

Question Paper Name: Life Sciences 12th Feb 2017
Subject Name: Life Sciences
Duration: 180
Total Marks: 100



Organizing Institute: Indian Institute of Technology Roorkee



Question Number : 1

Correct : 1 Wrong : -0.33

CO reacts readily with

- (A) Fe (B) Fe^{2+} (C) Fe^{4+} (D) Fe^{3+}

Question Number : 2

Correct : 1 Wrong : -0.33

Molecules that are **NOT** isoelectronic to NO_2^+ ion are

- (A) CO_2 and N_3^-
 (B) NCO^- and H_3BCN^-
 (C) BO_2^- and $\text{H}_3\text{CC}\equiv\text{CH}$
 (D) OF_2 and O_3^-

Question Number : 3

Correct : 1 Wrong : -0.33

The extensive quantity among the following is

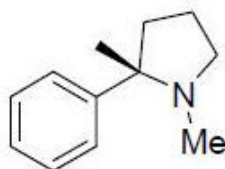
- (A) Pressure
 (B) Temperature
 (C) Chemical potential
 (D) Volume

Question Number : 4

Correct : 1 Wrong : -0.33

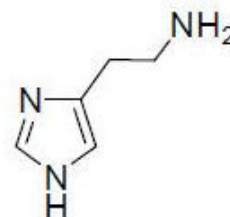
The compound that gives characteristic foul smell upon heating with potassium hydroxide and chloroform is

(A)



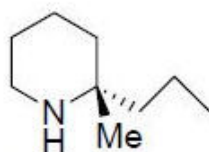
Nicotine

(B)



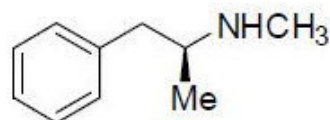
Histamine

(C)



Coniine

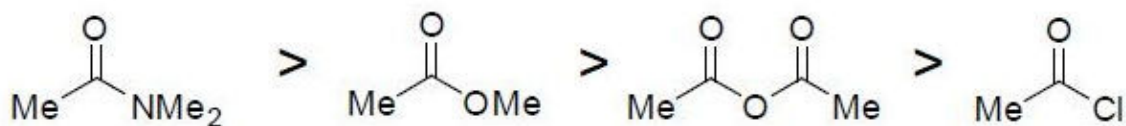
(D)



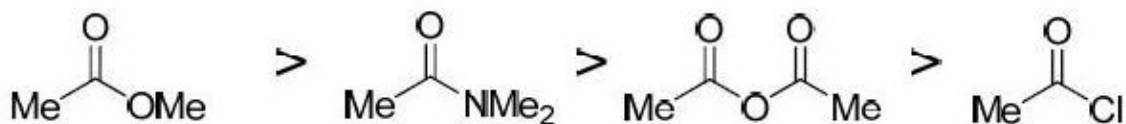
Methamphetamine

The correct order of stability in water is

(A)



(B)



(C)



(D)



The pair of molecules having non-linear structures is

(A) ICl_2^- and BeH_2

(B) CS_2 and I_3^-

(C) SCl_2 and ClO_2^-

(D) XeF_2 and CN_2^{2-}

Question Number : 7**Correct : 2 Wrong : -0.66**

The decreasing order of bond lengths for O_2 , B_2 , N_2 and C_2 is

- (A) $B_2 > C_2 > N_2 > O_2$
- (B) $B_2 > C_2 > O_2 > N_2$
- (C) $N_2 > C_2 > O_2 > B_2$
- (D) $B_2 > O_2 > N_2 > C_2$

Question Number : 8**Correct : 2 Wrong : -0.66**

The octahedral metal oxide with the highest CFSE value is

- (A) ZnO
- (B) MnO
- (C) VO
- (D) TiO

Question Number : 9**Correct : 2 Wrong : -0.66**

Assuming independent non-interacting electrons, the first ionization energy of Helium atom is

- (A) 13.6 eV
- (B) 27.2 eV
- (C) 54.4 eV
- (D) 108.8 eV

Question Number : 10**Correct : 2 Wrong : -0.66**

For a reaction $A + B \longrightarrow$ products, the following data was obtained.

