

Physics

- A coil of area $A = 0.25 \text{ m}^2$ is situated in a uniform magnetic field $B = 4.0 \text{ wb/m}^2$ and the area vector makes an angle of 60° with respect to the magnetic field. The value of the magnetic flux through the area A would be equal to.

A) 0.5 weber B) 1 weber
C) 2 weber D) $\frac{3}{2}$ weber
- A coil of area $A = 0.5 \text{ m}^2$ is situated in a uniform magnetic field $B = 4.0 \text{ wb/m}^2$ and the area vector makes an angle of 30° with respect to the magnetic field. The value of the magnetic flux through the area A would be equal to

A) 2 weber B) 1 weber
C) $\sqrt{3}$ weber D) $\frac{3}{2}$ weber
- A coil of N turns and area A is rotated at the rate of n rotations per second in a magnetic field of intensity B . If the rotation rate is doubled to $2n$ rotations per second, the magnitude of the maximum magnetic flux linked with the coil will be

A) NAB B) $2NAB$
C) $\frac{NAB}{2}$ D) $4\pi nNAB$
- A coil of N turns and area A is rotated at the rate of n rotations per second in a magnetic field of intensity B . The magnitude of the maximum induced electromotive force (EMF) in the coil will be

A) $NnAB$ B) NAB
C) $2\pi nNAB$ D) $\frac{NAB}{2}$
- A square coil of 10^{-2} m^2 area is placed perpendicular to a uniform magnetic field of intensity 10^3 wb/m^2 . The magnetic flux through the coil is

A) 10^5 weber B) 10 weber
C) 10^{-5} weber D) 100 weber
- A square coil of 10^{-3} m^2 area is placed in a uniform magnetic field of intensity 10^3 wb/m^2 such that the plane of the coil makes an angle of 30° with the field. The magnetic flux through the coil is

A) 1 weber B) $\frac{1}{2}$ weber
C) $\frac{\sqrt{3}}{2}$ weber D) 0 weber
- A coil of area 200 cm^2 has 100 turns. A magnetic field of $0.2 \text{ weber/metre}^2$ is perpendicular to the coil. The field is reduced to zero in 0.1 sec. The induced emf in the coil is

A) 2 V B) 4 V
C) 8 V D) Zero
- A coil of area 50 cm^2 has 200 turns. A magnetic field of $0.5 \text{ weber/metre}^2$ is perpendicular to the coil. The field is reduced to zero in 0.05 sec. The induced emf in the coil is

A) 5 V B) Zero
C) 10 V D) 20 V
- A coil has 500 turns and 1000 cm^2 as its area. The plane of the coil is placed at right angles to a magnetic induction field of $2 \times 10^{-5} \text{ wb/m}^2$. The coil is rotated through 180° in 0.1 sec. The average emf induced in the coil in mV is

A) 10 B) 40
C) 20 D) 5
- A coil has 1000 turns and 500 cm^2 as its area. The plane of the coil is placed at right angles to a magnetic induction field of $2 \times 10^{-5} \text{ wb/m}^2$. The coil is rotated through 90° in 0.2 sec. The average emf induced in the coil in mV is

A) 5 B) 10
C) 20 D) Zero
- A coil having 100 square loops each of side 10 cm is placed normal to a magnetic field which increases at a rate of 0.5 T/s . The induced emf in volt is

A) 5 B) 0.1
C) 0.5 D) 1
- A coil having 250 square loops each of side 20 cm is placed normal to a magnetic field which increases at a rate of 2 T/s . The induced emf in volt is

A) 10 B) 20
C) 5 D) 40
- The magnetic field of $2 \times 10^{-2} \text{ Tesla}$ acts at right angle to a coil of area 100 cm^2 with 100 turns. The average emf induced in the coil is 0.1 V when it is removed from the field in time t . The value of t is

A) 0.1 s B) 0.2 s
C) 2 s D) 0.02 s
- The magnetic field of $1 \times 10^{-2} \text{ Tesla}$ acts at right angle to a coil of area 200 cm^2 with 50 turns. The average emf induced in the coil is 0.5 V when it is removed from the field in time t . The value of t is

A) 0.2 s B) 0.1 s
C) 0.02 s D) 2 s

15. A circular coil of 500 turns of a wire has an enclosed area of 0.1 m^2 per turn. It is kept perpendicular to a magnetic field of induction 0.2 T and rotated by 90° about a diameter perpendicular to the field. How much charge will pass when the coil is connected to a galvanometer with a combined resistance of 50Ω ?

- A) 0.4 C B) 0.2 C
C) 2 C D) 0.1 C

16. A circular coil of 1000 turns of a wire has an enclosed area of 0.05 m^2 per turn. It is kept perpendicular to a magnetic field of induction 0.4 T and rotated by 180° about a diameter perpendicular to the field. How much charge will pass when the coil is connected to a galvanometer with a combined resistance of 50Ω ?

- A) 0.4 C B) 1.6 C
C) 0.8 C D) 4 C

17. Flux ϕ (in weber) in a closed circuit of resistance 2 ohm varies with time t (in sec) according to the equation $\phi = 5t^2 - 4t + 1$. What is the magnitude of the induced current at $t = 0.5 \text{ s}$?

- A) 0.5 A B) 1 A
C) 0.25 A D) 2 A

18. Flux ϕ (in weber) in a closed circuit of resistance 12 ohm varies with time t (in sec) according to the equation $\phi = 9t^2 - 6t + 2$. What is the magnitude of the induced current at $t = 0.5 \text{ s}$?

- A) 0.6 A B) 0.25 A
C) 0.5 A D) 0.3 A

19. A circular loop of radius r and resistance R is placed in a transverse uniform magnetic field B . If it suddenly changes into square form in time t , then the magnitude of induced charge will be

- A) $\frac{B\pi r^2}{R} \left(1 - \frac{\pi}{4}\right)$ B) $\frac{B\pi r^2}{R} \left(\frac{\pi}{4} - 1\right)$
C) $\frac{Br^2}{R} (4 - \pi)$ D) $\frac{B\pi r^2}{R} \left(1 + \frac{\pi}{4}\right)$

20. A square loop of side a and resistance R is placed in a transverse uniform magnetic field B . If it suddenly changes into circular form in time t , then the magnitude of the average induced emf will be

- A) $\frac{Ba^2}{t} (4\pi - 1)$ B) $\frac{Ba^2}{t} \left(1 - \frac{1}{4\pi}\right)$
C) $\frac{Ba^2}{t} \left(\frac{4}{\pi} - 1\right)$ D) $\frac{Ba^2}{Rt} \left(\frac{4}{\pi} - 1\right)$

21. A short-circuited coil is placed in a time-varying magnetic field. Electrical power is dissipated due to the current induced in the coil. If the number of turns were to be doubled and the wire radius halved, the electrical power dissipated would be

- A) Halved B) The same
C) Doubled D) Quadrupled

22. A short-circuited coil is placed in a time-varying magnetic field. Electrical power is dissipated due to the current induced in the coil. If the number of turns were to be doubled and the wire radius also doubled, the electrical power dissipated would be

- A) The same B) Doubled
C) Quadrupled D) Eight times

23. A conducting circular loop is placed in a uniform magnetic field $B = 20 \text{ mT}$ with its plane perpendicular to the field. If the radius of the loop starts shrinking at a constant rate 0.2 mm/s , then the induced emf in the loop at an instant when its radius is 1.0 cm is

- A) $0.16\pi \mu\text{V}$ B) $0.08\pi \mu\text{V}$
C) $0.8\pi \mu\text{V}$ D) $0.04\pi \mu\text{V}$

24. A conducting circular loop is placed in a uniform magnetic field $B = 50 \text{ mT}$ with its plane perpendicular to the field. If the radius of the loop starts shrinking at a constant rate 0.4 mm/s , then the induced emf in the loop at an instant when its radius is 2.0 cm is

- A) $0.4\pi \mu\text{V}$ B) $1.6\pi \mu\text{V}$
C) $0.8\pi \mu\text{V}$ D) $0.16\pi \mu\text{V}$

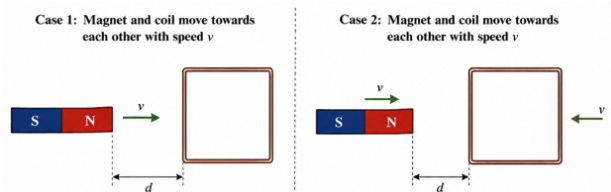
25. A solenoid has 1000 turns wound over a length of 0.314 m . Around its central section a coil of 50 turns and area of cross-section $1 \times 10^{-3} \text{ m}^2$ is wound. If an initial current of 2 A in the solenoid is reversed in 0.25 sec , the emf induced in the coil is equal to

- A) 3.2 mV B) 12.8 mV
C) 1.6 mV D) 6.4 mV

26. A solenoid has 2000 turns wound over a length of 0.628 m . Around its central section a coil of 100 turns and area of cross-section $2 \times 10^{-3} \text{ m}^2$ is wound. If an initial current of 4 A in the solenoid is reversed in 0.2 sec , the emf induced in the coil is equal to

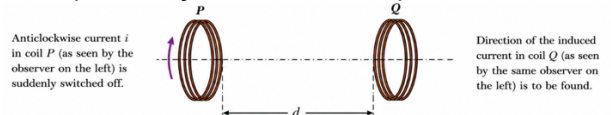
- A) 16 mV B) 64 mV
C) 32 mV D) 12.8 mV

27. In the following figure, the magnet is moved towards the coil with a speed v and induced emf is e . If the magnet and the coil move towards one another each moving with speed v , the induced emf in the coil will be



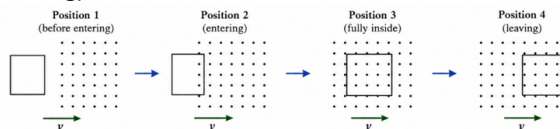
- A) e B) $2e$
C) $e/2$ D) $4e$

28. Two coils P and Q are lying a little distance apart coaxially. If an anticlockwise current i flowing in the coil P (as seen by the observer on the left) is suddenly switched off, then the direction of the induced current in coil Q (as seen by the same observer) is



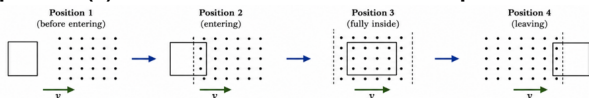
- A) Clockwise B) Towards north
C) Anticlockwise D) Towards south

29. A rectangular loop is drawn from left to right across a uniform magnetic field perpendicular out of the plane of the loop (shown by dots), passing through positions 1 (before entering), 2 (entering), 3 (fully inside) and 4 (leaving). Which statement is correct?



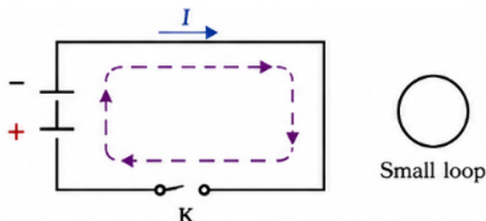
- A) The direction of current in position 1 is clockwise
 B) The direction of current in position 2 is clockwise
 C) The direction of current in position 3 is anti-clockwise
 D) The direction of current in position 4 is clockwise

30. A rectangular loop is drawn from left to right across a uniform magnetic field perpendicular into the plane of the loop, passing through positions 1 (before entering), 2 (entering), 3 (fully inside) and 4 (leaving). In which position(s) is the induced current in the loop zero?



