

Topic:- DU\_J19\_PHD\_CHEM

**1) Which of the two complexes  $\text{W}(\text{CO})_6$  or  $\text{IrCl}(\text{PPh}_2)_2(\text{CO})$  should undergo the faster exchange with  $^{13}\text{CO}$ , and the reason is****[Question ID = 2056]**

1.  $\text{IrCl}(\text{PPh}_2)_2(\text{CO})$ , associative process [Option ID = 8222]
2.  $\text{IrCl}(\text{PPh}_2)_2(\text{CO})$ , dissociative process [Option ID = 8221]
3.  $\text{W}(\text{CO})_6$ , interchange process [Option ID = 8223]
4. None of these [Option ID = 8224]

**Correct Answer :-**

- $\text{IrCl}(\text{PPh}_2)_2(\text{CO})$ , associative process [Option ID = 8222]

**2) Which one is known as 'oil of bitter almonds'?****[Question ID = 15232]**

1. Cinnamaldehyde [Option ID = 30925]
2. None of these [Option ID = 30928]
3. Benzaldehyde [Option ID = 30927]
4. Salicylaldehyde [Option ID = 30926]

**Correct Answer :-**

- Benzaldehyde [Option ID = 30927]

**3) Calculate the difference in the populations of the two nuclear spin states of  $^1\text{H}$  nuclei in a magnetic field of 10 T at a temperature of 298 K. The magnetogyric ratio of a free  $^1\text{H}$  nucleus is  $26.752 \times 10^7 \text{ T}^{-1}\text{s}^{-1}$ . [Question ID = 1988]**

1. 2 nuclei in  $10^6$  [Option ID = 7950]
2. 17 nuclei in  $10^6$  [Option ID = 7951]
3. 34 nuclei in  $10^6$  [Option ID = 7949]
4. 128 nuclei in  $10^6$  [Option ID = 7952]

**Correct Answer :-**

- 34 nuclei in  $10^6$  [Option ID = 7949]

**4) The activation energy ( $E_a$ ) of a chemical reaction can be obtained by plotting: [Question ID = 1983]**

1. Logarithm of rate constant versus absolute temperature [Option ID = 7929]
2. Logarithm of rate constant versus logarithm of absolute temperature [Option ID = 7930]
3. Logarithm of rate constant versus reciprocal of absolute temperature [Option ID = 7932]
4. Rate constant versus reciprocal of absolute temperature [Option ID = 7931]

**Correct Answer :-**

- Logarithm of rate constant versus reciprocal of absolute temperature [Option ID = 7932]

**5) Mossbauer spectroscopy is concerned with (A) Doppler effect (B) Photoelectric effect (C) Recoil energy (D) Cotton Effect [Question ID = 1990]**

1. A, C [Option ID = 7958]
2. A, B [Option ID = 7957]
3. B, C [Option ID = 7959]
4. B, D [Option ID = 7960]

**Correct Answer :-**

- A, C [Option ID = 7958]

**6) If a system loses 250 kJ of heat at the same time that it is doing 500 kJ of work, what is the change in the internal energy of the system? [Question ID = 2062]**

1. -750 kJ [Option ID = 8248]
2. +250 kJ [Option ID = 8245]
3. -250 kJ [Option ID = 8247]
4. +750 kJ [Option ID = 8246]

**Correct Answer :-**

- -750 kJ [Option ID = 8248]

**7) The molecule  $\text{CO}_2$  belongs to the symmetry group [Question ID = 1984]**

1.  $D_{\infty d}$  [Option ID = 7935]
2.  $D_{\infty h}$  [Option ID = 7934]
3.  $D_{2h}$  [Option ID = 7933]

4.  $D_{2d}$  [Option ID = 7936]

**Correct Answer :-**

- $D_{\infty h}$  [Option ID = 7934]

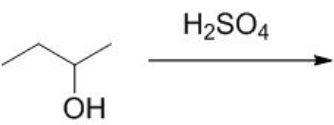
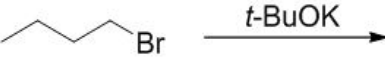
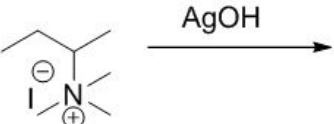
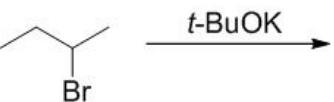
**8) In Stern-Gerlach's experiment the kind of magnetic field used was? [Question ID = 1982]**

