WINTER– 15 EXAMINATION

Subject Code: 17543 **Model Answer** **Page No: _1/19**

Important Instructions to examiners:

1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.

2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.

3) The language errors such as grammatical, spelling errors should not be given more Importance (Not applicable for subject English and Communication Skills.

4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for any equivalent figure drawn.

5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.

6) In case of some questions credit may be given by judgement on part of examiner of relevant answer based on candidate's understanding.

7) For programming language papers, credit may be given to any other program based on equivalent concept.

Q.1) (A) Attempt any THREE : **(12)**

(a) List four defects occurring in solid material. **(04)**

(1 mark each)

Ans :

- Point defects which include vacancy , vacancy substitutional , interstitial .

- schottky defect.

- Frenkel defect.

- Line defect which include edge dislocation, screw dislocation, grain boundary.

-Plane defects.

(b) Give four applications of Ti and its alloys. **(04)**

(1 mark each)

Ans :

-It is used for the production of hip prostheses.

- It is used for making of fracture equipment.

- It is used for surgical implant applications.

- It is used for manufacturing of implants.

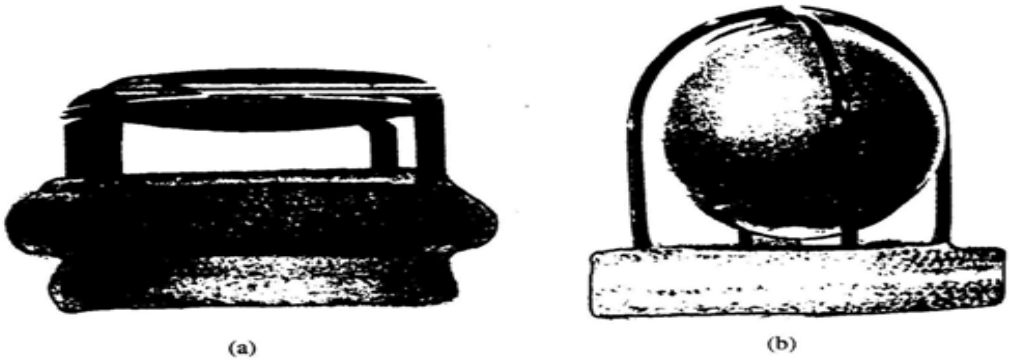
-It is used for making of bone screws and plates.

-It is also used for orthopedic application.

(c) Sketch (i) disk –in-cage (ii) ball-in-cage prosthetic heart valve. (04)

(2 marks for each diagram)

Ans :



(a) disk –in-cage prosthetic heart valve. **(b) ball-in-cage prosthetic heart valve.**

(d) State the use of impression materials used in dentistry and give its example. (04)

(Use = 2 marks , Example = 2 marks)

Ans :

Use of impression materials used in dentistry :

-Impression materials are used to make a reproduction of the gum surface as mold or model based on which dentures and restoration materials are fabricated.

-An excellent illustration of the importance of impression compounds in dentistry is the the preparation of a cast for an artificial denture.

Example of impression materials : (1 mark each)

-Elastic impression materials which include hydrocolloid and Elastomeric materials.

-Hydrocolloid impression materials used in dentistry includes reversible and irreversible materials.

- reversible Hydrocolloid impression materials include agar, a linear polysaccharide derived from seaweed containing galactose sulfate.

-The composition of hydrocolloid includes agar (8 -15%) Borax (0.2 -0.5 %) which strengthens the gel.

-Irreversible Hydrocolloid impression materials include brown seaweed polymer which is a polymer of β – D – Mannuronic Acid and D – Glucuronic acid known as alginic acid.

-Elastomers which find used as impression materials include silicones and polysulfides.

- Polysulfide rubber impression materials.

-Paste impression materials.

- Dental stone (Calcium sulfate α – Hemihydrate)

- Plaster of paris (Calcium sulfate β – Hemihydrate)

(B) Attempt any ONE : (06)

(a) State what do you mean by enamel and give its mechanical properties. (06)

Ans : (Enamel = 3 marks , Mechanical properties = 3 marks)

Enamel :

All teeth are made up of two portions, the crown the root, demarcated by the gingival (gum). The root is placed in a socket called the alveolus in the maxillary (upper) and madibular (lower) bones. The enamel is the hardest substance found in the body and consist of almost entirely of calcium apatite crystals (97%). The dentine is another mineralized tissue whose distribution of organic matrix and mineral is similar to that of regular compact bone.