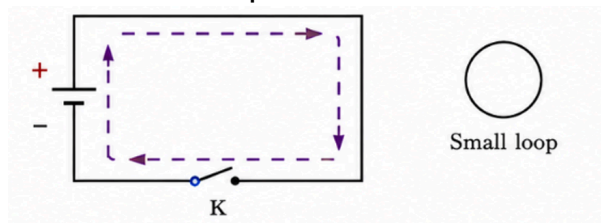
- A) Positions 1 and 3
 B) Positions 2 and 4
 C) Only position 3
 D) Only position 1

31. A small loop lies outside a circuit, to the right of it. The battery in the circuit is connected with reversed polarity (- on the left, + on the right) so that closing the key drives an anticlockwise current in the circuit. The key of the circuit is closed and opened alternately. The closed loop will show



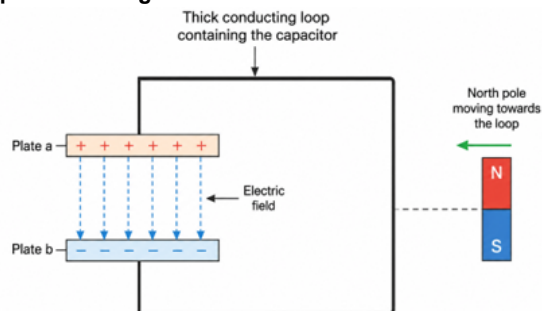
- A) Clockwise pulse followed by another clockwise pulse
 B) Anticlockwise pulse followed by another anticlockwise pulse
 C) Anticlockwise pulse followed by a clockwise pulse
 D) Clockwise pulse followed by an anticlockwise pulse

32. A small loop lies outside a circuit (same arrangement as the original figure, + terminal on the left so the circuit current is clockwise). The key is closed once and kept closed. The closed loop will show



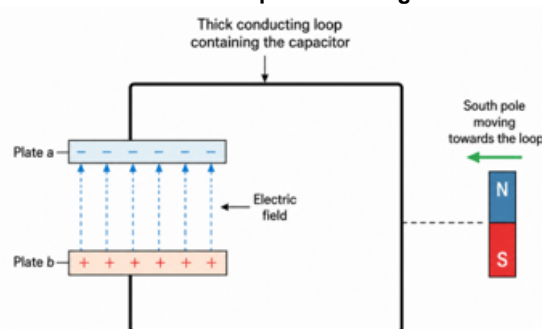
- A) A momentary clockwise pulse and then no current
 B) A momentary anticlockwise pulse and then no current
 C) A continuous clockwise current
 D) No current at any time

33. Consider the same arrangement as in the figure, but now the north pole of the magnet is moved towards the thick conducting loop containing the capacitor. Then excess positive charge will arrive on



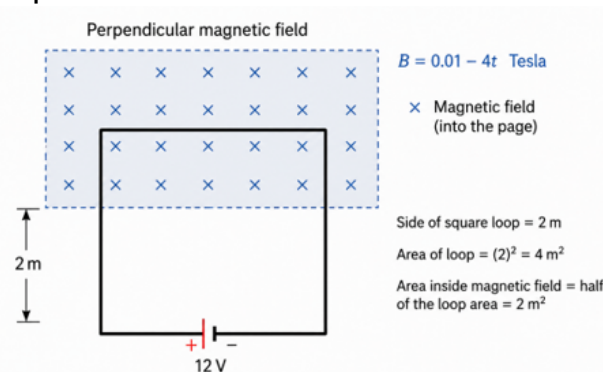
- A) Plate a
 B) Plate b
 C) Both plates simultaneously
 D) None of the above

34. Consider the same arrangement as in the figure, but now the south pole of the magnet faces the loop and is moved towards it. Then excess positive charge will arrive on



- A) Plate a
 B) Plate b
 C) Both plates simultaneously
 D) None of the above

35. A square loop of side 2 m is placed in a perpendicular magnetic field. Half of the area of the loop is inside the magnetic field. A battery of emf 12 V and negligible internal resistance is connected in the loop. The magnetic field changes with time according to the relation $B = 0.01 - 4t$ Tesla. The resultant emf in the loop will be



- A) 20 V
 B) 4 V
 C) 12 V
 D) 8 V

36. A short magnet is allowed to fall along the axis of a horizontal metallic ring. The acceleration of the falling magnet is

- A) Less than g
 B) Equal to g
 C) Greater than g
 D) Zero

37. A short magnet is allowed to fall along the axis of a horizontal plastic (insulating) ring. Starting from rest, the distance fallen by the magnet in one second is (take $g = 9.8 \text{ m/s}^2$)

- A) 4 m B) 4.9 m
C) 6 m D) 7 m

38. A circular loop of radius R carrying current I lies in $x - y$ plane with its centre at origin. The total magnetic flux through $x - y$ plane is:

- A) Directly proportional to I B) Directly proportional to R
C) Directly proportional to R^2 D) Zero

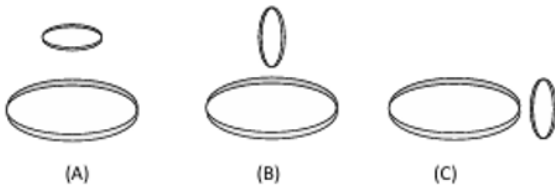
39. Two identical circular loops of metal wire are lying on a table without touching each other. Loop-A carries a current which increases with time. In response, the loop-B:

- A) Remains stationary B) Is attracted by the loop-A
C) Is repelled by the loop-A D) Rotates about its CM, with CM fixed

40. A wire of length 1 m is moving at a speed of 2 ms^{-1} perpendicular to its length and a homogeneous magnetic field of 0.5 T. The ends of the wire are joined to a circuit of resistance 6Ω . The rate at which work is being done to keep the wire moving at constant speed is:

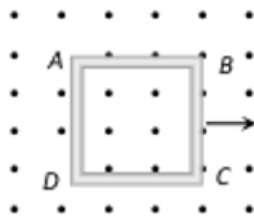
- A) $\frac{1}{12} \text{ W}$ B) $\frac{1}{6} \text{ W}$
C) $\frac{1}{3} \text{ W}$ D) 1 W

41. Two circular coils can be arranged in any of the three situations shown in the figure. Their mutual inductance will be:



- A) Maximum in situation (A) B) Maximum in situation (B)
C) Maximum in situation (C) D) The same in all situations

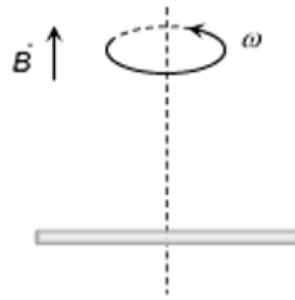
42. A metallic square loop ABCD is moving in its own plane with velocity v in a uniform magnetic field perpendicular to its plane as shown in the figure. An electric field is



induced:

- A) In AD, but not in BC B) In BC, but not in AD
C) Neither in AD nor in BC D) In both AD and BC

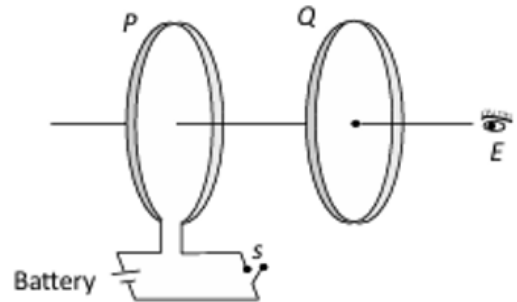
43. A conducting rod of length $2l$ is rotating with constant angular speed ω about its perpendicular bisector. A uniform magnetic field B exists parallel to the axis of rotation. The e.m.f. induced between two ends of the rod



is:

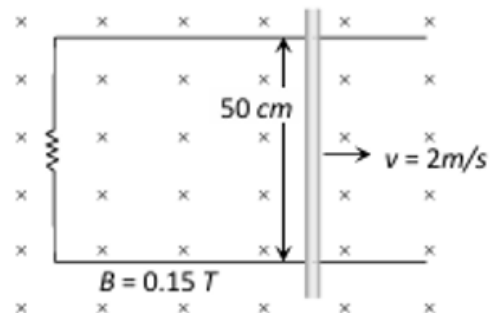
- A) $B\omega l^2$ B) $\frac{1}{2} B\omega l^2$
C) $\frac{1}{8} B\omega l^2$ D) Zero

44. As shown in the figure, P and Q are two coaxial conducting loops separated by some distance. When the switch S is closed, a clockwise current I_P flows in P (as seen by E) and an induced current I_{Q1} flows in Q . The switch remains closed for a long time. When S is opened, a current I_{Q2} flows in Q . Then the directions of I_{Q1} and I_{Q2} (as seen by E) are:



- A) Respectively clockwise and anticlockwise B) Both clockwise
C) Both anticlockwise D) Respectively anticlockwise and clockwise

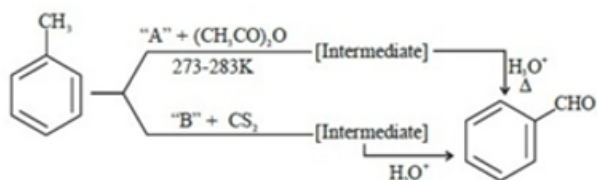
45. As shown in the figure a metal rod makes contact and complete the circuit. The circuit is perpendicular to the magnetic field with $B = 0.15 \text{ T}$. If the resistance is 3Ω , force needed to move the rod as indicated with a constant speed of 2 m/s is:



- A) $3.75 \times 10^{-3} \text{ N}$ B) $3.75 \times 10^{-2} \text{ N}$
C) $3.75 \times 10^2 \text{ N}$ D) $3.75 \times 10^{-4} \text{ N}$

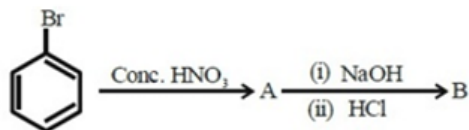
Chemistry

46. In the given reactions, identify the reagent *A* and reagent *B*.

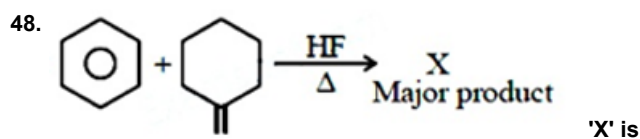


- A) $A - CrO_3, B - CrO_3$ B) $A - CrO_3, B - CrO_2Cl_2$
 C) D) $A - CrO_2Cl_2, B - CrO_3$
 $A - CrO_2Cl_2, B - CrO_2Cl_2$

47. Identify *A* and *B* in the following reaction sequence:

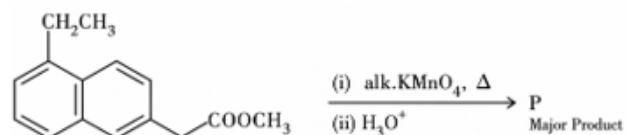


- A) B)
 C) D)
 A = B =
 A = B =



- A) B)
 C) D)

49. The major product 'P' formed in the given reaction is:

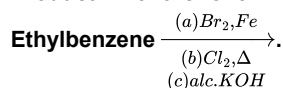


- A) B)
 C) D)

50. Halogenation of which one of the following will yield an m-substituted product with respect to the methyl group as a major product?

- A) B)
 C) D)

51. Product 'A' of the following sequence of reactions is:

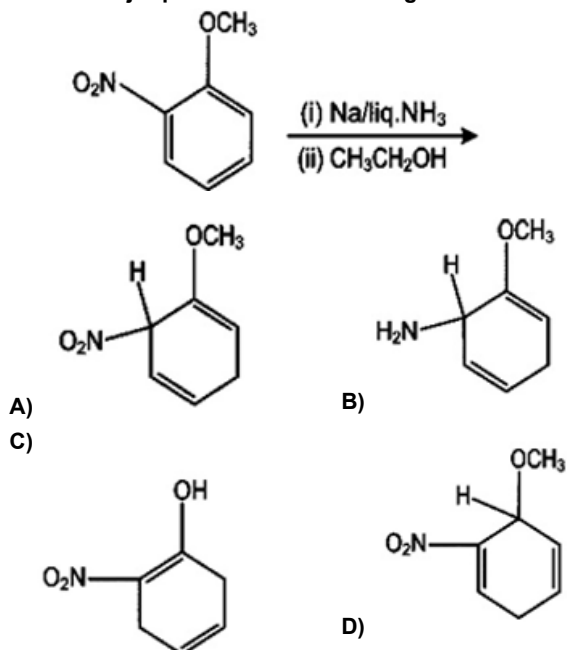


- A) B)
 C) D)

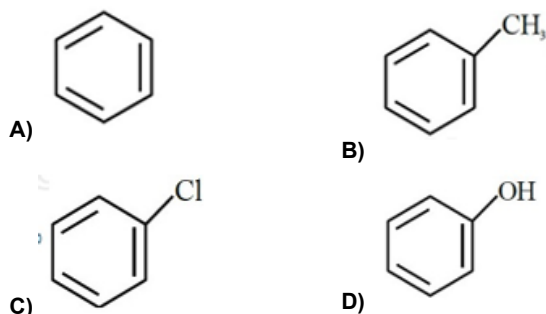
52. In Friedel-Crafts alkylation of aniline, one gets:

- A) Alkylated product with ortho and para substitution. B) Secondary amine after acidic treatment.
 C) An amide product. D) Positively charged nitrogen at the benzene ring.

