

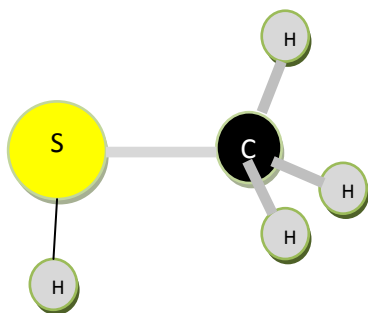
**VIDYA DRISHTI**  
[www.vidyadrishti.com](http://www.vidyadrishti.com)  
**IIT JEE 2009 Test Series 3**  
**CHEMISTRY PART-I**

**SECTION I**

**STRAIGHT OBJECTIVE TYPE**

This section contains 6 multiple choice questions. Each question has four choices (a), (b), (c) and (d), out of which ONLY ONE is correct. 3 MARKS will be awarded for correct answer. 1 MARK will be deducted for wrong answer.

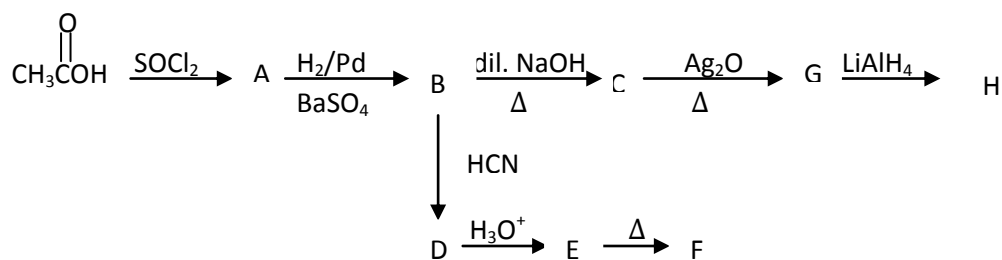
1. Which is the possible value of magnetic quantum number and total number of orbitals in shell for subshell designation 3d?  
(a) 1, 0, -1 and 4  
(b) 2, 1, 0, -1, -2 and 16  
(c) 2, 1, 0, -1, -2 and 9  
(d) 1, 0, -1 and 9
2. The structure of methyl mercaptan is shown below

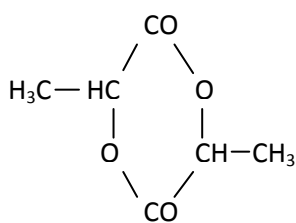
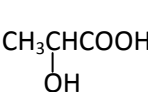


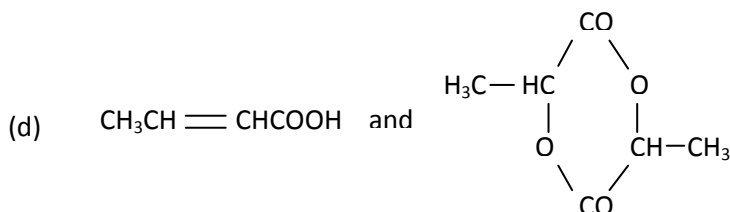
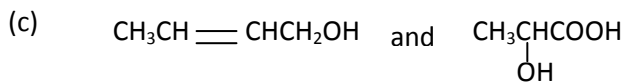
Which is the correct order of the bond lengths?

- (a) C-S > C-H > S-H
- (b) C-S > S-H > C-H
- (c) S-H > C-S > C-H
- (d) None of these