1. Inhomogeneous [Option ID = 7926]
2. Linear [Option ID = 7927]
3. Homogeneous [Option ID = 7925]
4. Circular [Option ID = 7928]

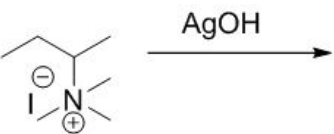
**Correct Answer :-**

- Inhomogeneous [Option ID = 7926]

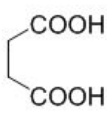
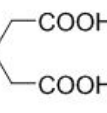
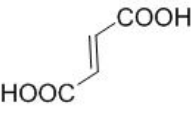
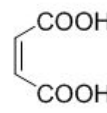
**9) Among the following, reactions which provides 1-butene as the major product is [Question ID = 2036]**

1.  [Option ID = 8144]
2.  [Option ID = 8141]
3.  [Option ID = 8143]
4.  [Option ID = 8142]

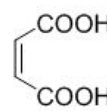
**Correct Answer :-**

-  [Option ID = 8143]

**10) Among the following diacids, the one that forms an anhydride fastest on heating with acetic anhydride is: [Question ID = 2027]**

1.  [Option ID = 8105]
2.  [Option ID = 8108]
3.  [Option ID = 8107]
4.  [Option ID = 8106]

**Correct Answer :-**

-  [Option ID = 8106]

**11) The free gas phase ion  $V^{3+}$  has a  $^3F$  ground term. The  $^1D$  and  $^3P$  terms lie respectively  $10642\text{ cm}^{-1}$  and  $12920\text{ cm}^{-1}$  above it. The energies of the terms are given in terms of Racah parameters as  $E(^3F) = A - 8B$ ,  $E(^3P) = A + 7B$ ,  $E(^1D) = A - 3B + 2C$ . The values of B and C for  $V^{3+}$  are [Question ID = 2049]**

1.  $B = 3168\text{ cm}^{-1}$ ,  $C = 861\text{ cm}^{-1}$  [Option ID = 8194]
2.  $B = 168\text{ cm}^{-1}$ ,  $C = 8613\text{ cm}^{-1}$  [Option ID = 8195]
3.  $B = 861\text{ cm}^{-1}$ ,  $C = 3168\text{ cm}^{-1}$  [Option ID = 8193]
4.  $B = 8613\text{ cm}^{-1}$ ,  $C = 168\text{ cm}^{-1}$  [Option ID = 8196]

**Correct Answer :-**

- B = 861 cm<sup>-1</sup>, C = 3168 cm<sup>-1</sup> [Option ID = 8193]

**12) The bond length of a homo-nuclear di-atomic molecule can be obtained by [Question ID = 1981]**

1. Vibrational Spectroscopy [Option ID = 7924]
2. Mossbauer Spectroscopy [Option ID = 7921]
3. Rotational Raman Spectroscopy [Option ID = 7923]
4. Microwave Spectroscopy [Option ID = 7922]

**Correct Answer :-**

- Rotational Raman Spectroscopy [Option ID = 7923]

**13) What is kinetic isotope effect? [Question ID = 2078]**

1. Vibrational frequency of the isotopically substituted bond [Option ID = 8311]
2. Reduced mass of the system with the isotopic substitution [Option ID = 8312]
3. Relative rate of the reaction with the two isotopes (normal vs. different isotope). [Option ID = 8310]
4. Bond dissociation energy of the isotopically substituted bond. [Option ID = 8309]

**Correct Answer :-**

- Relative rate of the reaction with the two isotopes (normal vs. different isotope). [Option ID = 8310]

**14) The conditions for a species to follow Fermi-Dirac statistics are [Question ID = 1993]**

1. Particles are distinguishable, with no restriction on filling up of energy levels [Option ID = 7970]
2. Particles are distinguishable, with a restriction on filling up of energy levels [Option ID = 7969]
3. Particles are indistinguishable, with no restriction on filling up of energy levels [Option ID = 7972]
4. Particles are indistinguishable, with a restriction on filling up of energy levels [Option ID = 7971]

**Correct Answer :-**

- Particles are indistinguishable, with a restriction on filling up of energy levels [Option ID = 7971]