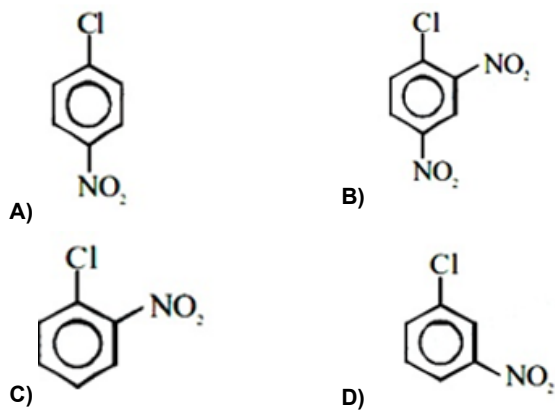
53. The major product of the following reaction is:



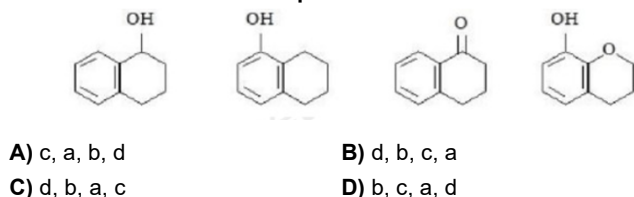
54. Which of the following compound will most easily be attacked by an electrophile?



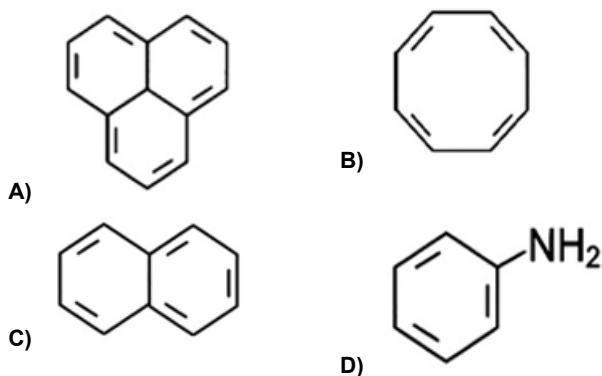
55. The compound which will have the lowest rate towards nucleophilic aromatic substitution on treatment with OH^- is:



56. Arrange the following compounds in increasing order of rate of aromatic electrophilic substitution reaction:



57. Which of the following is not an example of benzenoid compound?



58. Arrange the following in increasing order of reactivity towards nitration: A. p-xylene B. bromobenzene C. mesitylene D. nitrobenzene E. benzene. Choose the correct answer from the options given below

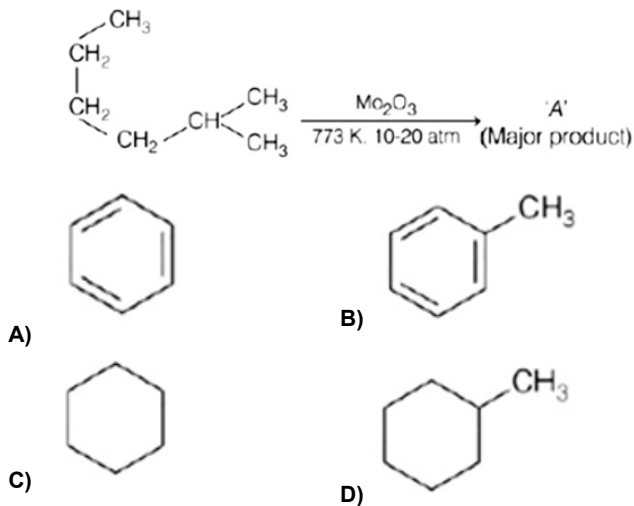
- A) $C < D < E < A < B$

 B) $D < B < E < A < C$

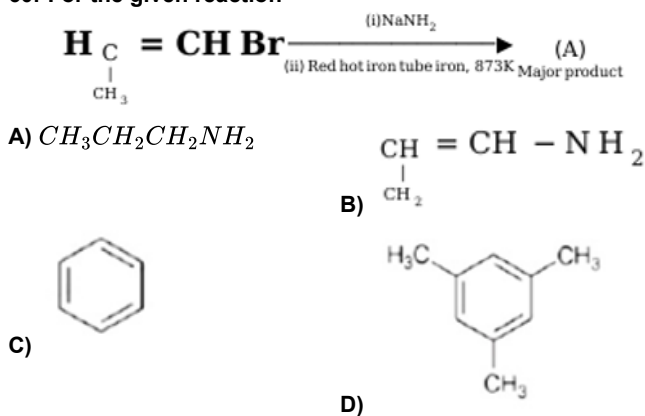
 C) $D < C < E < A < B$

 D) $C < D < E < B < A$

59. Identify A in the given chemical reaction:



60. For the given reaction



61. the correct sequence of reagents used in the preparation of 4-bromo-2-nitroethyl benzene from benzene is.

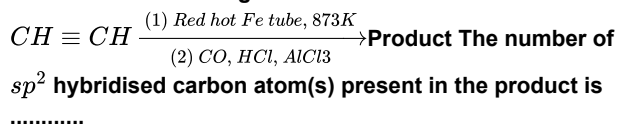
- A) $\text{CH}_3\text{COCl}/\text{AlCl}_3, \text{Br}_2/\text{AlBr}_3, \text{CH}_3\text{COCl}/\text{AlCl}_3, \text{HNO}_3/\text{H}_2\text{SO}_4, \text{Zn}/\text{HCl}/\text{HCl}$

 B) $\text{CH}_3\text{COCl}/\text{AlCl}_3, \text{Br}_2/\text{AlBr}_3, \text{CH}_3\text{COCl}/\text{AlCl}_3, \text{HNO}_3/\text{H}_2\text{SO}_4, \text{Zn}/\text{HCl}/\text{HCl}$

 C) $\text{Br}_2/\text{AlBr}_3, \text{CH}_3\text{COCl}/\text{AlCl}_3, \text{HNO}_3/\text{H}_2\text{SO}_4, \text{Zn}/\text{HCl}/\text{HCl}$

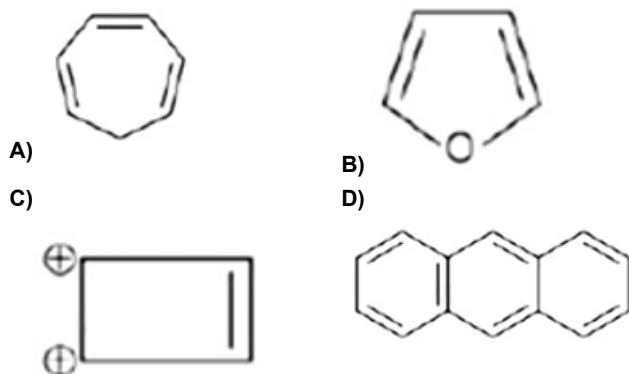
 D) $\text{Br}_2/\text{AlBr}_3, \text{CH}_3\text{COCl}/\text{AlCl}_3, \text{HNO}_3/\text{H}_2\text{SO}_4, \text{Zn}/\text{HCl}/\text{HCl}$

62. Consider the following chemical reaction.

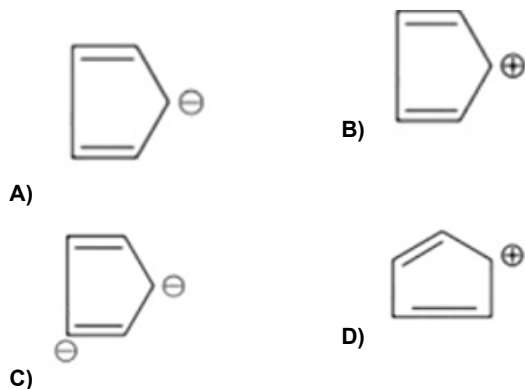


- A) 4
C) 8
B) 7
D) 9

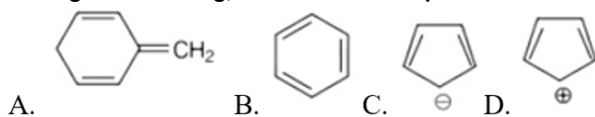
63. Which one of the following compounds is non-aromatic?



64. Which of the following is an aromatic compound?

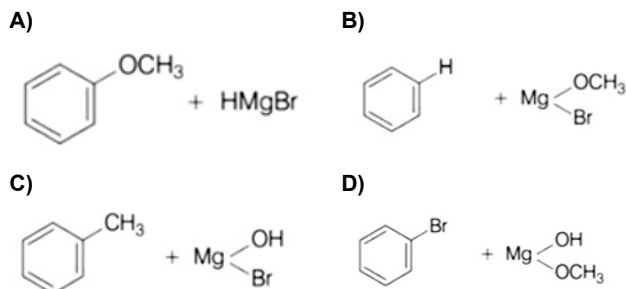
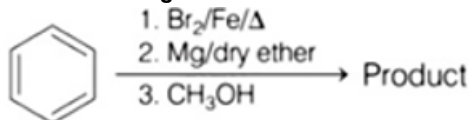


65. Among the following, the aromatic compounds are:

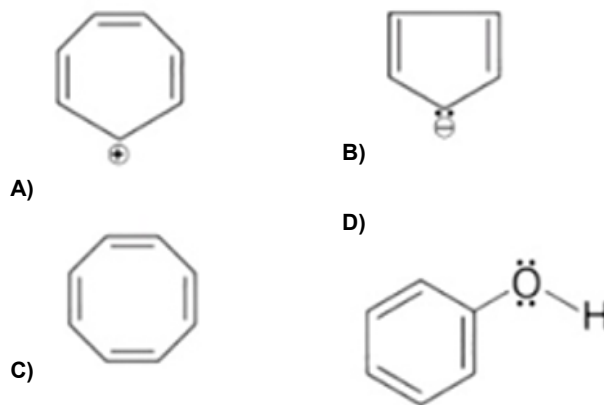


- A) Only (A) and (B)
C) (B), (C) and (D)
B) Only (B) and (C)
D) (A), (B) and (C)

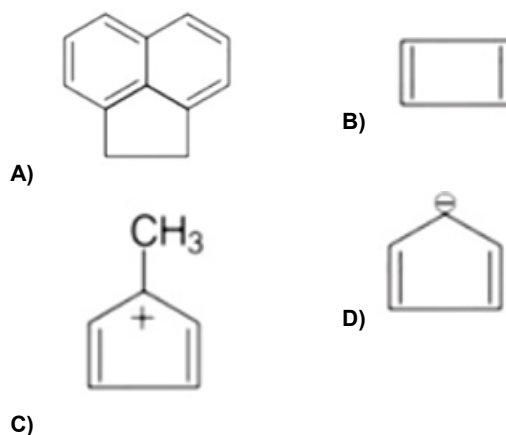
66. For the following



67. Which one of the following compounds is not aromatic?



68. Which one of the following compounds is aromatic in nature?



69. In the following sequence of reactions, the maximum number of atoms present in molecule 'C' in one plane is _____.

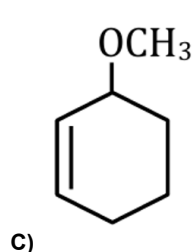
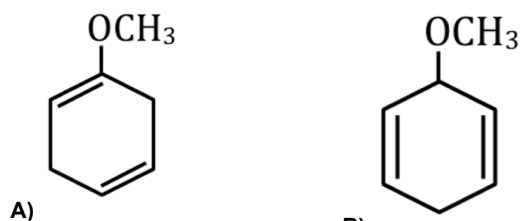
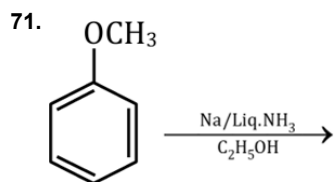
$$A \xrightarrow[\text{Cu tube}]{\text{Red hot}} B \xrightarrow[\text{Anhydrous } AlCl_3]{CH_3Cl(L.eq.)} C$$

(A is a lowest molecular weight alkyne)

