

I L Brown: MCQs in Pathology

This edition (1985) derives its questions from the 12th Edition of Muirs Textbook of Pathology.

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1. Genetics and Disease

1. For each of the features of DNA replication listed on the left select the most appropriate association from the list on the right.

- a. Splicing
 - b. Transcription
 - c. Translation
-
- A. Enzyme induced methylation.
 - B. mRNA copy of DNA.
 - C. Production of polypeptide chains from tRNA.
 - D. Removal of superfluous introns.
 - E. Stretches of DNA nearer 3' end of chain.

1. The answer is D, B, C. During splicing superfluous information transcribed from the introns of the genes is edited out of the mRNA.

Transcription is the process whereby an mRNA copy of the DNA of the gene is produced before a polypeptide can be synthesised.

Translation comprises production of tRNA by mRNA, with the tRNA amino acids arranged in the order necessary for the production of the specified polypeptide.

Stretches of DNA nearer 3' end of chain are promoters which control transcription by acting as switches upstream to the gene to be transcribed.

Enzyme induced methylation is a post-translation modification of polypeptide in the somatic cell.

2. For each of the patterns of inheritance on the left select the most appropriate disease from those on the right.

- a. Autosomal recessive.
- b. Dominant.
- c. X-linked recessive.

- A. Ankylosing spondylitis.
- B. Breast cancer.
- C. Duchenne muscular dystrophy.
- D. Glycogen storage disease.
- E. Neurofibromatosis.

The answer is D, E, C. Glycogen storage disease is an autosomal recessive specific enzyme deficiency that results in excessive accumulation of glycogen in liver, kidney, myocardium.

In neurofibromatosis a dominant character is expressed in one parent and can be expected in half of the offspring; multiple tumours of small nerves are present in this condition.

Duchenne muscular dystrophy is X-linked recessive disease. The gene for this form of muscular dystrophy is present on the X chromosome, hence females are not affected (being XX) while males are (being XY).

Ankylosing spondylitis is a disease of the vertebral column which is associated with a specific HLA type.

Breast cancer may tend to recur in particular families but there is no known genetic component.

2. Cell Damage

3. For each of the causes of membrane damage listed on the left select the most appropriate association from those listed on the right.

- a. *C. welchii* aphlatoxin.
- b. Hypoxia.
- c. Ouabain.

- A. Digestive damage to cell membrane.
- B. Failure of oxidative phosphorylation in mitochondria.
- C. Mechanical rupture of cell membrane.
- D. Poisoning of cell membrane ion pump.
- E. Stimulation of cell membrane ion pump.

The answer is A, B, D. *Clostridium welchii* aphlatoxin is a lecithinase which digests cell membrane resulting in increased permeability.

Hypoxia results in decreased oxidative phosphorylation in mitochondria with resultant lack of ATP.

Ouabain is a specific cell membrane ion pump antagonist which competes with K⁺ for a site on Na⁺K⁺ dependent ATP ase.

4. For each of the features on the left select the most appropriate association from the list on the right.

- a. Differentiation.
- b. Heterotopia.
- c. Metaplasia.

- A. Development of a clone of cells growing independently of normal cellular control.
- B. Loss of cellular specialization.
- C. Result of error in intercellular communication in developing fetus.
- D. Result of gene activation due to environmental change.
- E. Structural and functional specialization of cells.

The answer is E, C, D. Differentiation is a structural and functional specialization of cells. This is a feature of multicellular organisms, and depends on the selection of genes which each cell type expresses.

Heterotopia is a result of error in intercellular communication in developing fetus. Groups of cell differentiate in a way which is inappropriate to their anatomical location.

Metaplasia is a result of gene activation due to environmental change. This is the change of one differentiated cell type into another, and is often seen as a result of environmental factors, i.e., cigarette smoking.

Loss of cellular specialization is dedifferentiation.

Neoplasia comprises the development of a clone of cells growing independently of normal cellular controls.

5. For each example of necrosis listed on the left select the most suitable description from those on the right.

- a. Caseous necrosis.
 - b. Coagulative necrosis.
 - c. Colliquative necrosis.
-
- A. Cheese-like material.
 - B. Dull, swollen firm area.
 - C. Firm yellow/white patches.
 - D. Green/black discolouration.
 - E. Soft, liquefying material.

The answer is A, B, E. Caseous necrosis - cheese-like material. This is the typical appearance of tuberculous necrosis, but a similar appearance may also be seen in necrotic tumours, particularly squamous carcinoma.

Coagulative necrosis - dull, swollen firm area. This is typical of infarction in solid organs such as heart, kidney. Histologically 'ghost' outlines of the tissue structure are still present.

Colliquative necrosis - soft, liquefying material. This is typical of necrotic tissue with a high content of fluid, i.e., brain tissue. Histologically the tissue structure is lost.

3. Inflammation

6. If the following features of the acute inflammatory reaction were placed in chronological order which would come *fourth*?

- A. Arteriolar contraction.
- B. Blood flow slows.
- C. Dilatation of arterioles.
- D. Emigration of leucocytes from blood vessels.
- E. Protein rich fluid escapes from blood vessels.

The answer is B. In the acute inflammatory response the injury results in an initial contraction of arterioles (A) followed rapidly by arteriolar dilatation (C) in the process of active hyperaemia; as a result of the hyperaemia the inflammatory exudate is formed (E) and is responsible for swelling and pain; the microcirculation remains engorged, but blood flow slows down (B) with associated emigration of leucocytes (D).

7. Which *ONE* of the following ultrastructural features is believed to allow for the increased permeability of the vascular endothelium in acutely inflamed tissue?

- A. Cytoplasmic micropinocytotic vesicles.

- B. Gaps in endothelial tight junctions.
- C. Gaps in the basement membrane.
- D. Increase in number of phagolysosomes.
- E. No morphological changes.

The answer is B. There is experimental evidence that gaps appear between vascular endothelial cells during acute inflammation caused by injury and by chemical mediators. These gaps are temporary. Micropinocytotic vesicles (A) do transfer material across cells but are not increased in inflammation.

8. For each of the phases of increased vascular permeability in the acute inflammatory reaction noted on the left choose the most suitable association from those on the right.

- a. Immediate sustained response.
 - b. Immediate transient response.
 - c. Delayed prolonged leakage.
-
- A. Endothelial cells elongate.
 - B. Leakage occurs through vascular endothelium.
 - C. Leakage occurs through venules and capillaries.
 - D. Secretion of exogenous mediators by endothelial cells.
 - E. Surrounding tissue and endothelium damaged.

The answer is E, B, C. Immediate sustained response - surrounding tissue and endothelium damaged. This occurs in more severe injury in which vascular damage may be so great as to cause thrombosis and even infarction of the tissues.

Immediate transient response - Leakage occurs through vascular endothelium. In the experimental models only venular leakage occurs in this phase; this suggests endogenous mediator activity.

Delayed prolonged leakage - Leakage occurs through venules and capillaries. Both capillaries and venules leak in this phase, but leakage is confined to the zone of injury suggesting that this is due to direct endothelial injury.

9. Which *ONE* of the following is *not* an endogenous mediator of increased vascular permeability?

- A. Angiotensin.
- B. C3a and C5a.
- C. 5-hydroxytryptamine.
- D. Kallikrein.
- E. Prostaglandin E2.

The answer is A. Angiotensin is produced by the action of renin on angiotensinogen and is involved in the secretion of aldosterone and in pressor effects.

C3a and C5a (B) are part of the complement cascade and are activated C3 and C5; they act by liberating histamine from mast cells.

5-hydroxytryptamine (C) or serotonin causes increased vascular permeability in rodents but not in man.

Kallikrein (D) is produced by the activation of Hageman factor (factor XII) producing prekallikrein activator which converts prekallikrein to kallikrein.

Prostaglandin E2 (E) is secreted by polymorphs which are phagocytically active, it does not cause increased permeability itself but potentiates the activity of other factors.

10. Which *ONE* of the following is *not* a useful effect of acute inflammation?

- A. Dilution of toxins.
- B. Formation of fibrin.
- C. Phagocytosis.
- D. Stimulation of immune response.
- E. Swelling of tissues.

The answer is E. Tissue swelling may result in obstruction of a vital passageway, i.e., larynx, or may cause ischaemic necrosis within an enclosed space, i.e., testis.

The others are all useful but some people may have an inappropriate immune response and may therefore develop a pathological condition as part of their physiological response, i.e., asthmatics. There is also a rare condition in which a deficiency of a complement activation controlling factor (C1-inhibitor) allows complement activation to occur (angio-neurotic oedema).

11. Which *ONE* of the following is *not* an acceptable characteristic of a granuloma.

- A. Composed of altered macrophages.
- B. Composed of fused macrophages (giant cells).
- C. Composed of epithelioid cells.
- D. Composed of a mixture of chronic inflammatory cells.
- E. Composed of polymorphonuclear leucocytes, cellular debris and fibrin.

The answer is E. Composed of polymorphonuclear leucocytes, cellular debris and fibrin - This is a description of pus as would be found in an abscess. Polymorphonuclear leucocytes and nuclear debris can be found in a true granuloma if there is a focus of suppuration: an infective granuloma.

The definition of 'granuloma' is controversial; it may be used to mean a chronic inflammatory lesion forming a tissue mass or it may be restricted to a lesion composed of macrophages or even of altered macrophages (epithelioid cells).

12. For each of the cell type listed on the left choose the most appropriate association from those on the right.

- a. Alveolar macrophages.
- b. Kupffer cells.
- c. Langhans' giant cells.

- A. CNS phagocytes.
- B. Digest bone matrix.
- C. Lining cells of hepatic sinusoids.
- D. Nuclei arranged peripherally in the cytoplasm.
- E. Phagocytic activity dependent on oxygen.

The answer is E, C, D. Alveolar macrophages - phagocytic activity dependent on oxygen. The alveolar macrophages illustrate the point that local environment may influence cellular function; unlike other phagocytic cells these cells require high oxygen tension for full activity.

Kupffer cells - lining cells of hepatic sinusoids. The Kupffer cell lines the hepatic sinusoids and is active in phagocytosis of particulate matter in the liver.

Langhans' giant cell - nuclei arranged peripherally in the cytoplasm. The Langhans' giant cell characteristically has a large number of peripherally arranged nuclei; this cell is typical of the tuberculous granuloma.

Central nervous system phagocytes. The representative of the mononuclear phagocyte system in the CNS (A) is the microglial cell.

Digest bone matrix. Osteoclasts are derived from bone marrow precursors and digest matrix (B).

4. Healing and Repair

13. If the following events were placed in their most probable order of occurrence following a skin wound which would come *fourth*?

- A. Blood clot formation.
- B. Growth of granulation tissue.
- C. Loss of vascularity of fibrous scar.
- D. Migration of epithelial cells from wound edges.
- E. Wound edges united by collagen.

The answer is E. In a wound healing by first intention the gap fills with blood clot (A); epithelium migrates from the wound edges and within 48 hours the gap is bridged by epithelium (D); granulation tissue grows into the wound (B) forming a scaffolding by which the wound edges are united by collagen (D), producing a narrow fibrous scar which gradually loses its vascularity (C).

14. From the list on the right choose the most suitable association for each of the types of collagen listed on the left.

- a. Type I collagen.
- b. Type II collagen.
- c. Type IV collagen.

- A. Basement membrane.
- B. Cartilage.
- C. Dermis.
- D. Embryonic dermis.
- E. Synovial membrane.

The answer is C, B, A. Type I collagen is found in dermis, tendon, bone, dentine and cornea. (C)

Type II collagen is found in cartilage, intervertebral disks, vitreous body. (B)

Type III collagen is found in embryonic dermis, early scar tissue, synovial membrane and is known as reticulin.

Type IV collagen is found in basement membrane and shows a different ultrastructural appearance from the others (it does not have the typical 64 nm banding). (A)

15. If the following events in the healing of an open wound were in their most probable order which would come *fourth*?

- A. Emigration of polymorphonuclear leucocytes and macrophages.
- B. Epithelial proliferation.
- C. Myofibroblast contraction.
- D. Orientation of fibroblasts parallel to the capillary buds.
- E. Proliferation of new capillaries from the base of the wound.

The answer is D. In a wound healing by second intention (either an open wound or ulcer with loss of tissue, or an infected wound) there is emigration of polymorphonuclear leucocytes, macrophages from the vessels (A) initially with the presence of more abundant fibrinous exudate. Epithelial proliferation (B) is the first sign of healing followed by the proliferation of capillary buds (E) forming granulation tissue with the associated proliferating fibroblasts (D). The fibroblast orientation later becomes parallel to the epithelial surface and contractility of these 'myofibroblasts' (C) helps to reduce the area of the open wound. Scar tissue is usually more prominent than following first intention healing.

16. Which *ONE* of the following does *not* impair healing of a wound?

- A. Deficiency of galactosamine.
- B. Deficiency of vitamin C.
- C. Excess of adrenal glucocorticoid hormones.
- D. Good vascular supply.
- E. Tissue hypoxia.

The answer is D. Wounds in areas of poor vascularity (i.e., the skin of the shin) heal very slowly compared with wounds of the face and scalp. Tissue hypoxia following severe injury results in poor healing (E). Galactosamine and vitamin C (A, B) are essential for the repair of ground substances and collagen including type IV (basement membrane) collagen. Excessive glucocorticoids (C) are associated with poor healing, and this may be seen in patients on long-term steroid therapy.

17. Which of the following events occurs *fourth* in sequence after a fracture of a typical long bone?

- A. Capillary proliferation from viable marrow.
- B. Increased osteoclastic resorption.
- C. Lamellar bone replaces woven bone.
- D. Ossification of the persistent fibrin clot.
- E. Periosteal proliferation around the fractured bone ends.

The answer is D. Following fracture of a long bone provisional callus is formed by the proliferation of periosteal inner layer (E) which forms a cuff of bone trabeculae which produce the external callus; medullary cavity reaction (A) results in organization of the fibrin clot with production of woven bone in the marrow spaces; cortical reaction (B) results in increased osteoclastic resorption. The external callus unites the fragments externally, but not the bone ends which are joined by the fibrin clot and debris which in turn are ossified by osteogenic cells from the medullary cavity and periosteal callus (D). The final steps is remodelling of the bone (C) with formation of lamellar bone and resorption of the external callus, and eventually medullary callus.

5. The Immune Response

18. For each of the features of the immunoglobulin molecule listed on the left select the most appropriate association from those on the right.

- a. Fab fragment.
 - b. Fc fragment.
 - c. $F(ab^1)_2$ fragment.
-
- A. C-terminal region.
 - B. Consists of heavy chains only.
 - C. Consists of light chain and part of heavy chain.
 - D. Consists of light chains only.
 - E. Pepsin digestion product.

The answer is C, A, E. Fab fragment - consists of light chain and part of heavy chain. Papain digestion of monomeric immunoglobulin results in the production of two antibody-binding fragments (Fab) which consist of light chains plus part of the heavy chain.

Fc fragment - C-terminal region. Papain digestion of monomeric immunoglobulin results in the production of a fragment consisting of the C-terminal ends of the heavy chains linked together (Fc).

F(ab¹)₂ fragment - pepsin digestion product. Pepsin digestion splits the immunoglobulin molecule to produce a fragment consisting of two Fab fragments united by a portion of the Fc fragment.