**15) The moment of inertia of O<sub>2</sub> molecule having internuclear distance of 121 pm is [Question ID = 1995]**

1. 2.95 X 10<sup>-46</sup> Kg m<sup>2</sup> [Option ID = 7977]
2. 2.95 X 10<sup>-44</sup> Kg m<sup>2</sup> [Option ID = 7978]
3. 1.95 X 10<sup>-46</sup> Kg m<sup>2</sup> [Option ID = 7979]
4. 1.95 X 10<sup>-46</sup> Kg m<sup>2</sup> [Option ID = 7980]

**Correct Answer :-**

- 1.95 X 10<sup>-46</sup> Kg m<sup>2</sup> [Option ID = 7980]

**16) For a non-linear and non-cyclic molecule with N atoms, what is the number of bending modes of vibration? [Question ID = 1985]**

1. 2N-5 [Option ID = 7939]
2. 3N-5 [Option ID = 7938]
3. 2N-4 [Option ID = 7940]
4. 3N-6 [Option ID = 7937]

**Correct Answer :-**

- 2N-5 [Option ID = 7939]

**17) The number of Zn<sup>2+</sup> ions and S<sup>2-</sup> ions are in the ZnS sphalerite unit cell [Question ID = 2059]**

1. 2, 4 [Option ID = 8236]
2. 8, 8 [Option ID = 8235]
3. 1, 1 [Option ID = 8234]
4. 4, 4 [Option ID = 8233]

**Correct Answer :-**

- 4, 4 [Option ID = 8233]

**18) The number of ESR signals formed in the spectrum of naphthalene anion radical are [Question ID = 1992]**

1. 28 [Option ID = 7968]
2. 27 [Option ID = 7967]
3. 25 [Option ID = 7965]
4. 26 [Option ID = 7966]

**Correct Answer :-**

- 25 [Option ID = 7965]

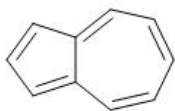
**19) The pH of a 1 molar solution of a weak acid with a K<sub>a</sub> = 10<sup>-10</sup> will be [Question ID = 2060]**

1. none of these [Option ID = 8240]
2. 5 [Option ID = 8239]
3. 1 [Option ID = 8238]
4. 10 [Option ID = 8237]

**Correct Answer :-**

- 5 [Option ID = 8239]

20) The compound given below is:



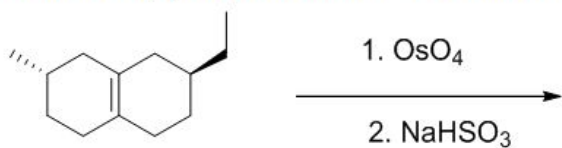
**[Question ID = 2043]**

1. anti-aromatic and has no dipole moment [Option ID = 8172]
2. non-aromatic and has high dipole moment [Option ID = 8171]
3. aromatic and has high dipole moment [Option ID = 8169]
4. aromatic and has no dipole moment [Option ID = 8170]

**Correct Answer :-**

- aromatic and has high dipole moment [Option ID = 8169]

21) How many products will be formed in the following reaction?



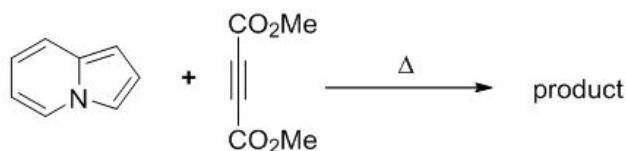
**[Question ID = 2048]**

1. 2 [Option ID = 8190]
2. 10 [Option ID = 8189]
3. 3 [Option ID = 8191]
4. 4 [Option ID = 8192]

**Correct Answer :-**

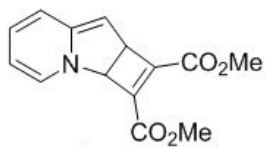
- 2 [Option ID = 8190]

22) The major product formed in the reaction given below is:

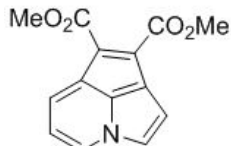


**[Question ID = 2025]**

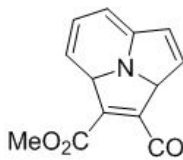
1. None of these [Option ID = 8100]



2. [Option ID = 8098]

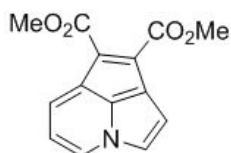


3. [Option ID = 8097]