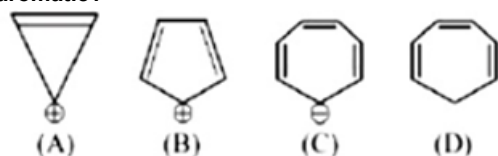
- A) 11
C) 13
B) 19
D) 20

70. The number of sp^2 hybrid orbitals in a molecule of benzene is:

- A) 24
C) 18
B) 6
D) 12

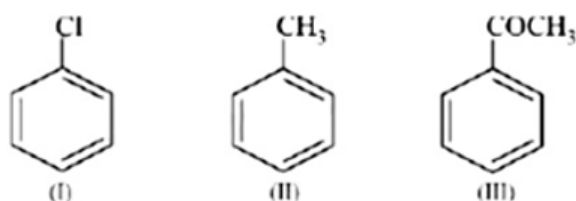


72. Which compound(s) out of the following is/are not aromatic?



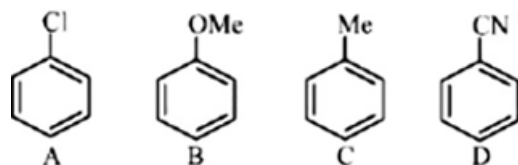
- A) (C) and (D) B) (C) and (B)
C) (B) D) (A) and (C)

73. The increasing order of the reactivity of the following compounds towards electrophilic aromatic substitution reactions is:



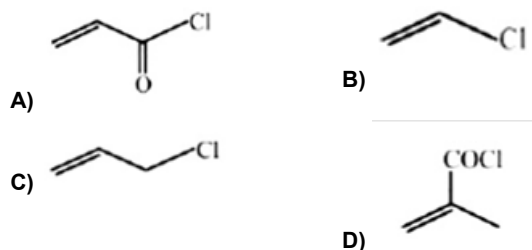
- A) II < I < III B) III < II < I
C) III < I < II D) I < III < II

74. The increasing order of reactivity of the following compounds towards aromatic electrophilic substitution reaction is:

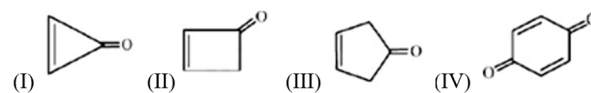


- A) D < A < C < B B) B < C < A < D
C) A < B < C < D D) D < B < A < C

75. Which of the following compounds will not undergo Friedel Craft's reaction with benzene?



76. Which of the following compounds will show highest dipole moment?

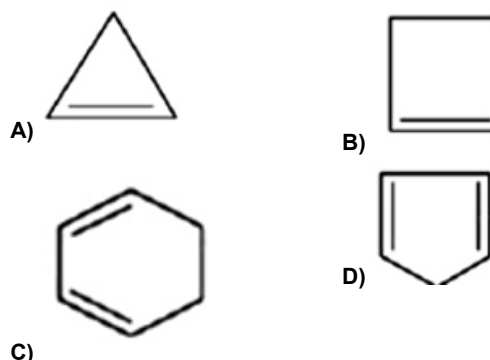


- A) (I) B) (II)
C) (III) D) (IV)

77. Which one of the following class of compounds is obtained by polymerization of acetylene?

- A) Poly-yne B) Poly-ene
C) Poly-ester D) Poly-amine

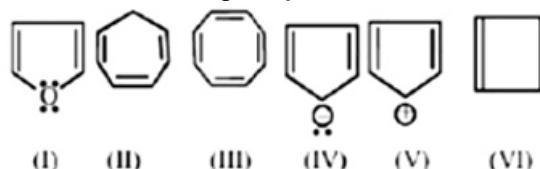
78. Which of the following compounds is most reactive to an aqueous solution of sodium carbonate?



79. Which of the following would not give 2-phenyl butane as the major product in a Friedel-Crafts alkylation reaction?

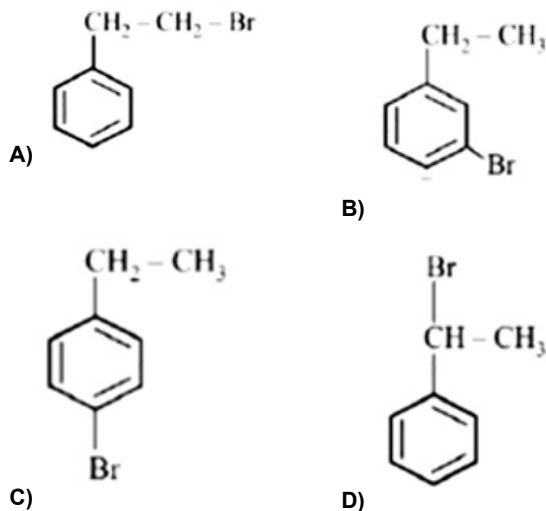
- A) 1-butene + HF B) 2-butanol + H_2SO_4
C) Butanoyl chloride + AlCl_3 D) Butyl chloride + AlCl_3 then Zn, HCl

80. Which of the following compounds are antiaromatic?

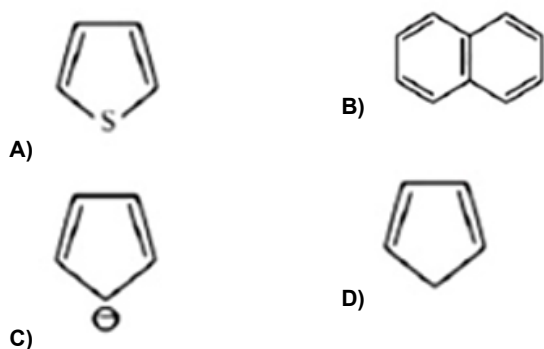


- A) (I) and (V) B) (II) and (V)
C) (I) and (IV) D) (III) and (VI)

81. The product of the reaction between ethyl benzene and N-bromosuccinimide is:



82. The non aromatic compound among the following is:



83. Toluene is nitrated and the resulting product is reduced with tin and hydrochloric acid. The product so obtained is diazotised and then heated with cuprous bromide. The reaction mixture so formed contains:

- A) mixture of o- and p-bromotoluenes
B) mixture of o- and p-dibromobenzenes
C) mixture of o- and p-bromoanilines
D) mixture of o- and m-bromotoluenes

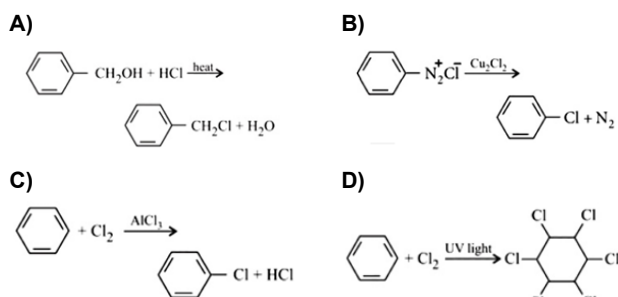
84. The compound formed as a result of oxidation of ethyl benzene by $KMnO_4$ is:

- A) benzyl alcohol
B) benzophenone
C) acetophenone
D) benzoic acid

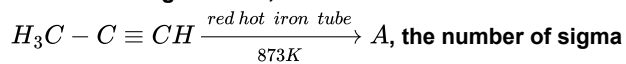
85. Benzene on nitration gives nitrobenzene in presence of HNO_3 and H_2SO_4 mixture, where:

- A) Both H_2SO_4 and HNO_3 act as bases
B) HNO_3 acts as an acid and H_2SO_4 acts as a base
C) Both H_2SO_4 and HNO_3 act as acids
D) HNO_3 acts as a base and H_2SO_4 acts as an acid

86. Among the following the reaction that proceeds through an electrophilic substitution is



87. In the following reaction,



(σ) bonds present in the product A, is

- A) 21
B) 9
C) 24
D) 18

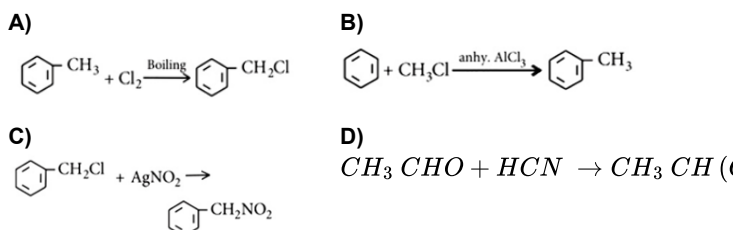
88. Which of the following can be used as the halide component for Friedel-Crafts reaction?

- A) Chlorobenzene
B) Bromobenzene
C) Chloroethene
D) Isopropyl chloride

89. The reaction of toluene with Cl_2 in presence of $FeCl_3$ gives X and reaction in presence of light gives Y. Thus, X and Y are

- A) X - Benzal chloride, Y = o-chlorotoluene
B) X = m-chlorotoluene, Y = p-chlorotoluene
C) X = o- and p-chlorotoluene, Y = Trichloromethyl benzene
D) X = Benzyl chloride, Y = m-chlorotoluene

90. Which one of the following is a free-radical substitution reaction?



Botany

91. If a double-stranded DNA molecule contains 340 Adenine bases and 260 Guanine bases, what is the total number of phosphodiester bonds present in this DNA fragment?

- A) 600
B) 1200
C) 1198
D) 2400

92. According to Chargaff's rules, which of the following base ratios is highly constant for a given biological species but varies between different species?

- A) $(A + G) / (T + C)$
B) $(A + T) / (G + C)$
C) $(A + C) / (T + G)$
D) G / C

93. How many turns are present in a linear B-DNA fragment that has a physical length of 68 nanometres?

- A) 10 turns
B) 20 turns
C) 200 turns
D) 34 turns

94. What unique biochemical property allows basic histones to interact stably with eukaryotic genomic DNA?

- A) Histones contain a high concentration of acidic amino acids that react with bases.
B) Positively charged side chains of Lysine and Arginine bind to the negatively charged phosphate backbone of DNA.
C) Covalent disulphide bonds link histones directly to the ribose sugars.
D) Histone proteins act as hydrophobic shields inside the major groove.

95. A section of chromatin containing six distinct nucleosome beads on a string would involve a total of how many core histone protein molecules?

- A) 6
B) 24
C) 48
D) 54

96. Which specific component acts to seal the DNA strand as it wraps around the histone core particle, stabilizing the higher-order chromatin fibers?

- A) Non-histone scaffold proteins
- B) Histone H1 linker protein
- C) Acetyl groups on histone tails
- D) RNA Primase complex

97. Under cytological staining, heterochromatin exhibits which set of characteristics compared to euchromatin?

- A) Densely packed, stains lightly, transcriptionally active
- B) Loosely packed, stains darkly, transcriptionally silent
- C) Densely packed, stains darkly, transcriptionally silent
- D) Loosely packed, stains lightly, transcriptionally active

98. What chemical structural difference distinguishes Thymine from Uracil?

- A) Presence of a hydroxyl group at C2'
- B) Methylation at the C5 position
- C) Absence of a phosphate group at the 5'-end
- D) A double ring purine framework

99. In Frederick Griffith's transformation experiments, what happened when heat-killed S-strain bacteria and living R-strain bacteria were co-injected into healthy mice?

- A) The mice survived because R-strain bacteria neutralized the S-strain toxins.
- B) The mice died, and living smooth-capsulated (S-strain) bacteria were recovered from their blood.
- C) The mice survived, but their immune systems produced no antibodies.
- D) The mice died due to an immediate viral contamination within the broth.

100.

Avery, MacLeod, and McCarty expanded on Griffith's work by proving that the transforming principle was DNA. Which of the following observations supported their claim?

- A) Treatment with trypsin and chymotrypsin completely abolished transforming ability.
- B) Treatment with ribonuclease (RNase) enhanced the speed of transformation.
- C) Digestion with deoxyribonuclease (DNase) completely inhibited the transformation process.
- D) The transforming substance lacked phosphorus entirely.

101.

Why did Hershey and Chase choose radioactive Phosphorus (32P) and Sulfur (35S) to label bacteriophages instead of radioactive Carbon or Nitrogen?

- A) Carbon and Nitrogen make bacteriophages mutate too rapidly to track.
- B) Phosphorus is uniquely present in DNA but absent in proteins, while Sulfur is present in some proteins but completely absent in DNA.
- C) Sulfur easily dissolves the host bacterial wall, allowing faster entry of Phosphorus.
- D) Phosphorus labels the viral capsule, while Sulfur isolates the core nucleic acids.

102.

During the Hershey-Chase blender experiment, where was the radioactivity detected after infecting bacteria with 35S-labeled phages followed by agitation and centrifugation?

- A) Primarily in the bacterial cell pellet at the bottom of the tube.
- B) Equidistant between the pellet and the liquid medium.
- C) Primarily in the liquid supernatant containing empty viral coats.
- D) The radioactivity disappeared entirely during blending.

103.

