

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

$$y(x, t) = 0.03 \sin \pi (2t - 0.01x)$$

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 note 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 :

4×2=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 :

3×3=9

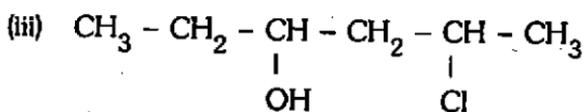
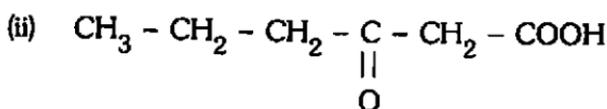
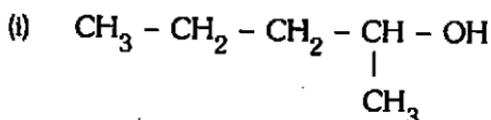
- (a) What is COD ? Which chemical substance is generally used in its measurement ? Why is COD preferred over BOD ?
- (b) Describe the characteristics of s and p block elements.
- (c) A compound contains 4.07% hydrogen, 24.27% carbon and 71.65% chlorine. Its molar mass is 99. Calculate its empirical and molecular formula.
- (d) Which of the following has higher melting point and why ?

Pentane or 2-methyl butane.

7. Attempt any **three** parts :

3x3=9

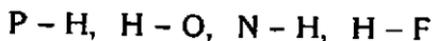
- (a) Define endothermic and exothermic chemical reactions with the help of suitable examples of each.
- (b) Name two inert elements. In which group of the periodic table are they placed ?
- (c) Using s, p, d, f notations, describe the orbital with following quantum numbers :
- (i) $n = 1, l = 0$
- (ii) $n = 2, l = 0$
- (iii) $n = 3, l = 1$
- (d) Give I.U.P.A.C names of the following :



8. Attempt any **three** parts :

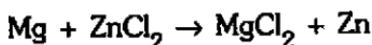
3x3=9

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



(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.



(d) Complete the following reactions :

