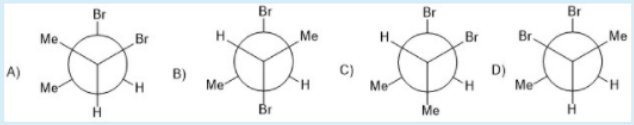
Question 1

Correct

Mark 2.00 out of 2.00

Flag question

The gauche interaction values for Me/Me, Me/Br and Br/Br are 3.3, 0.8, 3.o kJ/mol respectively. Among the following, the most stable conformation of 2,3-dibromobutane is:



- A
- B ✓
- C
- D

Mark 2.00 out of 2.00

The correct answer is: B

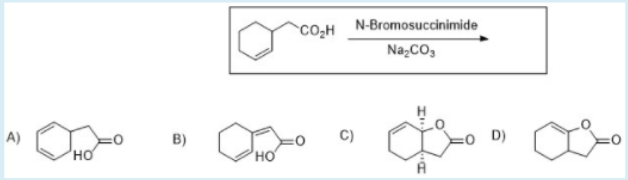
Question 2

Incorrect

Mark 0.00 out of 1.00

Flag question

The major product formed in the following transformation is:



- A
- B
- C
- D ✗

Mark 0.00 out of 1.00

The correct answer is: C

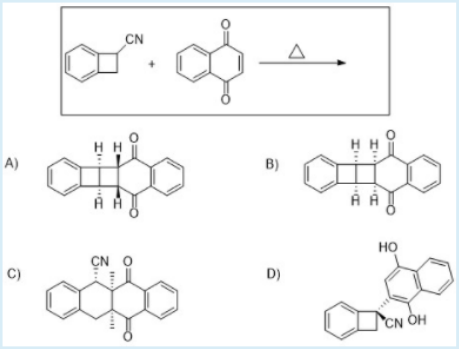
Question 3

Correct

Mark 2.00 out of 2.00

Flag question

The major product formed in the following reaction is:



- A
- B
- C ✓
- D

Mark 2.00 out of 2.00

The correct answer is: C

Question 4

Correct

Mark 2.00 out of 2.00

Flag question

The total number of metal-metal bonds (h^4-$C_4H_4)_2Ru_2(CO)_3$ is

(a) 0 (b) 1 (c) 2 (d) 3

- A
- B
- C
- D ✓

Mark 2.00 out of 2.00

The correct answer is: D

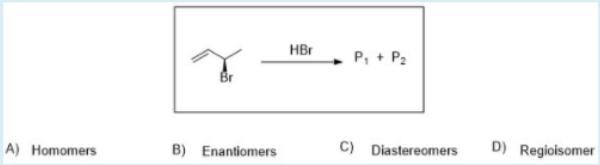
Question 5

Correct

Mark 1.00 out of 1.00

Flag question

In the following Markownikov addition reaction, the product P_1 and P_2 are:



A) Homomers B) Enantiomers C) Diastereomers D) Regioisomer

- A
- B
- C ✓
- D

Mark 1.00 out of 1.00

The correct answer is: C

Question 6

Correct

Mark 1.00 out of 1.00

Flag question

In the Diels-Alder reaction, the most reactive diene amongst the following is:

A) (4E)-1,4-hexadiene

B) (4Z)-1,4-hexadiene

C) (2E, 4E)-2,4-hexadiene

D) (2Z, 4Z)-2,4-hexadiene

A B C ✓ D

Mark 1.00 out of 1.00

The correct answer is: C

Question 7

Correct

Mark 3.00 out of 3.00

Flag question

In a non-degenerate system, an energy separation of 65 cm-1 between the ground state and the first excited state implies the fraction of molecules in the first excited state at 254 Kelvin is ____. **[3 marks]**

Answer must be correct up to 3 decimal places. Please type in the answer only up to 3 decimal places.