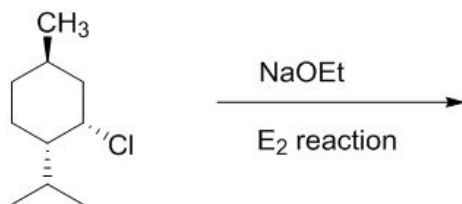
4. [Option ID = 8099]

**Correct Answer :-**

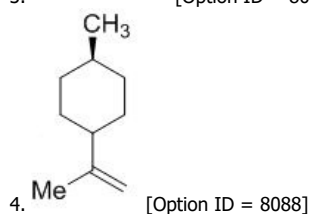
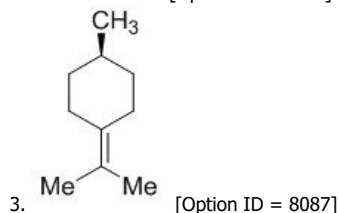
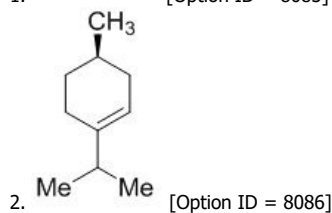
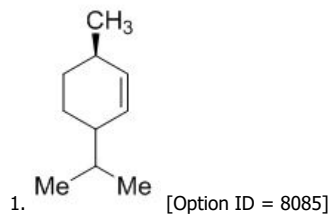


- [Option ID = 8097]

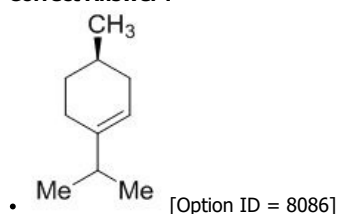
23) Identify the major product of the reaction?



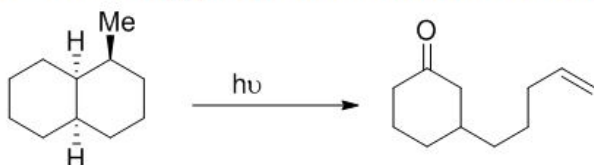
[Question ID = 2022]



Correct Answer :-



24) The following photochemical conversion proceeds through



[Question ID = 2033]

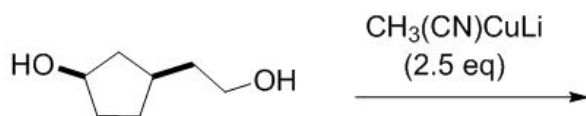
1. Paterno-Buchi reaction [Option ID = 8130]
2. Norrish type II reaction [Option ID = 8132]
3. Norrish type I reaction [Option ID = 8131]
4. Barton reaction [Option ID = 8129]

Correct Answer :-

- Norrish type II reaction [Option ID = 8132]

25)

Find out the major product of the following reaction is:



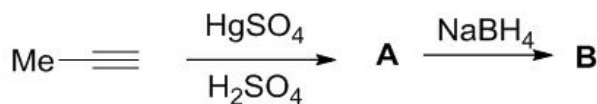
[Question ID = 2015]

1. [Option ID = 8059]
2. [Option ID = 8058]
3. [Option ID = 8057]
4. [Option ID = 8060]

Correct Answer :-

- [Option ID = 8058]

26) The product obtained from the following sequence of reaction is:



The product obtained from the following sequence of reaction is:

[Question ID = 2023]

1. 2-propanol [Option ID = 8090]
2. propanol [Option ID = 8092]
3. propanol [Option ID = 8089]
4. 1-propanol [Option ID = 8091]

Correct Answer :-

- 2-propanol [Option ID = 8090]

27) Which of the following is the correct normalization coefficient of the wave function  $\psi = A \sin(n\pi x/L)$  for a particle in one-dimensional box of length  $L$ ?

