1 \, mA$

Solution:(Correct Answer:D)

 $\begin{array}{l} i_{C} = \frac{90}{100} \times i_{E} \\ = = > 10 = 0.9 \times i_{E} \\ i_{E} = 11 \, mA \\ \text{Also} \ i_{E} = i_{B} + i_{C} \\ \Rightarrow i_{B} = 11 - 10 = 1 \, mA. \end{array}$

(187) Two identical charged spheres suspended from a common point by two massless strings of lengths l, are initially at a distance d ($d \ll l$) apart because of their mutual repulsion. The charges begin to leak from both the spheres at a constant rate. As a result, the spheres approach each other with a velocity v. Then v varies as a function of the distance x between the spheres, as [NEET 2016, AIEEE 2011]

(A) $v \propto x$ (B) $v \propto x^{-\frac{1}{2}}$ (C) $v \propto x^{-1}$ (D) $v \propto x^{\frac{1}{2}}$

Solution:(Correct Answer:B)

From figure, $T \cos \theta = mg$(*i*) $T \sin \theta = \frac{kq^2}{x^2}$(*ii*) From eqns. (*i*) and (*ii*), $tan\theta = \frac{kq^2}{x^2mg}$ since θ is small, $\therefore \tan \theta \approx \sin \theta = \frac{x}{2l}$ $\therefore \quad \frac{x}{2l} = \frac{kq^2}{x^2mg} \Rightarrow q^2 = x^3 \frac{mg}{2lk}$ or $q \propto x^{3/2}$ $\Rightarrow \frac{dq}{dt} \propto \frac{3}{2}\sqrt{x} \frac{dx}{dt} = \frac{3}{2}\sqrt{xv}$ since, $\frac{dq}{dt} = \text{constant}$ $\therefore v \propto \frac{1}{\sqrt{x}}$

(188) An alternating voltage $v~(t)=220~{\rm sin}~100\pi l~volt$ is applied to a purely resistive load of $50~\Omega$. The time taken for the current to rise from half of the peak value of the peak value is.....ms [JEE MAIN 2019]

(A)	2.2	(B)	3.3
(C)	5	(D)	7.2

Solution:(Correct Answer:B)

 $V(t)=220\sin(100\pi t)$ volt time taken, $t=\frac{\theta}{\omega}=\frac{\frac{\pi}{3}}{100\pi}=\frac{1}{300}\sec=3.3\,\mathrm{ms}$



- (189) Barrier potential of a P-N junction diode does not depend on [AIPMT 2003]
 - (A) Temperature (B) Forward bias
 - (C) Doping density (D) Diode design

Solution:(Correct Answer:D)

(d) Barrier potential does not depends on diode design while barrier potential depends upon temperature, doping density, and forward biasing.

(190) In an experiment, electrons are accelerated, from rest, by applying, a voltage of 500 V. Calculate the radius of the path if a magnetic field 100 mT is then applied. [Charge of the electron $= 1.6 \times 10^{-19} C$ Mass of the electron $= 9.1 \times 10^{-31} ka$] [LEE MAIN 2019]

(A)
$$7.5 \times 10^{-3} m$$
 (B) $7.5 \times 10^{-2} m$

(C)
$$7.5 m$$
 (D) $7.5 \times 10^{-4} m$

Solution:(Correct Answer:D)

(191) A uniform wire of length l and radius r has a resistance of 100Ω . It is recast into a wire of radius $\frac{r}{2}$. The resistance of new wire will be Ω [JEE MAIN 2017]

(A) 1600	(B) 400
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(C) 200 (I	D)	100
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Solution:(Correct Answer:A)

Given, $R_1 = 100 \Omega$, r' = r/2, $R_2 =$? Resistivity of wire, $R = \frac{\rho l}{A}$ \therefore Area × length = volume Hence, $R = \frac{\rho V}{A^2}$ since, $\rho \rightarrow \text{constant}$, $V \rightarrow \text{constant}$ $R \propto \frac{1}{A^2}$ or $R \propto \frac{1}{r^4}$ \therefore $A = \pi r^2$ $\frac{R_2}{R_1} = 16 \Rightarrow R_2 = 16 \times 100 = 1600 \Omega$, Resistance of new wire.

(192) A 16 Ω wire is bend to form a square loop. A 9 V battery with internal resistance 1 Ω is connected across one of its sides. If a 4 μ F capacitor is connected across one of its diagonals, the energy stored by the capacitor will be $\frac{x}{2} \mu$ J. where x = 1, UEE MAIN 2024

(A) 52 (B) 42		
(,) =	A) 52	(B) 42

C) 81 (D) 12
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Solution:(Correct Answer:C)

$$I = \frac{V}{R_{eq}}I = \frac{V}{R_{eq}} = \frac{9}{1 + \frac{12 \times 4}{12 + 4}} = \frac{9}{4}$$
$$I_1 = \frac{9}{4} \times \frac{4}{16} = \frac{9}{16}$$



(193) The charge on capacitor of capacitance $15\mu F$ in the figure given below is . . . μc [JEE MAIN 2022]



(B) 130 (D) 585

Solution:(Correct Answer:A)