19. For each of the types of immunoglobulin listed on the left select the most appropriate association from those on the right.

- a. IgG class specific antibody.
 - b. IgM class specific antibody.
 - c. Dimeric IgA class antibody.
-
- A. J-chain.
 - B. Lymphocyte surface antigen receptor.
 - C. Mast cell degranulation.
 - D. Primary antibody response.
 - E. Secondary antibody response.

The answer is E, D, A. Following injection of antigen into an animal not previously exposed to that antigen there is a transient appearance in the blood of a small quantity of specific IgM class antibody in about 7 days (primary antibody response); re-injection of the antigen at a later date results in production of IgG class antibody in large amounts within 4 days (secondary antibody response).

IgA is secreted by plasma cells as a dimer, i.e., 2 molecules linked together by a polypeptide, J-chain. IgM is also produced as a pentamer, the 5 IgM molecules being linked by 1 J-chain and 4 disulphide bonds.

Mast cell degranulation (C) is a property of IgE.

Lymphocyte surface antigen receptor (B) is a property of IgD.

20. For each of the types of T lymphocyte listed on the left select the most appropriate association from the list of surface markers on the right.

- a. Helper T lymphocytes.
 - b. Prothymocytes.
 - c. Suppressor T lymphocytes.
-
- A. T₄ positive cells.
 - B. T₄ - T₈ positive cells.
 - C. T₈ positive cells.
 - D. T₉ positive cells.
 - E. T₁₀ positive cells.

The answer is A, E, C. Monoclonal antibodies to T lymphocyte surface antigens have resulted in identification of various subtypes of T lymphocyte. T₉ positive cells are primitive T lymphocytes. Cells bearing both T₄ and T₈ are common thymocytes.

Helper T lymphocytes - T₄ positive cells.

Prothymocytes - T₁₀ positive cells.

Suppressor T lymphocytes - T₈ positive cells.

21. If the following features were put in chronological order which would come *fourth*?

- A. Exposure to antigen.
- B. Differentiation into plasmablasts.
- C. Immunoblast proliferation.
- D. Production of mature plasma cells.
- E. Stimulation of germinal centre cells.

The answer is B. Exposure to antigen (A) results in stimulation of (E) the cells in the superficial cortex of the lymph node (germinal centre cells); these cells enlarge and develop into B-immunoblasts (C) which divide and some differentiate into plasmablasts (B), which mature into plasma cells (D). A proportion of the B-immunoblasts differentiate into B memory cells and join the circulating pool of small lymphocytes.

22. For each of the features of a lymph node listed on the left select the most appropriate association from those on the right?

- a. Expansion of the deep cortex (paracortex) of the lymph node.
 - b. Primary lymphoid nodules.
 - c. Production of germinal centres.
-
- A. Macrophage predominates.
 - B. Plasma cells predominate.
 - C. Region of T-cell response.
 - D. Superficial cortex of stimulated lymph node.
 - E. Superficial cortex of unstimulated lymph node.

The answer is C, E, D. Expansion of the deep cortex (paracortex) of the lymph node - region of T-cell response. The deep (or para) cortex is the T-lymphocytic zone of the lymph node and this enlarges during antigenic stimulus resulting in a cell mediated response.

Primary lymphoid nodules - superficial cortex of unstimulated lymph node. In the unstimulated lymph node there are localized aggregates of lymphocytes in the superficial cortex.

Production of germinal centres - superficial cortex of stimulated lymph node. Following antigenic stimulation of a type resulting in antibody production (humoral response) the primary nodules enlarge, to become germinal centres where B-lymphocytes proliferate.

During the humoral response plasma cells are produced and these may be seen in the cortex deep to the germinal centres and in the medullary cords.

Macrophages are present lining the lymph sinuses and in some forms of stimulation may become very prominent (sinus histiocytosis).

6. Immunopathology

23. For each of the components of complement listed on the left select the most appropriate association from the features on the right.

- a. C3b.
 - b. C5a.
 - c. C5b-9 complex.
-
- A. Chemotactic for neutrophil polymorphs.
 - B. Deficiency has no pathological effect.
 - C. Inhibits mast cell degranulation.
 - D. Macrophage surface receptor.
 - E. Target cell plasma membrane injury.

The answer is D, A, E. C3b - macrophage surface receptor. Macrophages (and polymorphs) have surface receptors for C3b which results in enhanced adherence of these cells to target cells with C3b on their surface.

C5a - chemotactic for neutrophil polymorphs. C5a promotes the emigration and accumulation of neutrophil polymorphs and macrophages.

C5b-9 complex - target cell plasma membrane injury. The final product of the complement cascade is a complex of C5b6789 which is inserted into the target cell plasma membrane resulting in cell lysis.

Deficiency of the early stages of the complement cascade has no pathological effect.

C3a and C5a both stimulate mast cell and basophil degranulation.

24. If the following features of the atopic reaction were placed in their correct order which would come *fourth*?

- A. Antigen absorbed for the second time.
- B. Degranulation of mast cells.
- C. Inhalation of pollen.
- D. Mast cell binding by Fc component of IgE.
- E. Production of IgE.

The answer is A. Atopy (anaphylactic, immediate or type 1 hypersensitivity) occurs when IgE binds to mast cells and causes degranulation; antigen is absorbed (C) and the immune response produces specific IgE (E) which binds by its Fc component to mast cells (D); subsequent exposure to the antigen (A) results in antigen trapping by the IgE Fab components on the mast cells with subsequent degranulation (B).

25. For each of the hypersensitivity reactions on the left select the most appropriate association from the conditions on the right.

- a. Arthus reaction.
- b. Cytotoxic antibody reaction.
- c. Delayed hypersensitivity reaction.

- A. Asthma.
- B. Auto-immune haemolytic anaemia.
- C. Extrinsic allergic alveolitis.
- D. Infantile eczema.
- E. Tuberculoid leprosy.

The answer is C, B, E. Artus reaction - extrinsic allergic alveolitis. Immune complex, Arthus type (type 3) reaction is the basis of extrinsic allergic alveolitis (farmer's lung) which is a reaction to bacterial spores growing on mouldy hay.

Cytotoxic antibody reaction - auto-immune haemolytic anaemia. Cytotoxic antibody (type 2) reactions are mediated by antibody which combines with cell surface antigenic determinants usually causing lysis. Auto-immune haemolytic anaemia, idiopathic thrombocytopenic purpura are examples.

Delayed hypersensitivity reaction - tuberculoid leprosy. Delayed hypersensitivity (type 4) reactions are mediated by primed T-lymphocytes; Tuberculoid leprosy, tuberculosis and contact dermatitis are examples.

Asthma and infantile eczema are examples of atopy (type 1).

26. Which *ONE* of the following is *not* an organ specific auto-immune disease?

- A. Auto-immune adrenalitis.
- B. Chronic auto-immune gastritis.
- C. Chronic auto-immune thyroiditis.
- D. Insulin dependent diabetes.
- E. Rheumatoid arthritis.

The answer is E. Rheumatoid arthritis is one of the group of connective tissue diseases with evidence for an auto-immune pathogenesis. Rheumatoid factor consists of IgM antibodies to altered IgG which is autoantigenic. In insulin dependent diabetes the trigger for the auto-immune reaction may be a viral infection.

27. For each of the types of immunological deficiency states listed on the left select the most appropriate association from those on the right.

- a. Di George syndrome.
- b. Infantile sex-linked agammaglobulinaemia.
- c. Severe combined immunodeficiency.

- A. Defective B-cell function.
- B. Defective B- and T-cell function.
- C. Defective T-cell function.
- D. Defective platelets.
- E. Defective vessels.

The answer is C, A, B. Di George syndrome - defective T-cell function. There is almost complete failure of development of the thymus and parathyroids from the third and fourth branchial arches.

Infantile sex-linked agammaglobulinaemia - defective B-cell function. This selective B-cell defect (Bruton type) results in failure to produce IgG, IgM and IgA.

Severe combined immunodeficiency - defective B- and T-cell function. This combined type (Swiss type) of agammaglobulinaemia has failure of development of both thymus dependent and thymus independent systems.

Platelets are abnormal (D) in the rare Wiskott-Aldrich syndrome in which T-cell function, IgM and IgA are also abnormal.

Abnormal vessels (E) are a feature of ataxia telangiectasia in which there is abnormal cell mediated immunity and low levels of IgA and IgE.

7. Infection

28. Which *ONE* of the following is *not* a feature of interferons?

- A. Imparts resistance to virus infection.
- B. Inhibits virtually all viruses.
- C. Released from cells in response to virus infection.
- D. Species specific cellular protein.
- E. Virus specific antiviral effect.

The answer is E. The production of interferons is induced in host cells by virus; the interferons are not specific, but are an important host defence mechanism against virus infection. They act by inhibiting translation of viral mRNA by host cells.

29. For each of the features listed on the left select the most appropriate association from those on the right.

- a. Bacteraemia.
- b. Pyaemia.
- c. Septicaemia.

- A. Due to bacterial exotoxin.
- B. Fragment of septic thrombus.
- C. End result of viral infection.
- D. May be the result of vigorous teeth brushing.

E. Multiplication of bacteria in the blood.

The answer is D, B, E. Bacteraemia - may be the result of vigorous teeth brushing. Bacteraemia is the presence of small numbers of bacteria in the blood; this can occur in normal individuals, i.e., after teeth brushing (NB this may be important in patients with valvular heart disease).

Pyaemia - fragment of septic thrombus. Pyaemia (pus in blood) is the result of localized pyogenic infection damaging vascular endothelium and producing infected thrombus which breaks down.

Septicaemia - multiplication of bacteria in the blood. Septicaemia is the presence and multiplication of organisms in the blood stream; this is the most serious type.

Bacterial exotoxins (A) are produced by living bacteria. None of these is an end result of viral infection (C) since all are caused by bacteria.

30. Which one of the following is the best definition of gangrene?

- A. Digestion of dead tissue by saprophytic bacteria.
- B. Digestion of living tissue by saprophytic bacteria.
- C. Gas production in dead tissue.
- D. Necrosis of tissue caused by bacterial toxins.
- E. Necrosis of tissue caused by ischaemia.

The answer is A. In gangrene, tissue which is dead is digested by bacteria which are incapable of invading and multiplying in living tissue (saprophytes). Gas production (C) may be present in some forms of gangrene particularly when caused by the anaerobic *Clostridia*.

Necrosis of tissue is an essential prerequisite for gangrene, but it may be caused by ischaemia (E), i.e., secondary gangrene or by bacterial toxins (D), i.e., primary gangrene.

31. The pathogenicity of the tubercle bacillus is due to which *ONE* of the following?

- A. Ability to multiply within macrophages.
- B. Delayed hypersensitivity reaction against the bacteria.
- C. Direct toxic effect on host cells.
- D. Effective antibody response.
- E. Necrosis caused by expanding granulomas.

The answer is B. Mycobacteria stimulate a specific T-cell response of cell mediated immunity; while this is effective in reducing the infection the delayed hypersensitivity reaction also damages the tissues. The tubercle bacilli have no demonstrable direct toxic action (C) and can survive within macrophages (A). This may account for latent infections and reactivation of tuberculosis. There is no significant humoral response to tubercle bacilli (D). Necrosis occurs in tuberculosis, but it is usually within the granuloma (E).

32. For each of the features of tuberculous infection listed on the left select the most appropriate association from those on the right.

- a. Cold abscess.
 - b. Miliary tubercles.
 - c. Primary complex.
-
- A. Lesion in the lung.
 - B. Lesion in lung and hilar lymph nodes.
 - C. Scar tissue with calcification.
 - D. Small white lesions in the liver, spleen and kidney.
 - E. Soft white mass of caseous pus.

The answer is E, D, B. Caseous material may liquefy following invasion by polymorphs to produce tuberculous pus; this occurs in kidneys and bone and may extend into soft tissues.

Spread by the blood stream occurs in miliary TB and organs affected contain multiple small (1-2 mm) white nodules (miliary tubercles) which undergo caseous necrosis.

Initial infection produces the primary lesion, i.e., in lung (A) which remains small, but bacteria spread to the regional lymph nodes to form the primary complex of primary lesions plus involved regional lymph nodes. Scar tissue with calcification (C) is a common result of healing of tuberculosis.

33. For each of the features of syphilis listed on the left select the most appropriate association from those on the right.

- a. Primary sore.
 - b. Secondary lesions.
 - c. Tertiary lesions.
-
- A. Degeneration of posterior columns of spinal cord.
 - B. Destruction of the nasal bones.
 - C. Miliary gummas.
 - D. Rash on the soles of the feet.
 - E. Pale brown nodules on the penis.

The answer is E, D, B. The primary sore occurs after an incubation period of 3-4 weeks during which period *Treponema pallidum* is spreading in the blood.

The secondary lesions occur 2-3 months after infection and are characterized by skin rashes, alopecia and general malaise.

The typical lesions of the tertiary phase occur many years after infection and cause necrosis of internal organs, liver, testis and bones. The gumma is a necrotic granuloma.

Tabes dorsalis (A) occurs in the late quaternary phase of neurosyphilis. Miliary gummas (C) are present in congenital syphilis.

8. Disturbances of Blood Flow

34. Which *ONE* of the following is *not* a feature of thromboxane A₂?

- A. Inhibits platelet adenylyl cyclase.
- B. Produced by action of an endothelial cell enzyme.
- C. Produced by conversion of cyclic endoperoxidase by platelets.
- D. Prostaglandin with a half-life of 30 seconds.
- E. Stimulates platelet adhesion and aggregation.

The answer is B. Vascular endothelium is rich in prostacyclin synthetase which produces prostacyclin from the cyclic endoperoxidases. Thromboxane A₂ is produced by the action of platelet thromboxane synthetase on cyclic endoperoxides (C). It stimulates platelet adhesion and aggregation (E) by inhibiting platelet adenylyl cyclase (A). It is a prostaglandin with a very short half life (D).

35. For each of the features of the clotting (coagulation) mechanism on the left select the most appropriate association from those on the right.

- a. Common pathway.
 - b. Extrinsic pathway.
 - c. Intrinsic pathway.
-
- A. Can occur in the test tube.
 - B. Converts prothrombin to thrombin.
 - C. Produced by fibroblasts.
 - D. Production of plasmin.
 - E. Result of tissue injury.

The answer is B, E, A. The common pathway (produced by extrinsic or intrinsic routes) results in the conversion of prothrombin to thrombin, which converts fibrinogen to fibrin monomer.

The extrinsic pathway is the result of the action of thrombokinase produced by tissue injury.

The intrinsic pathway results in clotting without the participation of tissue injury factors.

The production of plasmin (D) is the result of the action of activators on plasminogen and is responsible for the solubilization of fibrin. Fibrin is not produced by fibroblasts (C).

36. Which *ONE* of the following is *not* associated with thrombosis?

- A. Activation of the coagulation mechanism.

- B. Endothelial damage.
- C. Formation of platelet aggregates.
- D. Thrombocytopenia.
- E. Vascular stasis.

The answer is D. Lack of platelets or abnormal platelets will result in a decreased ability to form thrombus.

The major factors predisposing to thrombosis are abnormalities of vessel walls (B), disturbances of blood flow (E) and alterations to blood favouring coagulation (A) and platelet aggregation (C).