RNA is highly vulnerable to spontaneous chemical hydrolysis and degradation because it possesses:

- A) A stable double-stranded structure that resists bending.
- B) A highly reactive free 2'-hydroxyl (-OH) group on its ribose sugar ring.
- C) A thymine base that undergoes rapid deamination.
- D) Stronger phosphodiester linkages than DNA.

104.

Which organic molecule was the first true genetic material to evolve on Earth, serving both as a repository of information and a metabolic catalyst?

- A) DNA
- B) Protein
- C) RNA
- D) Phospholipids

105.

DNA evolved from RNA through chemical modifications that enhanced its stability. These modifications include the development of a double-stranded structure with complementary base pairing and the:

- A) Replacement of Thymine by Uracil
- B) Conversion of ribose sugar into deoxyribose sugar
- C) Elimination of all purine bases from the coding strand
- D) Attachment of an acetyl group to the C3' position

106.

The semi-conservative replication model implies that after one round of division, each new DNA double helix contains:

- A) Short, interspersed pieces of parental and daughter strands mixed randomly.
- B) Two entirely new daughter strands, while the parental molecule remains intact.
- C) One intact parental strand and one newly synthesized daughter strand.
- D) Double strands made entirely of newly arranged ribose blocks.

107.

In Meselson and Stahl's experiment, E. coli cells grown in a heavy 15N medium were transferred to a light 14N medium. What was the density composition of the DNA extracted after exactly one generation (20 minutes)?

- A) 100% heavy density DNA
- B) 50% heavy and 50% light density DNA
- C) 100% intermediate/hybrid density DNA
- D) 75% light and 25% hybrid density DNA

108.

If the Meselson-Stahl replication cycle is carried out for four full generations (80 minutes) in a light 14N medium, what will be the proportion of hybrid DNA molecules to completely light DNA molecules?

- A) 2 hybrid : 6 light
- B) 2 hybrid : 14 light
- C) 4 hybrid : 12 light
- D) 0 hybrid : 16 light

109.

Why does DNA replication require an RNA primase enzyme to lay down a short primer before DNA Polymerase can begin synthesis?

- A) DNA Polymerase cannot break the hydrogen bonds of the parent helix.
- B) DNA Polymerase can only add new nucleotides to the free 3'-OH end of an existing polynucleotide strand.
- C) RNA primers act to attract topoisomerase enzymes to the origin site.
- D) The primer converts deoxyribose sugars into ribose configurations.

110.

During replication, the lagging strand is synthesized in short fragments called Okazaki fragments because:

- A) The lagging strand template has a 3' → 5' polarity relative to the fork movement.
- B) DNA polymerase can only synthesize DNA continuously in the 5' → 3' direction.
- C) DNA ligase works faster than DNA helicase.
- D) Eukaryotic cells lack single-strand binding proteins.

111.

Which enzyme is responsible for removing the RNA primers and filling in the gaps with deoxyribonucleotides during prokaryotic DNA replication?

- A) DNA Polymerase III
- B) DNA Polymerase I
- C) DNA Topoisomerase
- D) RNA Polymerase II

112.

What would happen if a cell lacks functional DNA Ligase enzymes during the S-phase of the cell cycle?

- A) Replication will not initiate at the origin site (ori).
- B) The leading strand will turn into an RNA molecule.
- C) Okazaki fragments on the lagging strand will remain disconnected, leaving nicks in the sugar-phosphate backbone.
- D) The DNA double helix will become permanently overwound.

113.

What is the role of DNA Topoisomerase (Gyrase) ahead of the advancing replication fork?

- A) Breaking hydrogen bonds to separate the two template strands.
- B) Adding adenine residues to stabilize the single strands.
- C) Relieving the torsional strain and supercoiling caused by the unwinding of the double helix.
- D) Binding to the RNA primer to trigger elongation.

114.

In a prokaryotic cell, DNA replication takes place at a rate of approximately:

- A) 20 base pairs per second
- B) 2000 base pairs per second
- C) 200,000 base pairs per minute
- D) 2 base pairs per hour

115.

Failure of cell division after DNA replication has completed successfully inside a cell results in:

- A) Immediate apoptosis via lysosomal bursting
- B) Polyploidy (an increase in the number of chromosome sets)
- C) The conversion of DNA into RNA structures
- D) The deletion of the origin of replication site.

116.

The process of transcription involves copying genetic information from:

- A) Both strands of DNA into a double-stranded RNA molecule.
- B) Only one selected strand of DNA (template strand) into a single-stranded RNA.
- C) An mRNA molecule into a functional structural protein chain.
- D) A protein sequence back into a stable DNA code.

117.

If the sequence of bases in the template strand of a transcription unit is written as 3'-TACGGCATG-5', what will be the corresponding sequence of bases on the primary mRNA transcript?

- A) 5'-ATGCCGTAC-3'
- B) 5'-AUGCCGUAC-3'
- C) 3'-AUGCCGUAC-5'
- D) 5'-UACGGCAUG-3'

118.

By convention, the structural locations of the promoter and terminator within a transcription unit are defined based on the polarity of the:

- A) Template strand
- B) Coding strand
- C) Nascent tRNA molecule
- D) Histone octamer core

119.

In prokaryotes, what is the role of the Rho factor during transcription?

- A) It binds to the promoter to initiate RNA chain elongation.
- B) It adds a methyl guanosine cap to the transcript.
- C) It interacts with RNA polymerase to trigger the termination of transcription.
- D) It unwinds the DNA double helix at the Pribnow box.

120.

Eukaryotic cells possess three distinct RNA polymerase enzymes. What is the specific functional product generated by RNA Polymerase I?

- A) Transfer RNAs (tRNAs) and 5S rRNA
- B) Heterogeneous nuclear RNA (hnRNA)
- C) Large ribosomal RNAs (28S, 18S, and 5.8S rRNAs)
- D) Small nuclear RNAs (snRNAs)

121.

What unique structural arrangement distinguishes eukaryotic structural genes from prokaryotic structural genes?

- A) Eukaryotic structural genes are polycistronic.
- B) Eukaryotic structural genes are monocistronic and contain split-gene sequences (exons and introns).
- C) Eukaryotic genes lack promoter sequences entirely.
- D) Eukaryotic genes are transcribed directly inside the cytoplasm.

122.

During the post-transcriptional processing of eukaryotic hnRNA, the tailing reaction involves:

- A) Adding 200-300 adenylate residues to the 3'-end in a template-independent manner.
- B) Attaching a methyl guanosine triphosphate group to the 5'-end.
- C) Deleting all exons using the spliceosome machinery.
- D) Linking the transcript to the small ribosomal subunit.

123.

In the structure of the Lac operon, the regulatory gene denoted as the i-gene is responsible for coding:

- A) The inducer molecule allolactose
- B) The structural enzyme beta-galactosidase
- C) The active lac repressor protein
- D) The RNA polymerase core enzyme

124.

In the Lac operon, the structural gene lacZ codes for the enzyme beta-galactosidase. What is the primary metabolic role of this enzyme?

- A) Transporting lactose from the external environment into the cell cytoplasm.
- B) Hydrolyzing the disaccharide lactose into its component monosaccharides, glucose and galactose.
- C) Attaching acetyl groups to non-functional toxic thiogalactosides.
- D) Phosphorylating glucose molecules during glycolysis.

125.

What direct physical event prevents the transcription of structural genes (lacZ, lacY, lacA) when E. coli cells are grown in a medium completely lacking lactose?

- A) RNA Polymerase mutates and binds to the terminator site.
- B) The active repressor protein binds tightly to the operator region, creating a physical roadblock for RNA Polymerase.
- C) Lactose molecules physically wrap around the promoter site, blocking transcription factors.
- D) The structural genes are deleted from the bacterial chromosome.

126.

What happens to the repressor protein when lactose (allolactose) enters the bacterial cytoplasm?

- A) The inducer binds to the repressor, causing a conformational shape change that forces it to release the operator site.
- B) The inducer digests the repressor into free amino acids.
- C) The repressor binds more tightly to the promoter region.
- D) The repressor triggers the immediate synthesis of an RNA primer.

127.

Why is a basic, very low level of Lac operon expression required inside an E. coli cell at all times, even when no lactose is present in the surrounding medium?

- A) To prevent the cell wall from collapsing.
- B) Because without basic expression, the permease enzyme would be absent, and lactose could never enter the cell to trigger induction.
- C) To continuously synthesize glucose from cellular water molecules.
- D) To maintain the positive charge on histone octamers.

128.

The pitch of one full turn of the B-DNA helix is:

- A) 0.34 nm
- B) 2.0 nm
- C) 3.4 nm
- D) 34 nm

129.

What specific radioactive isotopes did Alfred Hershey and Martha Chase use in 1952 to label bacteriophage components?

- A) ^{32}P for proteins, ^{35}S for DNA
- B) ^{15}N for DNA, ^{14}C for proteins
- C) ^{32}P for DNA, ^{35}S for proteins
- D) 3H for RNA, ^{14}C for DNA

130.

What does it mean when the genetic code is described as "unambiguous"?

- A) One codon can specify multiple amino acids.
- B) Multiple distinct codons can code for the same amino acid.
- C) One specific codon always codes for exactly one specific amino acid.
- D) The code varies between different species.

131.

The actual catalytic peptide bond formation during translation in bacteria is carried out by:

- A) A specialized proteinaceous enzyme
- B) The 23S rRNA acting as a ribozyme
- C) Initiation Factor 3
- D) The poly-A tail

132.

What is the composition of the structural unit known as a nucleosome?

- A) Histone octamer + 146 bp of DNA + Histone H1 protein
- B) Histone octamer + 200 bp of DNA loop
- C) Non-histone chromosomal proteins + naked DNA loop
- D) Ribosomal proteins paired with pre-mRNA strands

133.

Avery, MacLeod, and McCarty chemically purified components from heat-killed S-strain bacteria to find the transforming principle. Transformation was prevented ONLY by:

- A) Proteases
- B) RNases
- C) DNases
- D) Lipases

134.

In the Lac operon, which gene codes for the repressor protein that regulates the system?

- A) lacZ
- B) lacY
- C) lacA
- D) lacI

135.

Regulation of the Lac operon by a repressor protein is classified as:

- A) Positive regulation
- B) Feedback inhibition
- C) Negative regulation
- D) Target modification

Zoology.

136.

The testes in humans are situated outside the abdominal cavity inside a pouch called scrotum. The purpose served is for:

- A)** acceleration of maturation of sperms
B) providing more space for the growth of epididymis
C) escaping any possible compression by the visceral organs
D) maintaining the scrotal temperature lower than the internal body temperature

137.

The tunica albuginea is a covering around the:

- A)** testes
B) ovaries
C) scrotal sacs
D) epididymis

138.

The primary regulator of Leydig cell secretion is :

- A)** FSH releasing factor
B) Androgen-binding protein
C) Luteinizing hormone (LH)
D) Follicle stimulating hormone

139.

Supporting cells found in between the germinal epithelium of testis are called :

- A)** Phagocytes
B) Sertoli cells
C) Leydig cells
D) Granular cells

140.

Sertoli cells are found :

- A)** between the seminiferous tubules
B) in the germinal epithelium of ovary
C) in the upper part of the Fallopian tube
D) in the germinal epithelium of the seminiferous tubules

141.

The spermatids mature in :

- A)** Sertoli cells
B) Leydig cells
C) Both 1 and 2
D) None of these

142.

Which of the following is correct about mammalian testes ?

- A)** Graafian follicles, Sertoli cells, Leydig cells
B) Sertoli cells, Seminiferous tubules, Leydig cells
C) Graafian follicles, Leydig cells, Seminiferous tubules
D) Graafian follicles, Sertoli cells, Seminiferous tubules

143.

In the male reproductive system, sperms are concentrated in the :

- A)** rete testis
B) epididymis
C) vas deferens
D) seminal vesicle

144.

If the vasa differentia of a man is surgically cut or blocked :

- A)** semen will be without sperms
B) spermatogenesis will not take place
C) testosterone will disappear from blood
D) sperms in the semen become nonmotile

145.

Match the following :

Set-I		Set-II	
(A)	Inguinal canal	(1)	Net work of seminiferous tubules
(B)	Rete testis	(2)	Secondary sexual characters
(C)	Leydig cells	(3)	For descending of testis
(D)	Prepuce	(4)	Dorsal bundles of connective tissue
(E)	Corpora cavernosa	(5)	Terminal skin of penis

- A)** A →1; B →2; C →3; D →5; E→4
B) A →3; B →1; C →4; D →2; E→5
C) A →2; B →4; C →3; D →5; E→1
D) A →3; B →1; C →2; D →5; E→4

146.