3. There are how many axial and equilateral C-H bond in cyclo hexane of boat form  
 (a) 3 and 6  
 (b) 6 and 4  
 (c) 6 and 6  
 (d) none of these
4. The mineral for the metal copper is  
 (a) chalcocite  
 (b) chalcopyrite  
 (c) Malachite  
 (d) All the above
5. An organic compound (A) contains C = 32%, H=6.66%, and N = 18.67%. on reduction, it gives a primary amine (B) which gives ethyl alcohol with the nitrous acid. (B) gives an offensive odour on warming with CHCl<sub>3</sub> and KOH and gives compound (C) which on reduction forms ethyl methyl amine. Assign (A), (B) and (C).  
 (a) C<sub>2</sub>H<sub>5</sub>N, C<sub>2</sub>H<sub>7</sub>N, C<sub>3</sub>H<sub>5</sub>N  
 (b) C<sub>2</sub>H<sub>5</sub>N, C<sub>2</sub>H<sub>5</sub>NH<sub>2</sub>, C<sub>2</sub>H<sub>5</sub>N  
 (c) C<sub>2</sub>H<sub>5</sub>NO<sub>2</sub>, C<sub>2</sub>H<sub>5</sub>NH<sub>2</sub>, C<sub>2</sub>H<sub>5</sub>N  
 (d) C<sub>2</sub>H<sub>5</sub>NO<sub>2</sub>, C<sub>2</sub>H<sub>5</sub>NH<sub>2</sub>, C<sub>3</sub>H<sub>5</sub>N
6. In the following sequence of reaction, what is H and F



- (a)  $\text{CH}_3\text{CH}=\text{CHCH}_2\text{OH}$  and 
- (b)  $\text{CH}_3\text{CH}=\text{CHCOOH}$  and 

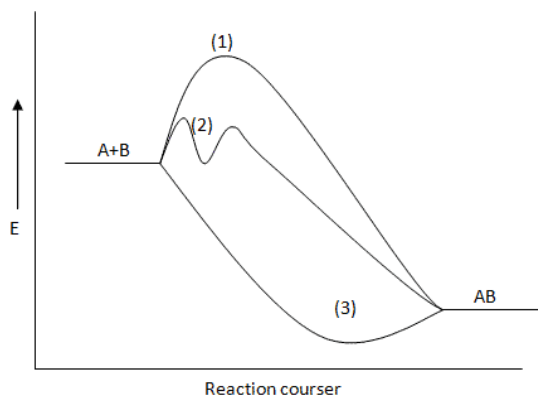


## SECTION II

### MULTIPLE CHOICE TYPE QUESTIONS

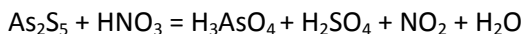
This section contains 6 multiple choice questions. Each question has 4 choices (A), (B), (C) and (D), out of which ONLY ONE is correct. NO NEGATIVE marking.

- Which of the following statement is correct?
  - The third ionization potential of Mg is greater than third ionization potential of Al
  - The first ionization potential of Na is less than first ionization potential of Mg
  - The second ionization potential of Mg is greater than the second ionization potential of Na
  - The first ionization potential of Al is less than the first ionization potential of Mg
- Among  $\text{H}_3\text{BO}_3$ ,  $\text{C}_{(\text{gr})}$ ,  $\text{NH}_4\text{Cl}$ ,  $\text{CH}_3\text{CONH}_2$ ,  $\text{Na}_2\text{CO}_3$ , which has hybridization of  $\text{sp}^2$ 
  - $\text{CH}_3\text{CONH}_2$
  - $\text{C}_{(\text{gr})}$ ,  $\text{CH}_3\text{CONH}_2$
  - $\text{Na}_2\text{CO}_3$ ,  $\text{C}_{(\text{gr})}$ ,  $\text{CH}_3\text{CONH}_2$
  - None of these
- The exothermic reaction between substances A and B is presented in the plot below. Catalyst-induced preparation of the substance AB follows the pathway values as:



- (a) 1
- (b) 2
- (c) 3
- (d) 1,3

10. What is the co-efficient of the components in the following reaction after balancing?



- (a) Co-efficient of  $\text{H}_3\text{AsO}_4$  is 2 and Co-efficient of  $\text{H}_2\text{O}$  is 10
- (b) Co-efficient of  $\text{H}_3\text{AsO}_4$  is 2 and Co-efficient of  $\text{HNO}_3$  is 40
- (c) Co-efficient of  $\text{As}_2\text{S}_5$  is 1 and Co-efficient of  $\text{NO}_2$  is 40
- (d) Co-efficient of  $\text{H}_2\text{SO}_4$  is 5 and Co-efficient of  $\text{H}_2\text{O}$  is 12