37. If the following events were placed in chronological order which would come *fourth*?

- A. Cholecystectomy.
- B. Deep venous thrombosis.
- C. Embolization.
- D. Pulmonary infarction.
- E. Stasis in calf veins.

The answer is C. During surgery and post operatively (A) stasis occurs in the deep veins in the calves (E) resulting in thrombosis (B); fragments of thrombus break off into the circulation (C), plug the pulmonary arteries and cause infarction (D). A significant number of emboli come from thrombosis of pelvic veins.

38. For each of the types of infarct listed on the left select the most suitable cause from the list on the right.

- a. Cerebral boundary zone infarction.
 - b. Haemorrhagic infarction.
 - c. Venous infarction.
- A. Coronary artery thrombosis.
 - B. Embolization of renal artery.
 - C. Follows an episode of hypotension.
 - D. Marantic thrombosis of superior longitudinal sinus.
 - E. Obstruction of superior mesenteric artery.

The answer is C, E, D. There are areas of relatively poor vascularization between the territories of the major cerebral arteries; hypotension may result in poor perfusion in these areas giving localized infarction.

Obstruction of the superior mesenteric artery results in haemorrhagic infarction of the intestine which progresses to gangrene.

In debilitated children thrombosis of the superior longitudinal sinus results in engorgement of the cerebral cortical veins and haemorrhage.

Emboli in the renal artery cause pale wedge-shaped infarcts of the renal cortex (B). Thrombosis of the coronary arteries results in myocardial infarction (A). Both of these are examples of end arteries.

39. Which *ONE* of the following is *not* a cause of general oedema?

- A. Carcinomatosis.
- B. Hay fever.
- C. Kwashiorkor.
- D. Nephrotic syndrome.
- E. Right ventricular failure.

The answer is B. Hay fever is a cause of local oedema; the active hyperaemia of the acute inflammatory reaction being responsible. Right ventricular failure (E) causes cardiac oedema; hypoalbuminaemia is a feature of the nephrotic syndrome (D) which is accompanied by oedema; kwashiorkor (C) is responsible for oedema due to the severe hypoproteinaemia; some patients with chronic wasting diseases (A) develop oedema as a result of cardiac failure and hypoproteinaemia.

40. Which *ONE* of the following is *not* a cause of secondary hyperaldosteronism?

- A. Adrenocortical adenoma.
- B. Hepatic cirrhosis with ascites.
- C. Nephrotic syndrome.
- D. Renal artery stenosis.
- E. Untreated congestive cardiac failure.

The answer is A. Adrenocortical adenomas may secrete excess aldosterone producing primary hyperaldosteronism.

Patients with hepatic cirrhosis with ascites (B), nephrotic syndrome (C) and cardiac failure (E) have retention of sodium and water (oedema), but the sodium is extravascular and so the kidney responds as in sodium deprivation.

Renal artery stenosis (D) results in a stimulus to renin release.

41. For each of the types of shock listed on the left select the most appropriate cause from the list on the right.

- a. Cardiogenic shock.
- b. Hypovolaemic shock.
- c. Septic shock.

- A. Burns involving 15 per cent of the skin's surface.
- B. Cytotoxic drug therapy.
- C. Incompatible blood transfusion.
- D. Pancreatitis.
- E. Rupture of a heart valve cup.

The answer is E, A, B. The commonest cause of cardiogenic shock is myocardial infarction; but rupture of a heart valve, cardiac tamponade or arrhythmia can cause it.

Hypovolaemic shock usually results from trauma - severe haemorrhage, or burns being the usual cause. In extensive burns there is considerable exudation of plasma resulting in hypovolaemia.

Septic shock occurs in patients with septicaemia or extensive localized infections, i.e., peritonitis; it may complicate gastrointestinal, urogenital or biliary surgery and can occur in immunosuppressed patients. The shock of pancreatitis (D) is probably chemical in nature, while that of incompatible blood transfusion (C) is the result of an immunologically mediated reaction.

9. Tissue Degenerations

42. Which *ONE* of the following is *not* a feature of amyloid?

- A. Extracellular fibrillar material.
- B. Filaments of 75 nm diameter.
- C. Intracellular protein.
- D. Present initially in the wall of small blood vessels.
- E. Shows red-green birefringence when stained with Congo Red.

The answer is C. Amyloid is an extracellular substance (A) consisting of fibrillar material with a characteristic ultrastructural appearance (B). It is seen initially in the walls of small blood vessels (D) in relation to the basement membrane. The most specific histological reaction is the red-green birefringence seen with Congo Red and polarized light microscopy (E).

43. For each of the types of amyloid listed on the left select the most appropriate cause from the list on the right.

- a. Amyloid of immunoglobulin origin.
- b. Amyloid of unknown origin.
- c. Genetically determined amyloid.

- A. Bronchopneumonia.
- B. Depression of T-cell function.
- C. Familial Mediterranean fever.
- D. Multiple myeloma.
- E. Rheumatoid arthritis.

The answer is D, E, C. Fifteen per cent of patients with multiple myeloma have amyloid of immunoglobulin origin derived from immunoglobulin light chains produced by the neoplastic cells.

Amyloid of unknown origin is seen in chronic infections (TB, syphilis, osteomyelitis) as well as in patients with rheumatoid arthritis.

Genetically determined amyloid is rare and is seen particularly around the Mediterranean; there are several different types.

Depression of T-cell function (B) has been suggested as a cause of amyloid but the evidence is contradictory. Bronchopneumonia (A) is an acute infection and is not associated with amyloid; bronchiectasis is a chronic lung condition often complicated by amyloid.

44. For each of the types of pigmentary abnormality listed on the left select the most suitable cause from those on the right.

- a. Chloasma.
 - b. Haemochromatosis.
 - c. Melanosis coli.
-
- A. Adrenal gland failure.
 - B. Ingestion of purgatives.
 - C. Iron storage in parenchymal cells.
 - D. Obstruction of the biliary tract.
 - E. Side effects of oral contraceptives.

The answer is E, C, B. An increase in melanin pigment in the skin of the face is seen in pregnancy and occurs as a complication of oral contraceptive therapy.

Excessive iron absorption results in overload of storage capacity and iron is deposited in the parenchymal cells of organs such as liver.

Excessive ingestion of anthracene derived purgatives results in a brown pigmentation of the colonic mucosa as a result of deposition of pigment in macrophages. Adrenal gland failure (Addison's disease) causes increased melanin pigmentation of the skin (A). Obstruction of the biliary tree (D) results in jaundice due to increased bilirubin and bilirubin glucuronide.

45. Which *ONE* of the following does *not* predispose to dystrophic calcification?

- A. Active phagocytosis of debris.
- B. Fat necrosis.
- C. Hyaline change in fibrous tissue.
- D. Inspissated material in salivary ducts.
- E. Venous thrombosis.

The answer is A. Rapid removal of tissue debris, necrotic material etc. would not allow dystrophic calcification to occur. The others all result in the local factors likely to result in calcification (fat necrosis, hyaline change in fibrous tissue, inspissated material in salivary ducts, venous thrombosis).

10. Tumours: General Features

46. From the list on the right select the most appropriate definition for each of terms on the left.

- a. Anaplasia.
- b. Differentiation.
- c. Dysplasia.

- A. Complete loss of resemblance to tissue of origin.
- B. Degree of resemblance to tissue of origin.
- C. Describes rate of growth of tumour tissue.
- D. Partial loss of resemblance to tissue of origin.
- E. Tissue of origin.

The answer is A, B, D. Anaplasia is a complete loss of resemblance to tissue of origin and is a feature of malignant tumours.

Differentiation is the degree of resemblance of a tumour to its tissue of origin: well differentiated tumours closely resemble their tissue of origin, poorly differentiated tumours show little resemblance.

Dysplasia is a partial loss of resemblance to tissue of origin and is a feature of many pre-malignant conditions and of some benign tumours.

There is no specific term for the rate of growth of tumour tissue (C): the mitotic rate of a tumour gives some idea of tumour growth.

The tissue of origin (E) is known as the histogenesis.

47. For which *ONE* of the following tumours is there a definite genetic basis in a proportion of cases?

- A. Bronchial carcinoma.
- B. Cervical carcinoma.
- C. Colonic carcinoma.
- D. Endometrial carcinoma.
- E. Vaginal carcinoma.

The answer is C. Polyposis (adenomatosis) coli has a Mendelian dominant inheritance, half the members of the family developing colonic polyps with resultant colonic carcinoma in early adult life.

Some families have similar tumour, i.e., bronchial carcinoma or gastric carcinoma occurring in siblings and in several generations without definite evidence of a genetic predisposition.

Vaginal (clear cell) carcinoma (E) may develop in teenage girls whose mothers took diethylstilbestrol in pregnancy.

48. In which *ONE* of the following animal species does an experimental model for bladder carcinogenesis by 2-naphthylamine exist?

- A. Cat.
- B. Dog.
- C. Mouse.
- D. Rat.
- E. Syrian Golden Hamster.

The answer is B. Epidemiological evidence implicated 2-naphthylamine as a potential bladder carcinogen in the aniline dye industry; only dogs and man convert the non-carcinogenic 2-naphthylamine to carcinogenic 1-hydroxy-2-naphthylamine in the kidney.

This carcinogen is concentrated in the urine and can induce urothelial tumours.

49. For each of the chemical carcinogens listed on the left select the most appropriate tumour from the list on the right.

- a. Arsenic.
- b. 2-acetyl-aminofluorene.
- c. Nitrosamine.

- A. Breast cancer.
- B. Liver cancer.
- C. Pleural mesothelioma.
- D. Skin cancer.
- E. Stomach cancer.

The answer is D, B, E. Chronic arsenical administration can cause skin cancer; inhalation of arsenical compounds can also cause bronchial carcinoma.

Aminofluorenes can cause liver and bladder cancer.

Chemical action within the stomach can form nitrosamines from food; nitrosylation can also occur in the colon, and may be responsible for colonic carcinoma production. Breast cancer (A) has no known chemical carcinogen. Pleural mesothelioma (C) is associated with asbestos exposure.

50. For each of the forms of radiation listed on the left select the most appropriate association from the list on the right.

- a. 'Hard' X-rays.
- b. 'Soft' X-rays.
- c. Ultraviolet-B light.

- A. Chronic myeloid leukaemia.
- B. Gastric carcinoma.
- C. Malignant melanoma.
- D. Skin cancer in radiologists.
- E. Squamous carcinoma of the mouth.

The answer is A, D, C. Chronic myeloid leukaemia occurred in radiologists who calibrated x-ray machinery using their arms; more penetrating x-rays are able to reach the haematopoietic marrow.

Skin cancer occurred in the earlier days of radiology when soft x-rays were used, and calibration was performed as above.

Malignant melanoma (as well as squamous carcinoma and basal cell carcinoma) occur in white-skinned people exposed to high intensity sunlight.

Gastric carcinoma (B) and squamous carcinoma of the mouth (E) may be associated with irritation or trauma to mucosal surfaces, i.e., peptic ulcer, ill-fitting dentures.

51. Which *ONE* of the following is *not* associated with EB virus infection?

- A. Burkitt's lymphoma.
- B. Carcinoma of the cervix uteri.
- C. Infectious mononucleosis.
- D. Nasopharyngeal carcinoma.
- E. No clinical symptoms.

The answer is B. Carcinoma of the uterine cervix is associated with infection by another DNA virus (herpes simplex type 2). Burkitt's lymphoma (A) is caused by EB virus which infects B-lymphocytes and occurs in areas where malaria is endemic causing depression of T-cell function.

Infectious mononucleosis (C) is a febrile illness with lymphadenopathy caused by EB virus infection in which there is a vigorous T-cell response; presumably eliminating the transformed B-cells.

Nasopharyngeal carcinoma occurs particularly in China, the tumour cells contain integrated EB virus DNA (D). The majority of people have no detectable clinical illness when infected by EB virus (E).

52. For each of the types of retrovirus (oncornavirus) listed on the left select the most appropriate association from the list on the right.

- a. Feline leukaemia virus.
 - b. Mouse mammary tumour virus.
 - c. Rous sarcoma virus.
-
- A. Bittner's milk factor.
 - B. Effective vaccine available.
 - C. Known to cause leukaemia in man.
 - D. Present in fetal mice.
 - E. Transforms chicken fibroblasts in culture.

The answer is B, A, E. Feline leukaemia virus causes leukaemia in cats, in which it spreads by horizontal transmission (i.e., personal contact); the vaccine is effective after infection has taken place.

Bittner's milk factor is responsible for apparently 'genetic' breast cancer in female mice.

This is the earliest discovered tumour forming virus (1911) and produces sarcomas in chickens.

Mouse leukaemia virus is present in all fetal mice (D) and may have a physiological role. There are no known RNA virus induced tumours in man (C) although it is probable that leukaemia is of viral aetiology.

53. For each of the types of neoplasm listed on the left select the most appropriate definition from the list on the right.

- a. Adenoma.
- b. Carcinoma.
- c. Papilloma.

- A. Benign connective tissue tumour.
- B. Benign epithelial tumour derived from glandular tissue.
- C. Benign epithelial tumour derived from a surface.
- D. Malignant connective tissue tumour.
- E. Malignant epithelial tumour.

The answer is B, E, C. Adenoma occur more commonly in endocrine than exocrine tissue and often retain secretory activity.

Carcinoma is a generic term which may be more fully described by prefixes such as 'adeno-', 'squamous-'.

Papillomas are common tumours in the urinary tract, breast ducts. Some benign tumours of the intestine have been called papillomas, but they are really adenomas.

54. Which *ONE* is the *fourth* commonest organ site of metastasis at autopsy in patients with carcinoma?

- A. Adrenal.
- B. Bone.
- C. Brain.
- D. Liver.
- E. Lungs.

The answer is A. Liver is the commonest site of metastases (36 per cent) followed by the lungs (29 per cent), bones (14 per cent), adrenals (9 per cent) and brain (6 per cent). Other sites such as spleen, muscle, skin are much less common. NB. Carcinoma commonly

spreads to lymph nodes which are not included in this list, but would undoubtedly be involved in all of these cases.

55. From the list of tumour types on the right select the most appropriate mode of spread from the list on the left.

- a. Intracavitary spread.
- b. Intraepithelial spread.
- c. Retrograde venous spread.

- A. Breast carcinoma.
- B. Bronchial carcinoma.
- C. Gastric carcinoma.
- D. Prostatic carcinoma.
- E. Renal carcinoma.

The answer is C, A, D. Gastric carcinoma of signet ring cell type spreads to the ovary in premenopausal women (Krukenberg tumour).

Paget's disease of the breast is the only common example of this; malignant cells from underlying breast cancer extend upwards into the nipple skin from the nipple ducts involved by intraduct carcinoma.

Prostatic carcinoma invades the vessels of the intravertebral venous plexus in which flow is reversed into the vertebral bodies.

56. For each of the types of tumour listed on the left select the most appropriate association from those on the right.

- a. Glomangioma.
- b. Leiomyoma.
- c. Teratoma.

- A. Benign tumour of adipose tissue.
- B. Benign tumour of smooth muscle.
- C. Cystic tumour of ovary.
- D. Fibrous tumour infiltrating rectus abdominis muscle.
- E. Vascular tumour on a finger.

The answer is E, B, C. The glomangioma is derived from glomus bodies which control blood flow and temperature in the extremities.