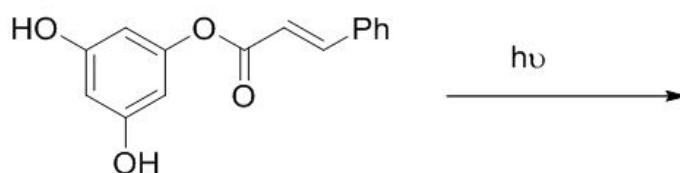
[Question ID = 1987]

1.  $(L/2)^{1/2}$  [Option ID = 7948]
2.  $(2/L)^{1/2}$  [Option ID = 7947]
3.  $(2)^{1/2}$  [Option ID = 7945]
4.  $(1/L)^{1/2}$  [Option ID = 7946]

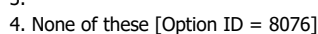
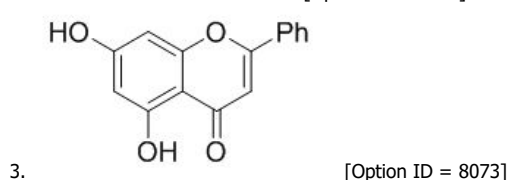
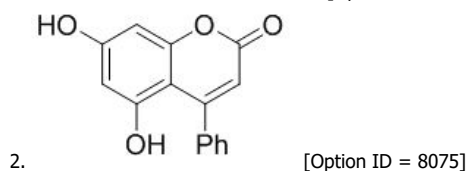
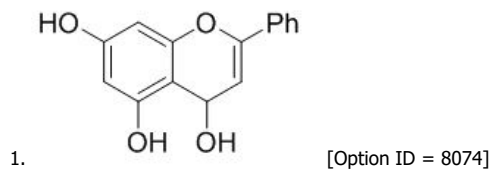
Correct Answer :-

- $(2/L)^{1/2}$  [Option ID = 7947]

28) The major product formed in the following reaction is:



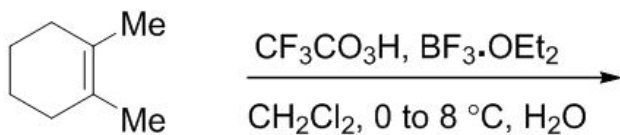
[Question ID = 2019]



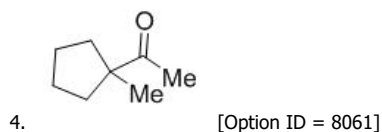
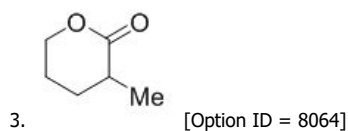
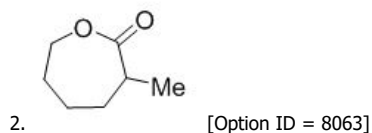
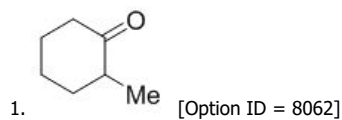
**Correct Answer :-**

- None of these [Option ID = 8076]

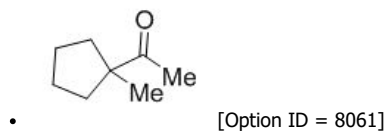
29) Find Major Product of the following reaction:



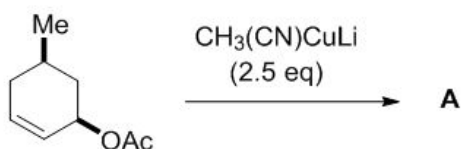
[Question ID = 2016]



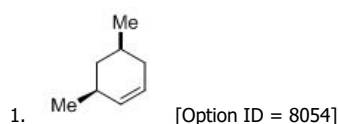
**Correct Answer :-**

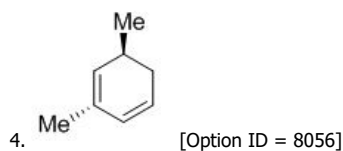
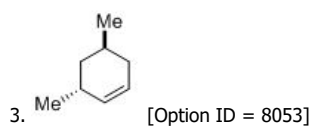


30) Find product (A) of the below reaction is:

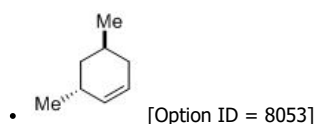


[Question ID = 2014]