(C) 260

$$\frac{1}{C_{eq}} = \frac{1}{10} + \frac{1}{15} + \frac{1}{20} = \frac{12+8+6}{120} = \frac{26}{120}$$

$$C_{eq} = \frac{60}{13} \mu F$$

$$Q = \frac{13\times60}{13} = 60 \,\mu C$$
Charge on each capacitor is same
$$\therefore \text{ they are in series.}$$

$$10\mu F \ 15\mu F \ 20\mu F$$



(194) $\frac{x}{x+4}$ is the ratio of energies of photons produced due to transition of an electron of hydrogen atom from its (i) third permitted energy level to the second level and (ii)the highest permitted energy level to the second permitted level. The value of x will be. [JEE MAIN 2022]

(A) 6	(B) 5
(C) 4	(D) 3

Solution:(Correct Answer:B)

$$\frac{13.6\left(\frac{1}{2^2} - \frac{1}{3^2}\right)}{13.6\left(\frac{1}{2^2} - 0\right)} = \frac{x}{x+4}; \frac{\frac{1}{4} - \frac{1}{9}}{\frac{1}{4}} = \frac{x}{x+4}$$
$$\frac{5}{9} = \frac{x}{x+4}$$
$$5x + 20 = 9x$$
$$4x = 20$$
$$x = 5$$

(195) In a Young's double slit experiment, a student observes 8 fringes in a certain segment of screen when a monochromatic light of 600 nm wavelength is used. If the wavelength of light is changed to 400 nm, then the number of fringes he would observe in the same region of the screen **İS:** [NEET 2022] 111 0

(A) 8	(B) 9
(C) 12	(D) 6

(C) 12

Solution:(Correct Answer:C)

- $y = (n\lambda) \left(\frac{D}{d}\right)$ $n_1\lambda_1 = n_2\lambda_2$ $(8) (600nm) = n_2(400)$ $n_2 = 12$
- (196) In the circuit shown below, maximum zener diode current will bemA [JEE MAIN 2022]



Solution:(Correct Answer:A)

(C) 95



(197) A magnet of magnetic moment $50 \,\hat{i} \, A - m^2$ is placed along the x- axis in a magnetic field $\vec{B} = (0.5\,\hat{i} + 3.0\,\hat{i})T$. The torque acting on the magnet is

(A) $175 \ \hat{k} \ N{-}m$	(B) 150 <i>k̂ N−m</i>
(C) $75 \hat{k} N - m$	(D) $25\sqrt{37}\hat{k}N{-}m$

Solution:(Correct Answer:B)

(b) $\overrightarrow{\tau} = \overrightarrow{M} \times \overrightarrow{B} \Rightarrow \overrightarrow{\tau} = 50\hat{i} \times (0.5\hat{i} + 3\hat{j})$ $= 150 \left(\hat{i} \times \hat{j} \right) = 150 \, \hat{k} \, N \times m.$

- (198) A parallel plate capacitor is charged by connecting it to a battery through a resistor. If l is the current in the circuit, then in the gap between the plates: [NEET 2024]
 - (A) Displacement current of magnitude equal to / flows in the same direction as /
 - (B) Displacement current of magnitude equal to / flows in a direction opposite to that of I
 - (C) Displacement current of magnitude greater than / flows but can be in any direction
 - (D) There is no current

Solution:(Correct Answer:A)

According to modified Ampere's law



- (199) An object is placed at a distance of $12 \, cm$ in front of a plane mirror. The virtual and erect image is formed by the mirror. Now the mirror is moved by $4 \, cm$ towards the stationary object. The distance by which the position of image would be shifted, will be: [JEE MAIN 2023]
 - (A) 4 cm towards mirror (B) 8 cm towards mirror
 - (C) $8 \, cm$ away from mirror (D) $2 \, cm$ towards mirror

Solution:(Correct Answer:B)

 \therefore Shifting of image will be $8 \, cm$ towards mirror.



- (200) A metallic surface is illuminated with radiation of wavelength λ , the stopping potential is V_0 . If the same surface is illuminated with radiation of wavelength 2λ , the stopping potential becomes $\frac{V_0}{4}$. The threshold wavelength for this metallic surface will be - [JEE MAIN 2023] (A) $\frac{\lambda}{4}$ (B) 4λ
 - (C) $\frac{3}{2}\lambda$ (D) 3λ

Solution:(Correct Answer:D)

From the equation of photoelectric effect

$$eV_0 = \frac{hc}{\lambda} - \phi_0 = \frac{hc}{\lambda} - \frac{hc}{\lambda_0}$$

$$\frac{eV_0}{4} = \frac{hc}{2\lambda} = \frac{hc}{\lambda_0}$$

$$\Rightarrow \frac{1}{4} \left(\frac{hc}{\lambda} - \frac{hc}{\lambda_0}\right) = \frac{hc}{2\lambda} - \frac{hc}{\lambda_0}$$

$$\frac{1}{\lambda_0} - \frac{1}{4\lambda_0} = \frac{1}{2\lambda} - \frac{1}{4\lambda}$$

$$\Rightarrow \lambda_0 = 3\lambda$$

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