Ub

F.E. (All Br.) I (Rev) 23/5/07

1fh-19-5-Ex-Nk-07.12

Appl. Sciences I

Con. 2748-07. ND-242

(REVISED COURSE)

Appl. Sciences-I, May '07

(3 Hours) [Total Marks : 100

MASTER

Section I—(Marks : 50)

N.B.(1) Question No. **1** is **compulsory**.
(2) Attempt any **four** question out of remaining **six** questions.
(3) Assume any suitable data wherever, if **required** and justify the same.

1. (a) Calculate the critical radius ratio for ligancy '6'. 5
(b) Explain Nondestructive testing. 5

2. (a) Draw the following :— 5
(100) (111) (123)
[121] [110].
(b) Calculate the length of an iron rod which can be used to produce ultrasonic waves of frequency 20 KHz. Density of iron rod is $7{\cdot}23 \times 10^3$ kg/m^3 Young's modulus is $11{\cdot}6 \times 10^{10}$ N/m^2. 5

3. (a) Draw the diagram of piezoelectric oscillator and explain its working for producing ultrasonic wave. 5
(b) Calculate the impact velocities of electron accelerated through 100 V ($e = 1{\cdot}6 \times 10^{-19}$ C, Mass of electron = $9{\cdot}1 \times 10^{-31}$ kg). 5

4. (a) Explain electrostatic focussing. 5
(b) Derive the formula for De-Broglie wavelength in term of Kinetic energy. 5

5. (a) Calculate De-Broglie wavelength of 10 Kev electron. 5
(b) Calculate the Number of atoms per unit cell of a metal having the lattice parameter 2·9 A° and density is 7·87 gm/cm^3, Atomic weight of a metal is 55·85, Avogadro's constant is $6{\cdot}0238 \times 10^{23}$ gm/mole. 5

6. (a) Draw the diagram of CRT and explain all parts in detail. 5
(b) Calculate atomic packing factor for simple cubic structure. 5

7. (a) Write short notes on Miller Indices ? 5
(b) Explain wave particle duality and De-Broglie's Hypothesis ? 5

[TURN OVER

Appl. Science I, May '07, Page 2

Section II—(Marks : 50)

N.B.(1) Answer **Section II** on **separate** answer sheet.
(2) Question No. **8** is **compulsory**.
(3) Attempt any **two** from the question Nos. **9** to **12**.
(4) **Figures** to the **right** indicate **maximum** marks.
(5) Assume suitable data if **required**.
(6) At Wt Ca = 40, Mg = 24, H = 1, C = 12, Cl = 35·5, Na = 23, S = 32, S_i = 28.

8. Attempt any **six** :— 18
   (a) Explain phosphate conditioning for internal treatment of water.
   (b) Explain condensation polymerisation with the help of suitable example.
   (c) What are blended oils ? How are they better than animal or vegatable oils ?
   (d) Explain the effect of carbon mono-oxide and NO_x as air pollutant.
   (e) Explain boiler corrosion due to dissolved oxygen in water. How can it be prevented ?
   (f) Distinguish between LDPE and HDPE.
   (g) Explain extreme pressure lubrication.

9. (a) What is demineralisation ? Explain demineralisation with reference to the following points : 10
      (i) Principle
      (ii) Ingradients used
      (iii) Chemical equations
      (iv) Advantages and Disadvantages.
   (b) Write preparation properties and uses of— 6
      (i) Ureaformaldehyde
      (ii) Bakelite.

10. (a) Calculate lime (90% pure) and soda ash (90% pure) to soften 1,00,000 litres of water containing : 6

$Mg(HCO_3)_2$	146 mg/lit	$Mg Cl_2$	95 mg/lit
$Ca(HCO_3)_2$	81 mg/lit	$Ca Cl_2$	111 mg/lit
Na_2SO_4	15 mg/lit	SiO_2	10 mg/lit

   (b) Explain hydrodynamic or thickfilm lubrication with the help of a diagram. 5
   (c) Explain BOD and COD stating its applications. 5

11. (a) What are plastics ? Write their main constituents. Write the functions and examples of each constituent. 6
   (b) What is saponification number ? How is it experimentally determined ? State its significance.
   (c) 50 ml of standard hard water (1·2 g $CaCO_3$/lit) requires 32 ml of EDTA solution. 100 ml of water sample consumes 14 ml EDTA solution. 100 ml of boiled and filtered water sample consumes 8·5 ml EDTA solution. Calculate temporary hardness of this sample from above experimental data. 5

12. (a) Explain why and how Vulcanisation improves the properties of raw rubber. 5
   (b) Principle and reactions involved in the lime-soda method for softening of water. 5
   (c) (i) Semi solid lubricants 6
      (ii) List the type of air pollutant and corresponding method to control polution.