Useful Information (must use these values, if required):

\(h=6.6\times10^{-34}~\rm{J~s}, \ \pi=3.14, \ N_A=6.02\times10^{23}~\rm{mol^{-1}}, \ k_B=1.38\times10^{-23}~\rm{J K^{-1}} \)

$e = 1.6 \times 10^{-19}\,\mathrm{C}, \mathrm{c} = 3 \times 10^{8}\,\mathrm{ms}^{-1}, \mathrm{R} = 8.314\,\mathrm{JK}^{-1}\mathrm{mol}^{-1}$

Answer: 0.409 ✓

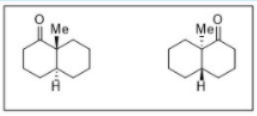
Question 8

Correct

Mark 1.00 out of 1.00

Flag question

The two compounds given below are:



A) Enantiomers B) Diastereomers C) Identical D) Regioisomer

- A
- B
- C ✓
- D

Mark 1.00 out of 1.00

The correct answer is: C

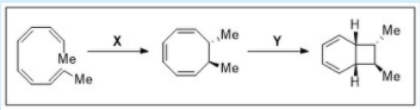
Question 9

Correct

Mark 2.00 out of 2.00

Flag question

The conditions X-Y, required for the following pericyclic reactions are:



A) X: Δ and Y : Δ B) X: hν and Y : Δ

C) X: hν and Y : hν D) X: Δ and Y : hν

- A
- B ✓
- C
- D

Mark 2.00 out of 2.00

The correct answer is: B

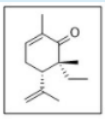
Question 10

Incorrect

Mark 0.00 out of 1.00

Flag question

The configuration at the two stereocentres in the compound given below are:



A) 5R, 6R B) 5R, 6S C) 5S, 6R D) 5S, 6S

- A ✗
- B
- C
- D

Mark 0.00 out of 1.00

The correct answer is: C

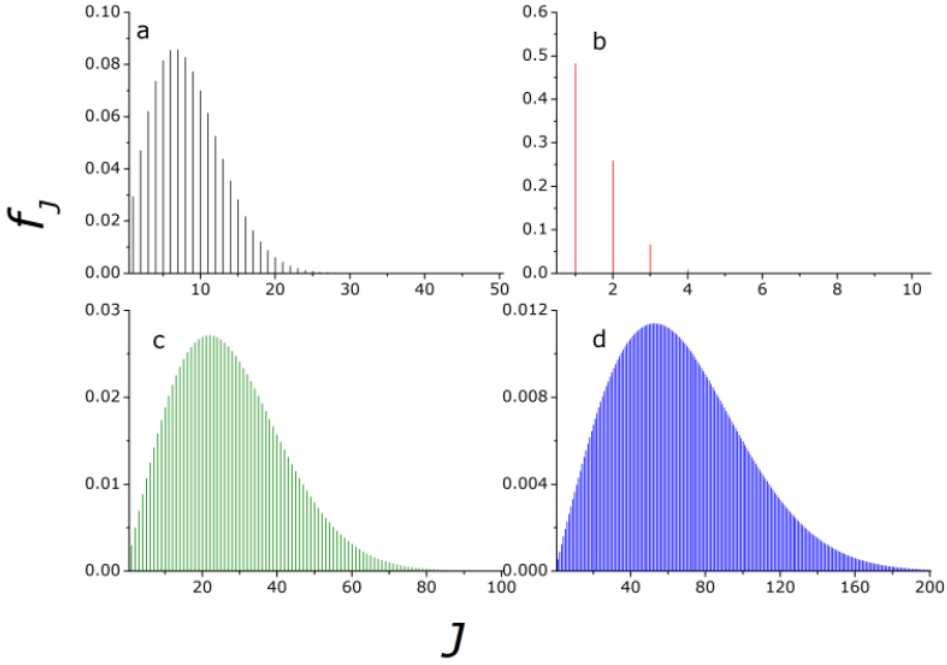
Question 11

Correct

Mark 2.00 out of 2.00

Flag question

The fractional occupation of the rotational states at 300 K are given below for four molecular species. Chose the correct option. **[2 marks]**