Mechanical properties enamel : (1 mark each)

1) Density ($g/cm^{3)}$: 2.2

2) Compressive Strength (Mpa) : 241

3) Young's Modulus (GPa) : 48

4) Thermal conductivity (W/mk) : 0.82

(b) Give the categorization of hard tissue replacement materials according to their compatibility with bony tissue. (06)

(3 marks for each Categorization)

Ans :

Categorization of hard tissue replacement materials :

1) Metallic materials : (3 marks)

- Stainless steel alloy

- Cobalt Chromium

- Titanium

The label Biocompatibility suggests that the material describe plays universally good or harmonious behavior in contact with tissue and body fluids.

The compatibility with bone tissue of the metallic material is good due to its high strength stiffness fatigue resistance sterilizability and manufacturability and long term storage as well as its adequate mechanical properties. Due to this properties metallic materials are more compatible with bone tissue.

2) Ceramic material : (3 marks)

-Carbon

-Alumina.

-Zirconia.

-Calcium phosphate.

The Ceramic material have high hardness due to this low friction and wear occur. Therefore it is used as joint replacement material. It has excellent Biocompatibility and wear properties make this material based choice for Orthopedic Prosthesis. It gives stiffness of bones and it has good compressive strength, bending strength, hardness, high density and elastic modulus. The ceramic material has high strength and an elastic modulus closed to that of bone due to this ceramic materials are compatible with bone tissue.

Q.2) Attempt any FOUR : (16)

(a) The greatest tensile stress which steel of a particular sort can withstand without breaking is about 10^9 Nm^{-2}. A wire of cross section area 0.01 mm^2 is made of this steel. What is the greatest force that it can withstand ? (04)

Ans : (Formula = 01 mark , Solution = 03 marks)

Given ,

- Tensile stress = 10^9 Nm^{-2}

- Cross Section area = 0.01 mm^2

- Force = ?

We have,

Stress (σ) = $\frac{\text{Force (F)}}{\text{Area (A)}}$

Force (F)= 10^9 x 0.01

Force (F) = 10 x 10^6 N or Force (F) = 10^7 N

(b) Give any four major historical developments of biomaterials along with year and inventor. (04)

(1 mark each)

Ans :

Year	Author	Activity
1) 600BC	Sushruta Samhita	Nose Reconstruction.
2) 1860 -1870	J. Lister	Aseptic surgical techniques developed.
3) 1893 - 1912	W.A.Lane	Steel screws and plates for fracture fixation.
4) 1926	E.W.Hey-Groves	Used carpenter's screw for femoral neck fracture fixation.
5) 1938	P.Wiles	First total hip replacement.
6) 1940	M.J.Dorzee, Franceschetti	Acrylics for corneal replacement.
7) 1944	W.J.Kolff	Hemodialyser.
8) 1946	J.Judet and R. Judet	First biomechanically designed hip prosthesis. First plastics used in joint replacement.
9) 1952	A.B.Voorhees, A. Jaretzta, A.H. Blackmore	First blood vessel replacement made of cloth.
10) 1953	A. Kantrowitz	Intraortic ballon pumping.
11) 1958	J.Charnley	First use of acrylic bone cement in total hip replacements.
12) 1958	S.Furman , G. Robinson	First successful direct stimulation of heart.
13) 1960	A.Starr, M.I.Edwards	Heart valve.
14) 1980	W.J.Kolff et al.	Artificial heart.