The leiomyoma is found in the uterus where it is the commonest tumour type.

The benign dermoid cyst of the ovary is a cystic teratoma; teratomas in the male are invariably malignant. Benign tumours of adipose tissue (A) are lipomas. The dermoid tumour is a benign fibrous proliferation (D) which infiltrate muscle giving the impression of malignancy.

11. Blood Vessels

57. For each one of the forms of atheroma listed on the left select the most appropriate association from the list on the right.

- a. Atheromatous aneurysm.
 - b. Complicated atheroma.
 - c. Early atheromatous lesion.
-
- A. Affects vessels of less than 2 mm diameter.
 - B. Fat in intimal smooth muscle cells.
 - C. Mucoïd degeneration of the media.
 - D. Thinning of the media with loss of elasticity.
 - E. Ulceration of the plaque with mural thrombus formation.

The answer is D, E, B. Thinning of the media, with extension of plaque into it results in loss of elasticity and may allow an aneurysm to form; this usually occurs in the lower abdominal aorta.

Plaques showing ulceration, thrombosis and calcification represent severe disease.

Mucoïd degeneration of the media (Erdheim's medial degeneration) is associated with dissecting aneurysm which usually involves the proximal aorta (C).

Atheroma usually affects vessels of more than 2 mm diameter (A).

58. Which *ONE* of the following is *not* a predisposing factor for atheroma?

- A. Cigarette smoking.
- B. High level of serum high density lipoprotein.
- C. High level of serum low density lipoprotein (LDL).
- D. Male sex.
- E. Systemic hypertension.

The answer is B. High levels of serum HDL are associated with decreased risk of ischaemic heart disease; in vitro, HDL results in transfer of cholesterol from the intima of cultured aorta to the culture medium.

High level of serum LDL is the major risk factor of atheroma (C); the others increase the risk by unknown mechanism.

59. For each of the types of systemic hypertension listed on the left select the most appropriate association from the list on the right.

- a. Accelerated phase hypertension.
- b. Chronic benign essential hypertension in a small vessel.
- c. Early benign essential hypertension.

- A. Hyaline arteriolosclerosis.
- B. Hyaline arteriolosclerosis with fibrinoid necrosis.
- C. Hypertrophy of medial muscle and elastic.
- D. Medial calcification.
- E. Median and intimal necrosis of a segment of arterial wall.

The answer is B, A, C. In accelerated phase (malignant phase) hypertension there is necrosis added to the features of benign hypertension, with permeation of the vessel wall by plasma and fibrin.

Hyaline arteriolosclerosis is the lesion of chronic benign essential hypertension in a small vessel in which there is medial thickening plus intimal thickening which may narrow the lumen.

The early feature of benign essential hypertension involve hypertrophy of medial muscle and elastic; larger vessels often dilate. Medial calcification (D) is dystrophic calcification of the larger vessels of the lower limbs in elderly people (Monckeberg's sclerosis).

Polyarteritis nodosa has the feature described in (E).

60. Which *ONE* of the following is *not* involved in the aetiology of systemic hypertension?

- A. Arteriolosclerosis.
- B. Chronic glomerulonephritis.
- C. Conn's syndrome.
- D. Pheochromocytoma.
- E. Raised sodium intake.

The answer is A. Arteriolosclerosis is the result of hypertension.

Renal hypertension is usually the result of chronic glomerulonephritis (B) or chronic pyelonephritis.

Conn's syndrome (primary hyperaldosteronism) is due to an adrenal tumour secreting aldosterone (C).

Pheochromocytomas (D) secrete catecholamines.

Population studies have shown hypertension to correlate well with high average salt intake (E).

61. From the list of diseases on the left select the most appropriate histological description from the list on the right.

- a. Infiltration of aortic adventitia with plasma cells and lymphocytes.
- b. Periarteritis and endarteritis of the aortic vasa vasorum.

c. Thrombotic occlusion of short lengths of arteries and veins of limbs.

- A. Buerger's disease.
- B. Giant cell (temporal) arteritis.
- C. Raynaud's disease.
- D. Rheumatoid arteritis.
- E. Syphilitic aortitis.

The answer is D, E, A. Lesions similar to those seen in the heart in rheumatic fever can be found in the walls of larger veins.

The arteritic lesion of syphilis involves the whole vessel wall; damage to the vasa vasorum results in damage to the aortic media with aneurysm formation; this is usually in the thoracic aorta.

Buerger's disease (thromboangiitis obliterans) involves both arteries and veins.

Giant cell (temporal) arteritis (B) occurs in the elderly; there is destruction of the elastic lamina with giant cell formation.

Raynaud's disease (C) is associated with abnormal spasm of digital vessels; the histological features are uncertain.

12. Heart

62. If the following events were placed in chronological order which would come *fourth*?

- A. Left ventricular hypertrophy.
- B. Occlusion of right coronary artery.
- C. Pyelonephritis.
- D. Rupture of left ventricle.
- E. Systemic hypertension.

The answer is B. Chronic pyelonephritis (C) result in systemic hypertension (E) with left ventricular hypertrophy (A); hypertension is associated with increased risk of atheroma and thrombotic occlusion of a coronary artery (B) which causes myocardial infarction, complicated by necrosis of the left ventricular wall and eventual rupture (D).

63. Which *ONE* of the following is least likely to be found in a child dying of acute rheumatic fever?

- A. Aschoff bodies.
- B. 'Bread and butter' pericarditis.
- C. History of recent sore throat.
- D. Large crumbling vegetations on the mitral valve.
- E. Raised anti-streptolysin O titre (ASO) titre.

The answer is D. The vegetations of acute rheumatic fever are usually small nodular aggregates of fibrin and platelets along the line of apposition of the valve cusps.

Aschoff bodies (A) are pathognomonic of rheumatic carditis. Pericarditis of an exudative fibrinous type (B) is present as rheumatic fever is a pancarditis; the 'bread and butter' appearance is due to the sticky fibrinous exudate. A recent sore throat due to infection by beta-haemolytic streptococci (C) is reflected in the raised ASO titre (E).

64. For each of the valvular abnormalities on the left select the most appropriate association from the list of conditions on the right.

- a. Combined aortic incompetence and mitral stenosis.
 - b. Mitral incompetence.
 - c. Pulmonary stenosis.
-
- A. Carcinoid syndrome.
 - B. Congenital bicuspid valve.
 - C. Marfan's syndrome.
 - D. Rheumatic endocarditis.
 - E. Senile change in valve.

The answer is D, C, A. Mitral stenosis and aortic incompetence are a common result of chronic rheumatic heart disease.

Mitral incompetence due to myxoid degeneration of the valve cusps occurs in the rare Marfan's syndrome: the 'floppy' mitral valve syndrome has similar histological features but is not associated with congenital anomalies.

In the carcinoid syndrome metastatic carcinoid tumour is associated with release of 5-hydroxytryptamine into the systemic circulation, causing fibroblastic proliferation in the valve cusps and ring. Bicuspid aortic valve (B) is a common congenital anomaly. Senile changes in heart valves are usually related to calcification of the cusps (E).

65. Which is the *fourth* in the following sequence of events?

- A. Bacteraemia.
- B. Infective endocarditis.
- C. Mitral stenosis.
- D. Tonsillectomy.
- E. Valvular vegetations.

The answer is B. Infective endocarditis usually follows bacteraemia (A) in a patient with some abnormality of the heart valves (C). This is often associated with previous rheumatic fever, although congenital valve anomalies are also involved.

Tonsillectomy (D) is the cause of the bacteraemia, which results in large soft crumbly vegetations on the abnormal valve cusps. The order is C-D-A-B-E.

66. Which *ONE* of the following is an example of acyanotic congenital heart disease?

- A. Anomalous venous drainage.
- B. Coarctation of the aorta.
- C. Fallot's tetralogy.
- D. Tricuspid atresia.
- E. Truncus arteriosus.

The answer is B. Coarctation of the aorta occurs predominantly in males and is a narrowing of the aorta between the left subclavian artery and the orifice of the ductus arteriosus. The others are all examples of cyanotic anomalies in which systemic venous blood is mixed with oxygenated blood leaving the heart; the red cell count rises which increases the cyanosis.

66. Which *ONE* of the following is *not* a histological feature of chronic bronchitis?

- A. Calcification of bronchial cartilages.
- B. Goblet cell metaplasia.
- C. Hypertrophy of smooth muscle.
- D. Mucous gland hyperplasia.
- E. Squamous metaplasia of respiratory epithelium.

The answer is C. Smooth muscle hypertrophy is seen in bronchial asthma.

The histological features of chronic bronchitis include hyperplasia of the mucous glands (D) and goblet cell metaplasia in the terminal bronchioles.

Respiratory epithelium may undergo squamous metaplasia (E), and calcification of cartilage (A) can occur.

13. Respiratory System

67. Which *ONE* of the following is *not* a histological feature of chronic bronchitis?

- A. Calcification of bronchial cartilages.
- B. Goblet cell metaplasia.
- C. Hypertrophy of smooth muscle.
- D. Mucous gland hyperplasia.
- E. Squamous metaplasia of respiratory epithelium.

The answer is C. Smooth muscle hypertrophy is seen in bronchial asthma.

The histological features of chronic bronchitis include hyperplasia of the mucous glands (D) and goblet cell metaplasia in the terminal bronchioles (B).

Respiratory epithelium may undergo squamous metaplasia (E), and calcification of cartilages (A) can occur.

68. For each of the types of bronchial asthma listed on the left select the most appropriate association from the list on the right.

- a. Extrinsic asthma.
 - b. Intrinsic asthma.
 - c. Status asthmaticus.
-
- A. Commences in childhood.
 - B. No allergen implicated.
 - C. Prolonged attack with severe respiratory distress.
 - D. Tight ventricular hypertrophy a feature.
 - E. Type III hypersensitivity reaction.

The answer is A, B, C. This usually occurs in childhood, often with a history of eczema or food allergy; there is often a detectable allergen which triggers a Type I (atopic) reaction.

This usually develops in adults with atopic history, although drug hypersensitivities may develop; there is an association with bronchitis.

Status asthmaticus is a continuous attack of asthma, with severe respiratory distress which may be fatal; at autopsy the lungs are distended with air, and plugs of mucus are present in segmental bronchi.

Right ventricular hypertrophy (D) is not a feature of bronchial asthma, but is seen in patients with chronic bronchitis and emphysema. Type III hypersensitivity reactions occur in extrinsic allergic alveolitis (E).

69. If the following features were placed in chronological order which would come *fourth*?

- A. Bronchiectasis.
- B. Bronchopulmonary anastomoses.
- C. Congestive cardiac failure.
- D. Raised pulmonary artery pressure.
- E. Whooping cough.

The answer is D. Whooping cough in childhood (E) results in the formation of bronchiectasis (A) by pulmonary collapse and imperfect resolution of pneumonia; bronchiectasis disturbs the pulmonary haemodynamics such that bronchopulmonary anastomoses (B) are formed which result in raised pulmonary artery pressure (D); right ventricular hypertrophy with congestive cardiac failure (C) may follow.

70. Which *ONE* of the following is least likely to result in a sustained rise in pulmonary artery pressure?

- A. Atrial septal defect.
- B. Chronic bronchitis and emphysema.

- C. Lobar pneumonia.
- D. Pulmonary fibrosis.
- E. Pulmonary thrombo-embolic disease.

The answer is C. Lobar pneumonia is usually a short-term illness with resolution without chronic lung damage.

Congenital shunts, i.e., ASD (A) which are pre-tricuspid produce pulmonary hypertension in adolescence. Chronic bronchitis and emphysema (B) results in chronic hypoxia which stimulates muscularization of the pulmonary vascular tree. Pulmonary fibrosis (D) has a similar effect, but eventually there is fibrous obliteration of the vasculature. Pulmonary thromboembolic disease (E) of the recurrent type leads to a progressive increase in pulmonary vascular resistance.

71. For each of the types of pulmonary emphysema listed on the left select the most appropriate association from the list on the right.

- a. Alveolar duct emphysema.
 - b. Bronchiolar emphysema.
 - c. Panacinar emphysema.
- A. Air in the interlobular space.
 - B. Enlargement of alveolar ducts, spaces and respiratory bronchioles.
 - C. Enlargement of centrilobular air spaces.
 - D. Fusiform dilatation of alveolar ducts surrounded by coal dust.
 - E. Normal respiratory bronchioles with enlarged ducts and alveoli.

The answer is E, C, B. This is the initial stage of alveolar emphysema.

This is centrilobular emphysema, and is more serious than the other form of bronchiolar emphysema (focal duct emphysema) which occurs in coal workers.

This is the late stage of alveolar emphysema, in which the entire respiratory acinus is involved.

In focal duct emphysema there is fusiform dilatation of the respiratory bronchioles which are surrounded by coal dust (D). Air in the interlobular spaces (A) is interstitial emphysema caused by rupture of the air spaces usually as a result of overdistention or trauma.

72. For each of the types of pneumonia listed on the left select the most appropriate association from the list on the right.

- a. Aspiration pneumonia.
 - b. Bronchopneumonia with abscess formation.
 - c. Recently discovered form of lobar pneumonia.
- A. Interstitial mononuclear cell infiltrate.
 - B. *Legionella pneumophila* identified in lung sectors.

- C. Spontaneous resolution on the eight day.
- D. Sputum culture yields *Klebsiella pneumoniae*.
- E. Suppurative bronchopneumonia with foreign body giant cells.

73. Which *ONE* of the following compounds is *not* associated with pulmonary fibrosis/or Alveolar damage.

- a. Asbestosis.
- b. Bleomycin.
- C. Busulphan.
- D. Paraquat.
- E. Stilboestrol.

The answer is E. Stilboestrol is not known to cause pulmonary fibrosis. The other compounds may all cause pulmonary fibrosis; paraquat (D) taken either accidentally or intentionally causes severe intra-alveolar fibrosis; the other drugs all cause pulmonary fibrosis in a proportion of patients. Amiodarone (A) causes aggregation of macrophages in alveoli.

74. For each of the forms of industrial lung diseases on the left select the most appropriate association from the list on the right.

- a. Asbestosis.
 - b. Bagassosis.
 - c. Caplan's syndrome.
-
- A. Arthus reaction to antigenic mould.
 - B. Fibrosis in sub-pleural region of the lower lobes.
 - C. Lung lesions in miners with rheumatoid arthritis.
 - D. Particles of carbon in alveolar macrophages.
 - E. Sarcoid-like reaction in lungs.

The answer is B, A, C. Asbestos exposure is associated with pleural fibrous plaques, fibrosis of the lung (asbestosis) and mesothelioma; asbestosis is the only form of pneumoconiosis with increased risk of bronchial carcinoma.

Inhaled organic dusts, i.e., moulds, can cause extrinsic allergic alveolitis (Arthus reaction).

Pneumoconiosis and rheumatoid arthritis are associated with large rounded nodules in the lung which may undergo necrosis and resemble TB or cancer.

The presence of carbon in macrophages (D) is known as anthracosis and is almost universal. The metal beryllium causes sarcoid-like reactions in lungs, liver and lymph nodes (E).

75. Which of the following events comes *fourth* in chronological order?

- A. Bronchial carcinoma.