$[A]_0$ (M)	$[B]_0$ (M)	Initial rate
0.1	0.1	r
0.2	0.1	4r
0.1	0.2	2r

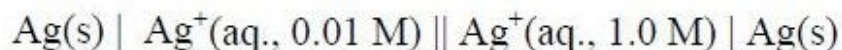
A_0 and B_0 are initial concentrations of A and B, respectively. The overall order of the reaction is

- (A) 2
- (B) 3
- (C) 4
- (D) 6

Question Number : 11

Correct : 2 Wrong : -0.66

The EMF for the following cell at 298.15 K is



(Standard reduction potential for $\text{Ag}^+ + \text{e}^- \longrightarrow \text{Ag}$ is -0.80 V)

- (A) 0.12 V (B) 0.68 V (C) 0.80 V (D) 0.92 V

Question Number : 12

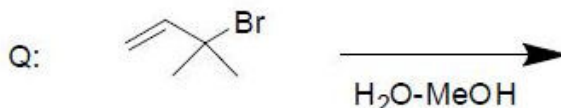
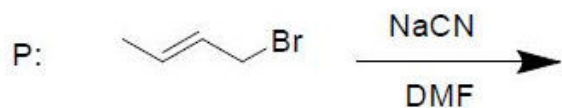
Correct : 2 Wrong : 0

One gram of a protein is dissolved in one liter of water. The resulting solution exerts an osmotic pressure of 1.4 Torr at 298 K. Assuming that the protein does not ionize in solution, the molecular weight of the protein is _____ g mol^{-1} . ($R = 0.082 \text{ L atm mol}^{-1} \text{ K}^{-1}$)

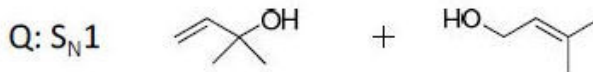
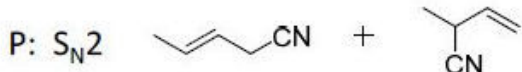
Question Number : 13

Correct : 2 Wrong : -0.66

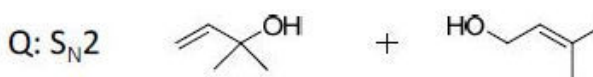
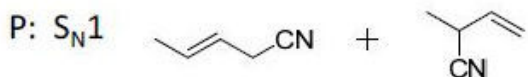
The type of nucleophilic substitution and the possible products for each of the reactions P and Q are



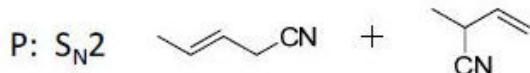
(A)



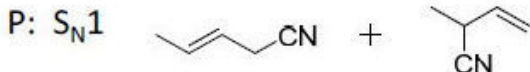
(B)



(C)



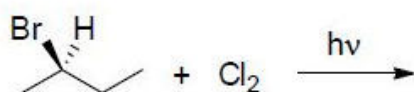
(D)



Question Number : 14

Correct : 2 Wrong : -0.66

If mono-chlorination occurs at every carbon in the following reaction, the number of isomers (stereo isomers + constitutional isomers) that one can have is

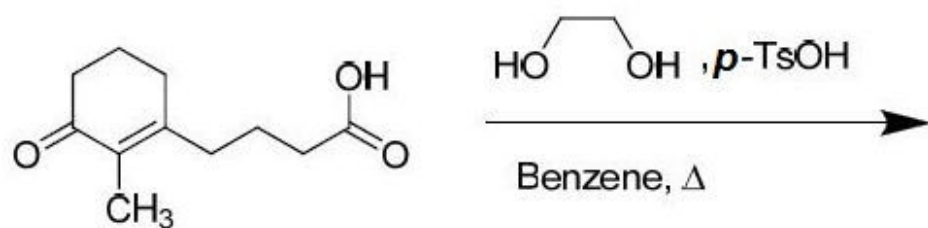


- (A) 4 (B) 5 (C) 6 (D) 8

Question Number : 15

Correct : 2 Wrong : -0.66

The major product in the following reaction is



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

Question Number : 116

Correct : 1 Wrong : -0.33

The event would have been successful if you _____ able to come.

- (A) are (B) had been (C) have been (D) would have been

Question Number : 117

Correct : 1 Wrong : -0.33

There was no doubt that their work was thorough.

Which of the words below is closest in meaning to the underlined word above?

- (A) pretty (B) complete (C) sloppy (D) haphazard

Question Number : 118

Correct : 1 Wrong : -0.33

Four cards lie on a table. Each card has a number printed on one side and a colour on the other. The faces visible on the cards are 2, 3, red, and blue.

Proposition: If a card has an even value on one side, then its opposite face is red.

The cards which MUST be turned over to verify the above proposition are

- (A) 2, red (B) 2, 3, red (C) 2, blue (D) 2, red, blue

Question Number : 119

Correct : 1 Wrong : -0.33

What is the value of x when $81 \times \left(\frac{16}{25}\right)^{x+2} \div \left(\frac{3}{5}\right)^{2x+4} = 144$?

- (A) 1 (B) -1 (C) -2 (D) Cannot be determined

Question Number : 120**Correct : 1 Wrong : -0.33**

Two dice are thrown simultaneously. The probability that the product of the numbers appearing on the top faces of the dice is a perfect square is

- (A) $\frac{1}{9}$ (B) $\frac{2}{9}$ (C) $\frac{1}{3}$ (D) $\frac{4}{9}$

Question Number : 121**Correct : 2 Wrong : -0.66**

Bhaichung was observing the pattern of people entering and leaving a car service centre. There was a single window where customers were being served. He saw that people inevitably came out of the centre in the order that they went in. However, the time they spent inside seemed to vary a lot: some people came out in a matter of minutes while for others it took much longer.