(c) Give four mechanical properties of Ti and its alloys. (04)

(1 mark each)

Ans :

Properties	Grade-1	Grade-2	Grade-3	Grade-4
1) Tensile Strength (Mpa)	280	345	450	550
2) Yield Strength (Mpa)	170	275	380	485
3) Elongation (%)	24	20	18	15
4) Reduction of area (%)	30	30	30	25

(d) Give four mechanical properties of any one alloy of carbon. (04)

(1 mark for each property of any one alloy of carbon)

Ans :

Property	Graphite Carbon alloy	Glassy (Vitreous) Carbon alloy	Pyrolytic Carbon alloy
1) Density (g/ml)	1.5-1.9	1.5	1.5 - 2.0
2) Elastic modulus (Gpa)	24	24	28
3) Compressive Strength (Mpa)	138	172	517
4) Mechanical Strength and toughness	Low	Low	High

(e) State the need for vascular implant and give material used for the same. (04)

Ans : (Need = 2 marks , Material used = 2 marks)

Need for vascular implant :

Diseases of the cardiovascular system contribute to about 20 % of the fatality in older people. Arteriosclerosis, a process affecting the large and medium sized diameter arteries, specially the aorta. Coronary arteries and cerebral arteries is a major cause of death. Diseased blood vessels and inefficient heart valves are routinely replaced with natural tissues or synthetic materials including natural or synthetic polymers.

Material used for vascular implant :

-Polyethylene.

- Polypropylene.

-Polyacrylates

-Plyurethanes.

-Silicon rubber.

-Cellulose.

-Collgens.

-Elastin.

-Hydrogel.

(f) Give name of any four materials used for deep cavities filling. (04)

(1 mark each)

Ans :

Materials used for deep cavities filling :

- Dental Amalgam.

- Glass Ionomer.

- PMMA Resins.

- Plastic (Cements, pastes) or solid pieces (thin cones).

- Many of these cements contain synthetic polymers such as polyethylene , Epoxy , Polyacrylate, Polycarbonate, Silicones which contribute to the hardness of final product and also seal the internal part of the canals.

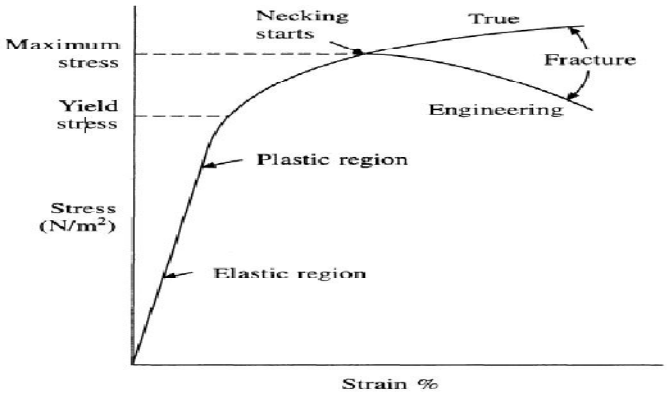
- Gutta – percha mixed with cement is widely use as sealing materials.

Q. 3. Attempt any FOUR : **(16)**

a) Sketch stress-strain curve and explain it. **(04)**

(Diagram-02 Mark, Description-02 Mark)

Ans:



The ability of material to withstand static load can be determined by a standard tensile, compressive and shear tests. From a load-displacement curve a stress-strain diagram can be constructed by knowing cross-sectional area and length of rod. The stress-strain curve of a solid can be demarcated by the yield point or stress (YS) into elastic and plastic regions.

In the elastic region, the strain increases in direct proportion to the applied stress whereas in the plastic region strain changes are no longer proportional to the applied stress. Further when the applied stress is removed, the material will not return to its original shape but will be permanently deformed. This phenomenon is termed as plastic deformation. The peak stress in fig. is often followed by an apparent decrease until a point is reached where the material ruptures. The peak stress is called as the tensile or ultimate tensile strength (TS or UTS) and the final stress where failure occurs is called the failure or fracture strength (FS).

Hardness is the measure of plastic deformation and is defined as the force per unit area of indention or penetration and thus has the dimension of stress. A material that can withstand high stresses and will undergo considerable plastic deformation (ductile-tough material) is tougher than the one that has high capacity for deformation but can only withstand relatively low stress(ductile soft).

b) How materials can be protected from corrosion? **(04)**

Ans : Corrosive attack due to the nature of biological environment can not always be controlled, reduction of corrosion is possible via kee decision in the design and the fabrication of the implant. The device would be fabricated from only nonreactive metals like gold, silveror platinum but in many cases the mechanical properties limit their usefulness. Therefore metals known to form passive oxide coating are often employed ,either in their pure or ollyed form, to create implants to corrosion resistance as well as sufficient mechanical strengthen addition extra processing steps may be included to prevent specific type of corrosion for instance heat treating stainless steel may reduce intergranular corrosion. .Additionally pretrating a metal with nitric acid forms a passive surface layer before implantation.

