SUBJECT CODE : 15PH/MC/PA14

B.Sc. DEGREE EXAMINATION NOVEMBER 2017
BRANCH III - PHYSICS
FIRST SEMESTER

COURSE : MAJOR – CORE
PAPER : PROPERTIES OF MATTER AND ATOMIC PHYSICS
TIME : 3HOURS   MAX. MARKS : 100

SECTION – A

ANSWER ALL QUESTIONS: (30 x 1 = 30)

I   CHOOSE THE CORRECT ANSWERS:

1. Which one of the following substances has the highest elasticity?
    a) Steel   b) Copper
    c) Rubber   d) Sponge

2. The depression of cantilever is directly proportional to
    a) square of its length   b) square root of its length
    c) its length   d) cube of its length

3. The modulus of elasticity is equal to
    a) Stress + Strain   b) Stress/Strain
    c) Strain/Stress   d) Stress x Strain

4. Which of the following examples could be characterized as the result of surface tension
    a) A child sips milk through a straw
    b) Spilled mercury forms into small drops
    c) Table salt is in the form of cubic crystals
    d) None

5. Surface tension mainly arises due to
    a) Gravitational force   b) Electrostatic force
    c) Cohesive molecular force   d) Adhesive molecular force

6. With the rise in temperature, the surface tension of liquids
    a) Decreases   b) Increases
    c) Remains the unchanged   d) None

7. Streamline motion is that motion in which there is
    a) Only longitudinal velocity gradient
    b) Only radial velocity gradient
    c) Longitudinal as well as radial velocity gradient
    d) Neither longitudinal nor radial velocity gradient

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8. Hair of a shaving brush align together when it is removed from water, due to
   a) Surface tension   b) Viscosity
   c) Elasticity   d) None of these

9. Machine parts are jammed in winter due to
   a) Increase in viscosity of the lubricant
   b) decrease in viscosity of the lubricant
   c) Increase in surface tension of the lubricant
   d) Increase in surface tension of the lubricant

10. The study of positive rays helped in the discovery of
    a) Proton   b) Isotopes
    c) Electron   d) Alpha Particles

11. Mass spectrograph determines
    a) Spectrum of light
    b) Charge of the ion
    c) Specific charge of the positive rays
    d) Specific charge of the cathode rays

12. X-rays are generally produced from
    a) Cathode rays   b) Gamma rays
    c) Positive rays   d) Alpha rays

13. Orbital quantum number is
    a) s   b) n
    c) l   d) ml

14. The angular momentum of electron in an atom produces
    b) Magnetic moment   b) Zeeman effect
    c) Light   d) nuclear fission

15. The first successful quantitative theory of atomic structure was developed by
    a) Niels Bohr   b) J.J.Thomson
    c) E. Rutherford   d) Dalton

II FILL IN THE BLANKS:

16. The unit of young's modulus is _____.
17. A waterproofing agent changes the angle of contact from _____.
18. The Coefficient of viscosity is _____.
19. Moseley's law relates _____.
20. The electronic configuration of $_{11}Na^{23}$ _____.

III STATE WHETHER TRUE OR FALSE:

21. Torque = Moment of Inertia x Angular Velocity.
22. The angle of contact for pure mercury and clean glass is 130°.
23. The Reynold's number R should be less than 2000.
24. Compton effect is associated with Positive rays.
25. The maximum number of electrons in the subshells s, p, d, f can be 2, 6, 14, 18.

IV   ANSWER BRIEFLY:

26.   Define Modulus of rigidity.
27.   Define surface Tension.
28.   Define critical velocity.
29.   State Bragg's law.
30.   A quantum state is defined by a set of four quantum numbers (n, l, m_1 and m_2).
        Find $1s^2$ state relevant quantum numbers.

SECTION – B

ANSWER ANY FIVE QUESTIONS: **(5 x 5 = 25)**

31.   Calculate the work done in twisting a steel wire of radius 10^{-3} m and length 0.25m
        through an angle of 45°. Given $\acute{\eta} = 8 \times 10^{16}$ N/m^2.

32.   The pressure for air in a soap bubble of diameter 7×10^{-3}m is 8×10^{-3}m of water
        column above the atmospheric pressure. Calculate the surface tension of soap
        solution.

33.   Find the limiting velocity of a rain drop.
        Assume, diameter = 10^{-3} m, Density of air relative to water = 1.3×10^{-3}
        Coefficient of viscosity of air = 1.81×10^{-5} SI units, Density of water 10^{-3} Kg/m^3

34.   Write short note on Bragg's X-ray Spectrometer.

35.   Monochromatic X-rays of wavelength 0.124 Å are scattered by a Carbon block.
        Find the wavelength of X-rays scattered through 180°.

36.   What is Bohr magneton? Calculate its value.

37.   Discuss the concept of spin and space quantization as introduced in the vector atom
        model.

SECTION – C

ANSWER ANY THREE QUESTIONS: **(3 x 15 = 45)**

38.   Derive an expression for the depression of the loaded end of a light cantilever.

39.   Derive an expression for the excess pressure inside a curved liquid surface.

40.   Discuss Poiseuilles method for determining the coefficient of viscosity of a liquid.

41.   What is photo-electric effect? Describe Einstein's photoelectric equation? Verify the
        equation experimentally?

42.   What is Zeeman Effect? Describe the experimental arrangement for studying the
        effect?

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