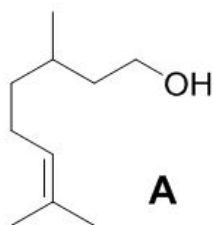


Correct Answer :-

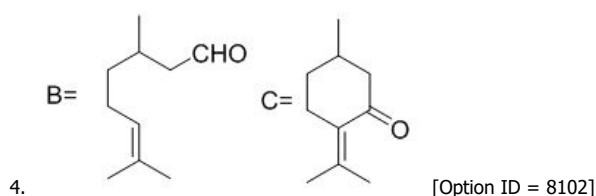
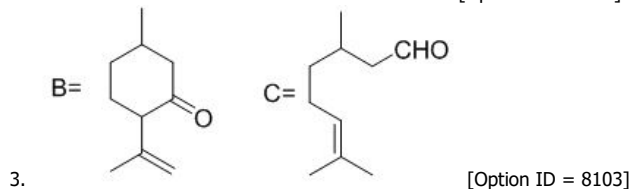
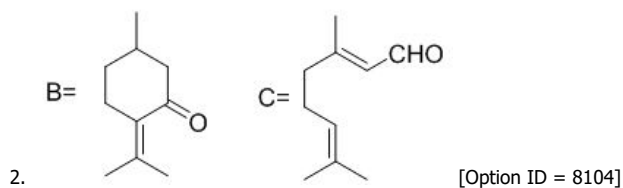
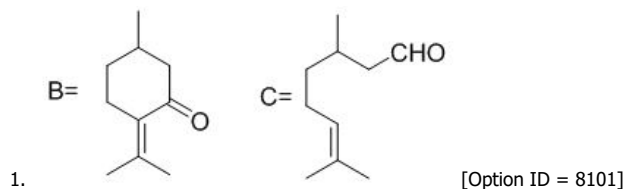


31)

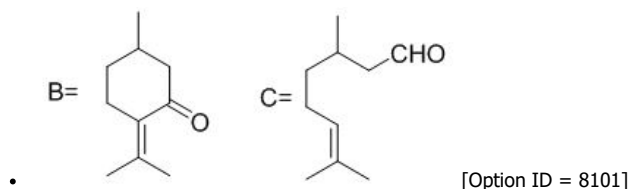
Citronellol **A** on oxidation with pyridinium chlorochromate (PCC) followed by treatment with aq. sodium hydroxide gives the product **B** (IR:  $1720\text{ cm}^{-1}$ ); whereas oxidation with PCC in the presence of sodium acetate gives the product **C** (IR:  $1720\text{ cm}^{-1}$ ). Compound **B** and **C** are



[Question ID = 2026]



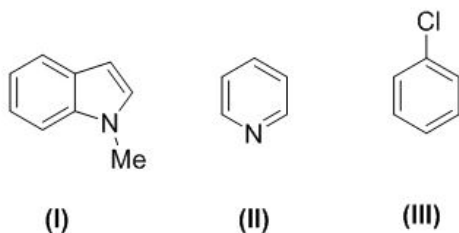
Correct Answer :-





32)

The correct order for the rates of electrophilic aromatic substitution of the following compound is:



[Question ID = 2030]

1. III>II> I [Option ID = 8119]
2. I>III> II [Option ID = 8120]
3. I>II> III [Option ID = 8117]
4. II>I> III [Option ID = 8118]

**Correct Answer :-**

- I>III> II [Option ID = 8120]

33) What does the following symbol refer in a laboratory



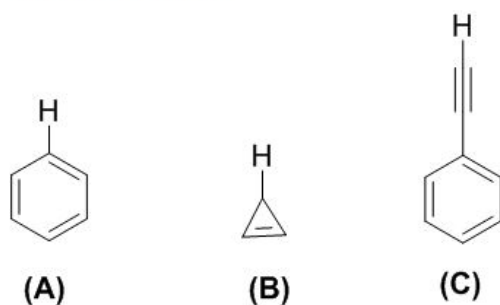
[Question ID = 2054]

1. Flammable [Option ID = 8214]
2. Oxidizing [Option ID = 8216]
3. Corrosive [Option ID = 8215]
4. Poisonous [Option ID = 8213]

**Correct Answer :-**

- Corrosive [Option ID = 8215]

34) The correct order of the bond dissociation energies for the indicated C-H bond in the following compounds is:



[Question ID = 2032]

1. C>B> A [Option ID = 8125]
2. A>C> B [Option ID = 8127]
3. C>A> B [Option ID = 8128]
4. A>B> C [Option ID = 8126]

**Correct Answer :-**

- C>A> B [Option ID = 8128]

35) The Coulomb potential energy at distance  $r$  of a hydrogenic atom of atomic number  $Z$  is proportional to.