The correct sequence of spermatogenetic stages leading to the formation of sperms in a mature human testes is :

- A)** spermatogonia – spermatocyte – spermatid – sperms
B) spermatid – spermatocyte – spermatogonia – sperms
C) spermatogonia – spermatid – spermatocyte – sperms
D) spermatocyte – spermatogonia – spermatid – sperms

147.

What happens during spermatogenesis ?

- A)** Mitosis
B) Meiosis
C) Metamorphosis
D) Both 1 and 2

148.

By which cell division spermatogonia are formed ?

- A)** Mitosis
B) Amitosis
C) Meiosis I
D) Meiosis II

149.

Spermatogenesis is promoted by :

- A)** FSH
B) MSH
C) ACTH
D) hCG

150.

Indicate the correct sequence during spermiogenesis :

- A)** Spermatozoa → spermatogonia
B) spermatogonia → spermatocyte
C) Spermatid → spermatozoa
D) spermatocyte → Spermatozoa

151.

In spermatogenesis, the phase of maturation involves :

- A)** the growth of spermatogonia into primary spermatocyte
B) the formation of spermatogonia from gonocytes through mitosis
C) the formation of spermatids from primary spermatocytes through meiosis
D) the formation of oogonia from the spermatocytes through meiosis

152.

Which one of the following pairs is diploid ?

- A)** Spermatid and sperm
B) Spermatogonia and spermatid
C) Primary and secondary spermatocytes
D) Spermatogonia and primary spermatocyte

153.

Which of the following are haploid in nature ? A) Spermatids B) Spermatogonia C) Primary spermatocytes D) Secondary spermatocytes

- A) 1 and 2 are correct B) 1 and 4 are correct
C) 2 and 4 are correct D) 1, 2 and 3 are correct

154.

Number of spermatozoa produced by a single primary spermatocyte during spermatogenesis is :

- A) one B) two
C) four D) eight

155.

Number of chromosomes in a primary spermatocyte is :

- A) same as in spermatid B) same as in spermatogonium
C) half of that in spermatogonium D) same as in secondary spermatocyte

156.

The products of the first maturation division of germ cells in testis are known as :

- A) sperms B) oocytes
C) spermatids D) secondary spermatocytes

157.

Sperms formed from four primary spermatocytes are :

- A) 1 B) 4
C) 16 D) 32

158.

The number of sperms formed from a secondary spermatocyte is :

- A) 2 B) 4
C) 6 D) 8

159.

How many secondary spermatocytes are required to form 400 spermatozoa ?

- A) 40 B) 100
C) 200 D) 400

160.

Acrosome is a type of :

- A) lysosome B) flagellum
C) ribosome D) basal body

161.

Acrosome of sperm is formed from :

- A) nucleus of spermatid B) centrosome of spermatid
C) mitochondria of spermatid D) golgi complex of spermatid

162.

Vasa efferentia are the ductules leading from :

- A) testicular lobules to rete testis B) vas deferens to epididymis
C) rete testis to vas deferens D) epididymis to urethra

163.

In spermatogenesis, reduction division of chromosome occurs during conversion of :

- A) spermatids to sperms B) secondary spermatocytes to spermatids
C) spermatogonia to primary spermatocytes D) primary spermatocytes to secondary spermatocytes

164.

A couple have been trying to conceive a child for over a year without success. Recently, the man's doctor informed him that his seminal vesicles are defective. This means that

- A) the man makes functional sperm, but they are not delivered because he is unable to ejaculate. B) the man's sperm lack functional flagella
C) the fluid needed to lubricate the man's urethra for easier sperm travel is defective D) the man's semen lacks the fructose fuel needed for the sperm to swim.

165.

Consider the following statements regarding the structure of the human testis: 1. Each testis is covered by a dense covering called tunica vaginalis. 2. Seminiferous tubules are lined internally by Sertoli cells only. 3. Interstitial spaces contain blood vessels and Leydig cells. 4. Primary spermatocytes are formed from spermatogonia by mitosis. Which of the above statements are correct?

- A) 1 and 3 only B) 3 and 4 only
C) 1, 2 and 3 D) 1, 3 and 4

166.

Regarding spermatogenesis: 1. Spermatids are haploid cells formed by meiosis II. 2. Spermiogenesis occurs in seminiferous tubules under testosterone influence. 3. LH acts on Sertoli cells. 4. FSH acts on Leydig cells. How many statements are incorrect?

- A) One B) Two
C) Three D) Four

167.

Which of the following statements are true regarding epididymis? 1. It stores spermatozoa temporarily. 2. It provides maturation to spermatozoa. 3. It connects to seminiferous tubules through vasa efferentia. 4. It opens into ejaculatory duct.

- A) 1, 2 and 3 B) 2 and 4
C) 1 and 3 only D) All of these

168.

Which of the following statements is false about seminiferous tubules?

- A) They open into rete testis. B) They are lined by Sertoli and spermatogenic cells.
C) Lumen is filled with spermatogonia. D) Surrounded by basement membrane and interstitial tissue.

169.

Select the incorrect statements for Sertoli cells:

- A) Provide nutrition. B) Secrete inhibin.
C) Secrete testosterone. D) Form blood-testis barrier.

170.

1. Seminiferous tubule → Rete testis → Vasa efferentia → Epididymis → Vas deferens → Ejaculatory duct. 2. Ejaculatory duct opens into prostatic urethra. Which are correct?

- A) 1 only
- B) 2 only
- C) Both
- D) None

171.

Select the incorrect statement Hormonal control in males:

- A) LH → Leydig → Testosterone
- B) FSH → Sertoli → Spermatogenic factors
- C) Testosterone → Negative feedback
- D) Inhibin → Suppresses LH

172.

Select the incorrectly matched pair:

- A) Rete testis – Network inside testis
- B) Vasa efferentia – Connect rete testis to epididymis
- C) Epididymis – Site where sperms combine with semen
- D) Vas deferens – Conducts sperm to ejaculatory duct

173.

Which are not directly involved in sperm transport? 1. Seminal vesicle 2. Urinary bladder 3. Prostate gland 4. Vas deferens

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

174.

A male shows normal secondary characters but no spermatogenesis. Possible reasons:

- A) Mutation in LH receptor
- B) Hyper secretion of thyroxine
- C) Deficiency of FSH
- D) Deficiency of testosterone

175.

Incorrect statements regarding sperm:

- A) Middle piece → mitochondria
- B) Acrosome → Golgi origin
- C) Tail → For swimming and Helps penetrate zona pellucida
- D) Head → Nucleus + acrosome

176.

Choose the incorrect one Seminal plasma statements:

- A) Medium for sperm transport
- B) Alkaline in nature
- C) Contains Ca^{2+} and enzymes
- D) Secreted only by seminal vesicles

177.

If interstitial (Leydig) cells are destroyed: 1. ↓ Testosterone 2. ↓ Spermatogenesis 3. ↓ Accessory gland function 4. ↓ Spermiogenesis

- A) 1 and 2 only
- B) 2 and 3 only
- C) 3 and 4 only
- D) 1,2,3,4

178.

Incorrect about Leydig cells:

- A) Lie within seminiferous tubules
- B) Respond to LH
- C) Secrete testosterone
- D) Affect spermatogenesis

179.

Choose the incorrect statement Regarding the scrotum:

- A) Maintains testis 2–2.5°C lower
- B) Tunica vaginalis lines scrotum externally
- C) Helps in spermatogenesis
- D) Contracts to maintain warmth

180.

Choose the incorrect statements 1. Spermatogenesis starts at puberty via gonadotropins. 2. Spermiogenesis = Spermatid → Sperm. 3. Spermiation = Release of sperm. 4. Androgens control sexual behavior and metabolism.

- A) All except 4
- B) All except 2,3
- C) All except 3
- D) All except 1,2,3

ANSWER KEY

Physics

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

Chemistry

46.	2	58.	2	70.	3	82.	4
47.	1	59.	2	71.	1	83.	1
48.	1	60.	4	72.	1	84.	4
49.	1	61.	2	73.	3	85.	4
50.	3	62.	2	74.	1	86.	3
51.	4	63.	1	75.	2	87.	1
52.	4	64.	1	76.	1	88.	4
53.	1	65.	2	77.	2	89.	3
54.	4	66.	2	78.	4	90.	1
55.	4	67.	3	79.	3		
56.	1	68.	4	80.	4		
57.	2	69.	3	81.	4		

Botany

91.	3	103.	2	115.	2	127.	2
92.	2	104.	3	116.	2	128.	3
93.	2	105.	2	117.	2	129.	3
94.	2	106.	3	118.	2	130.	3
95.	3	107.	3	119.	3	131.	2
96.	2	108.	2	120.	3	132.	2
97.	3	109.	2	121.	2	133.	3
98.	2	110.	2	122.	1	134.	4
99.	2	111.	2	123.	3	135.	3
100.	3	112.	3	124.	2		
101.	2	113.	3	125.	2		
102.	3	114.	2	126.	1		

Zoology

136.	4	141.	1	146.	1	151.	3
137.	1	142.	2	147.	4	152.	4
138.	3	143.	2	148.	1	153.	2
139.	2	144.	4	149.	1	154.	3
140.	4	145.	4	150.	3	155.	2

156.	4	163.	4	170.	3	177.	4
157.	3	164.	4	171.	4	178.	1
158.	1	165.	4	172.	3	179.	2
159.	3	166.	3	173.	1	180.	4
160.	1	167.	1	174.	3		
161.	4	168.	3	175.	3		
162.	3	169.	3	176.	4		

SOLUTIONS

Q1.

Answer: A

Explanation:

$$\Phi = BA \cos \theta = 4.0 \times 0.25 \times \cos 60^\circ = 1 \times 0.5 = 0.5 \text{ weber.}$$

Q2.

Answer: C

Explanation:

$$\Phi = BA \cos \theta = 4.0 \times 0.5 \times \cos 30^\circ = 2 \times \frac{\sqrt{3}}{2} = \sqrt{3} \approx 1.73 \text{ weber.}$$

Q3.

Answer: A

Explanation:

$\Phi_{max} = NBA$; the maximum flux is independent of the rotation speed n , so doubling n to $2n$ does not change it: $\Phi_{max} = NBA$.

Q4.

Answer: C

Explanation:

$$\varepsilon_{max} = NBA\omega = NBA(2\pi n) = 2\pi nNAB, \text{ since } \omega = 2\pi n.$$

Q5.

Answer: B

Explanation:

Coil plane perpendicular to $\vec{B} \Rightarrow$ area vector parallel to $\vec{B}$ ($\theta = 0^\circ$), so $\Phi = BA \cos 0^\circ = 10^3 \times 10^{-2} = 10 \text{ weber.}$

Q6.

Answer: B

Explanation:

Plane at 30° to $\vec{B} \Rightarrow$ area vector at $\theta = 90^\circ - 30^\circ = 60^\circ$ to $\vec{B}$, so $\Phi = BA \cos 60^\circ = 10^3 \times 10^{-3} \times \frac{1}{2} = \frac{1}{2} \text{ weber.}$

Q7.

Answer: B

Explanation:

$$|\varepsilon| = NA \frac{\Delta B}{\Delta t} = 100 \times (2 \times 10^{-2}) \times \frac{0.2}{0.1} = 100 \times 0.02 \times 2 = 4 \text{ V.}$$

Q8.

Answer: C

Explanation:

$$|\varepsilon| = NA \frac{\Delta B}{\Delta t} = 200 \times (5 \times 10^{-3}) \times \frac{0.5}{0.05} = 200 \times 0.005 \times 10 = 10 \text{ V.}$$

Q9.

Answer: C

Explanation:

$\Phi_i = NBA = 500 \times 2 \times 10^{-5} \times 0.1 = 10^{-3} \text{ Wb}$; after 180° , $\Delta \Phi = 2\Phi_i = 2 \times 10^{-3} \text{ Wb}$, so $|\varepsilon| = \frac{2 \times 10^{-3}}{0.1} = 2 \times 10^{-2} \text{ V} = 20 \text{ mV.}$

Q10.

Answer: A

Explanation:

$\Phi_i = NBA = 10^{-3} \text{ Wb}$; after 90° , $\Phi_f = 0$, so $|\varepsilon| = \frac{10^{-3}}{0.2} = 5 \times 10^{-3} \text{ V} = 5 \text{ mV.}$

Q11.

