DU PhD in Chemistry

Topic:- DU_J19_PHD_CHEM

1) Which of the two complexes $W(CO)_6$ or $IrCl(PPh_2)_2(CO)$ should undergo the faster exchange with ^{13}CO, and the reason is

[Question ID = 2056]

1. $IrCl(PPh_2)_2(CO)$, associative process [Option ID = 8222]
2. $IrCl(PPh_2)_2(CO)$, dissociative process [Option ID = 8221]
3. $W(CO)_6$, interchange process [Option ID = 8223]
4. None of these [Option ID = 8224]

Correct Answer :-

- $IrCl(PPh_2)_2(CO)$, dissociative process [Option ID = 8221]

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 :-

- Cinnamaldehyde [Option ID = 30925]

3) Calculate the difference in the populations of the two nuclear spin states of ^1H nuclei in a magnetic field of 10 T at a temperature of 298 K. The magnetogyric ratio of a free ^1H nucleus is 26.752 X 10^7 $T^{-1}s^{-1}$. [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 absolute temperature [Option ID = 7929]

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, B [Option ID = 7957]

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 :-

- +250 kJ [Option ID = 8245]

7) The molecule 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_{2h} [Option ID = 7933]

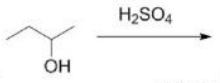
8) In Stern-Gerlach's experiment the kind of magnetic field used was? [Question ID = 1982]

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

Correct Answer :-

- Homogeneous [Option ID = 7925]

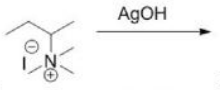
9) Among the following, reactions which provides 1-butene as the major product is [Question ID = 2036]

1. 

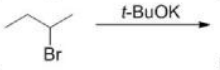
[Option ID = 8144]

2. 

[Option ID = 8141]

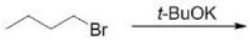
3. 

[Option ID = 8143]

4. 

[Option ID = 8142]

Correct Answer :-

- 

[Option ID = 8141]

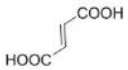
10) Among the following diacids, the one that forms an anhydride fastest on heating with acetic anhydride is: [Question ID = 2027]

1. 

[Option ID = 8105]

2. 

[Option ID = 8108]

3. 

[Option ID = 8107]

4. 

[Option ID = 8106]

Correct Answer :-



- [Option ID = 8105]

11) The free gas phase ion V^{3+} has a ^3F ground term. The ^1D and ^3P terms lie respectively 10642 cm^{-1} and 12920 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 cm^{-1}, C = 861 cm^{-1} [Option ID = 8194]
2. B = 168 cm^{-1}, C = 8613 cm^{-1} [Option ID = 8195]
3. B = 861 cm^{-1}, C = 3168 cm^{-1} [Option ID = 8193]
4. B = 8613 cm^{-1}, C = 168 cm^{-1} [Option ID = 8196]

Correct Answer :-

- B = 861 cm^{-1}, C = 3168 cm^{-1} [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 :-

- Mossbauer Spectroscopy [Option ID = 7921]

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 :-

- Bond dissociation energy of the isotopically substituted bond. [Option ID = 8309]

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 distinguishable, with a restriction on filling up of energy levels [Option ID = 7969]

15) The moment of inertia of O_2 molecule having internuclear distance of 121 pm is [Question ID = 1995]

1. 2.95 X 10^{-46} Kg m^2 [Option ID = 7977]
2. 2.95 X 10^{-44} Kg m^2 [Option ID = 7978]
3. 1.95 X 10^{-46} Kg m^2 [Option ID = 7979]
4. 1.95 X 10^{-46} Kg m^2 [Option ID = 7980]

Correct Answer :-

- 2.95 X 10^{-46} Kg m^2 [Option ID = 7977]

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 :-

- 3N-6 [Option ID = 7937]

17) The number of Zn^{2+} ions and S^{2-} 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 Ka = 10^{-10} will be [Question ID = 2060]

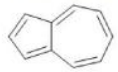
1. none of these [Option ID = 8240]
2. 5 [Option ID = 8239]
3. 1 [Option ID = 8238]
4. 10 [Option ID = 8237]

Correct Answer :-

- 10 [Option ID = 8237]

20)

The compound given below is:



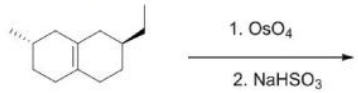
[Question ID = 2043]

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?