### SECTION III

#### ASSERTION-REASON TYPE

This question contains 4 reasoning type questions. Each question has 4 choices (a), (b), (c) and (d), out of which ONLY ONE is correct. 3 MARKS will be awarded for correct answer. 1 MARK will be deducted for wrong answer. NO MARKS WILL BE GIVEN OR DEDUCTED IF A QUESTION IS NOT ANSWERED.

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11. Statement-1: the molecular geometry of  $\text{NO}_2$  and  $\text{OH}_2$  is Bent  
Statement-2: these contains one lone pair of electrons
- (a) STATEMENT-1 is True, STATEMENT-2 is true; STATEMENT-2 is a correct explanation for STATEMENT 1
  - (b) STATEMENT-1 is True, STATEMENT-2 is true; STATEMENT-2 is NOT a correct explanation for STATEMENT-1
  - (c) STATEMENT-1 is True, STATEMENT-2 is False
  - (d) STATEMENT-1 is False, STATEMENT-2 is true
12. Statement-1: when  $\text{CH}_3\text{-CHBr-CD}_3$  is treated with alc. KOH, gives a major product  $\text{CH}_2=\text{CH-CD}_3$ .  
Statement-2: in the  $\text{SN}_2$  reaction, attack of nucleophile is from front direction.
- (a) STATEMENT-1 is True, STATEMENT-2 is true; STATEMENT-2 is a correct explanation for STATEMENT 1
  - (b) STATEMENT-1 is True, STATEMENT-2 is true; STATEMENT-2 is NOT a correct explanation for STATEMENT-1
  - (c) STATEMENT-1 is True, STATEMENT-2 is False
  - (d) STATEMENT-1 is False, STATEMENT-2 is true

13. Statement-1: The above order is of increasing acidic strength  
Statement-2: acidic strength decreases as electro negativity of atom decreases
- (a) STATEMENT-1 is True, STATEMENT-2 is true; STATEMENT-2 is a correct explanation for STATEMENT 1  
(b) STATEMENT-1 is True, STATEMENT-2 is true; STATEMENT-2 is NOT a correct explanation for STATEMENT-1  
(c) STATEMENT-1 is True, STATEMENT-2 is False  
(d) STATEMENT-1 is False, STATEMENT-2 is true
14. Statement-1: lead and copper gives the self reduction but silver gives the carbon reduction  
Statement-2: sodium does not give electrolytic reduction
- (a) STATEMENT-1 is True, STATEMENT-2 is true; STATEMENT-2 is a correct explanation for STATEMENT 1  
(b) STATEMENT-1 is True, STATEMENT-2 is true; STATEMENT-2 is NOT a correct explanation for STATEMENT-1  
(c) STATEMENT-1 is True, STATEMENT-2 is False  
(d) STATEMENT-1 is False, STATEMENT-2 is true

## SECTION IV

### LINKED COMPREHENSION TYPE

This section contains 2 paragraphs. Based upon each paragraph, 3 multiple choice questions have to be answered. Each question has four choices (a), (b), (c) and (d), out of which ONLY ONE is correct. 4 MARKS will be awarded for correct answer. 1 MARK will be deducted for wrong answer. NO MARKS WILL BE GIVEN OR DEDUCTED IF A QUESTION IS NOT ANSWERED.

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#### Paragraph for Questions numbers 15 to 17

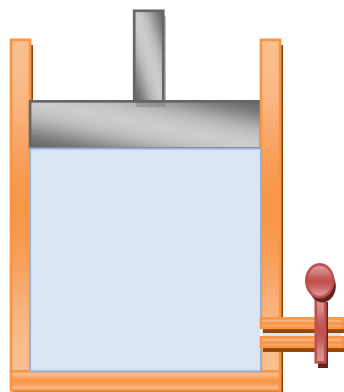
Experiments with a large number of gases reveal that four variables are needed to define the physical condition, or state, of a gas: temperature,  $T$ , pressure,  $P$ , volume,  $V$ , and amount of gas, which is usually expressed as the number of moles,  $n$ . The equation that expresses the relationship among  $T$ ,  $P$ ,  $V$  and  $n$  are known as gas laws.