Answer: C

Explanation:

$$|\varepsilon| = NA \frac{dB}{dt} = 100 \times (0.1)^2 \times 0.5 = 100 \times 0.01 \times 0.5 = 0.5 \text{ V.}$$

Q12.

Answer: B

Explanation:

$$|\varepsilon| = NA \frac{dB}{dt} = 250 \times (0.2)^2 \times 2 = 250 \times 0.04 \times 2 = 20 \text{ V.}$$

Q13.

Answer: B

Explanation:

$$\Phi_i = NBA = 100 \times 2 \times 10^{-2} \times 10^{-2} = 2 \times 10^{-2} \text{ Wb}; \text{ then } t = \frac{\Delta \Phi}{\varepsilon} = \frac{2 \times 10^{-2}}{0.1} = 0.2 \text{ s.}$$

Q14.

Answer: C

Explanation:

$$\Phi_i = NBA = 50 \times 1 \times 10^{-2} \times 2 \times 10^{-2} = 10^{-2} \text{ Wb}; \text{ then } t = \frac{\Delta \Phi}{\varepsilon} = \frac{10^{-2}}{0.5} = 0.02 \text{ s.}$$

Q15.

Answer: B

Explanation:

$$q = \frac{|\Delta \Phi|}{R} = \frac{NBA(\cos 0^\circ - \cos 90^\circ)}{R} = \frac{500 \times 0.2 \times 0.1}{50} = \frac{10}{50} = 0.2 \text{ C (charge is independent of time).}$$

Q16.

Answer: C

Explanation:

$$q = \frac{|\Delta \Phi|}{R} = \frac{2NBA}{R} = \frac{2 \times 1000 \times 0.4 \times 0.05}{50} = \frac{40}{50} = 0.8 \text{ C.}$$

Q17.

Answer: A

Explanation:

$$|\varepsilon| = \left| \frac{d\phi}{dt} \right| = |10t - 4| = |10(0.5) - 4| = 1 \text{ V, so } I = \frac{|\varepsilon|}{R} = \frac{1}{2} = 0.5 \text{ A.}$$

Q18.

Answer: B

Explanation:

$$|\varepsilon| = \left| \frac{d\phi}{dt} \right| = |18t - 6| = |18(0.5) - 6| = 3 \text{ V, so } I = \frac{|\varepsilon|}{R} = \frac{3}{12} = 0.25 \text{ A.}$$

Q19.

Answer: A

Explanation:

$$\text{Wire length is conserved: } 2\pi r = 4s \Rightarrow s = \frac{\pi r}{2}; \text{ so } q = \frac{B|\Delta A|}{R} = \frac{B}{R} \left(\pi r^2 - \frac{\pi^2 r^2}{4} \right) = \frac{B\pi r^2}{R} \left(1 - \frac{\pi}{4} \right).$$

Q20.

Answer: C

Explanation:

$$\text{Perimeter conserved: } 4a = 2\pi r \Rightarrow r = \frac{2a}{\pi};$$

$$\varepsilon = \frac{B|\Delta A|}{t} = \frac{B}{t} \left(\frac{4a^2}{\pi} - a^2 \right) = \frac{Ba^2}{t} \left(\frac{4}{\pi} - 1 \right).$$

Q21.

Answer: A

Explanation:

$P = \frac{\varepsilon^2}{R}$ with $\varepsilon \propto N$ and $R \propto \frac{N}{r^2}$, so $P \propto Nr^2$; hence $P' \propto (2N)\left(\frac{r}{2}\right)^2 = \frac{1}{2}Nr^2 \rightarrow$ halved.

Q22.

Answer: D

Explanation:

$P \propto Nr^2$; with $N \rightarrow 2N$ and $r \rightarrow 2r$: $P' \propto (2N)(2r)^2 = 8Nr^2 \rightarrow$ eight times.

Q23.

Answer: B

Explanation:

$$|\varepsilon| = B \frac{dA}{dt} = B(2\pi r) \frac{dr}{dt} = 20 \times 10^{-3} \times 2\pi(10^{-2}) \times 0.2 \times 10^{-3} = 8\pi \times 10^{-8} \text{ V} = 0.08\pi \mu\text{V}$$

Q24.

Answer: C

Explanation:

$$|\varepsilon| = B(2\pi r) \frac{dr}{dt} = 50 \times 10^{-3} \times 2\pi(2 \times 10^{-2}) \times 0.4 \times 10^{-3} = 8\pi \times 10^{-5} \text{ V} = 0.8\pi \mu\text{V}$$

Q25.

Answer: A

Explanation:

$$B = \mu_0 \frac{N}{L} I = 4\pi \times 10^{-7} \times \frac{1000}{0.314} \times 2 \approx 8 \times 10^{-3} \text{ T};$$
$$\varepsilon = \frac{2(N_c B A)}{\Delta t} = \frac{2 \times 50 \times 8 \times 10^{-3} \times 10^{-3}}{0.25} = 3.2 \times 10^{-3} \text{ V} = 3.2 \text{ mV}.$$

Q26.

Answer: C

Explanation:

$$B = \mu_0 \frac{N}{L} I = 4\pi \times 10^{-7} \times \frac{2000}{0.628} \times 4 \approx 1.6 \times 10^{-2} \text{ T};$$
$$\varepsilon = \frac{2(N_c B A)}{\Delta t} = \frac{2 \times 100 \times 1.6 \times 10^{-2} \times 2 \times 10^{-3}}{0.2} = 32 \times 10^{-3} \text{ V} = 32 \text{ mV}.$$

Q27.

Answer: B

Explanation:

Induced emf depends on relative speed: first case $e \propto v$; second case relative speed $= v + v = 2v$, so $e' \propto 2v = 2e$.

Q28.

Answer: C

Explanation:

Anticlockwise current in P $\Rightarrow$ moment towards observer; switching off decreases this flux through Q $\Rightarrow$ by Lenz's law Q tries to maintain it $\Rightarrow$ Q's induced moment also points towards observer $\Rightarrow$ anticlockwise current in Q.

Q29.

Answer: B

Explanation:

Position 2: out-of-page flux increases $\Rightarrow$ induced current creates into-page flux $\Rightarrow$ clockwise. Positions 1 & 3: no flux change $\Rightarrow$ no current; position 4: out-of-page flux decreases $\Rightarrow$ anti-clockwise.

Q30.

Answer: A

Explanation:

Current is induced only when flux changes: at positions 1 and 3 the flux is constant ($\Phi = 0$ and $\Phi = BA$ respectively), so $\frac{d\Phi}{dt} = 0 \Rightarrow$ zero current there; at 2 and 4 the flux changes $\Rightarrow$ current flows.

Q31.

Answer: C

Explanation:

Anticlockwise circuit current $\Rightarrow$ field at the small loop (outside, right side) is into the page. Closing the key increases into-page flux $\Rightarrow$ induced anticlockwise pulse; opening decreases it $\Rightarrow$ induced clockwise pulse.

Q32.

Answer: A

Explanation:

At closing, out-of-page flux at the small loop suddenly increases $\Rightarrow$ momentary clockwise pulse (Lenz); once the current is steady, $\frac{d\Phi}{dt} = 0 \Rightarrow$ no induced current afterwards.

Q33.

Answer: A

Explanation:

In the original case (N pole receding) the induced emf made plate b positive. Now the same flux increases instead of decreasing, so by Lenz's law the induced current reverses $\Rightarrow$ plate a becomes positive.

Q34.

Answer: B

Explanation:

With S facing the loop, the flux points towards the magnet; approaching makes it increase, so the induced moment points away from the magnet — the same induced sense as the original (N receding) case $\Rightarrow$ plate b positive again.

Q35.

Answer: A

Explanation:

Induced emf $= A_{eff} \left| \frac{dB}{dt} \right| = \frac{2 \times 2}{2} \times 4 = 8 \text{ V}$; resultant emf $= 12 + 8 = 20 \text{ V}$ (induced emf aids the battery).

Q36.

Answer: A

Explanation:

The falling magnet changes the flux through the ring $\Rightarrow$ induced current opposes the fall (Lenz's law) $\Rightarrow$ upward opposing force $\Rightarrow$ $a = \frac{mg - F}{m} < g$.

Q37.

Answer: B

Explanation:

Plastic ring $\Rightarrow$ no induced current $\Rightarrow$ free fall: $h = \frac{1}{2}gt^2 = \frac{1}{2} \times 9.8 \times 1^2 = 4.9 \text{ m}$.

Q38.

Answer: D

Explanation:

Magnetic field lines of a closed current loop form closed loops themselves. For an infinite plane containing the loop, every field line that passes through the area inside the loop must return by passing through the plane outside the loop, making the net flux zero.

Q39.

Answer: C

Explanation:

According to Lenz's law, loop-B will induce a current to oppose the increasing magnetic field from loop-A. This results in an induced current in loop-B that flows in the opposite direction to loop-A, causing magnetic repulsion.

Q40.

Answer: B

Explanation:

The rate of doing work (power) required to maintain constant speed is equal to the electrical power dissipated in the circuit, calculated using $P = \frac{e^2}{R}$.

Q41.

Answer: A

Explanation:

Mutual inductance depends on the flux linkage between two coils. It is maximum when the coils are arranged such that the maximum amount of magnetic flux from one coil passes through the other.

Q42.

Answer: D

Explanation:

When a conductor moves through a magnetic field, the Lorentz force acts on the charges within it, inducing an electric field $\mathbf{E} = \mathbf{v} \times \mathbf{B}$. This occurs for any part of the loop moving across field lines.

Q43.

Answer: D

Explanation:

EMF is induced between the center of the rod and each end. However, because the rod is rotating about its center, the potential at both ends is the same relative to the center, leading to zero potential difference between the ends.

Q44.

Answer: D

Explanation:

By Lenz's law, when the switch is closed, I_P increases, inducing an opposing anticlockwise current in Q . When the switch is opened, I_P decreases, and Q induces a clockwise current to maintain the flux.

Q45.

Answer: A

Explanation:

The force required to move the rod at constant speed is equal to the magnetic force $F = IlB$. The current I is generated by the motional EMF $e = Blv$.

Q46.

Answer: B

Explanation:

The first path involves the oxidation of the methyl group to a gem-diacetate using chromic oxide (CrO_3) in acetic anhydride, followed by hydrolysis. The second path is the Etard reaction, which uses chromyl chloride (CrO_2Cl_2) in carbon disulfide (CS_2) to oxidize the methyl group to a chromium complex, which then yields benzaldehyde upon hydrolysis.

Q47.

Answer: A

Explanation:

Nitration of Bromobenzene with concentrated HNO_3 under vigorous conditions leads to the formation of 1-bromo-2,4,6-trinitrobenzene. Subsequent treatment with NaOH results in nucleophilic aromatic substitution (S_NAr), where the bromide is replaced by a hydroxyl group, yielding picric acid (2,4,6-trinitrophenol) after acidification.

Q48.

Answer: A

Explanation:

Hydrogen fluoride (HF) acts as a catalyst to protonate the exocyclic double bond of methylenecyclohexane, forming a stable tertiary carbocation. This carbocation then undergoes an Electrophilic Aromatic Substitution (EAS) reaction with the benzene ring to form 1-methyl-1-phenylcyclohexane.

Q49.

Answer: A

Explanation:

Alkaline $KMnO_4$ is a strong oxidizing agent that oxidizes side chains (alkyl or alkenyl) attached to aromatic rings into carboxylic acid ($-COOH$) groups, provided there is at least one benzylic hydrogen present.

Q50.

Answer: C

Explanation:

In m-nitrotoluene, the methyl group ($-CH_3$) is ortho/para directing, while the nitro group ($-NO_2$) is meta directing. The directing effects of both groups reinforce each other, leading the electrophile to the position that is meta to the methyl group (and para to the nitro group).

Q51.

Answer: D

Explanation:

The sequence involves: (1) Electrophilic aromatic bromination, (2) Benzylic free-radical chlorination, and (3) Elimination to form an alkene side chain.

Q52.

Answer: D

Explanation:

Aniline does not undergo standard Friedel-Crafts alkylation because the lone pair on the nitrogen atom reacts with the Lewis acid catalyst ($AlCl_3$). This forms a complex where the nitrogen becomes positively charged, which strongly deactivates the benzene ring toward electrophilic attack.

Q53.

Answer: A

Explanation:

This reaction is a Birch reduction. Sodium in liquid ammonia reduces the aromatic ring to a non-conjugated diene. The orientation of the reduction is influenced by the substituents; electron-withdrawing groups (like $-NO_2$) are typically reduced at the positions ipso and para to the group.