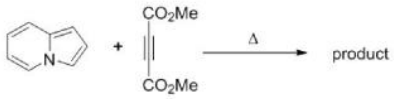
[Question ID = 2048]

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

Correct Answer :-

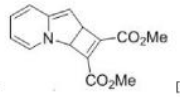
- 10 [Option ID = 8189]

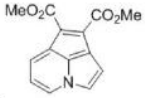
22) The major product formed in the reaction given below is:

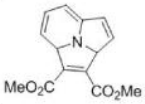


[Question ID = 2025]

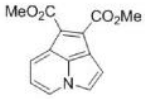
1. None of these [Option ID = 8100]

2.  [Option ID = 8098]

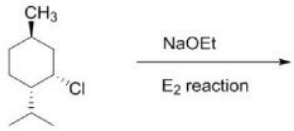
3.  [Option ID = 8097]

4.  [Option ID = 8099]

Correct Answer :-

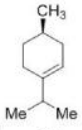
-  [Option ID = 8097]

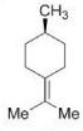
23) Identify the major product of the reaction?

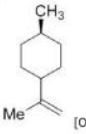


[Question ID = 2022]

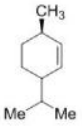
1.  [Option ID = 8085]

2.  [Option ID = 8086]

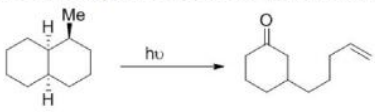
3.  [Option ID = 8087]

4.  [Option ID = 8088]

Correct Answer :-

-  [Option ID = 8085]

24) The following photochemical conversion proceeds through



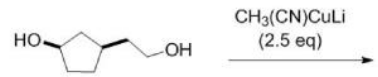
[Question ID = 2033]

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]

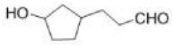
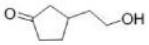
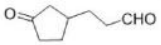
Correct Answer :-

- Barton reaction [Option ID = 8129]

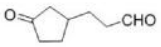
25) Find out the major product of the following reaction is:



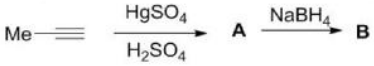
[Question ID = 2015]

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

Correct Answer :-

-  [Option ID = 8057]

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 :-

- propanol [Option ID = 8089]

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?

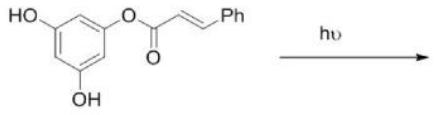
[Question ID = 1987]

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]

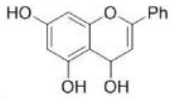
Correct Answer :-

- $(2)^{1/2}$ [Option ID = 7945]

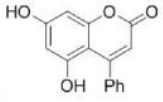
28) The major product formed in the following reaction is:



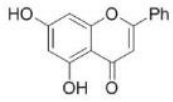
[Question ID = 2019]

1. 

[Option ID = 8074]

2. 

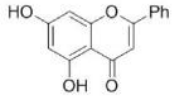
[Option ID = 8075]

3. 

[Option ID = 8073]

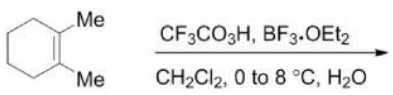
4. None of these [Option ID = 8076]

Correct Answer :-

- 

[Option ID = 8073]

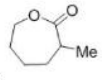
29) Find Major Product of the following reaction:



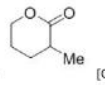
[Question ID = 2016]

1. 

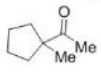
[Option ID = 8062]

2. 

[Option ID = 8063]

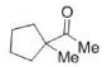
3. 

[Option ID = 8064]

4. 

