

**BACHELOR OF PHARMACY EXAMINATION , 2017**

(1st Year, 1st Semester, Supplementary)

**Physics - I A (Old Syllabus)**

Time : Three hours

Full Marks : 100

Answer any 5 questions:

1. (a) Write the zeroth law of thermodynamics, which thermodynamic variable is obtained from this law?  
(b) How can temperature be measured? Describe two different types of thermometers and discuss their advantages and disadvantages.  
(c) What is meant by internal energy in thermodynamics? How is it related to work and heat exchange.  
(d) What is meant by a 'state function'? What is a 'quasi-static process', can it be realized in practice? (4+8+4+4)
2. Discuss the following processes and calculate the change in internal energy in each case (a) an adiabatic process, (b) an isochoric process, (c) a cyclic process and (d) free expansion of an ideal gas. (e) Try to represent these on a PV diagram, is this possible for all the cases? (4x5)
3. Give two statements of the second law of thermodynamics.  
Explain what is meant by an irreversible process.  
Write the entropy principle and illustrate it with some examples. What is a Carnot engine, derive an expression for its efficiency. Draw the TS diagram for the Carnot engine and hence show that all such engines operating between the same two temperatures have the same efficiency. (4+2+4+10)
4. (a) What is an 'ideal gas'? Write the equation of state of an ideal gas. From the kinetic theory of gases, derive an expression for root mean square velocity of an ideal gas in terms of its absolute temperature. (b)

The molar mass of oxygen is 0.0320kg/mole, calculate the average speed and most probable speed of the gas molecules. (d) Write one simple equation of state for a real gas. Does this agree with results for experiments on change of phase in a real gas?

(2+2+5+5+4+2)

5. Describe Rutherford's experiment, what conclusions were drawn from it? What are the assumptions in Bohr's theory of the hydrogen atom. What experimental observations could be explained from this model? Are X-rays more energetic than (a) radio waves, (b) gamma-rays, (c) visible light? Describe the construction of a Coolidge tube. Give some practical applications of X-rays.

(3+2+3+2+3+4+3)

6. Name some experiments whose results could not be explained using classical physics. How did quantum mechanics resolve these problems? Discuss de Broglie's hypothesis? Calculate the de Broglie wavelength of an electron with a kinetic energy of 120 eV. (electron mass =  $9.11 \times 10^{-31}$  kg,  $h = 6.63 \times 10^{-34}$  J.s) An electron and a proton have same kinetic energy, which has shorter de Broglie wavelength? How does one conclude that an electron cannot be a part of the atomic nucleus?

(2+3+4+5+2+4)

7. Write short notes on any two  
(a) Entropy and disorder, (b) Characteristic and continuous X-ray spectra,  
(c) Heisenberg uncertainty principle. (10+10)