- B. Cerebral metastases.
- C. Raised intracranial pressure.
- D. Smoking 40 cigarettes per day.
- E. Squamous metaplasia of respiratory epithelium.

The answer is B. Cigarette smoking (D) results in chronic irritation of the ciliated respiratory epithelium which undergoes squamous metaplasia (E). Bronchial carcinoma develops (A) and may metastasize (B) to the brain where it will act as a space occupying lesion and cause raised intracranial pressure (C).

76. For each of the tumours listed on the left select the most appropriate association from the list on the right.

- a. Bronchial adenoma.
 - b. Oat cell carcinoma.
 - c. Pleural mesothelioma.
-
- A. Chance finding on chest X-ray.
 - B. Commonest at periphery of lung.
 - C. Mixed histological patterns.
 - D. Resemble carcinoid tumours of alimentary tract.
 - E. Tumour usually arises from main bronchus at hilum.

The answer is D, E, C. The bronchial adenoma is a slow growing malignant tumour which protrudes into the bronchial lumen and invades lung locally. Many contain neurosecretory granules.

This type of tumour may be associated with endocrine symptoms; it usually occurs at the hilum, and is thought to be derived from Feyrter cells.

Mesotheliomas often show a mixed pattern of papillary adenocarcinoma and spindle cell tumour; it is associated with previous exposure to asbestos, particularly crocidolite.

The benign adenochondroma is often a chance finding on X-ray (A): it is a hamartomatous lesion consisting of cartilage and lung tissue. Adenocarcinoma of the lung usually arise at the periphery (B) and are often associated with scar tissue.

14. Haemopoietic System

77. For each of the causes of anaemia on the left select the most appropriate association from the list on the right.

- a. Excessive destruction of erythrocytes.
 - b. Excessive loss of erythrocytes.
 - c. Diminished production of erythrocytes with marrow hyperplasia.
-
- A. Acholuric jaundice.
 - B. Deficiency of vitamin B₁₂.

- C. Drug therapy with chloramphenicol.
- D. Fibrosis of haemopoietic marrow.
- E. Massive gastrointestinal haemorrhage.

The answer is A, E, B. In haemolytic anaemia there is destruction of erythrocytes with excessive production of bilirubin which is conjugated and so is not excreted in the urine.

Erythrocytes are usually lost in large numbers following a severe bleed; if bleeding stops there is a brisk marrow response (reticulocytosis); chronic small blood losses result in iron deficiency anaemia.

Pernicious anaemia is due to lack of vitamin B₁₂ and folic acid and is a megaloblastic anaemia; this is an example of a dyshaemopoietic state (as is iron deficiency anaemia).

Idiosyncratic reactions to drugs, i.e., chloramphenicol (C) result in aplastic anaemia in which the marrow is hypocellular.

Myelofibrosis is a myeloproliferative disorder with fibrous replacement of the marrow (D) resulting in anaemia.

78. For each of the types of haemolytic anaemia listed on the left select the most appropriate description from the list on the right.

- a. Haemolytic disease of the newborn.
- b. Hereditary spherocytosis.
- c. Microangiopathic haemolytic anaemia.

- A. Abnormal sensitivity to cold.
- B. Defect in haemoglobin polypeptide chain.
- C. Genetically determined red cell defect.
- D. Red cell fragmentation.
- E. Rhesus incompatibility.

The answer is E, C, D. Rhesus incompatibility result in maternal iso-antibody production which crosses the placenta and may cause haemolysis in the baby.

This is a genetically determined red cell membrane defect, involving the membrane protein spectrin.

Red cell fragmentation occurs in several conditions in which small vessels are criss-crossed by strands of fibrin.

Abnormal sensitivity to cold (A) is one form of autoimmune haemolytic anaemia in which the auto-antibodies react only below 37 °C, causing auto-agglutination and lysis.

Defective haemoglobin synthesis (B) results in the haemoglobinopathies.

79. Which *ONE* of the following is *not* a cause of vitamin B₁₂ deficiency?

- A. Blind-loop syndrome.
- B. Dietary deficiency.
- C. Intrinsic factor deficiency.
- D. Resection of ascending colon.
- E. Resection of terminal ileum.

The answer is D. Vitamin B₁₂ complexed with intrinsic factor (C) is absorbed in the terminal ileum, disease or resection (E) of which will cause failure of absorption.

Dietary deficiency can occur (B). Blind-loop syndrome (A) occurs when bacteria in a loop of bowel proximal to the terminal ileum take up the B₁₂IF complex before it reaches its absorption site.

80. For each of the types of acute leukaemia listed on the left select the most appropriate association from the list on the right.

- a. Acute lymphoblastic leukaemia (L1).
- b. Acute monoblastic leukaemia (M5).
- c. Acute myeloblastic leukaemia (M2).

- A. Blast cells are Sudan Black positive.
- B. Leukaemic cells with cytoplasmic projections.
- C. Philadelphia chromosome positive.
- D. Sodium fluoride sensitive non-specific esterase activity.
- E. Tumour cells usually lack B- or T-cell markers.

The answer is E, D, A. In *ALL*, especially in children, there are usually no B- or T-cell markers and this indicated a good response to chemotherapy.

This enzyme histochemical reaction distinguishes monoblasts from myeloblasts.

The presence of Sudan Black B or peroxidase positive granules indicated a myeloblast origin.

Leukaemic cells with cytoplasmatic projections are found in hairy cell leukaemia which is of B-cell origin (B).

Philadelphia chromosome (C) is a marker of chronic granulocytic leukaemia.

81. Gross splenomegaly is a striking feature of which *ONE* of the following?

- A. Acute lymphoblastic leukaemia.
- B. Acute monoblastic leukaemia.
- C. Acute myeloblastic leukaemia.
- D. Acute myelomonocytic leukaemia.
- E. Acute granulocytic anaemia.

The answer is E. Chronic granulocytic leukaemia is the commonest cause of massive splenomegaly in the UK; splenomegaly does occur in the acute leukaemias but is seldom massive.

82. For each of the types of plasma cell tumour listed on the left select the most appropriate association from the list on the right.

- a. Heavy chain disease.
 - b. Light chain myeloma.
 - c. Macroglobulinaemia.
-
- A. Bence-Jones proteinuria.
 - B. Increased blood viscosity.
 - C. Increased red cell mass.
 - D. Mediterranean lymphoma.
 - E. Solitary tumour in a long bone.

The answer is D, A, B. This rare condition involves a neoplastic proliferation of lymphoid cells in the mucosa of the small intestine; the cells produce alpha chain.

Bence-Jones protein consists of light chains of immunoglobulin molecules; 15 per cent of myelomas produce only light chains.

Waldenstrom's macroglobulinaemia is a condition in which the neoplastic cells produce IgM which increases blood viscosity.

Increased cell mass occurs in the myeloproliferative disorder polycythaemia rubra vera (C).

A solitary tumour in a long bone is typical of a solitary plasmacytoma (E).

83. For each of the defects of coagulation listed on the left select the most appropriate cause from the list on the right.

- a. Christmas disease (haemophilia B).
 - b. Haemophilia A.
 - c. Von Willebrandt's disease.
-
- A. Combined deficiency of factor II, VII, IX, X.
 - B. Congenital deficiency of factor IX.
 - C. Defective factor VIII with abnormal platelets.
 - D. Deficiency of vitamin K.
 - E. Deficiency of factor VIII.

The answer is B, E, C. Deficiency of factor IX results in failure of thromboplastin production from the intrinsic system.

The factor VIII in hemophilia A is functionally abnormal, due to deficiency of factor VIIIc.

Deficient factor VIIIr associated with abnormal platelet adhesion occurs in von Willebrandt's disease; bleeding from minor trauma occurs, but purpura is not a feature.

Combined deficiency occurs in patients on anticoagulant therapy (A). Deficiency of vitamin K (D) can occur in malabsorption and prolonged obstructive jaundice.

15. Lympho-Reticular System

84. Which *ONE* of the following is a cause of splenic atrophy?

- A. Coeliac disease.
- B. Letterer-Siwe disease.
- C. Malaria.
- D. Niemann-Pick disease.
- E. Sarcoidosis.

The answer is A. In coeliac disease splenic atrophy occurs, with the appearance of Howell-Jolly bodies in erythrocytes. The others all cause splenomegaly.

Letterer-Siwe disease (B) is one form of Histiocytosis-X, in which macrophages proliferate.

Malaria (C) is an example of an infection which causes splenomegaly.

Niemann-Pick disease (D) is a lipid storage disorder.

Sarcoidosis (E) commonly involves the spleen.

85. Which *ONE* of the following is the commonest neoplastic cause of enlargement of lymph nodes?

- A. Chronic lymphatic leukaemia.
- B. Diffuse non-Hodgkin's lymphoma.
- C. Follicular lymphoma.
- D. Nodular sclerosing Hodgkin's disease.
- E. Secondary carcinoma.

The answer is E. Secondary carcinoma is much more common than any of the others which may all arise primarily in lymph nodes.

86. For each of the types of Hodgkin's disease listed on the left select the most appropriate histological feature from the list on the right.

- a. Lymphocyte predominant.
- b. Mixed cellularity.

c. Nodular sclerosing.

- A. Coarse bands of collagen.
- B. Few Reed-Sternberg cells.
- C. Fibrous tissue prominent.
- D. Prominent eosinophils, plasma cells and macrophages.
- E. Abundant Reed-Sternberg cells.

The answer is B, D, A. In lymphocyte predominant Hodgkin's disease Reed-Sternberg cells are scanty, and the main cell type is the lymphocyte; this is the best prognostic type.

Mixed cellularity Hodgkin's disease is characterized by Reed-Sternberg cells set in a mixed cell background.

In nodular sclerosing HD dense bands of collagen divide the node into nodules which contain lacunar cells.

Prominent fibrous tissue (C) and abundant Reed-Sternberg cells (E) are features of the poor prognosis lymphocyte depleted type.

87. If the following events were placed in chronological order which would come *fourth*?

- A. Biopsy of cervical lymph node.
- B. Chemotherapy instituted.
- C. Fungal infection of the lungs.
- D. Lymphadenopathy detected by GP.
- E. Patient complains of night sweats.

The answer is B. The patient complains of night sweats (E) to the GP who discovers enlarged lymph nodes (D) which are biopsied by the surgeon (A). The nodes are involved by Hodgkin's disease and the patient is treated by chemotherapy (B) which results in immunosuppression with opportunistic fungal infections supervening (C).

88. Which *ONE* of the following examples of non-Hodgkin's lymphoma commonly occurs in children?

- A. Diffuse centrocytic.
- B. Follicular lymphoma.
- C. Intestinal histiocytic lymphoma.
- D. Lymphoblastic lymphoma in the thymus.
- E. Lymphocytic lymphoma.

The answer is D. The thymic, or mediastinal lymphoblastic lymphoma of T-cell type affects males in late childhood or adolescence. The other examples tend to occur in adults over the age of 30 years.

16. Alimentary Tract

89. For each of the tumours listed on the left select the most appropriate association from the list on the right.

- a. Adenolymphoma.
 - b. Pleomorphic salivary adenoma.
 - c. Squamous carcinoma of oral mucosa.
-
- A. Benign easily resectable tumour of parotid gland.
 - B. High incidence of local recurrence.
 - C. Malignant tumour of parotid gland.
 - D. May arise in Sjogren's disease.
 - E. Prognosis depends on site.

The answer is A, B, E. This occurs in middle-aged males, and is often bilateral, it is entirely benign. This is the second commonest parotid tumour.

Pleomorphic salivary adenomas are benign, but tend to extend through their capsule so that complete resection is not possible.

Intraoral squamous carcinoma has a worsening prognosis the further back in the oropharynx it is situated. Sjogren's disease (D) is an autoimmune disease of the salivary tissue; a malignant lymphoma may arise within the salivary gland in this condition. Adenoid cystic carcinoma is the commonest malignant salivary gland tumour (C).

90. If the following events were placed in chronological order which would come *fourth*?

- A. Aspiration bronchopneumonia.
- B. Difficulty in swallowing.
- C. Heavy alcohol intake.
- D. Oesophageal bouginage.
- E. Tracheo-oesophageal fistula.

The answer is E. Heavy alcohol intake (C) is associated with the development of oesophageal carcinoma in Western Europe. An early symptom of oesophageal carcinoma is dysphagia (B); surgical treatment may be impossible and palliative oesophageal bouginage undertaken (D). This may be complicated by oesophageal rupture, but occasionally the tumour itself extends locally into the trachea and a fistula may be formed (E) with resultant aspiration bronchopneumonia (A).

91. For each of the forms of gastritis listed on the left select the most appropriate association from the list of histological features on the right.

- a. Atrophic gastritis.
 - b. Chronic superficial gastritis.
 - c. Gastric atrophy.
-
- A. Granulomatous inflammation of the mucosa.

- B. Inflammation limited to superficial lamina propria.
- C. Loss of specialized mucosal cells.
- D. Mucosa thin with intestinal metaplasia.
- E. Mucosal hypertrophy.

The answer is C, B, D. This is the second stage of chronic gastritis in which specialized mucosal cells such as parietal cells are lost and there is severe inflammatory infiltration in the lamina propria.

This is the first stage of chronic gastritis, there is mucosal inflammation, but there is no loss of specialized cells.

This is the final stage of chronic gastritis in which the mucosa is thin due to loss of parietal cells, chief cells and replacement by mucous secreting epithelium resembling intestinal mucosa. These features are seen most strikingly in the auto-immune disease pernicious anaemia where antibodies are present against parietal cell and intrinsic factor.

Granulomatous (A) and hypertrophic (E) gastritis are rare.

92. Which *ONE* of the following is not a predisposing factor in peptic ulcer?

- a. Achlorhydria.
- b. Blood group O.
- c. Cigarette smoking.
- d. High gastrin secretion.
- e. Ingestion of aspirin.

The answer is A. The presence of gastric acid is necessary for the development of peptic ulcer; in the stomach defective mucosal protection appears to be more important than the quantity of acid; in the duodenum gastric hypersecretion is more important.

There is a higher incidence of peptic ulcer in people of blood group O (B). Cigarette smoking (C) and ingestion of certain drugs (E) result in increased risk of peptic (gastric) ulcer. High gastrin secretion (D), i.e., from pancreatic islet cell tumours, results in a fulminating ulcer diathesis (Zollinger-Ellison syndrome).

93. For each of the features of gastric carcinoma listed on the left select the most appropriate association from the list on the right.

- a. Linitis plastica.
 - b. Signet ring cells.
 - c. Superficial spreading carcinoma.
-
- A. Deep layers of stomach wall infiltrated and thickened.
 - B. Extensive spread in mucosa and submucosa.
 - C. Globule of mucin within tumour cells.
 - D. Nodular mass of tumour protruding into lumen.
 - E. Present in the edge of a gastric ulcer.

The answer is A, C, B. In this growth pattern the mucosa appears uninvolved grossly, the stomach wall becoming rigid due to tumour infiltration.

Signet ring cells are characteristic of gastric carcinoma but may be seen in other tumours also.

In this growth pattern there is no evidence of deep invasion, the tumour spreading widely in the superficial layers.

Gastric carcinoma has various growth patterns including nodular outgrowths (D) and large fungating ulcerated masses. Occasionally a carcinoma may arise in the edge of an ulcer (E); more commonly the ulcer is due to tumour necrosis.

