BNA-012

B.Sc. (NAUTICAL SCIENCE)

Term-End Examination

June, 2008

BNA-012 : APPLIED SCIENCE

Time : 2 hours *Maximum Marks : 70*

Note :

(i) This question paper consists of Section A and Section B.

(ii) In Section A attempt three questions in all. Question No. 1 is ***compulsory.***

(iii) Attempt all questions in Section B.

(iv) Assume any missing data.

SECTION A
(Nautical Physics)

Note : *Question No. 1 is* ***compulsory.*** *Attempt* ***two*** *more questions from this section.*

1. (a) State Principle of Calorimetry. 20 gm of steam at 100° C is passed into a mixture of 10 gm of ice and 100 gm of water at 0° C. Find the final temperature.
Given Latent heat of ice : 80 cal/gm
Latent heat of steam : 540 cal/gm 5

(b) What is Doppler's Effect ? A policeman on duty detects a reduction of 10% in the pitch of the horn of a car as it crosses him. If the velocity of sound is 330 m/s, calculate the speed of the car. 5

(c) A wave travels in a medium for which the particle displacement is given by

$$y(x, t) = 0{\cdot}03 \sin \pi (2t - 0{\cdot}01x)$$

where x and y are in metres and t is in seconds. Calculate the

(i) wavelength of the wave

(ii) velocity of the wave 5

2. (a) Give an example of the application of the law of conservation of angular momentum.

A cricket ball of mass 0·5 kg strikes a bat normally with a velocity of 30 m/s and rebounds with a velocity of 20 m/s in the opposite direction. Calculate the impulse of the force exerted by the ball on the bat. 5

(b) Two satellites of the same mass are revolving round the earth at heights R and 4R above the earth's surface, with R being the radius of the earth. What will be the ratio of their kinetic energies ? 5

3. (a) Discuss the construction and working of siren.

The disc of a siren having a circle of 40 holes rotates uniformly 500 times in 1 min 24 s. Find the frequency of the node emitted.

(Given : velocity of sound in air is 340 m/s) 5

(b) Define refraction of light. The critical angle of a liquid is 30°. Find refractive index of liquid. 5

4. (a) Describe different modes of heat transfer with suitable examples. 5

(b) Give the construction and working of telescope. 5

SECTION B

(Nautical Chemistry)

Note : *Attempt **all** questions in this section.*

5. Attempt ***all*** parts : $4 \times 2 = 8$

(a) Calculate the % of nitrogen in ammonia.

(b) Write the electronic configuration of Cr (24) and Cu (29).

(c) Which acids are present in acid rain ?

(d) Write two common uses of acetylene.

6. Attempt any ***three*** parts : $3 \times 3 = 9$

(a) What is COD ? Which chemical substance is generally used in its measurement ? Why is COD preferred over BOD ?

(b) Describe the characteristics of s and p block elements.

(c) A compound contains 4·07% hydrogen, 24·27% carbon and 71·65% chlorine. Its molar mass is 99. Calculate its empirical and molecular formula.

(d) Which of the following has higher melting point and why ?

Pentane or 2-methyl butane.

7. Attempt any ***three*** parts : $3 \times 3 = 9$

(a) Define endothermic and exothermic chemical reactions with the help of suitable examples of each.

(b) Name two inert elements. In which group of the periodic table are they placed ?

(c) Using s, p, d, f notations, describe the orbital with following quantum numbers :

(i) $n = 1, l = 0$

(ii) $n = 2, l = 0$

(iii) $n = 3, l = 1$

(d) Give I.U.P.A.C names of the following :

(i) $CH_3 - CH_2 - CH_2 - \underset{\displaystyle CH_3}{\underset{|}{CH}} - OH$

(ii) $CH_3 - CH_2 - CH_2 - \underset{\displaystyle O}{\underset{||}{C}} - CH_2 - COOH$

(iii) $CH_3 - CH_2 - \underset{\displaystyle OH}{\underset{|}{CH}} - CH_2 - \underset{\displaystyle Cl}{\underset{|}{CH}} - CH_3$

8. Attempt any ***three*** parts : $3 \times 3 = 9$

(a) Define polar bonds. Arrange the given bonds in increasing order of polarity :

$P - H,\ H - O,\ N - H,\ H - F$

(b) On a ship sailing in the Pacific Ocean with temperature 23·4° C, a balloon is filled with 2 *l* of air. What will be the volume of the balloon when the ship reaches the Indian Ocean where temperature is 26·1° C ?

(c) Which metal is being oxidized in the reaction given below ? Justify.

$$Mg + ZnCl_2 \rightarrow MgCl_2 + Zn$$

(d) Complete the following reactions :

(i) $CH_3 - CH = CH_2 + HBr \xrightarrow{\text{Peroxide}}$

(ii) $CH_3 - \underset{\underset{Cl}{|}}{CH} - CH_2 - CH_3 + KOH\ (alc) \longrightarrow$