

B.Sc. (NAUTICAL SCIENCE)

Term-End Examination

December, 2014

BNA-012 : APPLIED SCIENCE

00350

Time : 2 hours

Maximum Marks : 70

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

SECTION A

1. Attempt **all** parts : 5×1=5
- (a) The unit of specific heat capacity is _____ .
 - (b) The dimensions of work are _____ .
 - (c) An object in SHM has amplitude of 12 mm and a period of 0.40 seconds. The maximum velocity in cm per second is _____ .
 - (d) Binoculars work on the principle of _____ .
 - (e) _____ is measured as the amount of energy passing through or falling on a unit area, per second normal to the area.
2. Attempt any **two** parts : 2×5=10
- (a) State Newton's second law of motion. Derive the relation between Force and Acceleration. Also state the SI unit and dimension of force.

- (b) Explain the process of conduction in solids.
- (c) One kg of ice at -10°C is heated until the whole of it converts into water. How much heat is required ? Latent heat of steam is 540 cal/g and latent heat of ice is 80 cal/g . Specific heat of ice is $0.5\text{ cal/gm }^{\circ}\text{C}$ and specific heat of water is $1\text{ cal/gm }^{\circ}\text{C}$.

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

- (a) Explain Newton's formula to find the velocity of sound in the air.
- (b) Write a short note on prism binocular.
- (c) How much below the surface does the acceleration due to gravity become 70% of its value on the surface of the Earth ?
Radius of Earth = $6,400\text{ km}$.

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

- (a) Discuss the effect of the following on velocity of sound in the air :
- (i) Density
- (ii) Humidity
- (b) State and derive the work-energy principle.
- (c) A small mass of 0.2 kg is attached to one end of a helical spring and produces an extension of 15 mm . The mass is now pulled down 10 mm and set into vertical oscillations of amplitude 10 mm . Determine :
- (i) Time period of oscillation
- (ii) Frequency of oscillations

SECTION B

5. Attempt *all* parts :

5×1=5

- (a) Isotopes show the same _____ properties but different physical properties.
- (b) What type of bond is formed between two non-metals ?
- (c) Digestion of food is an example of _____ change.
- (d) The alkanes are generally called as _____ .
- (e) Out of eight possible oxides of nitrogen, only N_2O , NO and _____ are the important constituents of the atmosphere.

6. Attempt any *two* parts :

2×5=10

- (a) Define solid wastes. Explain in detail the classification of solid wastes.
- (b) Composition of an organic compound is as follows : C = 20%, H = 6.7%, N = 46.67% and rest is oxygen. If the molecular formula mass is 60, find the molecular formula of the given compound.
- (c) What is ionic bond ? Explain the ionic bond formation in sodium chloride.

7. Attempt any *two* parts : 2×5=10

- (a) Define toxicity, flammability, reactivity and solubility with brief explanation in regards to hazards of cargoes.
- (b) Give two properties and applications of methane.
- (c) Explain with examples :
 - (i) Displacement and Double displacement reaction
 - (ii) Oxidation and reduction reaction

8. Attempt any *two* parts : 2×5=10

- (a) What is meant by acid rain ? Explain the ill effects of acid rain.
- (b) A sample of nitrogen gas occupies a volume of 320 cm^3 at S.T.P. Calculate the volume at 66°C and 0.825 atm .
- (c) Write the IUPAC name of the following :
 - (i) Ethyl iodide
 - (ii) Propionaldehyde
 - (iii) n-propyl alcohol
 - (iv) Ethyl methyl ether
 - (v) Diethyl ketone