94. For each of the pathological features noted on the left select the most appropriate disease from the list on the right.

- a. Colonic mucosal pseudopolyps.
- b. Pericolonic abscess formation in the left iliac fossa.
- c. Small intestinal mucosa with cobblestone appearance.

- A. Appendicitis.
- B. Crohn's disease.
- C. Diverticulitis.
- D. Diverticulosis.
- E. Ulcerative colitis.

The answer is E, C, B. Pseudopolyps consist of surviving hyperplastic mucosa and granulation tissue.

Diverticulosis (D) is the presence of diverticula which are not inflamed; in diverticulitis the diverticula become inflamed and may rupture to produce pericolonic abscesses. The symptoms are similar to those in appendicitis (A) but affect the left side.

The appearance of linear fissuring and ulceration of the oedematous mucosa of Crohn's disease gives the typical cobblestone appearance.

95. For each of the organisms on the left select the most appropriate association from the list on the right.

- a. Campylobacter.
- b. Clostridium difficile.
- c. Vibrio cholerae.

- A. Antibiotic associated diarrhoea.
- B. Enlargement of Peyer's patches.
- C. Infective diarrhoea.
- D. Stimulation of adenyl cyclase activity.
- E. Stool examination often diagnostic.

The answer is C, A, D. Recently many cases of infective diarrhoea have been shown to be due to organisms of the Campylobacter group.

Antibiotic associated diarrhoea (pseudomembranous colitis) is due to infection by *Clostridium difficile* and the effects of its toxin on the mucosa.

The vibrio toxin stimulates adenyl cyclase activity which alters fluid and electrolyte balance between mucosal cells and gut lumen.

Enlargement of Peyer's patches is a feature of typhoid (B). Stool examination is essential for the diagnostic of amoebic dysentery (E).

96. Which *ONE* of the following is an example of a primary malabsorption syndrome.

- A. A-beta-lipoproteinaemia.
- B. Blind-loop syndrome.
- C. Coeliac disease.
- D. Crohn's disease.
- E. Pancreatic insufficiency.

The answer is C. Coeliac disease (gluten sensitive enteropathy) is a primary malabsorption syndrome, as are tropical sprue and Whipple's disease. The others are all causes of secondary malabsorption in that they interfere with absorption for various reasons, i.e., bacterial colonization in the blind-loop syndrome (B), severe mucosal damage in Crohn's disease (D). Pancreatic insufficiency (E) causes inadequate digestion. A-beta-lipoproteinaemia is a biochemical defect which interferes with absorption (A).

97. Which *ONE* of the following conditions predisposes to colonic carcinoma.

- A. Bacillary dysentery.
- B. Crohn's disease.
- C. Diverticular disease.
- D. Ischaemic colitis.
- E. Ulcerative colitis.

The answer is E. There is an increased risk of colonic carcinoma in patients with long-standing, extensive ulcerative colitis.

Crohn's disease (B) is associated with increased risk of small intestinal malignancy but this is very rare, and may have a characteristic growth pattern.

98. For each of the types of colonic polyp listed on the left select the most appropriate association from those on the right.

- a. Tubular adenoma.
- b. Tubulo-villous adenoma.
- c. Villous adenoma.

- A. Always shows invasion of the stalk.
- B. Hamartomatous lesion.
- C. High risk of undergoing malignant transformation.
- D. Intermediate histological features.
- E. Usually less than 10 mm diameter.

The answer is E, D, C. Tubular adenomas are usually small rounded nodules on a stalk. Tubulo-villous adenomas show a mixed histological pattern and are intermediate in size between tubular and villous adenomas. Villous adenomas are usually sessile, larger than 10 mm in diameter and have a large surface area; these are most likely to become malignant.

Invasion of the stalk of a polyp is an important criterion of malignancy (A) but is not invariably present. If the stalk has twisted glandular tissue may be trapped in the stalk giving rise to pseudoinvasion.

The juvenile polyp is a hamartomatous lesion of the mucosa (B).

17. Liver, Biliary Tract, Pancreas

99. In which *ONE* of the following conditions is fatty change of the liver *not* a feature?

- A. Alcohol abuse.
- B. Kwashiorkor.
- C. Obesity.
- D. Pernicious anaemia.
- E. Viral hepatitis.

The answer is E. Fatty change is not a feature in acute viral hepatitis. All of the others involve nutritional deficiency and toxic damage to hepatocytes which result in fatty change.

100. Which *ONE* of the following is *not* usually a feature of acute viral hepatitis in a liver biopsy?

- A. Acidophilic degeneration of hepatocytes.
- B. Ballooning degeneration of hepatocytes.
- C. Intact reticulin framework.
- D. Lymphocytic infiltrates in parenchyma and portal tracts.
- E. Mallory bodies.

The answer is E. Mallory bodies are usually found in alcoholic hepatitis, but occur in other conditions, i.e., Indian childhood cirrhosis.

The others are the histological hallmarks of acute hepatitis; acidophilic degeneration of hepatocytes (A) with extrusion of the pyknotic nucleus produces the Councilman body.

101. For each outcome of infection by hepatitis B (HB) virus on the left select the most appropriate association from the list on the right.

- a. Asymptomatic HB carrier with low infectivity.
 - b. HB positive chronic active hepatitis.
 - c. Recovery from acute hepatitis B.
- A. Anti-mitochondrial antibody develops.
 - B. HBcAb and HbsAb produced.
 - C. HBcAg and HbsAg both expressed in hepatocyte.
 - D. Predominant HBcAg expression.
 - E. Predominant HBsAg expression in serum and hepatocytes.

The answer is E, C, B. If virus is not completely eliminated a carrier state may develop with continued expression of HBsAg; this is viral envelope and is of low infectivity.

In some cases chronic liver disease develops with continued expression of HBcAg and HBs Ag.

Successful elimination of virus with resolution of the hepatitis results from adequate humoral responses.

Antimitochondrial Ab (A) is present in primary biliary cirrhosis. Predominant HBcAg (D) expression occurs in carriers who remain highly infective.

102. For each of the features of alcoholic liver disease listed on the left select the most appropriate association from the list on the right.

- a. Fatty liver.
 - b. Alcoholic hepatitis.
 - c. Micronodular cirrhosis.
- A. Evidence of hepatocyte regeneration.
 - B. Ground glass hepatocytes present.
 - C. Hepatitis predominantly around hepatic vein branches.
 - D. Portal areas severely affected initially.
 - E. Recovery occurs if alcohol withdrawn.

The answer is E, C, A. The metabolic effects of alcohol on hepatocytes responsible for fatty change are reversible if alcohol is stopped. This is the earliest feature of alcoholic liver damage.

The site of earliest damage in alcoholic liver disease is around the terminal hepatic vein (centrilobular); hepatocyte necrosis in this area is very suggestive of alcohol damage.

Before cirrhosis can be present hepatocyte regeneration has to occur, along with fibrosis; fibrosis on its own is not cirrhosis. Ground glass hepatocytes (B) are a feature of hepatitis B infection. The portal areas (D) are affected later in alcoholic hepatitis when extensive damage has occurred and when cirrhosis is present.

103. Oesophageal varices are caused by which *ONE* of the following?

- A. Enlarged liver pressing on the portal vein.
- B. Portal hypertension.
- C. Pulmonary hypertension.
- D. Systemic hypertension.
- E. Tumour metastases in the porta hepatis.

The answer is B. Portal hypertension (usually caused by cirrhosis) results from interference with the hepatic micro-circulation such that vessels in the portal-systemic anastomotic system become engorged and develop varicosities. This occurs most spectacularly in the oesophagus, and rupture of these veins is a common cause of death in alcoholics.

104. For each of the types of liver tumour listed on the left select the most appropriate association from the list on the right.

- a. Cholangiocarcinoma.
 - b. Haemangiosarcoma.
 - c. Liver cell adenoma.
-
- A. Commonest primary liver tumour.
 - B. Exposure to vinyl chloride monomer.
 - C. Sex hormone therapy.
 - D. Tumour of childhood.
 - E. Ulcerative colitis.

The answer is E, B, C. Patients with ulcerative colitis may develop sclerosing cholangitis which is associated with the development of cholangiocarcinoma. In the Far East infection by river fluke causes cholangiocarcinoma.

Exposure to vinyl chloride monomer is implicated in the development of haemangiosarcoma.

Oral contraceptive and sex hormone therapy have been associated with the development of liver cell adenomas which are benign liver cell tumours.

The commonest primary liver cell tumour (A) is the hepatocellular carcinoma. The hepatoblastoma is a liver tumour of childhood (D).

105. With which *ONE* of the following do gallstones and/or chronic cholecystitis *not* have a recognized association?

- A. Acute pancreatitis.
- B. Haemolytic anaemia.
- C. Hepatitis B infection.
- D. Intestinal obstruction.
- E. Typhoid fever.

The answer is C. There is no association with viral hepatitis.

Haemolytic anaemia (B) is associated with the formation of pigment stones. The presence of gallstones is associated with pancreatitis (A) and rarely with small intestinal obstruction (D). Typhoid fever may result in a carrier state in which organisms survive in the gallbladder (E).

106. For each of the pancreatic lesions listed on the left select the most appropriate association from the list on the right.

- a. Acute pancreatitis.
 - b. Cystic fibrosis.
 - c. Pancreatic adenocarcinoma.
-
- A. Autosomal dominant inheritance.
 - B. Increased sodium chloride content of sweat.
 - C. Raised serum amylase.
 - D. Recurrent peptic ulceration.
 - E. Thrombophlebitis migrans.

The answer is C, B, E. This is a diagnostic test for acute pancreatitis; the release of amylase is also responsible for the clinicopathological features of pancreatitis.

This autosomal recessive condition is caused by abnormal exocrine gland secretions; the abnormal sweat is a diagnostic test.

Thrombophlebitis migrans is one of the bizarre clinical effects seen in patients with pancreatic cancer.

Recurrent peptic ulceration (D) is a feature of the endocrine pancreatic tumours which secrete gastrin.

18. Nervous System

107. If the following events were placed in chronological order which would come *fourth*?

- A. Cingulate gyrus herniates beneath falx cerebri.
- B. Frontal lobe tumour in right hemisphere.
- C. Interventricular septum shifts to left of midline.
- D. Medial temporal lobe herniates through tentorial opening.
- E. Pontine and midbrain haemorrhage.

The answer is D. A tumour in the right frontal lobe (B) will act as a space occupying lesion resulting in raised intracranial pressure; expansion of the right hemisphere causes shift of the midline (C), the cingulate gyrus herniates beneath the falx (A); increasing expansion results in a tentorial hernia (D) and eventually fatal pontine and midbrain haemorrhage (E) supervene.

108. For each of the types of haematoma listed on the left select the most appropriate association from the list on the right.

- a. Acute subdural haematoma.
 - b. Chronic subdural haematoma.
 - c. Extradural haematoma.
-
- A. Associated with cerebral contusions and lacerations in many cases.
 - B. Due to rupture of an aneurysm.
 - C. May present weeks after trivial injury.
 - D. Scarring of frontal poles.
 - E. Usually due to a tear of the middle meningeal artery.

The answer is A, C, E. This is a common finding if death occurs soon after a head injury which causes severe damage to cerebral tissue.

Trivial injury (particularly in the elderly) may result in slow haemorrhage from the bridging veins which produces a slowly expanding haematoma.

Fracture of the skull, particularly the temporal bone, may result in tearing of a meningeal vessel; classically there is a lucid interval followed by headache, drowsiness and coma.

Rupture of an aneurysm (B) usually produces a subarachnoid haemorrhage.

Scarring (D) is a sign of previous head injury.

109. Which *ONE* of the following is *not* a common site of hypertensive intracerebral haemorrhage?

- A. Basal ganglia.
- B. Cerebellum.
- C. Internal capsule.
- D. Occipital poles.
- E. Pons.

The answer is D. Hypertensive intracerebral haemorrhage usually results from a rupture of a microaneurysm on a perforating cerebral artery; the commonest sites are basal ganglia (A), internal capsule (C), pons (E) and cerebellum (B).

110. Which *ONE* of the following is *not* a common site of a berry aneurysm?

- A. Basilar artery.
- B. Bifurcation of the middle cerebral artery.
- C. Junction of anterior communicating artery and anterior cerebral artery.
- D. Junction of internal carotid artery and posterior communicating artery.
- E. Vertebral artery.

The answer is E. Congenital or berry aneurysms are due to a defect in the medial coat at sites of bifurcation of the intracerebral arteries; the commonest sites are middle cerebral bifurcation (B), anterior communicator and anterior cerebral (C), internal carotid and posterior communicator (D) and on basilar artery (A). The aneurysms are often multiple.

111. If the following events were placed in chronological order which would come *fourth*?

- A. Abscess in temporal lobe.
- B. Chronic otitis media.
- C. Inadequate antibiotic therapy.
- D. Invasion of venous channels by bacteria.
- E. Osteitis of the tegmen tympani.

The answer is D. Chronic otitis media (B) inadequately treated (C) may result in inflammation of the surrounding bone (E); this allows invasion of the venous channels by bacteria (D) which gain access to the brain itself, producing an abscess (A).

112. For each of the types of virus infection listed on the left select the most appropriate association from the list on the right.

- a. Cytomegalovirus.
 - b. Herpes simplex virus.
 - c. Type 1 poliomyelitis virus.
-
- A. Anterior horn motor cells.
 - B. Bilateral temporal lobe necrosis.
 - C. Gasserian ganglion affected.
 - D. Inclusion body in Purkinje cell cytoplasm.
 - E. Nuclear inclusion bodies found in periventricular cells.

The answer is E, B, A. Cytomegalovirus infection of the CNS is usually acquired in utero and is characterized by intranuclear inclusion bodies.

Herpes simplex infection of the CNS gives bilateral temporal lobe necrosis (acute necrotizing encephalitis).

Poliomyelitis affects the motor cells of the anterior horns of the spinal cord.

The Gasserian ganglion is a common site of infection by Zoster (varicella) virus (C).

Inclusion bodies in the cytoplasm of the Purkinje cells of the cerebellum (D) is a diagnostic feature of rabies (Negri bodies).

113. For each of the conditions listed on the left select the most appropriate association from the list on the right.

- a. Acute disseminated perivenous encephalomyelitis.

- b. Acute haemorrhagic leukoencephalitis.
- c. Multiple sclerosis.

- A. Complication of septic shock.
- B. Complication of smallpox vaccination.
- C. Experimental model for demyelinating diseases.
- D. Familial disease due to enzyme deficiency.
- E. Unilateral optic neuritis an early symptom.

The answer is B, A, E. This condition follows viral infections such as measles, rubella and may complicate smallpox vaccination.

This condition may follow virus infections or may complicate septic shock.

An early symptom in the relapsing course of multiple sclerosis may be optic neuritis.

Experimental allergic encephalomyelitis (EAE) is an experimental model for demyelinating diseases (C).

There are several familial diseases due to enzyme deficiencies which cause abnormalities of myelination (D); metachromatic leukodystrophy is a deficiency of arylsulphatase.

114. For each of the conditions listed on the left select the most appropriate association from the list on the right.

- a. Amyotrophic lateral sclerosis.
- b. Progressive bulbar palsy.
- c. Progressive muscular atrophy.