Select one:

1. (a) N_2, (b) I_2, (c) Cl_2, (d) H_2
2. (a) Cl_2, (b) I_2, (c) N_2, (d) H_2
3. (a) I_2, (b) Cl_2, (c) H_2, (d) N_2
4. (a) N_2, (b) H_2, (c) Cl_2, (d) I_2 ✓

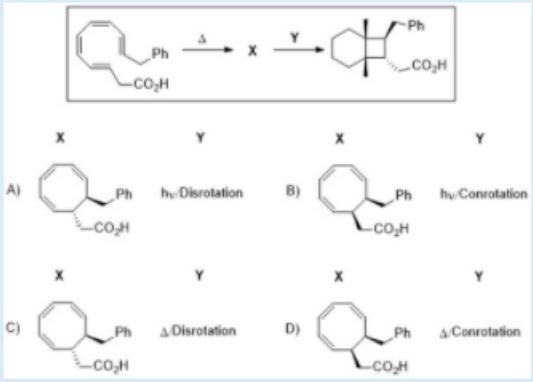
Question 12

Incorrect

Mark 0.00 out of 2.00

Flag question

In the following sequence of pericyclic reactions X and Y are:



- A
- B ✗
- C
- D

Mark 0.00 out of 2.00

The correct answer is: C

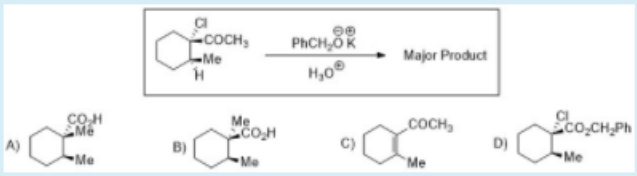
Question 13

Incorrect

Mark 0.00 out of 2.00

Flag question

Identify the major product:



- A
- B ✗
- C
- D

Mark 0.00 out of 2.00

The correct answer is: A

Question 14
Correct
Mark 2.00 out of 2.00
Flag question

Expanding an ideal gas from V_1 to V_2 can be carried out via various paths e.g. adiabatic and isotherm. Tick the correct statements. **[2 mark]**
(Caution: Wrong answers can get you negative marks)

Select one or more:

- [ ] 1. there is no heat exchanged in the isothermal path as the temperature is constant
- [x] 2. Under isothermal conditions, in order to maintain a constant temperature, the system takes up heat from the surroundings ✓
- [x] 3. under adiabatic conditions, the heat exchanged is zero, therefore the temperature must decrease ✓
- [x] 4. under adiabatic conditions, the temperature decreases, therefore the pressure must decrease ✓
- [ ] 5. All of the above statements are true

Your answer is correct.

The correct answers are: Under isothermal conditions, in order to maintain a constant temperature, the system takes up heat from the surroundings, under adiabatic conditions, the heat exchanged is zero, therefore the temperature must decrease, under adiabatic conditions, the temperature decreases, therefore the pressure must decrease

Question 15
Correct
Mark 2.00 out of 2.00
Flag question

Which of the following compound is inverse spinel?
(a) $MgAl_2O_4$ (b) $NiFe_2O_4$ (c) Mn_3O_4 (d) $FeCr_2O_4$

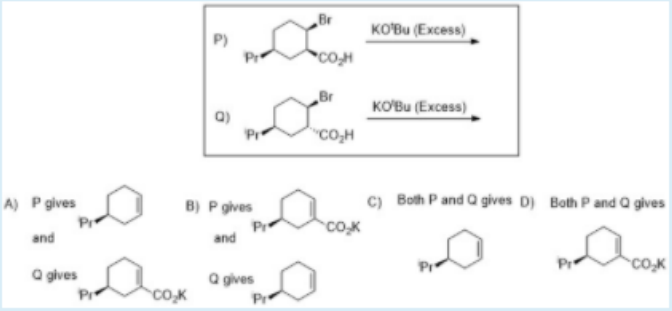
○ A ◉ B ✓ ○ C ○ D

Mark 2.00 out of 2.00

The correct answer is: B

Question 16
Incorrect
Mark 0.00 out of 2.00
Flag question

For the following two reactions P and Q the correct statement is:



A) P gives and Q gives

B) P gives and Q gives

C) Both P and Q gives

D) Both P and Q gives

○ A
○ B
○ C
◉ D ✗

Mark 0.00 out of 2.00

The correct answer is: B

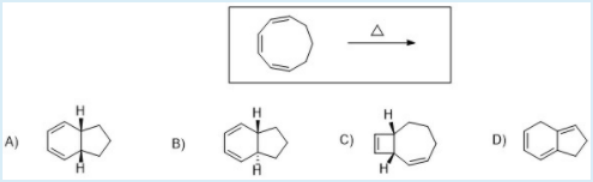
Question **18**

Correct

Mark 1.00 out of 1.00

Flag question

The major product formed in the reaction given below is:



- A ✓
- B
- C
- D

Mark 1.00 out of 1.00

The correct answer is: A

Question **19**

Correct

Mark 1.00 out of 1.00

Flag question

In the following concerted reaction, the product is formed by a:

A) 6_{π}-disrotatory electrocyclisation

B) 8_{π}-disrotatory electrocyclisation

C) 6_{π}-conrotatory electrocyclisation

D) 8_{π}-conrotatory electrocyclisation

A ✓ B C D

Mark 1.00 out of 1.00

The correct answer is: A

Question 20

Correct

Mark 2.00 out of 2.00

Flag question

Which among the following beryllium alkyl complexes is the least stable?

a) $Be(CH_2{}^tBu)_2$ b) $Be({}^nBu)_2$ c) $Be(Me)_2$ d) $Be(CH_2SiMe_3)_2$

- A
- B ✓
- C
- D

Mark 2.00 out of 2.00

The correct answer is: B

Question 21

Correct

Mark 0.50 out of 0.50

Flag question

A knowledge of the partition function tells about the number of particles in the lowest energy state

Select one:

- True ✓
- False

The correct answer is 'True'.

Question 22

Incorrect

Mark 0.00 out of 3.00

Flag question

Carbon monoxide exhibits an IR stretch at 612 cm^{-1}. The molar internal energy U at 294 K is equal to ____ Joules. **[3 marks]**

The answer must be correct upto 1 decimal place. Write only 1 decimal place in the answer.

Useful Information (must use these values, if required):

Assume CO to be an ideal gas.

$h = 6.6 \times 10^{-34}\,\mathrm{J\,s}, \pi = 3.14, \mathrm{N_A} = 6.02 \times 10^{23}\,\mathrm{mol^{-1}}$

$e = 1.6 \times 10^{-19}\,\mathrm{C}, \mathrm{c} = 3 \times 10^{8}\,\mathrm{ms^{-1}}, \mathrm{R} = 8.314\,\mathrm{JK^{-1}mol^{-1}}$

Answer: 5.2 ✗

2.5*8.314*294 + 5.9598*612 + 11.9196*612*exp(-1.4337*612/294)/(1-exp(-1.4337*612/294))

The correct answer is: 10146.7

Question 23
Correct
Mark 0.50 out of 0.50
Flag question

For a closed system, a process is carried out at constant pressure. Considering only PV work, and the fact that $q > 0$ for this processes, ΔT must be greater than zero.

Select one:
- True
- False ✓

FALSE: system can do work on the surroundings. w > q and \DeltaU < 0
The correct answer is 'False'.