Q54.

Answer: D

Explanation:

Electrophilic aromatic substitution is favored by high electron density in the benzene ring. Phenol has the highest electron density among the given compounds because the hydroxyl group ($-OH$) is a powerful activating group due to its strong resonance ($+M$) effect.

Q55.

Answer: D

Explanation:

Nucleophilic aromatic substitution (S_NAr) requires electron-withdrawing groups (EWGs) to stabilize the anionic intermediate through resonance. EWGs like the nitro group ($-NO_2$) are highly ineffective at this stabilization when placed at the meta position relative to the leaving group.

Q56.

Answer: A

Explanation:

The rate of aromatic electrophilic substitution (EAS) is determined by how much the substituents activate or deactivate the benzene ring. Activating groups (electron donors) increase the rate by raising electron density, while deactivating groups (electron withdrawers) decrease it.

Q57.

Answer: B

Explanation:

While standard chemistry identifies naphthalene and aniline as aromatic, the source designates option B as the correct answer for this specific problem. Aromatic compounds must be planar, conjugated, and possess $(4n + 2)\pi$ electrons.

Q58.

Answer: B

Explanation:

The rate of nitration (electrophilic aromatic substitution) is increased by electron-releasing groups (ERGs) and decreased by electron-withdrawing groups (EWGs). The nitro group is strongly deactivating, bromine is deactivating, and methyl groups are activating.

Q59.

Answer: B

Explanation:

Heating alkanes with seven or more carbons in the presence of specific metal oxides like Mo_2O_3 at high temperatures and pressures leads to aromatization. 2-methylhexane, being a seven-carbon alkane, is converted into toluene.

Q60.

Answer: D

Explanation:

The reaction proceeds through a two-step process: (1) dehydrobromination of 1-bromo-prop-1-ene to form propyne, and (2) cyclic trimerization of propyne to form mesitylene (1,3,5-trimethylbenzene).

Q61.

Answer: B

Explanation:

Benzene is first converted to acetophenone via acylation, then reduced to ethylbenzene. Bromination provides the para product due to the directing effect of the ethyl group, followed by nitration ortho to the ethyl group.

Q62.

Answer: B

Explanation:

Acetylene undergoes cyclic trimerization to form benzene. Benzene then undergoes the Gatterman-Koch reaction ($CO, HCl, AlCl_3$) to form benzaldehyde.

Q63.

Answer: A

Explanation:

A compound containing one or more sp^3 carbons in its ring structure is considered non-aromatic because the sp^3 carbon prevents the complete delocalization of π electrons.

Q64.

Answer: A

Explanation:

The cyclopentadienyl anion is aromatic because it is cyclic, planar, and contains 6π electrons (satisfying $(4n + 2)$ where $n = 1$), allowing for complete delocalization.

Q65.

Answer: B

Explanation:

Benzene and the cyclopentadienyl anion both have 6π electrons and a planar, conjugated ring system, satisfying Hückel's rule. Methylcyclohexadiene (A) lacks complete delocalization within the ring, and the cyclopentadienyl cation (D) is anti-aromatic with 4π electrons.

Q66.

Answer: B

Explanation:

Benzene undergoes electrophilic substitution to form bromobenzene. This reacts with magnesium to form a Grignard reagent (phenylmagnesium bromide), which then reacts with methanol (a protic solvent) to regenerate benzene and form a magnesium salt.

Q67.

Answer: C

Explanation:

Aromaticity requires a compound to be cyclic, planar, fully conjugated, and follow Hückel's rule ($4n + 2\pi$ electrons). Cyclooctatetraene is non-planar and adopts a "tub" shape to avoid anti-aromaticity, making it non-aromatic.

Q68.

Answer: D

Explanation:

The cyclopentadienyl anion is aromatic because it is a planar, cyclic, fully conjugated system with 6π electrons, which satisfies Hückel's $(4n + 2)$ rule for $n = 1$.

Q69.

Answer: C

Explanation:

Acetylene trimerizes to form benzene (B), which then undergoes Friedel-Crafts alkylation to form toluene (C). In toluene, all ring atoms and the alpha-carbon of the methyl group are in the same plane, along with one of the methyl hydrogens.

Q70.

Answer: C

Explanation:

Each carbon atom in a benzene ring is sp^2 hybridized. Since there are six carbon atoms and each sp^2 hybridized atom has three sp^2 hybrid orbitals, the total is 18.

Q71.

Answer: A

Q72.

Answer: A

Explanation:

Aromaticity requires a cyclic, planar, fully conjugated system with $(4n + 2)\pi$ electrons. Structure (A) follows this rule with 2π electrons ($n = 0$). Structures (B) and (C) follow the $4n$ rule (4π and 8π electrons respectively), making them antiaromatic. Structure (D) contains an sp^3 hybridized carbon, which breaks the conjugation, making it non-aromatic.

Q73.

Answer: C

Explanation:

The rate of electrophilic aromatic substitution (EAS) depends on the electron density of the ring. Activating groups increase density and rate, while deactivating groups decrease them. Toluene ($-CH_3$) is activating, Chlorobenzene ($-Cl$) is weakly deactivating, and Acetophenone ($-COCH_3$) is strongly deactivating.

Q74.

Answer: A

Explanation:

Reactivity in EAS is determined by the mesomeric ($+M/-M$) and inductive ($+I/-I$) effects of substituents. Anisole has the strongest activating group ($+M$), followed by toluene ($+H, +I$). Chlorobenzene ($-I$) and Benzonitrile ($-M, -I$) are deactivating, with the nitrile being the most powerful deactivator.

Q75.

Answer: B

Explanation:

Friedel-Craft's alkylation/acylation requires the formation of a stable carbocation or a strong complex with a Lewis acid. Vinyl halides (like vinyl chloride) are unreactive because the $C-Cl$ bond has partial double bond character due to resonance, making it very difficult to break.

Q76.

Answer: A

Explanation:

Cyclopropanone has an exceptionally high dipole moment because one of its major resonance contributors is a dipolar structure where the ring becomes a cyclopropenyl cation. This cation is aromatic (2π electrons), providing a powerful driving force for charge separation.

Q77.

Answer: B

Explanation:

The linear polymerization of acetylene ($HC \equiv CH$) under specific conditions produces polyacetylene. Polyacetylene consists of long chains with alternating single and double bonds, placing it in the class of poly-enes.

Q78.

Answer: D

Explanation:

Sodium carbonate is a base that reacts with compounds containing acidic hydrogens. Cyclopentadiene (Option D) is unusually acidic ($pK_a \approx 15$) because its deprotonation produces the cyclopentadienyl anion, which is aromatic and highly stable due to its 6π electron system.

Q79.

Answer: C

Explanation:

Friedel-Crafts alkylation typically yields products via carbocation intermediates, which often rearrange to the more stable sec-butyl position, forming 2-phenylbutane. However, the sequence in Option C involves acylation followed by Clemmensen reduction, which avoids rearrangement and produces n-butylbenzene (1-phenylbutane) instead.

Q80.

Answer: D

Explanation:

Antiaromatic compounds are cyclic, planar, fully conjugated systems that possess $4n\pi$ electrons. Compound (III) is shown as having 8π electrons and (VI) has 4π electrons, satisfying the $4n$ rule.

Q81.

Answer: D

Explanation:

N-bromosuccinimide (NBS) is a specific reagent used for free radical bromination at allylic or benzylic positions. In ethylbenzene, the hydrogen atoms on the carbon directly attached to the ring (benzylic position) are the most reactive.

Q82.

Answer: D

Explanation:

Aromaticity requires a fully conjugated π system across the entire ring. 1,3-cyclopentadiene (Option D) contains an sp^3 hybridized carbon atom, which lacks an unhybridized p-orbital and thus breaks the cycle of conjugation.

Q83.

Answer: A

Explanation:

The sequence follows standard aromatic substitution: (1) Nitration of toluene yields ortho and para nitro isomers. (2) Reduction converts nitro groups to amino groups. (3) Diazotization followed by the Sandmeyer reaction replaces the amino groups with bromine atoms, maintaining the original ortho/para orientation.

Q84.

Answer: D

Explanation:

Powerful oxidizing agents like alkaline $KMnO_4$ oxidize alkyl side chains of benzene rings completely into carboxylic acid groups ($-COOH$), provided there is at least one benzylic hydrogen present. Ethylbenzene meets this criterion and is oxidized to benzoic acid.

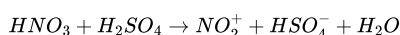
Q85.

Answer: D

Explanation:

In the nitration of benzene, concentrated H_2SO_4 is a stronger acid than HNO_3 . Therefore, H_2SO_4 donates a proton to HNO_3 , so H_2SO_4 acts as an acid and HNO_3 acts as a base.

The reaction is:



The electrophile formed is the nitronium ion, NO_2^+ , which attacks benzene to form nitrobenzene.

Hence, HNO_3 acts as a base and H_2SO_4 acts as an acid.

Correct Answer: D

Q86.

Answer: C

Explanation:

The attacking species in the reaction given in option (c) is an electrophile i.e., $Cl^{\delta+}$. Therefore, it is an electrophilic substitution reaction.

Q87.

Answer: A

Explanation:

There are 21σ bonds. (The source shows that propyne undergoes cyclic trimerization to form Mesitylene, 1,3,5-trimethylbenzene, which contains 21 sigma bonds).

Q88.

Answer: D

Explanation:

Chlorobenzene, bromobenzene and chloroethene are not suitable halide components as $C - X$ bond acquires some double bond character due to resonance of lone pair of electrons with π -bond.

Q89.

Answer: C

Explanation:

The reaction of Cl_2 , in presence of $FeCl_3$, with benzene (or toluene) yields a ring substitution product. In presence of sunlight, a free radical reaction takes place at the side chain.

Q90.

Answer: A

Explanation:

The reaction of toluene with Cl_2 in the presence of boiling or light involves the formation of a benzyl free radical.

Q91.

Answer: C

Q92.

Answer: B

Q93.

Answer: B

Q94.

Answer: B

Q95.

Answer: C

Q96.

Answer: B

Q97.

Answer: C

Q98.

Answer: B

Q99.

Answer: B

Q100.

Answer: C

Q101.

Answer: B

Q102.

Answer: C

Q103.

Answer: B

Q104.

Answer: C

Q105.

Answer: B

Q106.

Answer: C

Q107.

Answer: C

Q108.

Answer: B

Q109.

Answer: B

Q110.

Answer: B

Q111.

Answer: B

Q112.

Answer: C

Q113.

Answer: C

Q114.

Answer: B

Q115.

Answer: B

Q116.

Answer: B

Q117.

Answer: B

Q118.

Answer: B

Q119.

Answer: C

Q120.

Answer: C

Q121.

Answer: B

Q122.

Answer: A

Q123.

Answer: C

Q124.

Answer: B

Q125.

Answer: B

Q126.

Answer: A

Q127.

Answer: B

Q128.
Answer: C

Q129.
Answer: C

Q130.
Answer: C

Q131.
Answer: B

Q132.
Answer: B

Q133.
Answer: C

Q134.
Answer: D

Q135.
Answer: C

Q136.
Answer: D

Q137.
Answer: A

Q138.
Answer: C

Q139.
Answer: B

Q140.
Answer: D

Q141.
Answer: A

Q142.
Answer: B

Q143.
Answer: B

Q144.
Answer: D

Q145.
Answer: D

Q146.
Answer: A

Q147.
Answer: D

Q148.
Answer: A

Q149.
Answer: A

Q150.
Answer: C

Q151.
Answer: C

Q152.
Answer: D

Q153.
Answer: B

Q154.
Answer: C

Q155.
Answer: B

Q156.
Answer: D

Q157.
Answer: C

Q158.
Answer: A

Q159.
Answer: C

Q160.
Answer: A

Q161.
Answer: D

Q162.
Answer: C

Q163.
Answer: D

Q164.
Answer: D

Q165.
Answer: D

Q166.
Answer: C

Q167.
Answer: A

Q168.
Answer: C

Q169.
Answer: C

Q170.
Answer: C

Q171.
Answer: D

Q172.

Answer: C

Q173.

Answer: A

Q174.

Answer: C

Q175.

Answer: C

Q176.

Answer: D

Q177.

Answer: D

Q178.

Answer: A

Q179.

Answer: B

Q180.

Answer: D