c) Give four applications of collagen. **(04)**

(01 Mark each)

Ans:- The uses of collagen in dentistry are given below :

1. Collagen is used for prevention of oral bleeding.

2. It is used to support of regeneration of periodontal tissues.

3. It is used for promotion of healing of mucosal lining.

4. It is also used for prevention of migration of epithelial cells.

5. Collagen has also been used as a carrier substance for immobilization of various active substances used in dentistry.

6. Dressing materials containing collagen have been employed effectively to promote of defects in oral mucous membrane.

d) State four functions of kidney. **(04)**

(01 Mark each)

Ans: 1.Regulation of extracellular fluid volume.

2. Regulation of osmolarity.

3. Regulation of ion concentration.

4. Regulation of PH.

5. Excreation of waste and toxins.

e) State the meaning of temporary fixation devices and give its two examples. **(04)**

(Meaning-02 Marks, examples-02 Marks)

Ans:

Temporary fixation of joints can be achieves by implementing temporary fixation devices.

The purpose of temporary fixation devices is to stabilize fractured bone until natural healing processes have restored sufficient strength so that the implant can be removed.

Examples:

These devices include pins, nails, wires, screws, plates, and intramedullary devices.

1. Bone plates are used for joining bone fragments together during healing of load-bearing bones. The plate provides rigidity for the fixation of the fracture.

2. Screws are used with the plates to secure them to the bone.

Q. 4 A) Attempt any Three: **(12)**

a) Describe any four bonds present in atoms. **(04)**

(01 Mark each)

Ans: i) Metallic bonds: Metallic bonds allow high electrical and heat conductivity due to the free valence electrons, which act as the medium.

ii) Covalent bonds: covalent bonds share valence electrons with neighboring atoms. Generally covalent compounds show poor electrical and thermal conductivity as for ionic bonding.

iii)Van der waals: In physical chemistry, the van der Waals forces (or van der Waals' interaction), named after Dutch scientist Johannes Diderik van der Waals, are the residual attractive or repulsive forces between molecules or atomic groups that do not arise from a covalent bond, or electrostatic interaction. The resulting van der Waals forces can be attractive or repulsive.

iv) Hydrogen: The ground state of neutral hydrogen consists of a spherically symmetric electron cloud bound to a proton. Both the electron and the proton have intrinsic magnetic dipole moments ascribed to their spin, whose interaction results in a slight increase in energy when the spins are parallel, and a decrease when antiparallel. The fact that only parallel and antiparallel states are allowed is a result of the quantum mechanical discretization of the total angular momentum of the system.

v) Ionic: Ionic bonding is the complete transfer of valence electron(s) between atoms and is a type of chemical bond that generates two oppositely charged ions. It is observed because metals with few electrons in its outer-most orbital. By losing those electrons, these metals can achieve noble-gas configuration and satisfy the octet rule. Similarly, non-metals that have close to 8 electrons in its valence shell tend to readily accept electrons to achieve its noble gas configuration.

b) Give four application of carbon. **(04)**

(01 Mark each)

Ans:

1) Carbon is used for coating purpose in heart valves.

2) Blood vassals graph.

3) Percutenious devices.

4) For stimulation purpose of cochlea as a electrode.

c) State two types of blood clot formation techniques and differentiate them. **(04)**

(State – 02 Mark, Any two difference-02 Mark)

Ans:

1)Intrinsic pathway: The contact activation pathway(Intrinsic) begins with formation of the primary complex on collagen by high-molecular-weight kininogen (HMWK),prekallikrein, and FXII (Hageman factor). Prekallikrein is converted to kallikrein and FXII becomes FXIIa. FXIIa converts FXI into FXIa. Factor XIa activates FIX, which with its co-factor FVIIIa form the tenase complex, which activates FX to FXa. The minor role that the contact activation pathway has in initiating clot formation can be illustrated by the fact that patients with severe deficiencies of FXII, HMWK,

and prekallikrein do not have a bleeding disorder. Instead, contact activation system seems to be more involved in inflammation.