[Question ID = 1986]

1.  $Zr$  [Option ID = 7941]
2.  $1/Zr$  [Option ID = 7944]

3.  $Z/r$  [Option ID = 7942]
4.  $r/Z$  [Option ID = 7943]

**Correct Answer :-**

- $Z/r$  [Option ID = 7942]

**36) A buffer made of [Question ID = 2052]**

1. weak acid + conjugate base [Option ID = 8205]
2. distilled water + strong base [Option ID = 8207]
3. strong acid + conjugate base [Option ID = 8206]
4. distilled water + salt [Option ID = 8208]

**Correct Answer :-**

- weak acid + conjugate base [Option ID = 8205]

**37) What is graphene?**

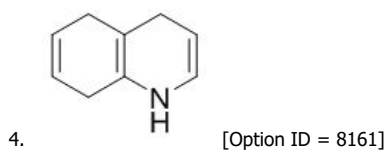
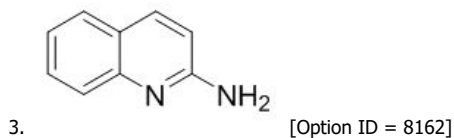
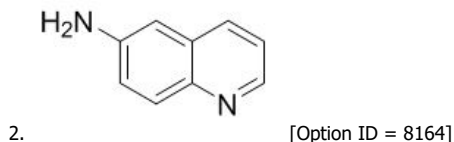
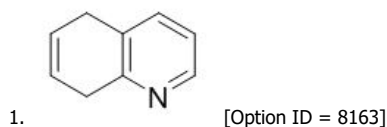
**[Question ID = 15233]**

1. A new material made from carbon nanotubes [Option ID = 30929]
2. A one-atom thick sheet of carbon [Option ID = 30931]
3. Thin film made from fullerenes [Option ID = 30930]
4. None of these [Option ID = 30932]

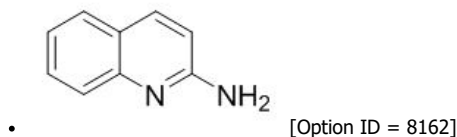
**Correct Answer :-**

- A one-atom thick sheet of carbon [Option ID = 30931]

**38) The major product formed in the reaction of quinoline with potassium amide (KNH<sub>2</sub>) in liquid ammonia is [Question ID = 2041]**



**Correct Answer :-**



**39) L-DOPA is used for the treatment of [Question ID = 2028]**

1. Diabetes [Option ID = 8111]
2. Tuberculosis [Option ID = 8109]
3. Cancer [Option ID = 8112]
4. Parkinson's disease [Option ID = 8110]

**Correct Answer :-**

- Parkinson's disease [Option ID = 8110]

**40) Which of the following is the correct set of apparatus for fractional distillation? [Question ID = 2053]**

1. Round bottomed flask, thermometer, fractionating column, water condenser and flask [Option ID = 8209]
2. Round bottomed flask, thermometer, water condenser and beaker [Option ID = 8211]
3. Round bottomed flask, thermometer, fractionating column, air condenser and flask [Option ID = 8210]
4. Round bottomed flask, thermometer, air condenser and beaker [Option ID = 8212]

**Correct Answer :-**

- Round bottomed flask, thermometer, fractionating column, water condenser and flask [Option ID = 8209]

**41) Which of the following is the correct antisymmetric wave function for the ground state of He atom [Question ID = 1989]**

1.  $\frac{1}{\sqrt{2}} 1_{sA}(1)1_{sB}(2)\beta(1)\beta(2)$  [Option ID = 7956]
2.  $1_{sA}(1)1_{sB}(2)\alpha(1)\alpha(2)$  [Option ID = 7953]
3.  $\frac{1}{\sqrt{2}} 1_{sA}(1)1_{sB}(2) [\alpha(1)\beta(2) - \alpha(2)\beta(1)]$  [Option ID = 7955]
4.  $1_{sA}(1)1_{sB}(2)\alpha(1)\beta(2)$  [Option ID = 7954]

**Correct Answer :-**

- $\frac{1}{\sqrt{2}} 1_{sA}(1)1_{sB}(2) [\alpha(1)\beta(2) - \alpha(2)\beta(1)]$  [Option ID = 7955]

**42) Which of the following exhibit quadruple splitting? [Question ID = 1991]**

1.  $K_3[Fe(CN)_6]$  [Option ID = 7962]
2.  $Fe(CO)_5$  [Option ID = 7964]
3.  $[Fe(H_2O)_6]Cl_3$  [Option ID = 7963]
4.  $K_4[Fe(CN)_6]$  [Option ID = 7961]