Question 24
Correct
Mark 2.00 out of 2.00
Flag question

The total number of metal-metal bonds $Fe_2(CO)_9$ is
(a) 3 (b) 2 (c) 1 (d) 0

A B C ✓ D

Mark 2.00 out of 2.00

The correct answer is: C

Question 25
Correct
Mark 2.00 out of 2.00
Flag question

Which of the following compound is used as a catalyst for hydroformylation?
(a) $[C_8H_{12}IrP(C_6H_{11})_3C_5H_5N]PF_6$
(b) $Pd(PPh_3)_4$
(c) *cis*-$[Rh(CO)_2I_2]^-$
(d) $HCo(CO)_4$

- A
- B
- C
- D ✓

Mark 2.00 out of 2.00

The correct answer is: D

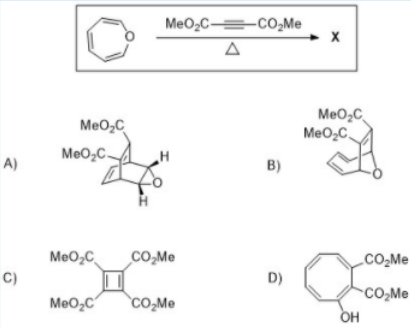
Question 26

Incorrect

Mark 0.00 out of 2.00

Flag question

The major product formed in this reaction is:



- A
- B ✗
- C
- D

Mark 0.00 out of 2.00

The correct answer is: A

Question 27

Correct

Mark 0.50 out of 0.50

Flag question

Processes in which the final temperature equals the initial temperature must be isothermal processes

Select one:

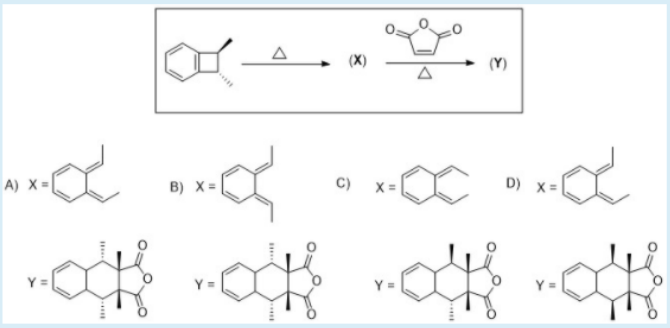
- True
- False ✓

FALSE: adiabatic+isochoric e.g. in book

The correct answer is 'False'.

Question 28
Correct
Mark 2.00 out of 2.00
Flag question

The major products X and Y in the following reaction sequence are:



- A
- B ✓
- C
- D

Mark 2.00 out of 2.00

The correct answer is: B

Question 29
Incorrect
Mark 0.00 out of 0.50
Flag question

ΔU is a state function

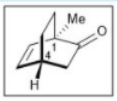
Select one:

- True ✗
- False

FALSE: U is a state function
The correct answer is 'False'.

Question 30
Correct
Mark 2.00 out of 2.00
Flag question

The configuration at the two stereocentres in the compound given below are:



A) 1R, 4R B) 1R, 4S C) 1S, 4R D) 1S, 4S

- A ✓
- B
- C
- D

Mark 2.00 out of 2.00

The correct answer is: A

Question 31
Incorrect
Mark 0.00 out of 3.00
Flag question

One mole of a monatomic ideal gas is heated from 291 to 407 K resulting in an increase in the volume from 22 to 297.1 liters. The entropy (in $\mathrm{JK^{-1}mol^{-1}}$) has increased by ____ .**[3 marks] The answer must be correct up to 1 decimal place. Answer only up to one decimal place.**

The C_p of the gas is given to be 29.8 $\mathrm{JK^{-1}mol^{-1}}$ and you may assume the heat capacities to be independent of temperature.

$h = 6.6 \times 10^{-34}\ \mathrm{J\ s}, \pi = 3.14, \mathrm{N_A} = 6.02 \times 10^{23}\ \mathrm{mo^{-}1}$

$e = 1.6 \times 10^{-19}\ \mathrm{C}, \mathrm{c} = 3 \times 10^{8}\ \mathrm{m\ s^{-}1R} = 8.314\mathrm{JK^{-}1mol^{-}1}$

Answer: 28.0 ✗

The correct answer is: 28.85