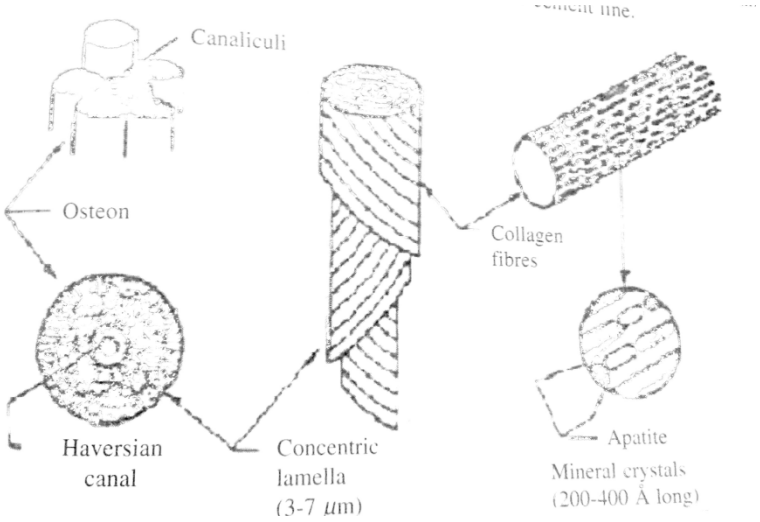
2) Extrinsic pathway: The main role of the tissue factor pathway (Extrinsic) is to generate a "thrombin burst", a process by which thrombin, the most important constituent of the coagulation cascade in terms of its feedback activation roles, is released very rapidly. FVIIa circulates in a higher amount than any other activated coagulation factor.

Difference :

Intrinsic pathway	**Extrinsic pathway.**
1) All the factors in he intrinsic pathway are available in circulation.	1) The extrinsic pathway is so named because it requires a substance not normally present in the blood for activation.
2) It is a natural technique for clotting.	2) It require external substance o get clotting.
3) The extrinsic pathway is initiated when blood comes into contact with tissue factor following the rupture of a blood vessel.	3)The intrinsic pathway, of which both clotting factor VIII and IX are a part, is initiated by the activation of certain "contact factors" in the plasma (e.g. factor XII, prekallikrein, or high-molecular-weight kininogen) following blood vessel injury
4) Activated by: (-) charged surfaces in vivo (collagen, subendothelial connective tissue) & in vitro (glass)	4) Activated by: Factor VII activation by tissue factor (TF) on subendothelium.
5) Factors: XII, XI (↓in haemophilia B), IX (↓in haemophilia A)	5)Factors Involved: VII
6)Activation time: 1 - 6 min (slow)	6)Time to Activation: 15s (fast)

d) Sketch detailed structure of osteon. **(04)**

Ans:



B) Attempt any ONE: (06)

a) Write the procedure for testing the reliability of dental implants and list the materials used in porous dental implants. (06)

(Testing -03 Mark, list material-03 Mark)

Ans:

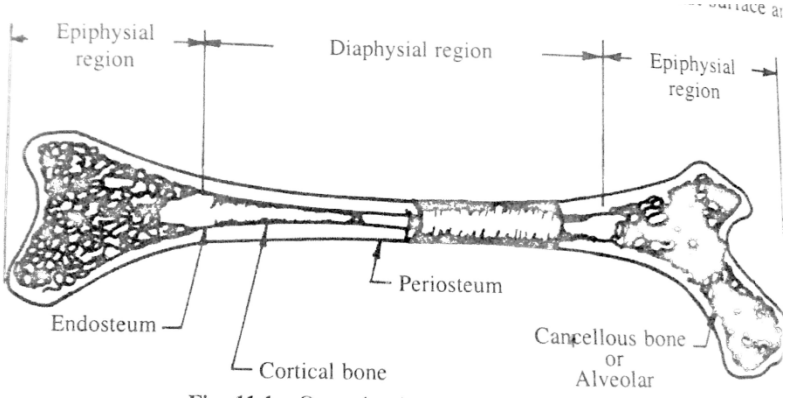
The testing and evaluation of dental implants involves several stages. First materials are tested for toxicity by implantation subcutaneously in rats for periods of time up to 30daysand through tissue culture test. The second step is testing the devices in an animal model. The baboon (monkey) is considered the most preferred experimental animal in dental implant studies, it's immunological responses and physiology are very similar to those of humans.

