

1105-01

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B.Sc. Part-I (Hons.) Examination, 2019

PHYSICS

[Paper : First]

[PPU-D-I(H)-PHY-1]

Time : Three Hours]

[Maximum Marks : 75

Note : Attempt five questions in all. Question No. 1 is compulsory and select at least one question from each section. Each question carries equal marks

1 (i) A 520 m long (measured when the spaceship is stationary) spaceship passes by the Earth. What length would the people on Earth say the spaceship was as it passed the Earth at $0.87c$?

- (a) 256 m
- (b) 123 m
- (c) 734 m
- (d) 456 m

(ii) An observer on Earth sees an alien spaceship approaching at $0.60c$. The Enterprise comes to the rescue overtaking the spaceship at $0.90c$ relative to the alien spaceship. How fast would the observers on earth measure the Enterprise to be travelling at ?

- (a) $0.853c$
- (b) $0.974c$
- (c) $0.342c$
- (d) $0.834c$

(iii) How much energy is contained in a particle that has a mass = $1 \mu\text{g}$?

- (a) 6.9×10^7 Joules
- (b) 9×10^7 Joules
- (c) 2.7×10^8 Joules
- (d) 3.4×10^8 Joules

(iv) Two wires A and B are of the same material. Their lengths are in the ratio of 1 : 2 and the diameters

are in the ratio of $2 : 1$. If they are pulled by the same force, then the increase in length ratio will be. mean free path of a gas molecule is inversely proportional to

- (a) $1 : 8$
- (b) $1 : 4$
- (c) $1 : 6$
- (d) $3 : 4$

(v) The rain drops are spherical in shape due to :

- (a) Surface tension
- (b) Viscosity
- (c) Diffusion
- (d) Pressure

(vi) The modulus of rigidity and Poisson's ratio of the wire are $2.87 \times 10^{10} \text{ N/m}^2$ and 0.379 respectively. What is the value of Young's modulus of the material of the wire :

- (a) $1.08773 \times 10^{10} \text{ N/m}^2$

[P.T.O.]

(b) $7.915 \times 10^{10} \text{ N/m}^2$

(c) $7.5725 \times 10^{10} \text{ N/m}^2$

(d) $0.1403 \times 10^{10} \text{ N/m}^2$

(vii) Calculate the Young's modulus in the cantilever depression method. The length is 1 m which is suspended with a load of 150 gm . The depression is found to be 4 cm . The thickness of the beam is 5 mm and breadth is 3 cm .

(a) $3.92 \times 10^{10} \text{ N/m}^2$

(b) $9000 \times 10^{10} \text{ N/m}^2$

(c) $4000 \times 10^{10} \text{ N/m}^2$

(d) $1.245 \times 10^{10} \text{ N/m}^2$

(viii) The mean distance of Earth from the Sun is $149.6 \times 10^6 \text{ km}$ and the mean distance of Mercury from the Sun is $57.9 \times 10^6 \text{ km}$. The period of Earth's revolutions is 1 year . what is the period of Mercury's revolution ?

- (a) 0.32 years

2 (a) At what speed does a clock move if it runs at a rate which is one half the rate of a clock at rest.

(b) At what speed does a meter stick move if its length is observed to shrink to 0.5.

3 (a) Prove the energy-momentum relationship
 $E^2 = p^2 c^2 + m^2 c^4$

(b) Discuss about inertial and non-inertial frame of references using proper examples.

4 Explain about surface tension and surface energy. Discuss the effects of temperature and pressure on surface tension. <http://www.ppuonline.com>

SECTION-B

5 State and explain D'Alembert's principle. Also obtain an expression for Lagrange's equation.

6 State three Kepler's laws and prove Kepler's third law.

7 What is cantilever? Obtain the value of depression at the end of a circular cross section.