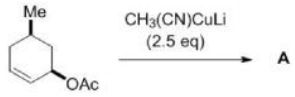
[Option ID = 8061]

Correct Answer :-



- [Option ID = 8061]

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



[Question ID = 2014]

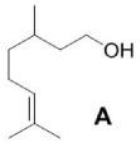
1.  [Option ID = 8054]
2.  [Option ID = 8055]
3.  [Option ID = 8053]
4.  [Option ID = 8056]

Correct Answer :-

-  [Option ID = 8053]

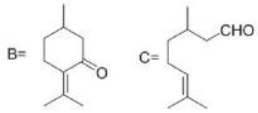
31)

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

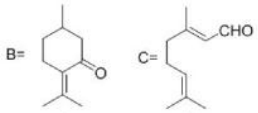


A

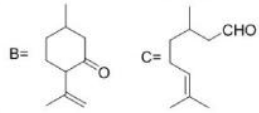
[Question ID = 2026]

1. 

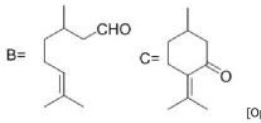
[Option ID = 8101]

2. 

[Option ID = 8104]

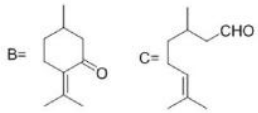
3. 

[Option ID = 8103]

4. 

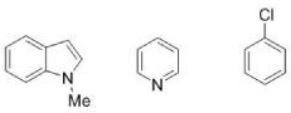
[Option ID = 8102]

Correct Answer :-

- 

[Option ID = 8101]

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



(I) **(II)** **(III)**

[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>II> III [Option ID = 8117]

33) What does the following symbol refer in a laboratory



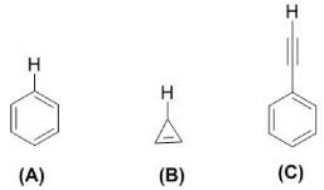
[Question ID = 2054]

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

Correct Answer :-

- Poisonous [Option ID = 8213]

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



(A) (B) (C)

[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>B> A [Option ID = 8125]

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 :-

- Zr [Option ID = 7941]

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?

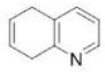
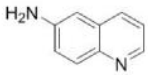
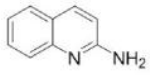
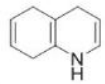
[Question ID = 15233]

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]

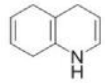
Correct Answer :-

- A new material made from carbon nanotubes [Option ID = 30929]

38) The major product formed in the reaction of quinoline with potassium amide (KNH2) in liquid ammonia is [Question ID = 2041]

1.  [Option ID = 8163]
2.  [Option ID = 8164]
3.  [Option ID = 8162]
4.  [Option ID = 8161]

Correct Answer :-

-  [Option ID = 8161]

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 :-

- Tuberculosis [Option ID = 8109]

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

Correct Answer :-

- $1_{sA}(1)1_{sB}(2)\alpha(1)\alpha(2)$ [Option ID = 7953]

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 :-

- $K_4[Fe(CN)_6]$ [Option ID = 7961]

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 :-

- Collisions between involves atoms/molecules [Option ID = 7981]

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

Correct Answer :-

- $(CH_3)_2NH$ > CH_3NH_2 > $(CH_3)_3N$ [Option ID = 8217]

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 :-

- H_2O [Option ID = 8241]

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 :-

- ^{54}Xe [Option ID = 8201]

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

[Question ID = 2050]

1. $SiF_4 > BF_3 > BCl_3 > AlCl_3$ [Option ID = 8198]
2. $SiF_4 < BF_3 < BCl_3 < AlCl_3$ [Option ID = 8200]
3. $BCl_3 < BF_3 < SiF_4 < AlCl_3$ [Option ID = 8197]
4. $BCl_3 < AlCl_3 < SiF_4 < BF_3$ [Option ID = 8199]

Correct Answer :-

- $BCl_3 < BF_3 < SiF_4 < AlCl_3$ [Option ID = 8197]

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 :-

- 1 [Option ID = 8249]

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 :-

- 1520 ways [Option ID = 7973]