Boyle's law: states that the volume of a fixed quantity of gas maintained at constant temperature is inversely proportional to the pressure.

Charles's law: states that the volume of a fixed amount of gas maintained at constant pressure is directly proportional to its absolute temperature.

Avogadro law: states that equal volume of gases at the same temperature and pressure contain equal numbers of molecules.

Now suppose we have a gas confined to a piston as shown in the figure below. Indicate what are the changes will take place



1. Decrease the average distance between the molecules
2. Increase the pressure of the gas
3. Increase the total mass of the gas in the cylinder
4. Increase the number of moles of gas present

15. Heat the gas from 298K to 360K, while maintaining the present position of the piston

- (a) 1,2
- (b) 2
- (c) 2,3
- (d) 4,2

16. Move the piston to reduce the volume of gas from 1 L to 0.5 L

- (a) 1, 2
- (b) 2
- (c) 2, 3
- (d) 4, 2

17. Inject additional gas through the gas inlet valve

- (a) 1, 2
- (b) 4, 1
- (c) 2, 1, 3
- (d) 4, 1, 2

**Paragraph for Questions numbers 18 to 20**

Entropy is a state function and its value depends on two or three variables temperature (T), pressure (P), and volume (V). entropy change for an ideal gas having number of moles (n) can be determined by the following equation.

$$\Delta S = 2.303 nC_v \log\left(\frac{T_2}{T_1}\right) + 2.303 nR \log\left(\frac{V_2}{V_1}\right)$$

$$\Delta S = 2.303 nC_p \log\left(\frac{T_2}{T_1}\right) + 2.303 nR \log\left(\frac{P_2}{P_1}\right)$$

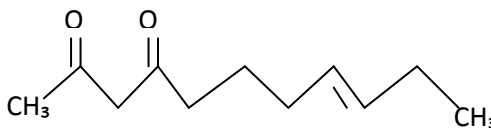
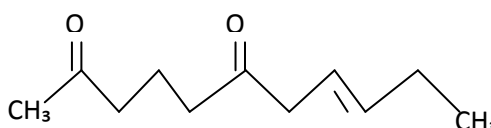
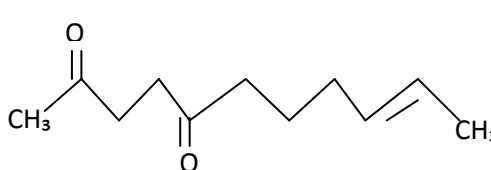
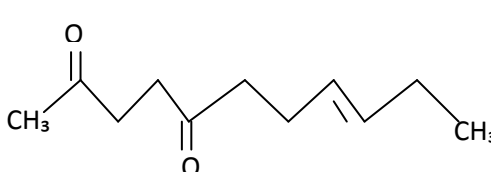
Since free energy change for a process or a chemical equation is a deciding factor of spontaneity, which can be obtained by using entropy change ( $\Delta S$ ) according to the expression,  $\Delta G = \Delta H - T \Delta S$  at a temperature T.