Materials used in porous dental implants.: A large no. of materials have been tested for porous dental implant which include stainless steel,Co-Cr-Mo alloy.PMMA,Al_2O_3,Dacron, calcium aluminate ,bioglass,vitreous and pyrolytic carbons**.**

b) Draw the structure of typical bone composition and comment on its electrical stimulation on bone healing. (06)

(Diagram-04 Mark, electrical stimulation on bone healing-02 Mark)

Ans:



Electrical stimulation has been shown to promote actin polymerization by fetal calvarial cells possibly through cyclic nucleotide or calcium dependent mechanisms. Damaged tissues tend to respond to a pulsed electromagnetic field (PEMF) preferentially with the result that normal structure and function is removed more rapidly. The femoral articular cartilage respond to PEMF. Electrostatic field have been investigated for both the correction of osteoporosis and stimulation of osteogenesis.Improved bone healing occurs at the negative electrode while resorption and osteoporosis occur at the positive electrode. The extent of healing due to electrical stimulation is related to the total energy applied. The effect of electrical stimuli on both growth and tissue repair.

Q. 5. Attempt any FOUR : **(16)**

a) Define biomaterials and give its classification. **(04)**

(Definition 02 marks, Classification 02 marks)

(Any relevant definition should be considered)

Ans:-

Biomaterial: It replaces a part or function of the body in safe reliable, economic and physiologically acceptable manner

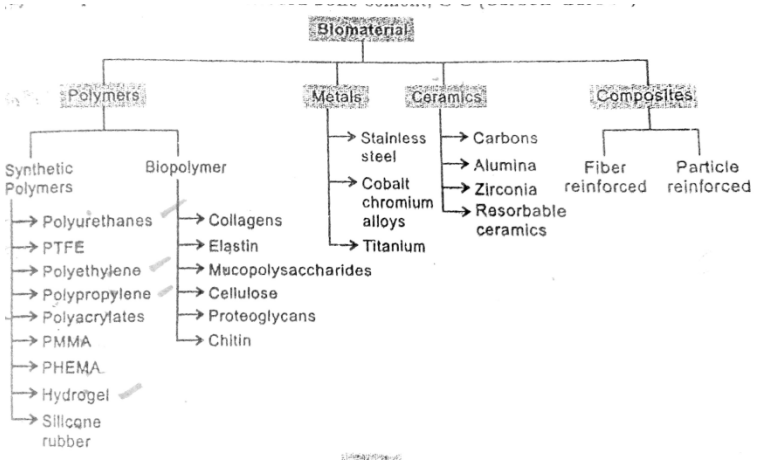
Biomaterial can be classified as follows:

a)Polymers:Polysers,polymides,silicon,rubber,polyether,collagen,elastin,mucopolysaccharides,chitinother polysaccharides,polyurethane,rubber,nylon,polytetrafloroethylene.

b) Metals: stainless steel, cobalt-chromium,itanium alloys, etc.

c) Ceramics: Alumina, zirconia, calcium phosphate

d) Composites: Fiber rainforceds,bone cement,C-C wire.



b) Give names of four resorbable ceramics. **(04)**

(01 Mark each)

Ans:-

Names of four resorbable ceramics are given below.

i) Plaster of Paris.

ii) Hydroxyapatite (HAP).

iii) β-tricalcium phosphate (TCP).

iv) Calcium aluminates.

c) Give four applications of hydrogel. (04)

(01 mark for each application)

Ans:

1) It is used in contact lenses.

2) It is used in dressing material.

3) It is used in drug delivery system.

4) It is used in transdermal drug delivery system.

d) List advantages and disadvantages of PMMA and UHMWPE with reference to total knee replacement. (04)

(02 marks for PMMA, 02 marks for UHMWPE including 01 advantages and 01 disadvantages for each)

Ans: PMMA

Advantage:1) It is having good resistance o ductile alkalis and other inorganic solution.(Any one)

2) It is having excellent biocompatibility.