- A. Damage to lower motor neurones in spinal cord.
- B. Damage to lower motor neurones in medulla.
- C. Damage to motor and sensory tracts.
- D. Impaired blood flow in anterior spinal artery.
- E. Upper and lower motor neurone damage.

The answer is E, B, A. This variant of motor neurone diseases involves degeneration of both upper and lower motor neurones.

In bulbar palsy the lower motor neurones of the medulla are affected.

In progressive muscular atrophy the spinal cord and lower motor neurones are affected.

Damage to motor and sensory tracts is a feature of Friedreich's ataxia (C).

Acute myelitis may be caused by vascular insufficiency in the spinal cord (D).

115. Which *ONE* of the following is the commonest intracerebral neoplasm?

- A. Astrocytoma.
- B. Ependymoma.
- C. Meningioma.
- D. Oligodendroglioma.
- E. Secondary carcinoma.

The answer is E. The commonest intracerebral neoplasms are secondaries.

Astrocytoma (A) is the commonest type of glioma.

Ependymoma (B) is found in children. Meningioma (C) originates from the arachnoid granulations and presses into the brain tissue from outside.

116. Which *ONE* of the following forms a cystic tumour mass in the cerebellum in children?

- A. Astrocytoma.
- B. Ependymoma.
- C. Glioblastoma multiforme.
- D. Haemangioblastoma.
- E. Medulloblastoma.

The answer is A. Cerebellar astrocytomas in children are usually cystic.

Glioblastoma multiforme (C) is an anaplastic astrocytoma which occurs in the cerebral hemisphere of adults.

Medulloblastoma (E) is derived from nerve cells and occurs in the cerebellum of children; it is not usually cystic.

Haemangioblastoma (D) is a tumour of blood vessels and occurs usually in the cerebellum.

19. Urinary System

117. Which *ONE* of the following is characteristically found in acute diffuse proliferative glomerulonephritis?

- A. Endothelial and mesangial cell hyperplasia.
- B. Fibrinoid necrosis of glomerular capillaries.
- C. Focal sclerosis of glomerular tufts.
- D. Hyalinization of arcuate arteries.
- E. Severe basement membrane thickening.

The answer is A. The characteristic finding in this type of glomerulonephritis is enlargement and hypercellularity of the glomeruli, contributed to by capillary endothelial cell and mesangial cell hyperplasia.

Fibrinoid necrosis of glomerular capillaries (B) and hyalinization of arcuate arteries (D) are seen in malignant phase hypertension.

Focal sclerosis (C) of glomerular tufts is seen in focal glomerulosclerosis. Basement membrane thickening (E) is seen in membranous glomerulonephritis.

118. Rapidly progressive glomerulonephritis is best characterized morphologically by which *ONE* of the following?

- A. Basement membrane thickening.
- B. Crescent formation.
- C. Fibrinoid necrosis of the afferent arteriole.
- D. Interstitial fibrosis.
- E. Mesangial cell proliferation.

The answer is B. Proliferation of the parietal epithelium of Bowman's capsule forms epithelial crescents which fill the capsular space.

Interstitial fibrosis (D) can have many causes but is seen where there is loss of glomeruli with resultant atrophy of the nephron.

119. For each of the ultrastructural features of glomerulonephritis listed on the left select the most appropriate association from the list on the right.

- a. Dense deposits in outer part of basement membrane.
 - b. Dense sub-epithelial deposits.
 - c. Fusion of epithelial cell foot processes.
-
- A. Acute diffuse glomerulonephritis.
 - B. Focal glomerulonephritis.
 - C. Membranous glomerulonephritis.
 - D. Mesangiocapillary glomerulonephritis.
 - E. Minimal change glomerulonephritis.

The answer is C, A, E. The dense deposits on the basement membrane are the 'spikes' seen on the basement membrane on light microscopy; they consist of IgG and complement.

The sub-epithelial deposits consist of IgG and complement and represent trapped small immune complexes.

The only feature of note in minimal change disease is fusion of the epithelial cell foot processes.

120. Which *ONE* of the following is *not* a feature of diabetic kidney?

- A. Crystals in the collecting tubules.
- B. Hyaline nodules at the periphery of the glomerular tuft.
- C. Hyaline thickening of the glomerular capillary basement membrane.

- D. Ischaemic glomerular change.
- E. Papillary necrosis.

The answer is A. Crystals in the collecting tubules are a feature of gout. Hyaline nodules (Kimmelstiel-Wilson) are seen in nodular glomerulosclerosis (B). Basement membrane thickening (C) is seen in diffuse glomerulosclerosis.

As a result of hyaline thickening of the afferent arterioles ischaemic glomerular damage (D) may occur.

Papillary necrosis (E) is commonly seen in diabetic kidneys.

121. For each of the features listed on the left select the most appropriate cause from the list on the right.

- a. Irregular cortical scars related to a deformed calyx.
- b. Multiple small abscesses in renal cortex.
- c. Streaks of suppuration extending from the papillae.

- A. Acute pyelonephritis.
- B. Chronic pyelonephritis.
- C. Infective endocarditis.
- D. Renal artery stenosis.
- E. Systemic hypertension.

The answer is B, C, A. The relationship between cortical scars and calyceal scars is important in differentiating the scarred kidneys of pyelonephritis from other causes of scarring, i.e., hypertension (E).

Infective endocarditis results in septic emboli which cause pyaemic abscesses in the kidneys.

Acute inflammation of the pelvis associated with streaks of pus extending along the medullary rays to the cortex is seen in acute pyelonephritis.

Renal artery stenosis (D) results in a uniform contraction of the kidney, usually unilateral.

122. Which *ONE* of the following is *not* a feature of clear cell carcinoma of the kidney?

- A. Bony secondaries.
- B. Childhood tumour.
- C. Haematuria.
- D. May appear encapsulated.
- E. Renal vein invasion.

The answer is B. The nephroblastoma is a childhood renal tumour. The clear cell carcinomas may appear encapsulated (D) but are malignant and often show renal vein invasion (E) with resultant lung and bone secondaries (A). Haematuria occurs if they extend into the pelvis (C).

123. For each of the conditions listed on the left select the most appropriate association from the list on the right.

- a. Bilateral hydronephrosis.
 - b. Pyonephrosis.
 - c. Unilateral hydronephrosis.
-
- A. Aberrant renal vein.
 - B. Infected staghorn calculus.
 - C. Michaelis-Gutman bodies.
 - D. Narrowing at pelvic-ureteric junction.
 - E. Urethral obstruction.

The answer is E, B, D. Infection of the renal pelvis is often associated with the presence of a calculus in the pelvis.

Other causes of unilateral hydronephrosis include impaction of a stone in the ureter, the presence of a ureteric tumour or an aberrant renal artery (not vein, A).

Michaelis-Gutman bodies (C) are seen in the condition of malakoplakia.

124. Which *ONE* of the following is the commonest type of bladder tumour?

- A. Adenocarcinoma.
- B. Papillary transitional cell carcinoma.
- C. Solid transitional cell carcinoma.
- D. Squamous carcinoma.
- E. Transitional cell papilloma.

The answer is E. The benign papillary transitional cell tumour is the commonest bladder neoplasm.

The transitional cell carcinomas (B, C) are the commonest malignant bladder tumours.

Squamous carcinoma (D) may arise from squamous metaplasia of transitional epithelium or directly from transitional epithelium.

Adenocarcinoma (A) is rare.

20. Locomotor System

125. If the following events were placed in chronological order which would come *fourth*?

- A. Formation of involucrum.
- B. Localized skin infection.
- C. Sequestrum formation.
- D. Subperiosteal abscess.
- E. Suppuration in medullary cavity.

The answer is C. A minor skin infection often caused by penicillin resistant *Staphylococcus aureus* (B) results in blood spread to the bone marrow (E) from where infection spreads through the cortical bone to produce a subperiosteal abscess (D); the presence of pus may result in thrombosis of the nutrient artery which causes death of the diaphyseal bone which forms the sequestrum (C). New bone is produced under the periosteum, forming an encasing sheath of irregular outline, the involucrum (A).

126. For each of the conditions listed on the left select the most appropriate association from the list on the right.

- a. Osteomalacia.
 - b. Rickets.
 - c. Scurvy.
-
- A. Failure of mineralisation of cartilage of epiphyseal growth plate.
 - B. Nephrocalcinosis.
 - C. Osteoid borders around calcified trabeculae.
 - D. Persistent unabsorbed calcified cartilage.
 - E. Subperiosteal new bone formation in several bones.

The answer is C, A, D. Vitamin D deficiency results in failure of calcium absorption and hence failure of calcification of osteoid matrix which is laid down around already mineralized bone.

Rickets is the childhood equivalent of osteomalacia; there is failure of mineralization of the cartilage of the epiphyseal growth plate and this results in deformity.

Vitamin C deficiency in children results in failure of resorption of calcified cartilage (scurbutic lattice).

Nephrocalcinosis (B) occurs in infantile hypercalcaemia.

Subperiosteal new bone formation at several sites (E) is a hallmark of the 'battered baby' syndrome.

127. For each of the conditions listed on the left select the most appropriate association from the list on the right.

- a. Osteoporosis.
- b. Paget's disease of the bone.
- c. Primary hyperparathyroidism.

- A. Collection of eosinophils.
- B. Decrease in amount of bone with normal mineralization of matrix.
- C. Fibrous tissue around and within trabeculae.
- D. Mosaic pattern of cement lines.
- E. Poor formation of bone at epiphyseal line.

The answer is B, D, C. This may be due to decreased bone formation, increased resorption or a combination.

The mosaic pattern indicates a disturbance of normal resorption and reconstruction.

Osteitis fibrosa is a feature of hyperparathyroidism in which there is osteoclastic resorption of the centres of trabeculae with fibrous replacement and surrounding fibrosis.

Collection of eosinophils in bone (A) are seen eosinophil granuloma of bone.

Bone is poorly formed in the hereditary condition osteogenesis imperfecta (E).

128. Which *ONE* of the following is the commonest tumour in bone?

- A. Benign chondroblastoma.
- B. Chondrosarcoma.
- C. Giant cell tumour.
- D. Secondary carcinoma.
- E. Osteosarcoma.

The answer is D. Secondary tumours are more common than primary bone tumours, occurring in 70 per cent of patients with disseminated malignant disease.

129. Which *ONE* of the following is *not* a feature of osteosarcoma?

- A. Fifty per cent of tumours occur around the knee.
- B. Lung secondaries common.
- C. May be associated with Paget's disease of bone.
- D. Peak incidence between 10 and 25 years of age.
- E. Usually metastasize to lymph nodes.

The answer is E. Lymph node metastases are a feature of carcinomas rather than sarcomas, and osteosarcoma typically metastasizes to the lung (B).

The usual site for osteosarcoma is in a long bone, the femur and tibia being especially common (A).

Osteosarcoma is a tumour of young people (D) but may occur in the elderly when it is usually associated with Paget's disease of bone (C).

130. For each of the types of tumour listed on the left select the most appropriate association from the list on the right.

- a. Chondrosarcoma.
- b. Chordoma.
- c. Ewing's tumour.

- A. Giant cells are a prominent feature.
- B. Large cystic tumour arising in buttock.
- C. Sacrococcygeal tumour consisting of large pale cells.
- D. Tumour cells may contain glycogen.
- E. Urinary catecholamine elevated.

The answer is B, C, D. Chondrosarcoma are often bulky, gelatinous cystic tumours arising from the pelvic bones.

Chordomas arise in the sacrococcygeal region or at the spheno-occipital region; the tumour cells often contain droplets of mucoid material.

Ewing's tumour usually occurs in children and consists of sheets of small cells which may contain glycogen. Giant cells are a feature of the giant cell tumour of bone or osteoclastoma (A). Urinary catecholamines are elevated (E) in neuroblastoma, a childhood tumour which may be difficult to distinguish from Ewing's tumour histologically.

131. Which *ONE* of the following is *not* a feature of rheumatoid arthritis?

- A. Foreign body giant cell reaction to crystals.
- B. Frondose, inflamed synovium.
- C. Necrosis of subcutaneous collagen.
- D. Pannus formation.
- E. Prominent lymphoid germinal centres within hypertrophied villi.

The answer is A. A foreign body giant cell reaction to crystals is characteristic of gout.

132. Osteoarthritis most commonly affects which *ONE* of the following sites?

- A. Ankle joint.
- B. Costchondral joint.
- C. Knee joint.
- D. Metacarpophalangeal joint.
- E. Proximal interphalangeal joint.

The answer is C. Osteoarthritis affects principally large load bearing joints, the knee and hip being most severely affected. Smaller joints develop osteoarthritis as a result of repeated trauma.

The small joints of the hand (D, E) are the usual site of rheumatoid arthritis.

133. For each of the conditions listed on the left select the most appropriate association from the list on the right.

- a. Malignant fibrous histiocytoma.
 - b. Myositis ossificans.
 - c. Rhabdomyosarcoma.
- A. Commonest benign tumour of soft tissues.
 - B. Commonest sarcoma of late adult life.
 - C. Commonest soft tissue sarcoma of children.
 - D. Follows muscular injury.
 - E. Results in deformity of hand.

The answer is B, D, C. This tumour recurs after surgery, and has a high incidence of metastases.

This is a benign condition which histologically may be mistaken for an osteosarcoma.

This is derived from striated muscle, and the cells are identified by the presence of cross striations.

The commonest benign tumour of soft tissues is a lipoma (A).

Dupuytren's contracture results in deformity of the hand (E).

21. Female Reproductive System

134. If the following clinical and pathological features were in chronological order which would come *fourth*?

- A. Cervical biopsy shows cervical intraepithelial neoplasia, grade III.
- B. Cone biopsy of cervix shows invasive squamous carcinoma.
- C. Early onset of sexual activity.
- D. Frozen pelvis.
- E. Ureteric obstruction with uraemia.

The answer is D. Early onset of sexual activity and promiscuous sexual activity (C) are associated with increased risk of cervical cancer; biopsy of the cervix (A) shows cervical intraepithelial neoplasia grade III. An excision or cone biopsy of the cervix is performed (B) which reveals invasive carcinoma; cervical cancer invades locally in the pelvis (D) and eventually causes uraemia by ureteric obstruction (E). Herpes virus type 2 and human papillomavirus have been implicated as possible carcinogenic agents.

135. For each of the conditions listed on the right select the most appropriate association from those listed on the left.

- a. Atypical hyperplasia of the endometrium.
- b. Endometrial adenocarcinoma.
- c. Mixed homologous sarcoma.

A. Aberrant endometrial tissue.

- B. Confined to uterus until a late stage.
- C. Irregular glandular proliferation without stromal proliferation.
- D. Proliferation of glandular and stromal endometrium.
- E. Tumour of endometrial stromal and glandular origin.

The answer is C, B, E. This is associated with increased risk of progression to cancer of the endometrium.

Due to the thickness of the myometrium invasive endometrial adenocarcinoma remains confined to the uterus for a long time.

Stromal sarcomas may be pure or mixed (i.e., contain adenocarcinoma). Homologous tumours contain only stromal cells; heterologous contain extra uterine components.

Aberrant endometrial tissue (A) present in ovaries, Fallopian tubes, appendix, etc. is known as endometriosis. Proliferation of glandular and stromal endometrial tissue (D) occurs in cystic glandular hyperplasia which is not a premalignant condition.

