

B.Sc. (NAUTICAL SCIENCE)

Term-End Examination

June, 2015

00305

BNA-012 : APPLIED SCIENCE

Time : 2 hours

Maximum Marks : 70

Note : *This question paper consists of two sections, Section A and Section B. Attempt all questions. Use of non-programmable scientific calculator is allowed.*

SECTION A

1. Attempt **all** parts. 5×1=5
- (a) Weight of a freely falling body is _____ Newton.
 - (b) What is anomalous expansion of water ?
 - (c) Period of oscillation of seconds pendulum is _____ seconds.
 - (d) Doppler effect of sound is a _____ phenomena.
 - (e) What is the relation between refractive index and critical angle ?
2. Attempt any **two** parts. 2×5=10
- (a) Velocity of sound in fresh water is 1450 m/s. Determine the adiabatic compressibility of water. Density of water is 1000 kg/m^3 .

- (b) Derive the relation $\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$ in the case of a concave mirror.
- (c) 10 gm of ice at 0°C is added to 100 gm of water at 20°C . If the final temperature of the mixture is 10.9°C , find the latent heat of fusion of ice. Specific heat of water is 4200 J/kg-K .

3. Attempt any *two* parts. $2 \times 5 = 10$

- (a) State parallelogram law of forces and find the magnitude of the resultant of two equal forces F inclined at 120° .
- (b) (i) Explain damped and undamped oscillation.
- (ii) Differentiate between forced oscillation and resonance.
- (c) At what height above the surface of the Earth, does the acceleration due to gravity become $1/8$ of that on the surface of the Earth? Radius of Earth = 64000 km .

4. Attempt any *two* parts. $2 \times 5 = 10$

- (a) Define work, power and energy and prove that kinetic energy is $\frac{1}{2}mv^2$.
- (b) State the laws of refraction and condition for total internal reflection.
- (c) What is the amplitude of motion of a wave in the path of a 80 dB , 1000 Hz sound wave? Assume that the density of air is 1.29 kg/m^3 and the velocity of sound in air is 330 m/s .

SECTION B

5. Attempt *all* parts.

5×1=5

- (a) Minamata disease is caused by the metal _____.
- (b) Mass number of an element is the total number of _____ and _____.
- (c) What is an endothermic reaction?
- (d) The bond formed by the sharing of electrons and atoms is known as _____ bond.
- (e) In a modern periodic table elements are arranged with increasing _____.

6. Attempt any *two* parts.

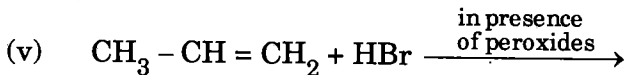
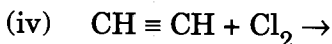
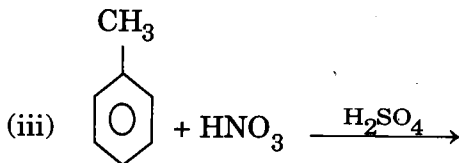
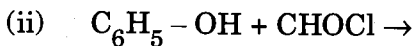
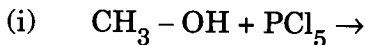
2×5=10

- (a) State Boyle's law and Charles' law and explain the terms used.
- (b) Explain the formation of an ionic bond with an example and the term ionisation energy.
- (c) What is the product formed in the following reactions :
 - (i) $\text{CH}_3 - \text{CH} = \text{CH}_2 + \text{HBr} \rightarrow$
 - (ii) $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{Cl} \xrightarrow{\text{Alcoholic KOH}}$

7. Attempt any *two* parts.

2×5=10

(a) Complete the following reactions :



(b) (i) State Aufbau principle and Hund's rule for maximum multiplicity, with examples.

(ii) Define Acid Rain.

(iii) A vessel containing air is sealed at 15°C . To what temperature should it be heated to double the pressure inside it?

(c) Define polymerisation. Explain condensation polymerisation and additional polymerisation with examples.

8. Attempt any *two* parts.

2×5=10

(a) Write the orbital-wise electronic configuration of the following elements :

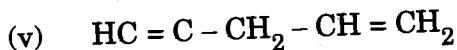
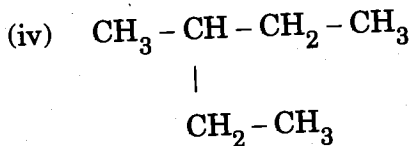
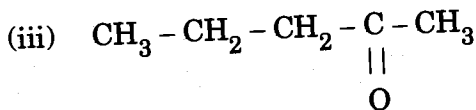
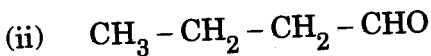
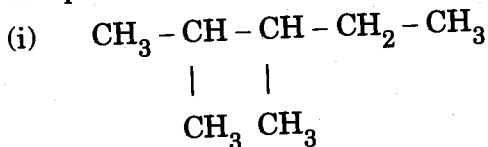
(i) Mg^{2+} , Cr, Cu

12 24 29

(ii) Define dipole moment. Arrange the given bonds in the increasing order of polarity.

N-H, H-F, O-H

(b) Give the IUPAC names of the following compounds :



- (c) An organic compound on analysis gave the following percentage composition, Carbon 40%, Hydrogen 6.66% and rest is Oxygen. The vapour density of the compound was found to be 30. Find out the empirical and molecular formula.
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