3) It can be easily machined with conventional tools,molded,surfacecoate and plasma etched with glow or corona discharge.

4) The femoral component is fixed to the cortical bone of the femoral shaft. The fixation system may be either PMMA cement or a biological ingrowth type. The tibial portion consists of a broad plateau covering the tibia, consisting of a stiff metal tray supporting a polymeric or fiber reinforced polymer.

Disadvantage:1) Repeated tensile loading may cause failure ofPMMA-bone interface(any one)

UHMWPE:

Advantages: 1) Long term survivability of orthopedic implant.(any one)

Disadvantages:

1) Cobalt-chromium alloy combined with ultra high molecular weight polyethylene (UHMWPE) remains the contact surfaces of choice, despite some adverse effects on biocompatibility and mechanical problems. (Any one)

2) These include creep and fatigue of UHMWPE component due to high stresses and repeated loading and wear of polymeric contact surface due to adhesion of the polymeric surface to the metal.

e) Give the biological tolerance for the following metals in human body. (04)

i) Nickel

ii) Chromium

iii) Titanium

(Any two metals 02 marks each)

Ans:

i) Nickel: It is an essential element of limited biological activity with a wide-ranging distribution. In humans, it has a level of approximately 10 mg in adult human tissues. A normal blood level of nickel is around 5mg/l. In human inhalation of nickel may lead to renal effects but observation of toxicity are largely confined to carcinogenesis and hypersensitivity. It is sufficient to note here that nickel carcinogenesis in experimental animal is well established. While these facts are of some concern, their reference to implantation is not yet clear. Contact dermatitis for nickel and nickel alloys has been well established.

ii) Chromium: Like many of the transition metals, chromium is both an essential dietary element that is required in low concentrations (blood level average 2.8μg/IOO g) and also a toxic substance if present in the raised amounts. Chromium compounds are only poorly absorbed after oral ingestion and storage of chromium (III) is largely confined to the reticuloendothelial systems. The hexavalent chromium ion is able to pass the plasma membrane freely, both in and out of the cell and the reduction takes place mainly in the mitochondria. The mechanism of chromium toxicity is not entirely clear but it has been suggested that the in vivo reduction from hexavalent to trivalent states may be important.

iii)**Titanium:**Unlike nickel,titanium has a very good reputation for biocompatibility. Titanium and its compounds are not carcinogenic in experimental animals and humen.

f) List three biomaterials used in total joint replacement along with their area of application. (04)

(List -01 Mark, Application area o each-03 Mark)

Ans:

Table 11.6 Biomaterials used in total joint replacement

Material	*Application*
Metals	
Stainless steels 316L	Femoral stems, heads
Cobalt-based alloys	Porous coatings, femoral stems, heads, tibial and femoral components
Cast Co–Cr–Mo	
Wrought Co–Ni–Cr–MO	
Wrought Co–Cr–W–Ni	
Titanium-based materials	
CP Ti	Porous coatings second phase in ceramic and PMMA composites
Ti–6Al–4V	Femoral stems, heads, tibial and femoral components, porous coatings
Ti–5Al–2.5Fe	Femoral stems, heads
Ti–Al–Nb	Femoral stems, heads
Ceramics	
Bioinert	
Carbon	Coatings on metallic femoral stems, second phase in composites and bone cement
Alumina	Femoral stems, heads, acetabular cups
Zirconia	Femoral heads, acetabular cups
Bioactive	
Calcium phosphates	Coatings on metallic and ceramic femoral stems, scaffold materials, second phase in PMMA and UHMWPE composites
Bioglasses	Coatings on metallic and ceramic femoral stems
Polymers	
PMMA	Bone cement
UHMWPE/HDPE	Acetabular cups, tibial and patellar components, porous coatings on metallic and ceramic femoral stems
Polysulfolene	Femoral stems, porous coatings on metallic femoral stems
PTFE	Femoral stems, porous coatings on metallic femoral stems
Composites	
Polymer-based	Femoral stems
Polysulflone-carbon	
Polycarbonate-carbon	
Polysulfone-Kevlar	
Polycarbonate-Kevlar	

Q. 6. Attempt any <u>FOUR</u> : (16)

a) State four cellular events in bone healing. (04)

Note: There are only three types of cellular events. Consider any two or three give 04 marks)

Ans: There are only three types of cellular events

1) Fibroblastic

2) Chondroblastic.