18. What would be the entropy change involved in thermodynamics expansion of 2 moles of a gas from a volume of 5 lts to a volume of 50 lts at 25°C [Given R = 8.3 J/mole-K]
- (a) 38.23 J/K  
 (b) 26.76 J/K  
 (c) 20 J/K  
 (d) 28.23 J/K
19. An isobaric process having one mole of ideal gas has entropy change 23.03 J/K for the temperature range 27°C to 327°C. What would be the molar specific heat capacity ( $C_v$ )?
- (a)  $\frac{10}{\log 2}$  J/K moles  
 (b)  $\frac{10}{\log 2} - 8.3$  J/K moles  
 (c)  $10 \times \log 2$  J/K moles  
 (d)  $10 \log 2 + 8.3$  J/K moles
20. For a reaction  $M_2O_{(s)} \rightarrow 2M_{(s)} + \frac{1}{2}O_{2(g)}$ ;  $\Delta H = 30$  kJ/mol and  $\Delta S = 0.07$  kJ/K-mol at 1 atm. Calculate upto which temperature the reaction would not be spontaneous.
- (a)  $T > 428.6$  K  
 (b)  $T > 300.8$  K  
 (c)  $T < 300.8$  K  
 (d)  $T < 428.6$  K

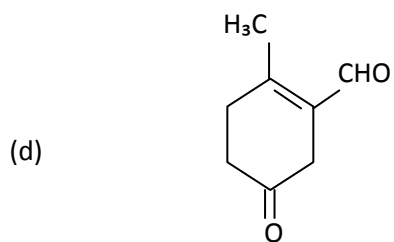
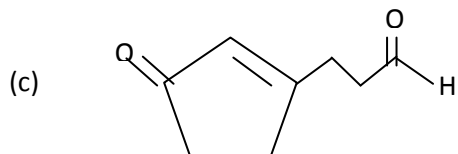
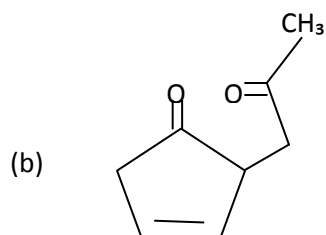
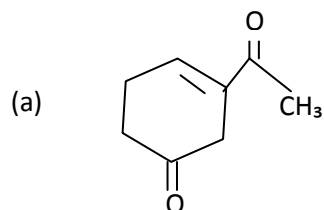
**Paragraph for Questions numbers 21 to 23**

An open chain unbranched compound A has the formula  $C_{11}H_{18}O_2$ . Upon ozonolysis, consuming only one mole of  $O_3$ . It gives  $CH_3CH_2CHO$  and another compound B with molecular formula  $C_8H_{12}O_3$ . B can give five crossed intramolecular aldol condensation products. Note that rings larger than six and smaller than five are less common in such intramolecular reactions. Compounds A and B both give iodoform tests. A when reacts with iodine and sodium hydroxide followed by acidification gives carboxylic acid. The resulting carboxylic acid when treated with  $SOCl_2$ ,  $CH_2N_2$  followed by  $Ag_2O$  is methanol gives a 5-oxo ester C.

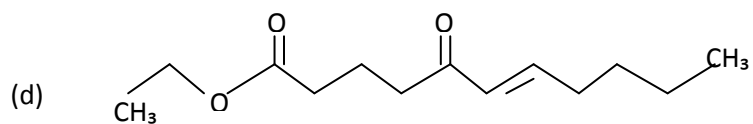
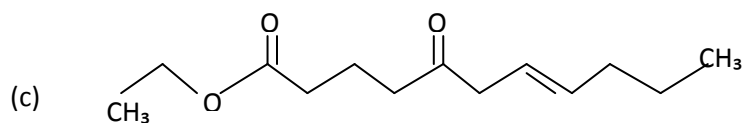
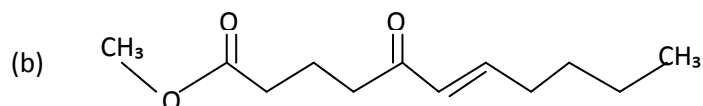
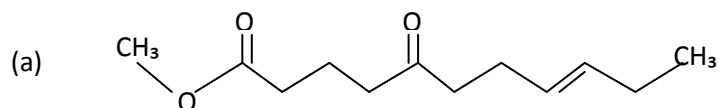
21. The compound A is

- (a) 
- (b) 
- (c) 
- (d) 

22. Which is not formed from compound B by aldol condensation?



23. Identify the compound C



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