136. For each of the types of ovarian tumour listed on the left select the most appropriate association from the list on the right.

- a. Cystic teratoma.
 - b. Granulosa cell tumour.
 - c. Mucinous cystadenoma.
-
- A. Associated with virilization.
 - B. Benign tumour of germ cell origin.
 - C. Histologically identical to seminoma.
 - D. May cause endometrial hyperplasia.
 - E. Pseudomyxoma peritonei.

The answer is B, D, E. Ovarian cystic teratomas are invariably benign and contain a mixture of well-differentiated tissues. This is the commonest ovarian tumour (15-20 per cent).

The granulosa cell tumour is derived from the sex cord stroma and frequently secretes oestrogen, producing precocious puberty, endometrial hyperplasia and cancer.

Mucinous cystadenoma are benign, but may rupture shedding seedlings of mucin secreting neoplastic cells into the peritoneal cavity.

Virilization (A) occurs in tumours of sex cord origin which secrete androgens (Sertoli-Leydig cell tumours).

The dysgerminoma is histologically identical to the testicular seminoma (C).

137. For each of the conditions listed on the left select the most appropriate association from the list on the right.

- a. Choriocarcinoma.
- b. Ectopic pregnancy.
- c. Hydatiform mole.

- A. Atypical trophoblastic proliferation.
- B. Chromosomal constitution YY.
- C. Common tumour in Great Britain.
- D. May occur with an intrauterine contraceptive device in site.
- E. Neoplastic allograft in mother.

The answer is E, D, A. This is a malignant tumour of cyto- and syncytiotrophoblast and is of purely fetal origin.

Ectopic pregnancy usually results from a tubal abnormality but the risk is increased in women who become pregnant with an IUCD in site.

In hydatiform mole there is an abnormal development of trophoblast which is genetically of paternal origin and has the chromosomal pattern XX.

Choriocarcinoma is a rare tumour in Great Britain (C) but is common in the Far East.

138. Which *ONE* one of the following is *not* a feature of cystic mastopathy?

- A. Apocrine metaplasia of glandular epithelium.
- B. Cyst formation.
- C. Formation of new breast lobules.
- D. Paget's disease of nipple.
- E. Sclerosing adenitis.

The answer is D. Paget's disease of nipple is intraepithelial spread of breast cancer cells. It occurs when ductal carcinoma spreads along major ducts to the nipple.

The others are all features of benign cystic mastopathy.

139. For each of the types of breast tumour listed on the left select the most appropriate association from the list on the right.

- a. Giant intracanalicular fibroadenoma.
- b. Intraduct carcinoma.
- c. Medullary carcinoma.

- A. Bleeding from the nipple.
- B. Heavy lymphocytic infiltrate.
- C. May progress to sarcoma.
- D. Multiple small nodules.
- E. Pre-invasive neoplasm.

The answer is C, E, B. Giant intracanalicular fibroadenoma occurs in older women and may undergo malignant transformation to a sarcoma.

The presence of malignant cells confined within ducts is a form of carcinoma-in-situ.

This histological variant of breast cancer is characterized by a lymphocytic infiltrate which may be responsible for slightly better prognosis.

Bleeding from the nipple (A) is seen in papillomas of the nipple ducts. Benign fibroadenomas often present as multiple small nodules (D) in the breast.

22. Male Reproductive System

140. Which *ONE* of the following is *not* true of prostatic carcinoma?

- A. Acid phosphatase level raised in serum.
- B. Alkaline phosphatase detected in tumour cells.
- C. Metastases are osteoplastic.
- D. Microacinar adenocarcinoma.
- E. Usually arises at periphery of the gland.

The answer is B. Alkaline phosphatase is not produced by prostatic carcinoma, although the presence of bone metastases (C) may result in a rise in serum alkaline phosphatase. Acid phosphatase (A) of prostatic origin can be detected in the serum in many cases.

141. For each of the types of testicular tumour listed on the left, select the most appropriate association from the list on the right.

- a. Differentiated teratoma.
 - b. Embryonal carcinoma.
 - c. Seminoma.
-
- A. Commonest testicular tumour in the elderly.
 - B. Consists of sheets of large pale cells and lymphocytes.
 - C. Consists of trophoblastic elements.
 - D. Occurs before puberty.
 - E. Poor prognosis type of teratoma.

The answer is D, E, B. Differentiated teratoma resembles the ovarian cystic teratoma, but is malignant in the male. It occurs before puberty.

Embryonal carcinoma is an anaplastic variant of teratoma and have poor prognosis.

Seminoma is the commonest type of testicular tumour, occurring usually in the fourth decade and consists of sheets of large pale cells and lymphocytes.

The commonest testicular tumour in the elderly (A) is a lymphoma. A teratoma consisting of trophoblastic elements (C) resembles choriocarcinoma and may secrete HCG, which may be used as a serum marker.

142. Which one of the following is *not* associated with male infertility?

- A. Alcoholic cirrhosis.
- B. Germ cell aplasia.
- C. Sperm count of 70×10^9 /litre.
- D. Testis small with prominent Leydig cells.
- E. XXY chromosomal pattern.

The answer is C. A sperm count of less than 50×10^9 /litre is associated with significant decrease in fertility.

Cirrhosis (A) is associated with increased endogenous oestrogen secretion. Germ cell aplasia (B) is seen in the del Castillo syndrome (or chromatin - negative Klinefelter's syndrome).

Small testes with loss of tubules show pseudohyperplasia of Leydig cells (D). Klinefelter's syndrome is associated with XXY chromosome pattern.

23. Endocrine System

143. For each feature on the left select the most appropriate association from the list on the right.

- a. Multiple peptic ulcers.
 - b. Nephrocalcinosis.
 - c. Virilisation.
-
- A. Adrenocortical adenoma.
 - B. Islet cells tumour of the pancreas.
 - C. Pheochromocytoma.
 - D. Parathyroid adenoma.
 - E. Thyroid adenoma.

The answer is B, D, A. Islet cell tumours of the pancreas may secrete gastrin which results in hypersecretion of gastric acid with resultant gastric and small intestinal peptic ulceration (Zollinger-Ellison syndrome).

Primary hyperparathyroidism is a result of parathyroid adenoma which results in hypercalcaemia, and deposition of calcium in and around renal tubules.

An adrenocortical adenoma may result in abnormal development due to excess secretion of androgens. Virilisation may also occur due to an enzyme deficiency (21-hydroxylase).

Phaeochromocytoma (C) is a tumour of the adrenal medulla which produces hypertension.

144. For each of the thyroid conditions on the left select the most appropriate association from the list on the right.

- a. Hyperthyroidism.
- b. Hypothyroidism.
- c. Non-toxic goitre.

- A. Adenoma.
- B. Auto-immune disease.
- C. Dyshormogenesis.
- D. Graves' disease.
- E. Iodine deficiency.

The answer is D, B, E. Graves' disease is caused by excessive secretion of T3 and T4, as a result of diffuse thyroid hyperplasia, caused by thyroid stimulating antibody.

Auto-immune thyroiditis is characterized by lymphoid infiltration and destruction of thyroid acini; Hashimoto's disease is the commonest type.

Iodine deficiency is the commonest cause of non-toxic goitre. Dyshormogenesis (C) results from genetically programmed lack of an essential hormone, i.e., dehalogenase.

Approximately 1 per cent of adenomas (A) are functionally active.

145. For each effect on the left select the most appropriate pituitary lesion from the list on the right.

- a. Acromegaly.
- b. Cushing's syndrome.
- c. Sheehan's syndrome.

- A. Craniopharyngioma.
- B. Auto-immune disease.
- C. Hyaline-change in pituitary basophils.
- D. Post partum necrosis.
- E. Rathke's cyst.

The answer is B, C, D. Eosinophil-cell adenomas secrete growth hormone which produce acromegaly in the adult, and result in gigantism when present before the epiphyse fuse.

Excess ACTH results in increased production of glucocorticoids by adrenals. Hyaline-change is a constant finding in the anterior pituitary.

Post partum hypotension results in ischaemic necrosis, in the enlarged pituitary of pregnancy; this results in panhypopituitarism.

Craniopharyngioma (C) and Rathke's cyst (E) are benign lesions of the suprasellar region which may result in anterior pituitary damage by pressure necrosis.

146. Which one of the following is *least* likely to lead to metastases by the blood stream?

- A. Follicular carcinoma of thyroid.
- B. Giant cell carcinoma of thyroid.
- C. Medullary carcinoma of thyroid.
- D. Papillary carcinoma of thyroid.
- E. Small cell anaplastic carcinoma of thyroid.

The answer is C. Medullary carcinoma consists of a neoplastic mass of C-cells in a stroma which may contain amyloid. It may be associated with multiple endocrine adenomas in other organs.

24. Skin

147. Which *ONE* of the following is not a virus infection of the skin?

- A. Condyloma acuminatum.
- B. Molluscum contagiosum.
- C. Pemphigus vulgaris.
- D. Verruca vulgaris.
- E. Zoster.

The answer is C. Pemphigus vulgaris is an inflammatory condition characterized by the presence of intraepidermal bullous formation; there is circulating IgG class antibody to intercellular substance of squamous epithelium.

148. Dermatitis herpetiformis is associated with which *ONE* of the following conditions?

- A. Ankylosing spondylitis.
- B. Coeliac disease.
- C. Diverticulitis.
- D. Emphysema.
- E. Whipple's disease.

The answer is B. The majority of patients with dermatitis herpetiformis have small intestinal villous abnormalities, and the intestinal lesions will repond to gluten withdrawal.

149. For each of the types of skin lesion listed on the left select the most appropriate association from those on the right.

- a. Basal cell carcinoma.
- b. Bowen's disease.
- c. Moluscum sebaceum.

- A. Squamous carcinoma-in-situ on the legs.
- B. Squamous carcinoma-in-situ on sun-exposed skin.
- C. Tumour of sweat gland.
- D. Tumour-like self-healing lesion.
- E. Very rarely metastasizes.

The answer is E, A, D. Basal cell carcinomas (rodent ulcers) are locally aggressive and destructive tumours which very rarely metastasize.

Carcinoma-in-situ of the skin may develop in areas not exposed to sunlight.

The importance of molluscum sebaceum is that it resembles squamous carcinoma histologically, but is entirely benign.

150. For each of the types of pigmented skin lesions listed on the left select the most appropriate association from the list on the right.

- a. Compound pigmental naevus.
- b. Lentigo maligna.
- c. Nodular melanoma.

- A. Growth phase vertical only.
- B. Increase in basal layer melanocytes.
- C. Melanocytes in dermis and epidermis.
- D. Presents on soles of feet.
- E. Slow-growing flat pigmented lesion.

The answer is C, A, E. Pigmented naevi are benign conditions in which there are increased numbers of melanocytes; the compound naevus is the commonest type in childhood. Melanocytes are in dermis and epidermis.

The lentigo maligna (Hutchinson's melanotic freckle) is essentially a malignant melanoma-in-situ. It is a slow-growing flat pigmented lesion.

Malignant melanomas have a horizontal and vertical growth phase; nodular melanoma appears to have a vertical phase with no preceding horizontal phase. Increased basal layer melanocytes are seen in a lentigo (B). A malignant melanoma which presents on the soles or palms is known as an acral lentiginous melanoma (D).

25. Parasitic Diseases

151. For each of the features of malaria listed on the left select the most appropriate association from the list on the right.

- a. Blackwater fever.
 - b. Malignant tertian fever.
 - c. Tropical splenomegaly syndrome.
-
- A. Acute intravascular haemolysis.
 - B. Overwhelming parasitaemia with shock.
 - C. Pericapillary ring haemorrhages.
 - D. Regresses with long-term antimalarial therapy.
 - E. Release of merozoites from burst RBC.

The answer is A, E, D. Acute haemolysis occurs in non-immune patients following quinine treatment for falciparum malaria.

Fever in malaria is either tertian (every 2 day) or quartan (every 3 days) and is due to release of merozoites from RBC's. Malignant tertian fever is due to *P. falciparum*.

Splenomegaly may occur in adults with falciparum malaria; its pathogenesis is uncertain.

Overwhelming parasitaemia with vascular collapse (B) is seen in algid malaria shock syndrome. Pericapillary ring haemorrhages are seen in cerebral malaria.

152. For each of the lesions on the left select the most appropriate association from the list on the right.

- a. Leishman-Donovan bodies in Kupffer cells.
 - b. Meningo-encephalitis.
 - c. Self-healing, crateriform ulcer.
-
- A. African trypanosomiasis.
 - B. Cutaneous leishmaniasis.
 - C. Muco-cutaneous leishmaniasis.
 - D. South-American trypanosomiasis.
 - E. Visceral leishmaniasis.

The answer is E, A, B. In visceral leishmaniasis ('Kala-azar') the organisms infect macrophages.

In African trypanosomiasis the flagellates stay in the circulation, enter the central nervous system and alter the sleep rhythm.

In cutaneous leishmaniasis a papule develops at the site of the insect bite and ulcerates.

In mucocutaneous leishmaniasis (C) non-healing secondary ulcers occur months or years after the primary lesion. South American trypanosomiasis (D) is characterised by infection of organs by the parasite (Chagas' disease); the loss of bowel ganglion cells is a notable feature.

153. If the following events were placed in chronological order, which would come *fourth*?

- A. Hepatic abscess formation.
- B. Ingestion of contaminated water.
- C. Lysis of epithelial cells in caecum.
- D. Release of motile trophozoites.
- E. Trophozoites enter portal blood.

The answer is E. Water is contaminated (B) by human faeces containing cysts; the cysts release 4 motile trophozoites in the intestine (D). If these are pathogenic they cause necrosis of intestinal cells (C), and invade the submucosa entering the portal blood stream (E) and resulting in a hepatic abscess (A).

154. If the following events were placed in chronological order, which would come *fourth*?

- A. Adult worms migrate to the perivesical veins.
- B. Cercaria released from snail.
- C. Human epidermis penetrated.
- D. Maturation in the portal veins.
- E. Miracidia hatch from eggs in fresh water.

The answer is D. Eggs excreted in faeces or urine hatch out in fresh water (E) and release miracidia which invade snails; cercaria are released from the snail (B) and invade human skin (C) losing their tails. The larvae invades vessels, reaches the liver and enters the portal circulation (D) where it matures and the adults migrate to i.e., the perivesical veins (A). The adults lay eggs which are excreted by the host.

155. For each of the lesions on the left select the most appropriate parasite from the list on the right.

- a. Cyst in the right lobe of liver.
- b. Elephantiasis.
- c. Subcutaneous nodules, blindness.

- A. *Echinococcus granulosus*.
- B. *Onchocerca volvulus*.
- C. *Opisthorchis sinensis*.
- D. *Taenia solium*.
- E. *Wuchereria bancrofti*.

The answer is A, E, B. Visceral cysts containing daughter cysts and scolices are the pathological features of hydatid disease.

In lymphatic filariasis lymphatics are blocked by the adult worms, giving gross lymphoedema and reactive fibrosis of soft tissues. Ocular damage due to the presence of the microfilaria in the eye are the most serious effects ('river blindness').

The adult *Opisthorchis* attaches to the biliary epithelium, and may promote the development of cholangiocarcinoma (C). Man is the definitive host for *T. solium* (the pork tapeworm).