

NA-852

Seat No. _____

First Year B. Sc. (Fire) Examination

April / May - 2003

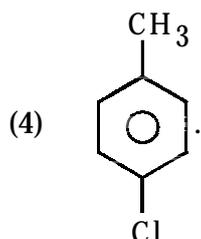
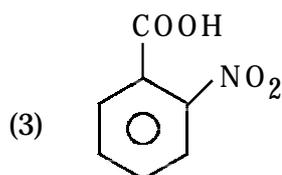
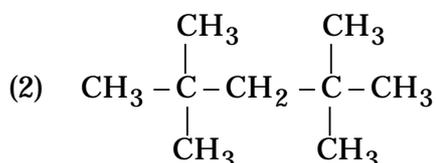
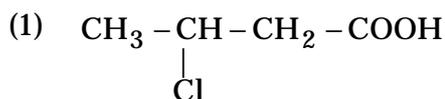
Applied Chemistry

Time : 3 Hours]

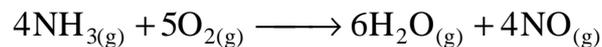
[Total Marks : 100

- Instructions :** (1) All questions are **compulsory**.
(2) Figures on the **right** indicate **full** marks.
(3) Draw neat figures, wherever required
Non-programmable scientific calculators are allowed.

- 1** (a) State the Carnot's theorem and explain Carnot's cycle **14**
for the efficiency of the reversible cycle.
(b) Discuss the first law of thermochemistry.
(c) Give the IUPAC names of the following compounds :



- (d) The standard heat of formation of NH_3 , H_2O and NO in gaseous state are 11, 57.8 and 21.6 k cal/mole respectively. Calculate the heat of reaction i.e. ΔH° .

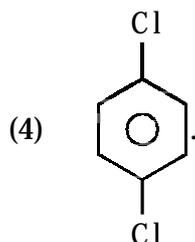
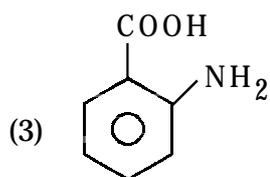
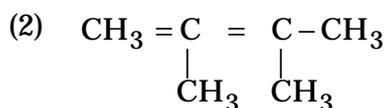
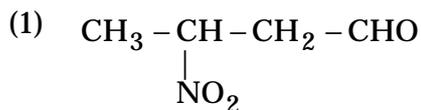


OR

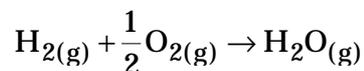
- 1 (a) Derive the Krichhoff's equation to study the effect of temperature on heat of reaction. **14**
- (b) What is heat capacity ? Give mathematical expression for heat capacity relationship at constant pressure i.e.

$$C_P - C_V = \left[P + \left(\frac{dE}{dV} \right)_T \right] \left(\frac{dV}{dT} \right)_P.$$

- (c) Give the IUPAC names of the following compounds :



- (d) Calculate the change in entropy ΔS per mole for the following reaction at 25° C.



$$\Delta H = -57.82 \text{ k.cal.}$$

$$\Delta G = -54.56 \text{ k.cal.}$$

- 2** (a) Define ignition. What is spontaneous ignition temperature ? Give procedure of spontaneous chain reaction between KMnO_4 and glycerin. **14**
- (b) Describe : How does combustion spread ?
- (c) Give dangerous properties and fire fighting of aniline and oxygen.

OR

- 2** (a) Discuss : Maximum flame temperature. **14**
- (b) Discuss flash point and fire point of organic solvents.
- (c) Give dangerous properties and fire fighting of toluene and hydrogen.

- 3** (a) Discuss the chemical mechanism of combustion of hydrogen. **14**
- (b) Give main characteristics and uses of any three common high explosives.
- (c) Write a short note on ambient conditions in of combustibility hazards.
- (d) Write a short note on titanium fire and its preventive action.

OR

- 3** (a) Write a note on the size and density of smoke particles. **14**
- (b) Derive the equation for the half life period of a second order reaction.
- (c) Define : Explosion. Explosive limit, Explosive range.
- (d) Write a short note on magnesium fire and its preventive action.

- 4** Answer any **four** of the following : **14**
- (a) Define and explain the term free energy.
 - (b) Write a short note on smouldering.
 - (c) Discuss Laminar versus Turbulent flames.
 - (d) Write a short note on fire retardance and give any two examples of it.
 - (e) Derive an equation for the rate constant of "nth" order reaction.
 - (f) Discuss flange fire.

- 5** (a) Write a short note on Boiling Liquid Expanding Vapour Explosion (BLEVE). **14**
- (b) Write an experiment to determine the specific heat of a substance (Copper).
- (c) Define calorific value.

A sample of coal has the following composition on mass basis :

$$C = 85.5\%, H = 12.5\%, O = 2\%.$$

Calculate the calorific value of the coal by using Dulong's formula.

OR

- 5** (a) Explain with a neat diagram the principle, construction and working of Junker's calorimeter. **14**
- (b) Write a note on hazards and risks associated with industry.
- (c) A Bomb calorimeter having water equivalent 300 gm is filled with 3 kg of water. The combustion of 2 gm of glucose [C₆H₁₂O₆] raised the temperature of water by 5° C; calculate the heat of combustion per mole of glucose.