From this, what can one conclude?

- (A) The centre operates on a first-come-first-served basis, but with variable service times, depending on specific customer needs.
(B) Customers were served in an arbitrary order, since they took varying amounts of time for service completion in the centre.
(C) Since some people came out within a few minutes of entering the centre, the system is likely to operate on a last-come-first-served basis.
(D) Entering the centre early ensured that one would have shorter service times and most people attempted to do this.

Question Number : 122**Correct : 2 Wrong : -0.66**

A map shows the elevations of Darjeeling, Gangtok, Kalimpong, Pelling, and Siliguri. Kalimpong is at a lower elevation than Gangtok. Pelling is at a lower elevation than Gangtok. Pelling is at a higher elevation than Siliguri. Darjeeling is at a higher elevation than Gangtok.

Which of the following statements can be inferred from the paragraph above?

- i. Pelling is at a higher elevation than Kalimpong
- ii. Kalimpong is at a lower elevation than Darjeeling
- iii. Kalimpong is at a higher elevation than Siliguri
- iv. Siliguri is at a lower elevation than Gangtok

- (A) Only ii (B) Only ii and iii (C) Only ii and iv (D) Only iii and iv

Question Number : 123

Correct : 2 Wrong : -0.66

P, Q, R, S, T and U are seated around a circular table. R is seated two places to the right of Q. P is seated three places to the left of R. S is seated opposite U. If P and U now switch seats, which of the following must necessarily be true?

- (A) P is immediately to the right of R
- (B) T is immediately to the left of P
- (C) T is immediately to the left of P or P is immediately to the right of Q
- (D) U is immediately to the right of R or P is immediately to the left of T

Question Number : 124

Correct : 2 Wrong : -0.66

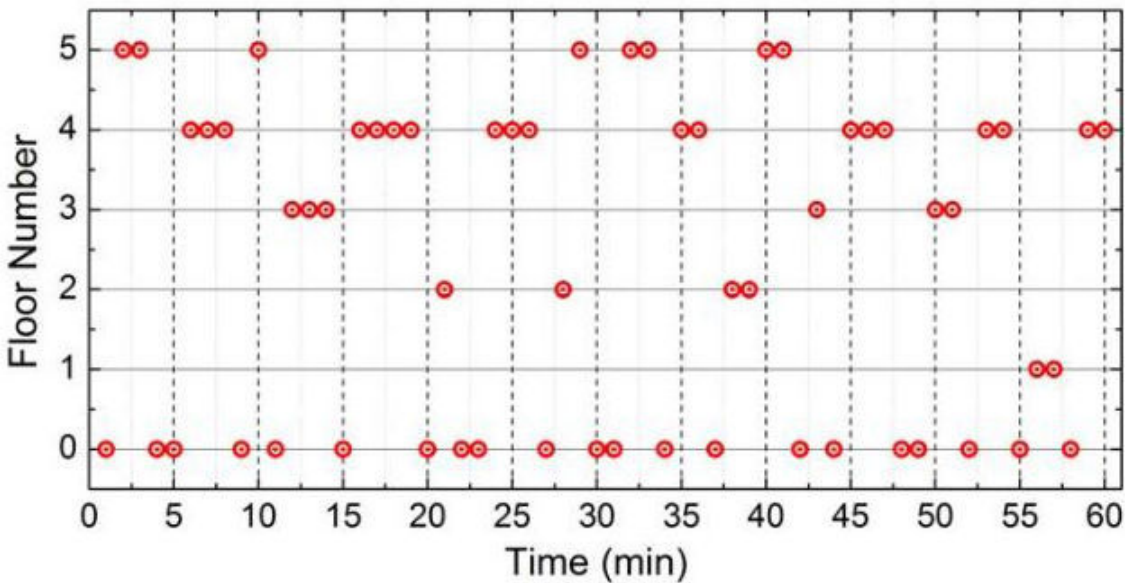
Budhan covers a distance of 19 km in 2 hours by cycling one fourth of the time and walking the rest. The next day he cycles (at the same speed as before) for half the time and walks the rest (at the same speed as before) and covers 26 km in 2 hours. The speed in km/h at which Budhan walks is

- (A) 1
- (B) 4
- (C) 5
- (D) 6

Question Number : 125

Correct : 2 Wrong : -0.66

The points in the graph below represent the halts of a lift for durations of 1 minute, over a period of 1 hour.



Which of the following statements are correct?

- i. The elevator never moves directly from any non-ground floor to another non-ground floor over the one hour period
- ii. The elevator stays on the fourth floor for the longest duration over the one hour period

- (A)) Only i
- (B) Only ii
- (C) Both i and ii
- (D) Neither i nor ii