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No. of Printed Pages : 4

BNA-012

B.Sc. (NAUTICAL SCIENCE)

Term-End Examination

December, 2015

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) Give the relation between moment of inertia, mass and radius of gyration.

(b) Differentiate between specific heat and heat capacity.

(c) Equation for period of oscillation of a loaded spring is _____ .

(d) Differentiate between transverse and longitudinal waves.

(e) Rainbow is formed due to _____ of light.

2. Attempt any ***two*** parts. *2×5=10*

(a) At what temperature will the speed of sound be double its value at 273 K ?

(b) Refractive indices of water and glass are 4/3 and 3/2 respectively. A ray of light travelling in water is incident on the water-glass interface at 30°. Calculate the angle of refraction.

(c) Define conduction, convection and radiation. Give one practical application for each in day-to-day life.

3. Attempt any ***two*** parts. *2×5=10*

(a) State Newton's law of gravitation and derive an expression for the variation of 'g' with altitude.

(b) A 3 kg object stretches a spring by 8 cm when it hangs vertically in equilibrium. The spring is then stretched further from equilibrium and the object is released. Find the frequency of motion and frequency, when the 3 kg object is replaced by another object of 4·5 kg. Take $g = 9{\cdot}8\ m/s^2$.

(c) State and prove the law of conservation of angular momentum.

4. Attempt any ***two*** parts. *2×5=10*

(a) State and prove the law of conservation of energy in the case of a freely falling body.

(b) Find the object distance in the case of a convex lens of focal length 25 cm, if the image is magnified to twice the size of the object in the case of real and virtual image.

(c) An automobile, moving at 30 m/s, is approaching a siren that has a frequency of 400 Hz. Find the apparent frequency of the siren as heard by the driver. Velocity of sound is 340 m/s.

SECTION B

5. Attempt ***all*** parts. *5×1=5*

(a) Global warming is due to _____ gas.

(b) The gases responsible for acid rain are _____ and _____ .

(c) Define an orbital.

(d) An electron is present in 3d orbital. What is its azimuthal quantum number ?

(e) What are isotopes ?

6. Attempt any ***two*** parts. *2×5=10*

(a) Give three properties and two uses of methane.

(b) Explain endothermic and exothermic reactions with one example each.

(c) State the ideal gas equation and explain the terms used and also explain the mole concept.

7. Attempt any ***two*** parts. *2×5=10*

(a) A compound contains 4·07% of hydrogen, 24·27% of carbon and 71·65% of chlorine. Its molecular mass is 98·96. What are the empirical and molecular formulae ? Atomic mass of chlorine is 35·5.

(b) What are quantum numbers ? What do they signify ?

(c) Write a note on air pollution.

8. Attempt any ***two*** parts. *2×5=10*

(a) Explain how the following vary along the period :

(i) Ionisation potential

(ii) Electron affinity

(b) Explain the different methods used to reduce water pollution.

(c) What is meant by COD and BOD of water ? Why is COD preferred over BOD ?