3) Asteablastic.a) Trabicular bone b) Compact bone.

1)Fibroblastic: is a type of cell that synthesizes the extracellular matrix and collagen, the structural team work for animal tissue and plays a critical role in the bone healing .Fibroblast are the most common cells of connective tissue in animals.

Fibroblast from the periosteum and surrounding tissues produce cells energetically in to the region of fracture 1 or 2 days.

2) **Chondroblastic**: Next, a soft callus made mostly of collagen is created around the fracture by another special group of cells called chondroblasts. This stage can last anywhere from 4 days to 3 weeks.

3) **Asteablastic:** Asteoblasts begin to form new trabecular bone in the marrow.

After two weeks a collagen matrix replaces the entire clot and chondroblasts are seen in the region between the matrix and advancing bone growth.

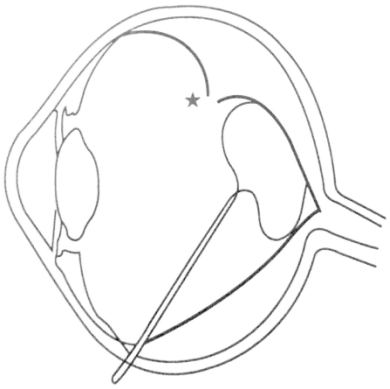
After a week or two the uptake of calcium and phosphorous in to the wound area increases which is attributed to the increased rate of bone mined deposition.

By third and fourth weeks the major activity is the replacement of chondraplasts by trabecular bone and after 5 -6 weeks the major activity is the remoulding of the bone tabular with the deposition of compact bone.

b) Sketch the diagram showing vitreous implant and give its drawbacks. (04)

(Diagram -02 Mark, Drawbacks- 02 Mark)

Ans:



Drawback:

It reports complications such as oil emulsification in the anterior chamber, glaucoma and coronial. dystrophy.

c) State the function of eye shields and list polymers used for its manufacturing. (04)

(Function – 02Mark, List polymer any four-02 Mark)

Ans: Thease are used in the treatment of basement membrane associated diseases, corneal abrasion and erosion, epithelial defects, cataract extraction, penetrating keratroplasty and other diseases that cause eye inflammation.

Polymers used for manufacturing: 1)Hydrogels

2)polyvinyl

3)Alcohol

4)Silicon rubber

5)Collagen.

d) Draw neat labelled diagram of Hollow fiber dialyzer. (04)

Note :(Any relevant diagram should be consider)

Ans:

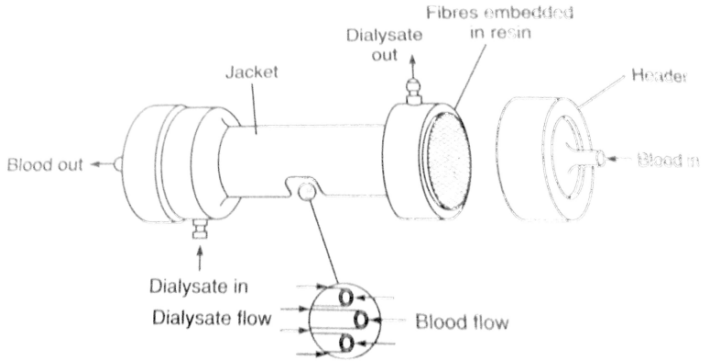


Fig : Hollow fiber dialyzer.

e) State need for cardiac pacemaker. (04)

Ans:

The rhythmic beating of the heart is due to triggering pulses that originate in an area of specialized tissue in the right atrium of the heart. This area known as the Sino-arterial node. In abnormal situation, if this natural pacemaker cases to function or becomes unreliable or if the triggering pulse does not reach heart muscle because of blocking by damaged tissues, the natural and normal synchronization of the heart action gets disturbed. When monitored, this manifests itself through a decrease in the heart rate and changes in the ECG waveform. By giving external electrical stimulation impulses to the heart muscle, it is possible to regulate the heart rate. These impulses are given by an electronic instrument called a pacemaker.