**Correct Answer :-**

- $Fe(CO)_5$  [Option ID = 7964]

**43) Which of the following does not affect the broadness of spectral lines of a sample? [Question ID = 1996]**

1. Collisions between involves atoms/molecules [Option ID = 7981]
2. Doppler Effect [Option ID = 7982]
3. Heisenberg's Uncertainty principle [Option ID = 7983]
4. Path length of a sample [Option ID = 7984]

**Correct Answer :-**

- Path length of a sample [Option ID = 7984]

**44) Which of the following is not a correct sequence for basic strength of compounds in aqueous medium? [Question ID = 2055]**

1.  $CH_3NH_2 > \text{pyridine} > \text{aniline}$  [Option ID = 8220]
2.  $(C_2H_5)_2NH > (C_2H_5)_3N > C_2H_5NH_2$  [Option ID = 8218]
3.  $\text{aniline} > \text{pyrrole} > \text{pyridine}$  [Option ID = 8219]
4.  $(CH_3)_2NH > CH_3NH_2 > (CH_3)_3N$  [Option ID = 8217]

**Correct Answer :-**

- $\text{aniline} > \text{pyrrole} > \text{pyridine}$  [Option ID = 8219]

**45) Which of the following compounds is the strongest Bronsted base [Question ID = 2064]**

1.  $NO_3^-$  [Option ID = 8255]
2.  $HSO_4^-$  [Option ID = 8254]
3.  $H_2PO_4^-$  [Option ID = 8256]
4.  $CH_3COO^-$  [Option ID = 8253]

**Correct Answer :-**

- $CH_3COO^-$  [Option ID = 8253]

**46) Which of the following molecules does not have a net dipole moment? [Question ID = 2061]**

1.  $H_2O$  [Option ID = 8241]
2.  $BrF_5$  [Option ID = 8244]
3.  $BF_3$  [Option ID = 8242]
4.  $NH_3$  [Option ID = 8243]

**Correct Answer :-**

- $BF_3$  [Option ID = 8242]

**47) Which one of the following is a radioactive colourless noble gas [Question ID = 2051]**

1.  $^{88}Ra$  [Option ID = 8203]
2.  $^{35}Br$  [Option ID = 8204]
3.  $^{86}Rn$  [Option ID = 8202]
4.  $^{54}Xe$  [Option ID = 8201]

**Correct Answer :-**

- $^{86}Rn$  [Option ID = 8202]

**48) The correct order of increasing Lewis acidity for  $BF_3$ ,  $BCl_3$ ,  $SiF_4$ ,  $AlCl_3$**

[Question ID = 2050]

1.  $\text{SiF}_4 > \text{BF}_3 > \text{BCl}_3 > \text{AlCl}_3$  [Option ID = 8198]
2.  $\text{SiF}_4 < \text{BF}_3 < \text{BCl}_3 < \text{AlCl}_3$  [Option ID = 8200]
3.  $\text{BCl}_3 < \text{BF}_3 < \text{SiF}_4 < \text{AlCl}_3$  [Option ID = 8197]
4.  $\text{BCl}_3 < \text{AlCl}_3 < \text{SiF}_4 < \text{BF}_3$  [Option ID = 8199]

**Correct Answer :-**

- $\text{SiF}_4 < \text{BF}_3 < \text{BCl}_3 < \text{AlCl}_3$  [Option ID = 8200]

**49) In a bucky ball, each carbon atom is bound to \_\_\_\_\_ adjacent carbon atoms. [Question ID = 2063]**

1. 2 [Option ID = 8250]
2. 1 [Option ID = 8249]
3. 3 [Option ID = 8251]
4. 4 [Option ID = 8252]

**Correct Answer :-**

- 3 [Option ID = 8251]

**50) In how many ways can 10 distinguishable particles be placed in 3 boxes, so that there are 3 particles in first box, 6 in second and 1 in third? [Question ID = 1994]**

1. 1260 ways [Option ID = 7974]
2. 1520 ways [Option ID = 7973]
3. None of these [Option ID = 7976]
4. 840 ways [Option ID = 7975]

**Correct Answer :-**

- 840 ways [Option ID = 7975]